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EXPLANATORY NOTE

Illustrated articles are marked with an asterisk (*). New shop equipment as described in the departments "Shop Equipment News" and "Condensed Clipping Index of Equipment" with a double dagger (‡). Cross references to a particular initial work may apply also to its derivatives. The cross references condense the matter and assist the reader but are not to be regarded as complete or conclusive. So, if there were a reference from "Milling" to "Jigs and Fixtures," and if the searcher failed to find the required article under the latter topic, he should look through the "Milling" entries, or others that the subject might suggest, as he would have done had there been no cross reference. The plural of any given item may not necessarily follow the singular immediately, as the items are listed in alphabetical order. All articles written by any given author are listed directly under his name in the special author's index which starts on page 13. Articles that are not credited to any author may be found under the heading "No author," listed under "N" in the Author's Index.

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Using Cost Figures to Cut Costs

Cost Figures Show How to Eliminate Unnecessary Supervision—Rearrangement of Work Cut Labor Cost and Increased Weekly Wages

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MANUFACTURERS not infrequently say, as an argument against cost accounting, "What is the use of knowing my costs? I can't use them as a basis for setting my selling prices; competition tells me what my selling price shall be."

Probably it is to have a guide in determining a profitable selling price that leads most men to install cost finding methods. Actually there is much to the argument that the selling price is determined more by competition than by cost figures. But the biggest value of a cost system is, I feel, to show that extravagances or inefficiencies exist, before they run into heavy losses, and to indicate how the cost of a product may be cut. In short, cost figures properly developed are a guide to correct manufacturing, selling and financing. They make the policies of the business.

Listing Overhead

A part of every modern cost system is a sheet for each department of the shop on which each item of overhead expense is listed. The normal amount of each item for normal operation of the department is listed and against it is the actual amount for the month. At the bottom of the sheet are shown the normal productive hours as against the actual.

In one shop, this sheet showed that productive department X operated only 3,000 hours as against 8,000 normal. But the charge for the foreman's salary remained constant. This suggested, as the entire shop was operating subnormally that perhaps the foreman of department X could be dropped or put on other work and that temporarily the foreman of department Y could handle both departments. This was done.

The expense analysis showed that department X ordinarily used four truckers, which when work fell off had been reduced to three. But it also showed that there was only about 40 per cent of the normal amount of product to be moved, so one more trucker was dropped. A stock chaser seemed to be needed and as he was a good man, he was kept, but he was given in addition to his regular duties those of another factory clerk who was let out.

In this shop, the force had been cut by guess as soon as production dropped, but the first of the month the expense analysis showed the manager how to lop off $3,500 a month more of the expense. He had actual figures to guide him as to overhead expense.

He also had actual figures on which to base the reduction of productive workers, for his labor reports showed him beyond doubt which of his workmen were efficient and should be kept, and which were mediocre and should be dropped. He did not have to rely on the opinion of a foreman who might be inclined to keep a worthless brother-in-law on the payroll.

So much for the use of a cost system when business slumps. It can be made to show the possibilities of savings when operation is normal.

In another shop, the monthly statement of operations which is drawn up as part of the cost finding showed that the reduced selling prices which were forced upon the company had turned profits into losses. The first thought was to overcome the loss by reducing wages but this seemed inadvisable because of a touchy labor situation. In fact because the men's wages had not kept up with the increases for similar work in other concerns it seemed necessary to enable the men to earn more.

Further scrutiny of the detailed cost figures showed that the losses were due to four causes.

First, much time was lost due to machine operators waiting for work, the entire shop at times being held up, especially in the morning, waiting for the moving gang to bring in work for them.

Second, there was a great deal of non-productive time due to frequent changes of set-up for various sizes, with the possibility that half the machines would change from 6-in. to 8-in. and back to 6-in. again in the same day, and the night gang changed to 8-in. again in the middle of the shift.

Third, frequently the foreman of the night gang would have to shut down half his machines and take the men out into the yard to bring in stock to keep them busy, for there was no moving gang on at night.

Fourth, the greater part of the foreman's time was taken up trying to keep his machines busy, so that he had little or no time to give to inspection, supervision and education.

The first three of these faults were plainly shown by the cost reports—borne out by personal observation. Investigation showed the possibilities of both reducing costs and increasing somewhat the earnings of the men.

The machine shop in this concern was the "neck of the bottle" from a production and shipping point of view. This department was considerably behind the foundry although it was running a day gang of 50 men and a night gang of 25 men.

There was no attempt at planning. The foreman gave verbal orders to the moving gang boss to bring in semi-finished stock as the occasion required, or the moving gang boss would send in stock as it suited his convenience.

Labor was indifferent and inefficient, took no interest in the work, was content to sit and wait for work to be brought to the machines, worked at a slow rate and

stalling was prevalent. The men were paid on a daily wage scale which varied according to length of service and the bargaining ability of the individual. They had no incentive to make them do more or better work.

The problem was to make it possible for the men to earn more money and to get a production increase which would not only offset the higher wages but decrease costs as well.

The first step was to set up planning machinery, put in a production and time-keeping booth and put into use the following forms: (1) Weekly requisition of parts to be machined—from production and shipping office; (2) daily work schedule—made out by booth man and foreman from weekly requisition; (3) moving gang move order—made out twice daily; (4) individual job ticket; (5) weighman's report of stock finished; (6) daily inventory of goods in process at end of shift.

These forms gave control of stock and insured a supply of parts at all times.

Meanwhile, time studies were taken on the various operations and, when the planning machinery was running smoothly, piece rates were put on all productive operations. In order to enlist the interest and co-operation of the non-productive workers, it was agreed to pay them as a bonus, the general average increase in pay above the base day rate earned by the men on piece rates. This included the foreman, booth men, crane operator, crane helper, weighman, repairman, toolroom men and general cleaner. In this way, every man in the department was interested in getting out more production, for each received his share in the increase.

The results which have been obtained are shown by the following figures. The "before" figures are monthly averages for four months in 1920; the "after" figures are monthly averages for five months in 1921 after the new methods were in operation.

	Before	After	Improvement per Cent
Total production in units	278.86	473.67	69.7
Cost per unit	$11.08	$8.30	25.1
Average wage	$4.37	$6.12	32.0

These figures are taken from the regular cost records of the concern. They are not hopes or guesses.

While the increased production and decreased costs undoubtedly made the biggest appeal to the owners; yet they say that there are other although perhaps less tangible results that are of nearly equal value. These are:

(1) Production control by the production department which knows every day just where the shop stands on orders to be machined, and is therefore able to meet promises of shipments on time.

(2) Superior quality of workmanship and better inspection which comes from relieving the foreman of stock chasing and so gives him an opportunity to inspect and supervise the work.

(3) Increase in shop efficiency, morale, care of machines, pride in work, and general shop cleanliness and orderly appearance.

These results came in a shop that was as well managed as the average even before the betterments were made.

Here is a case taken from the brass spinning department of a machine shop:

Spinning is performed on a light, high-speed lathe. In this operation, the workman has to bear heavily with a tool against the rapidly revolving work on the lathe.

The bearings of these spinning lathes wear rapidly and when worn the lathes vibrate badly. This vibration is transmitted to the workman and is so unpleasant that most workmen will lay off rather than suffer it.

In one plant the cost reports showed that on an average four out of twelve spinning lathes were out of service all of the time for this reason, although it takes but a few hours to replace the bearings. Frequently they were down five or six weeks because no extra bearings were kept in stock.

To an obvious suggestion that a dozen sets of bearings be carried in stock, the management objected that this would tie up several hundred dollars. They denied that the investment would be worth while.

As the spinning operation was the "neck of the bottle," there was no difficulty in proving that the production of the entire plant was reduced by approximately $10,000 a month on a product for which there was a ready sale at all times. Of this amount, about $5,000 a month was profit and overhead expense, which was a net loss to the concern. When these figures were realized by the management, extra bearings were put in stock with the result that now the lathes are never down more than a few hours.

This condition, and the loss it was causing were shown by the cost reports which were excellently designed to give not only cost figures but an index of the manufacturing efficiency. The trouble was that the management had not been making full use of its cost system.

The expense analysis in another plant indicated that for the work done the expense of the maintenance department was too high. This concern had its maintenance force divided into five gangs of carpenters, electricians, steam-fitters, concrete men and machine repair men. Each gang had a foreman who was paid from $200 to $250 a month.

It was possible to bring all gangs closely under the supervision of a master mechanic and do away with the foreman, by appointing one good workman in each gang to be gang leader. The gang leaders were paid $125 a month. The saving on foremen's salaries paid the salary of the master mechanic and left a net saving of $3,600 a year. The maintenance work is done as well and as promptly as before.

In another plant the cost records showed that there was an excessive maintenance cost and at the time, entirely too much idle machine time due to breakdowns An investigation showed that no attention was given to machines, belting, shafting or motors until a breakdown actually occurred. Then several maintenance men would make a grand rush to the spot. It was necessary to keep on the payroll enough men to handle these emergencies when they arose; but these men were idle a good part of the time.

The obvious remedy was to eliminate the emergencies as far as possible. This was done by making the maintenance gang act as inspectors who now patrol the plant according to schedule, examining all machines and equipment for signs of wear. When they find a place where it appears that repairs are soon to be needed they make them before serious trouble appears. This gives the foremen a chance to schedule work ahead to other machines and so reduce the loss of production. But by preventing emergency breakdowns it allows all of the maintenance and repair work to be done with just one-half as many maintenance men. In this plant, that alone is a saving of $9,200 a year.

Careful study of cost figures may result in sweeping changes not only in policies but in methods of wage

payment, layout of the shop and methods of working. This is exemplified by the experience of the management of a shop which operated its own foundry. Their cost figures had suggested the possibility of increasing production without adding to the force. That of course would mean reduced costs.

This shop turned out thin-sectioned, cored iron castings. It was a repetitive, quantity production shop. The castings were standard; there was no job work.

In the effort to increase production, time studies were taken and piece rates set which were based on fair standards of production. The men, however, not only refused to accept the piece rates; they refused to go beyond the daily tasks to which they were accustomed. The owners could not accept this refusal. It was necessary to devise means which would so alter the conditions of work that they would be without traditions of wage incentive on output. This was the problem.

Under the old method of working, a molding team consisting of a molder and helper, "put up" a stated number of molds, after which they poured off the molds themselves. Another set of men appeared at the end of the molders" period of duty and while two of them "cut" the sand, the remainder "shook out" the castings from the molds and removed the castings to the cleaning room.

Under the new method, the molders mold all day and do nothing else. A special team, equipped with a large ladle on an overhead track, does the pouring, which goes on concurrently with the molding, the molds being conveyed from the molding room to the pouring room by storage battery trucks. As fast as the molds are poured, they are taken on the trucks to a shakeout pit where they are lifted in groups of twelve by an electric hoist and the sand removed from the castings. As soon as the shakeout is completed, the castings are wheeled to the cleaning room.

Meanwhile the sand, which has been dumped into the shakeout pit, is removed by an elevator and passed through a sand treating machine and a cooling elevator into one-yard dump cars. These cars run on a narrow gage track above the molding sand hoppers, and the treated sand is dumped into the top of the hoppers. Each molder works below a sand hopper. The molders are thus kept constantly supplied with treated sand, this arrangement removing all limit to their output, aside from their own natural limits of physical capacity. Physical limits of the molders' capacity are extended by so disposing the hoppers and the trucks which receive the molds as to minimize the lifting which a molder is required to do.

In commenting upon the results which are stated below, it must be pointed out that the improvement shown was accomplished in spite of the excellent work which was done by the molders under the old system. There were no more industrious or efficient workers in the plant than the old molders. That this is true is proved by the unfailing evidence of time studies, which disclose the uniformity of individual performance times that connotes good work.

Here are the results from the changes:

	Per Cent
Average monthly production increase per molding team	62.9
Month's average production increase best molding team	78.1
Maximum individual team increase (one day only)	106.0
Monthly average wage increase—molders	26.7
Monthly average wage increase—all employees	16.7
Average labor and expense cost reduction	18.5

These are actual figures, but they are taken at a time when, due to lack of orders, the foundry is running much below capacity.

Based on the cost analyses, it appears certain that at normal activity of the plant, the cost per unit will be reduced a trifle more than 32 per cent due to the increased production per man.

Looked at another way, the reduction already actually accomplished enables the foundry to turn out its old daily production at a saving of $127.24 per day or a little more than $38,000 a year. That is considerably more in one year than the total cost of making the changes.

It should be clear from these instances that properly designed cost figures can be made to show unerringly where betterments are possible. Without them, it is necessary to study every process and operation in the plant indiscriminately—an ineffective and time consuming way.

The cost system should not be a thing apart from the general accounting of the business. Formerly business men found from the statement of condition—or balance sheet—and the statement of operations, how they stood at the end of the year. They tried—usually without success—to find out *why* they had made or lost money. But these financial statements show the business as a lump. The figures must be divided to show the various activities of the business, and the reports must analyze operations and conditions to show what actually goes on. When the general accounting is refined so that this is done, we have a cost system.

Keeping the Customer Satisfied

A well known lathe manufacturer who takes pride in the accuracy and reliability of his product, received a letter from a customer some hundreds of miles away, to the effect that a recently shipped lathe was not performing in a satisfactory manner. The customer stated that when a bar was placed on centers, turned for half its length, its position reversed and the remaining length turned, the two cuts would not be concentric in relation to each other; this proved the spindle to be not round, or out of alignment, or something. The closing paragraph of the letter informed the manufacturer that the defective lathe was being prepared for re-shipment to the factory.

The manufacturer immediately wired the cutsomer as follows: "Do not ship lathe. Am leaving for X tonight."

Arriving at the customer's factory after a tedious journey, he asked to see the lathe. A single glance was sufficient to reveal the "pug-nose" on the center, the result of having been driven to place with a hammer or other convenient weapon in the hands of the overzealous workman who set up the lathe in the customer's shop.

The center was not hardened. The manufacturer started up the lathe and, with a suitable tool, had the center redressed smooth and true in a very few seconds. The same test of bar turning as before now being applied, the two cuts were found to meet so exactly that the meeting point could be determined only by close observation.

The manufacturer was not in the plant half an hour; had not, in fact, even removed his overcoat. He lost two or three valuable days on the round trip and traveled nearly a thousand miles—to dress a lathe center, for the damage to which he was in no way responsible; but he left a satisfied and somewhat apologetic customer.

Supplying Oil to 2,000 Automatic Screw Machines

Oil Pumped from Tank Cars to Storage Tanks—Centrifugal Machines Separate Used Oil from Chips—An Elaborate System of Reclamation and Distribution

By E. C. HENN

IN THE Coit Plant of The National Acme Company at Cleveland, Ohio, where more than 2,000 multiple-spindle automatic screw machines and secondary operation machines are housed under one roof and over a floor space of more than ten acres, the supply of cutting lubricant is of vital importance. Storage, distribution and reclamation are three significant factors of the problem, the immensity of which is readily appreciated considering the great variety of materials cut and the volume of different lubricants used each working day.



FIG. 1. SOME OF THE OIL SEPARATORS

Operating at normal capacity, this plant turns out over a million and a half parts a day. Almost all of this work has its first operation performed in the automatic screw machine department. Not infrequently, the parts are completed upon the automatics. However, when conditions prohibit completion on the automatics, they are finished in the auxiliary or secondary screw machine department.

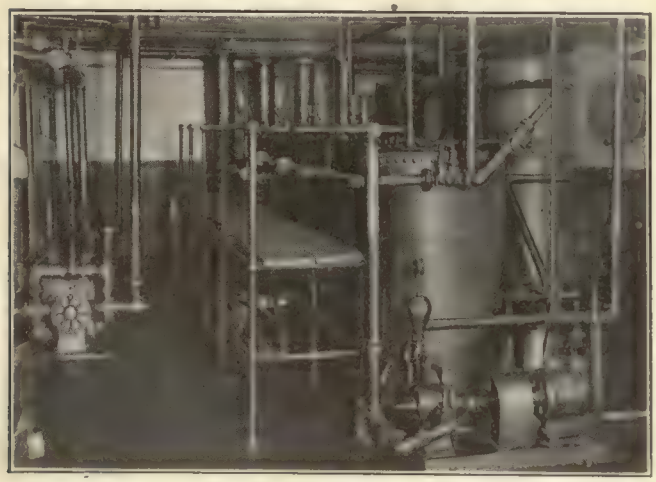


FIG. 4. THE RECLAMATION PLANT

Production in the automatic screw machine department is not interrupted during the working day by the gathering of work from the machines. When the operators leave their machines at the end of the shift, a night crew collects the parts and turnings from the automatics and takes the material in metal pails to the cleaning department where the first step in the reclamation process is conducted.

In this department, the pails are emptied into centrifugal oil separators where practically all of the oil adhering to the turnings and finished product is reclaimed and piped into the central storage and reclaiming plant. There are ten of these centrifugal separators, some of which can be seen in Fig. 1. One or more, as the quantity of production may require, are devoted to the reclamation of a certain type of lubricant. For example, four separators may be operating for the reclamation of lubricant from brass parts and turnings, five devoted to certain type steel parts and turnings and the remainder reclaiming a lubricant used in the cutting of another type of steel. A close-up view of one of the separators is shown in Fig. 2.



FIG. 2. CLOSE-UP VIEW OF ONE OF THE SEPARATORS

The storage and reclaiming plant is built under the ground floor of the building and is centrally located. In this plant are found the large storage tanks in which new oil from the tank cars is received; the large service tanks from which oil is dispensed to the distributing stations, and a very complete system of settling and sterilization tanks for the reclamation of the used lubricants.

Taking the two most important lubricants, i.e., those used in cutting of steel and brass, we will follow them through the various processes of reclamation. The

steel cutting oil is piped from the centrifugal separators *B*, Fig. 3, to the underground reclamation plant. Here it passes through a series of three primary settling tanks each having a capacity of approximately 25 gal. These tanks are about 10 in. in diameter and 6 ft. high. They are installed in parallel alignment with each other and are shown at *J*. The oil is piped into the first tank near its top. It flows out of the first tank through a pipe connected also at the top and enters the second tank near its base. This arrangement of piping which facilitates the progress of the clean oil and the settling of the sludge and undesirable residue, is continued on through the third primary tank. The sludge is cleaned from the bottom of these primary tanks at the end of each working day.

In the first of the primary tanks, the lubricant is treated with heat by a steam coil to raise the gravity of the fluid and accordingly enable the undesirable substances to settle more readily through the oil to the bottom of the tanks, and also to insure the flow of the cleaner and lighter oil from the top of the tanks.

In the next stage of reclamation, there are two secondary settling tanks, Fig. 4, each having a capacity of 400 gal. The used oil from the last primary tanks flows through both of the secondary tanks continuously and undergoes a settling process.

From the secondary tanks, the lubricant flows into the two 400-gal. sterilization tanks *T*, Fig. 3, where its temperature is raised from between 210 to 220 deg. F. for the sterilization process and the removal of objectionable bacterium growths. From the sterilization tank the oil flows by gravity to the service tanks *D* or *E* which are buried under the ground floor and adjacent to the central station, and from the service tanks the lubricant is pumped to the outlying disbursing stations.

At intervals of two or three days, depending upon operating conditions, one of these secondary settling and sterilization tanks is shut down for cleaning. Its contents, an accumulation of heavy oil and residue, is

CHEMICAL LABORATORY REPORT NAMCO

Lab. No. 1545

Analysis of 3 to 1 Cutting Oil Date 5/18/21

From [redacted] U.T.L.X. Car No. 22154

Lard Oil Content 26.10% Good

Temperature of oil in car = 82° F.

Capacity of tank car = 8000 gal.

Remarks: Oil level in car 5" below bottom of dome.

Chemist JVG

FIG. 5

CHEMICAL LABORATORY REPORT NAMCO

Lab. No. 1242

Analysis of No.1 Lard Oil - Inedible Date 6/14/20

From [redacted] Car No. DL&W 6612

Saponifiable Oil 100%

Shows absence of any mineral oil.

Iodine Absorption value 61.2

Shows No.1 Quality

Free fatty acid as Oleic acid = 20.46%

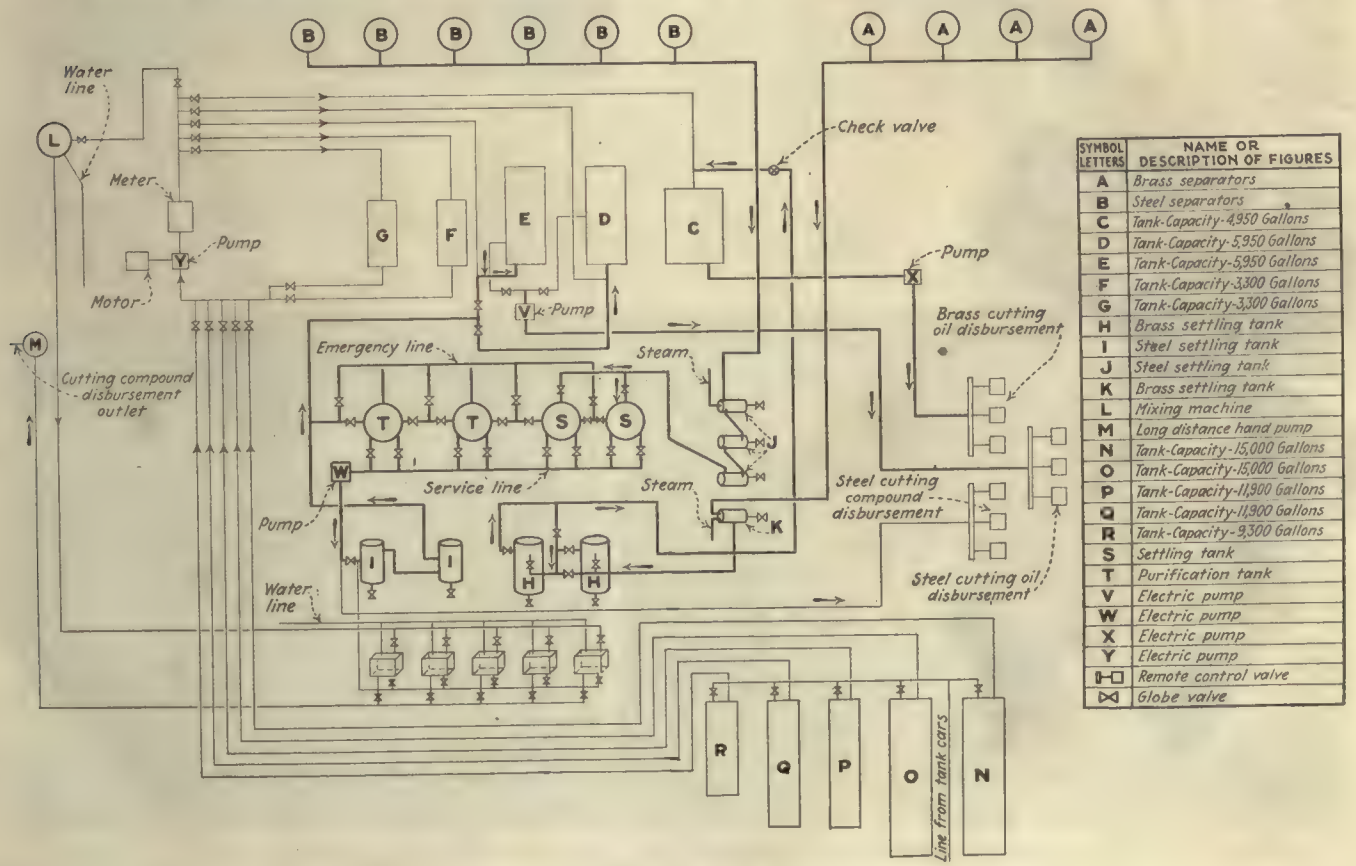
Remarks:

100 bbls. in lot.

Chemist JVG

FIG. 6

FIGS. 5 AND 6. LABORATORY REPORTS ON OIL RECEIVED



SYMBOL LETTERS	NAME OR DESCRIPTION OF FIGURES
A	Brass separators
B	Steel separators
C	Tank-Capacity-4,950 Gallons
D	Tank-Capacity-5,950 Gallons
E	Tank-Capacity-5,950 Gallons
F	Tank-Capacity-3,300 Gallons
G	Tank-Capacity-3,300 Gallons
H	Brass settling tank
I	Steel settling tank
J	Steel settling tank
K	Brass settling tank
L	Mixing machine
M	Long distance hand pump
N	Tank-Capacity-15,000 Gallons
O	Tank-Capacity-15,000 Gallons
P	Tank-Capacity-11,900 Gallons
Q	Tank-Capacity-11,900 Gallons
R	Tank-Capacity-9,300 Gallons
S	Settling tank
T	Purification tank
V	Electric pump
W	Electric pump
X	Electric pump
Y	Electric pump
	Remote control valve
	Globe valve

FIG. 3. LAYOUT OF THE OIL SYSTEM



FIG. 7. THE CENTRAL PUMPING STATION

pumped into a series of two 250-gal. secondary tanks *I*. Here it is allowed to settle for a period of 24 hr. Upon completion of the settling process the clean oil is pumped into the service tanks *E* and *D*. These two 250-gal. tanks are provided with valves near the bottoms from which heavy oil and residue are drained.

The system of reclaiming brass cutting oil does not differ greatly. The oil piped from the separators *A*, flows in the primary settling tank *K*, where it is heated by a steam coil for the same purpose as the steel cutting lubricant. From this primary settling tank, the oil is piped to two secondary settling tanks *H* from which it flows back into the service tank *C*.

This reclaimed oil shows very little deterioration. The loss in both steel and brass cutting oil through settling and sterilization is very small, in fact it is estimated that fully 90 per cent of the oil is recovered.

The Route Through the Shop

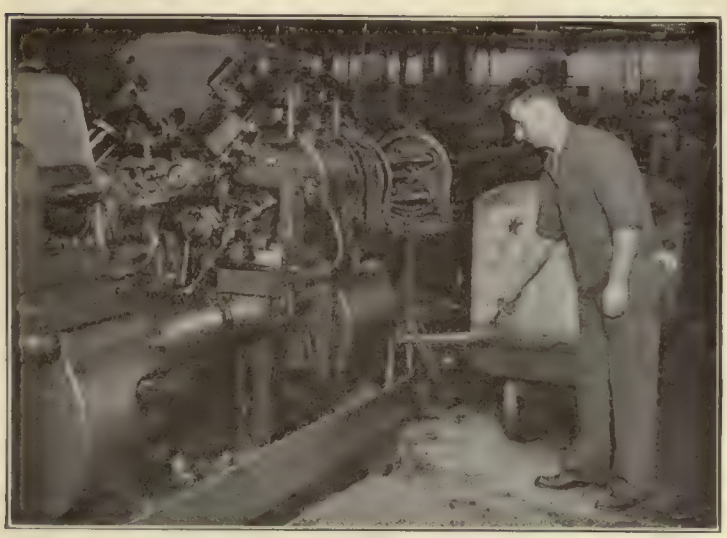
Practically all oil received at the plant is delivered in tank cars. The arrival of each tank car is reported to the chemical laboratory. The chemist inspects the car, measures the oil and also takes a sample for analysis. One copy of each laboratory report similar to those shown in Figs. 5 and 6 is forwarded to the office of the works manager, another to the office of the assistant superintendent and master mechanic, a third to the purchasing department and the fourth kept on file in the chemical laboratory.

Adjacent to the central station and located under the floor of the building are five oil storage tanks, *N*, *O*, *P*, *Q* and *R*, Fig. 3, varying in capacity from 9,300 to 15,000 gal. These tanks are used for the storage of new oil as it is received from the tank cars on the railroad siding at the plant. This oil is piped from the tank cars through a 4-in. main placed in a tile duct. At its siding end there is a flexible hose connection to enable the piping to reach the car. At its inside end, the 4-in. main enters a 4-in. header and from there the flow of the oil is directed into the storage tanks, the nature of the fluid governing the tank into which it is finally directed by control valves. Control of the oil in these storage tanks is directed from the central pumping station, Fig. 7. This oil can be pumped out for use at the main station or pumped into the service tanks.



FIG. 8. AN OUTLYING DISPENSING STATION

At the opposite side of the reclaiming plant, there are located underground, the five oil service tanks, *C*, *D*, *E*, *F* and *G*, Fig. 3,, varying in capacity from 3,300 to



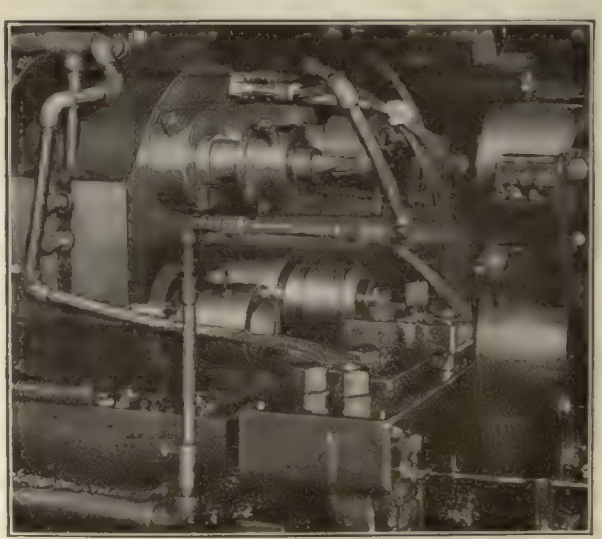


FIG. 9. REPLENISHING AN AUTOMATIC WITH OIL. FIG. 10. THE FIVE OIL STREAMS ON ONE OF THE AUTOMATIC MACHINES

5,950 gal., from which oil is pumped to the outlying disbursing stations.

On the floor above the reclamation station and storage plant is located the main pumping station for lubricants. The work of this station is greatly reduced by a system of twelve outlying disbursing stations suitably located in various parts of the plant. At these outlying stations, one of which is shown in Fig. 8, both steel and brass cutting oil is dispensed. The flow of the oil is governed by a remote control valve which, when opened, starts one of the electric pumps in the central station and causes the oil to flow.

The work of the outlying stations is supplemented by the oil distributing tanks (Fig. 9) mounted on wheels which are filled either at the central station or one of the outlying stations and used to replenish the supply of lubricant in the automatic screw machines.

How Far Should Drafting Cost Records Go?

By L. J. Spinner

Our drafting force of six men handles a wide range of work along the line of textile machinery. The factory seldom builds more than two or three machines of the same model at one time, and most of our orders call for modifications and variations of our standard types. This involves more drafting work than is usual in a plant of our size. In addition, we are designing a line of new machinery preparatory to entering a special field. Many of our machines are sold from sales drawings made up especially to show some new feature put out to meet a manufacturing condition in the customer's mill. A time clock is installed in the drafting room and job cards are provided which must be punched at the start and finish of a job. Reorganization of the shop has emphasized the value of job time records and has introduced the question of the limit of detail to which drafting cost work should go. This is a matter which I have never seen discussed in a technical journal, and I am sure that other shops are keenly interested as we are. In the hope of provoking discussion, I am submitting herewith my views which I transmitted to our office manager in the following memorandum:

I wish to discuss this matter at some length, as I believe we differ as to the degree to which job time-keeping should be carried in this department. Elapsed time records such as our job cards give, are useful in that they provide a ready means for charging time spent on a job. This is their primary function. In addition, however, they assist in the control and management of labor in so far as they give a comparison of present and previous times for doing similar work. In the drafting room it has been proposed to fill out separate cards for designing, detailing, tracing, and checking individual pieces, thereby giving a record corresponding to the separation of shop operations on a piece. I shall attempt to show that such great detail gives information of no greater value for cost purposes or for supervision, than does a much less complete record which gives the combined time of a man performing two or more operations.

In our organization draftsmen are called upon to design, detail, trace, check, compile parts lists, investigate special problems, answer customer's inquiries, blueprint, file, etc.

(1) New machines are often designed, which require considerable study of manufacturing processes, etc.

(2) Our men are often called upon to design machines similar to those of our regular line. In such cases, experimental and operating data are available. Occasionally, the work is no more difficult than that of laying out a left-hand machine from a right-hand.

(3) Parts of existing machines, which are redesigned to improve the operation of the part, to correct errors, or to increase the range of the machine, often present as many difficulties as the design of an entirely new machine.

(4) The design work of the preceding paragraphs may be either finished layouts, complete, and ready for detailing, or preliminary work such as proposal drawings, etc., which are really pictures, and in which the details are not fully worked out. In our work, a preliminary layout does not usually represent more than 10 per cent of the labor that a finished design does.

(1) This work may be done by the layout man working from his own design. The overall time for designing and detailing is least by this method when the details are not too great in number. While this is the quickest method, the saving in time is usually overbalanced by the higher rate of pay of the designer.

(2) The usual arrangement is for a detailer to work from a designer's layout. Depending upon the degree of completeness of the layout, the detailing may range from mere copying to actual minor design. The time required varies from that of simple measuring to that of working out methods of construction, machining, attachment of the piece, oiling, etc.

Checking

Among other things, the time necessary to check drawings depends upon the complexity of the machine, the familiarity of the checker with the intent of the designer, and the care and skill exercised by the designer, detailer and tracer. Every line, every dimension, every note on a drawing must be checked and measured. It is plain, then, that a checker's labor depends upon the skill, care and habits of thought of others, and upon the conditions under which others worked, whether interrupted, hurried, etc.

Tracing is largely mechanical except when complicated by the correction of scale, by rearrangement, etc. When a detailer traces his own work, it should result in greater speed, since he already has an understanding of the functions and individualities of the piece.

A draftsman does two distinct kinds of work. One is the drawing of a certain number of lines on a square foot of paper; the other is the thinking of what lines to draw. As a man goes up the scale from tracing, the occupation of thinking requires more and more of his time. I presume it is fair to say that less than 25 per cent of a designer's time is represented in the lines of his final layout. There is hardly a problem of design or detailing which does not involve some degree of invention. Would you measure inventive ability by the square foot of drawing? Or with a time clock? It seems to me that the only useful purpose of job time records in a drafting room is that of charging labor to the proper order. Dissimilarity of work wipes out all possibility of analysis and comparison and therefore, the simplest record possible is the most valuable. For this reason, I suggest that all of a man's work on a particular group of assembly, whether it be design detailing, checking, or a combination, be recorded on a single card with a single *overall* time record.

How Simplification of Product Widened Our Market

Saving Time and Money by Standardizing a Product—Educating the Consumer to the Use of a Standard Tool

By FREDERICK H. PAYNE
President, Greenfield Tap and Die Corporation

OUR business would not be at all the thing that it is today, if it weren't for the process of simplification which makes our large manufacturing unit much more efficient than it would be if we were making a multitude of designs as was the case forty years ago. Simplification increases our market, and at the same time allows us to use ordinary trade channels of distribution intensively and economically.

Four or five shops under different management sprang up at Greenfield and were competing with each other. Each shop had different designs, some of them based on talking points, which had to be kept up because the existence of each shop seemed to depend upon the uniqueness of its product.

Years ago every man who made a screw thread made it according to his own idea. Each manufacturer also took orders from a thousand customers, any one of whom might draw another unique specification for his own thread. When a manufacturer of mechanical products discovered that a competing manufacturer had a thread like this, he would immediately change his design, so that the final customer wanting a repair part for his machines couldn't accidentally order it from B. What schedule could be lived up to in making a product under these conditions?

Not only was each screw thread different from every other, but when made in such an irregular way, each thread was likely to be irregular within itself. Consequently one part of the screw might bind while another was loose. Quality was an unsolved problem.

Even while our shops were still competitors, they discovered that special product very seldom means excellent product, but does mean cost. An educational campaign was carried on among manufacturers and consumers and the resulting simplification has been of great benefit to the whole industry.

When the Greenfield Tap and Die Corporation was organized out of several of these Greenfield shops, the combined company at once proceeded toward still greater simplification. It assisted in simplifying the technical aspects of the product, and then sought to reap the benefit in economy of manufacture and sales. The lines of all the shops were pooled and redistributed so that each shop makes all the orders for one kind of article, without duplicating activities as formerly. This allows quality production and the development of special skill. All the branches of the former shops were also gradually merged into one common trade mark which helps sales momentum.

The merchandising of our product is sharply divided between simplified lines and special or miscellaneous complex lines. Only the regular or simplified lines are merchandised through jobbers in the ordinary sense. A jobber keeps a stock of these. Special goods are merchandised only through the catalog. Every page of our catalog describes prominently whether the goods are regular or special. If they are regular they can be had from the nearest jobber. If they are special they must be specially ordered either through the jobber or direct from the factory.

The jobber who handles such goods receives a great benefit from each step toward simplification of lines. He reduces the amount of stock necessary and increases his turnover and annual profits. He saves time in taking inventory. His errors in packing and in clerical work are reduced.

Simplification reduces the salesman's time used in visiting each prospect. It simplifies what a customer wants, and does most of his choosing for him. Each salesman gets an increased volume of business with no more bother. The commission on sales and the cost of sales are now much smaller percentages of total price than several years ago.

Some jobbers have adopted on our recommendation a maximum and minimum system of keeping stock and reordering our goods. As soon as the stock of one item reaches a minimum, they re-order a standard quantity. This saves them time in estimating their needs. The order quantity is an even number convenient for us to pack, and for the jobber to keep account of.

Where this method is developed completely, it makes some of our selling automatic. Our salesman can devote his time to constructive salesmanship. The jobber co-operates with us in inducing customers to purchase regular goods instead of insisting on special designs. He realizes that a jobber is always helped by standardization. Moreover, unique designs are not returnable, of course, and if the jobber's customer has ordered a special kind, and then refuses to take it, the jobber must be responsible. Whereas if the goods are standard an adjustment is possible.

The savings to the jobber, just described, are multiplied by three for the whole industry, taking in the manufacturer on one end and the consumer on the other. For the consumer also needs to keep a certain stock of tools, which though small, is important to him. The farther we carried simplifications the fewer tools he needed to keep to cover the variety. To many small consumers the expense through actual wearing out of tools used to be very small. They would not have enough jobs of the same kind to wear out a tool in a lifetime. The tools were much more likely to get lost than worn out. The big elements of expense were the first cost plus the replacement of losses. The wider the variety of pieces the less frequently each was used, and in the intervals the more likely each was to be lost. Under the consolidation of designs, each piece can actually use itself up. In fact, we teach customers how to re-sharpen the tools repeatedly. So the cost per job to the consumer went down.

Many consumers used to prefer to make their own special tools as needed. As our product came into use

in parallel with these home-made articles, however, they saw that our product was not only cheaper in price than the shop cost of their own, but was of better quality, would do more work, and be surer to do it. So they began to order their special taps as well as their regular ones from us. Our business has doubled even in special taps, though we have made that only a detail in comparison with our regularized lines.

Simplification made it possible for us to keep a large stock of finished goods in a central warehouse near the plants, directly under the main office. This ample stock has a remarkable effect on the speed of service to the customer, and at the same time it cuts down our clerical expense very greatly. The average article can be picked immediately out of stock, and shipped from the customer's original order without retyping, within a day. The shipped order is the only acknowledgment necessary, and the bill the only correspondence, whereas if an article is not in stock when ordered, as a special article cannot be, the correspondence department writes to the customer, the order department sends an inquiry and a follow-up to the factory as to the date of delivery, and a tickler file on promise dates has to be established. The original order retyped goes into a hold file, waiting to be matched against the factory order on its return. Meanwhile the correspondence department may have to answer one or more inquiries. All of this costs money and takes time. Accumulation of a more complete stock has cut the clerical force considerably, and the remaining force is now sufficient to take care of full business in ordinary times.

We get a constant comparison between the economy of simplified lines and special lines. We notice that every advance in simplification reduces the cost of packing and clerical work.

We did not abandon the business in special goods, but kept it, and used it to build business, in two ways. We wish to remain in such a position that a customer can get anything he wants in screw thread tools, regular and irregular, from our one company. So he turns to us as not only a dependable source, but an authority. Since we make all kinds, he believes us when we tell him that he may have special goods from us if he wants them, but that it will be much more to his advantage to select from the simplified lines.

Our salesmen are trained to examine special orders, find the use to which the goods are to be put, and, if they can do so tactfully, suggest the nearest standard size and point out the economy that would result to the customer if he could change to that size. Very often such a change is not only possible but advantageous in innumerable other ways in addition to immediate economy.

It is not necessarily a sign of intelligence to invent your own specifications. First, it quadruples the price. A small regular tap may cost only 35 cents, because it is run through in large quantities, while another tap exactly like it in appearance, except that it has one more thread per inch, might cost $1.50 to $2, and would take two weeks to get, instead of being picked out of stock. Moreover, its usefulness to the customer won't be nearly so great as if he had selected from the simplified line, because the product won't be interchangeable with anything else in his shop or his motor car.

The education of the trade has progressed so that 50 per cent fewer special orders are now made than ten years ago, in spite of the very great increase in the total quantity of goods.

Simplification destroyed some old products but it has also created some new and better ones. We were able to design a die which is much superior to our old ordinary die, but which must be constructed in an expensive way. The increased expense is justified only by the fact that instead of cutting say a thousand threads during its life the new product will cut many times that number, in some cases a hundred thousand. The purchaser couldn't afford to use such a tool if he did not have sufficient threads of that size to cut, and he has that number only because the public has been educated to use standard sizes for many various purposes.

Each new product we develop is in the direction of better quality. For the first cost is not so important to the customer now that each product can cover a great variety of work.

There is also a continual improvement in the quality of standard product. We now make the very complicated dimensions of threads accurate to a ten-thousandth of an inch if necessary, and to a thousandth as an ordinary manufacturing proposition, as contrasted with the former variations of several times that amount. This same accuracy is now applied to special goods also, of course, but it was the wide market and increased production fostered by simplification which allowed the expense of engineering investigations and development of necessary tools for the higher fields of accuracy.

Our shop early discovered that to keep our product uniform we needed tolerance gages, and soon we began making and selling these gages among our customers, so that they could measure their own product. We quickly discovered a considerable market for simplified standard dimensions, or interchangeability, which was the real thing we were selling in connection with gages. This market has grown and is still growing.

Recently a firm of motor car manufacturers organized and considered what it would need to start a factory. The manufacturers asked, "What is the greatest essential to our business?" and the answer was, "Standardization of dimensions, interchangeability of parts." Consequently the company bought $50,000 worth of gages right at the start, as naturally as it would spend a like amount for a permanent building or machines. It knew from the experience of other companies that interchangeability was its greatest need, not only in the product this year but between the product of different years, for many years ahead.

Quantity manufacture of the simplified lines taught us how to apply certain lessons of simplified handling to special lines also. The essential parts of the product may be unique, but the over-all dimensions may be common, such as the length of the whole article and the length of the threaded part. We analyzed the annual sales in quantities of each special product. Then we grouped certain dimensions which are so nearly the same that they can all be finished from the same size of partly finished blanks. Then we made group tables showing which of these blanks we could afford to partially prepare in quantities for stock. We quickly finish the blank in the particular form desired by the customer. This method is not as good as the regular quantity production from start to finish which is used on simplified goods, but it has reduced the cost of certain special products.

A special tap now costs less than did a regular tap years ago, when practically all so-called regular taps were really made on what we would now call special orders.

At first, the industry and the trade associations and organizations interested in simplification had to carry on a strong educational campaign, which has not yet ceased. As the use of standard goods spread among the public, standardization took on momentum and grew of its own accord.

Now when we are considering getting out a new product, we always ask the question, "Will it fit in with the simplified and standardized lines which the public has adopted as a policy?" For in a world that is being simplified, we do better business by truing up with the universal habit.

A Unit System of Tote Boxes

By Fred Albrecht
Office Manager, Lodge & Shipley Machine Tool Co.

One of the problems of the large manufacturing plant is the rapid and economical transportation of materials, both raw and finished, from one department to another. It is, of course, recognized in every well-managed establishment that, to prevent loss of time in any department, it is absolutely essential to keep the work moving between operations.

After much experimenting with various methods. The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, manufacturer of lathes, has adopted the plan of using specially designed platforms and trays which can be built up to any desired height. These "tote boxes," as they are termed in shop parlance, are used in connection with elevating trucks, the clearance under the platforms being just sufficient to accomodate the trucks. When the loads are rather heavy electric tractors are used for hauling.

In Fig. 1 is shown the construction of the platform and the tray. The platform is built of two 2 x 4 x 36-in. yellow pine timbers, to which two layers of ¾ x 5-in. yellow pine sheathing are nailed. The first layer is placed crosswise and is 24 in. wide. The upper layer is laid lengthwise and is 36 in. long. The corners are supported by cast-iron feet, each fastened by eight large wood screws. The design of the feet is such as to afford a solid support for the 2 x 4 in. timbers, as will be seen in Fig. 2. The feet extend ¾ in. above the floor of the platform, providing solid right-angled corners into which the tray is very easily fitted

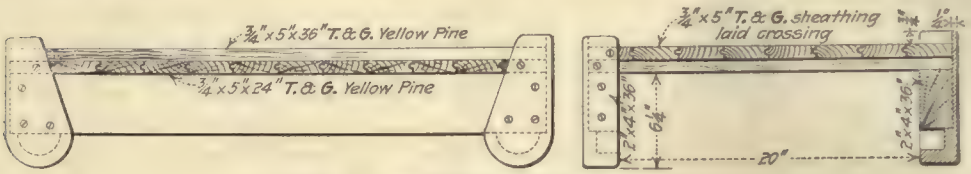


FIG. 2. DETAILS OF PLATFORM

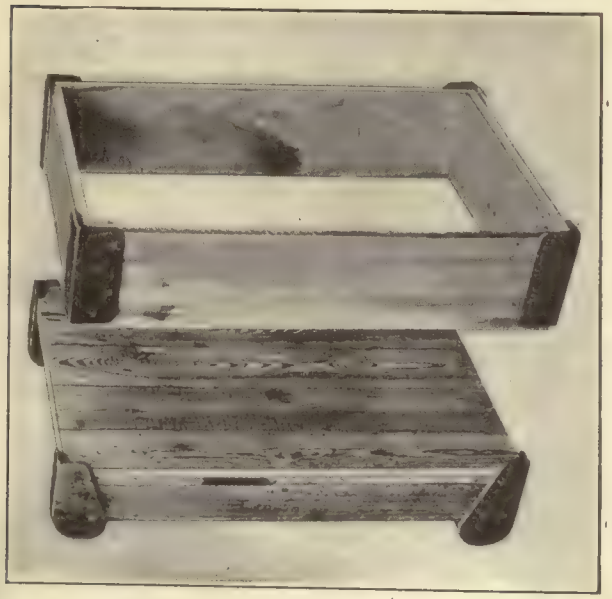


FIG. 1. PLATFORM AND TRAY

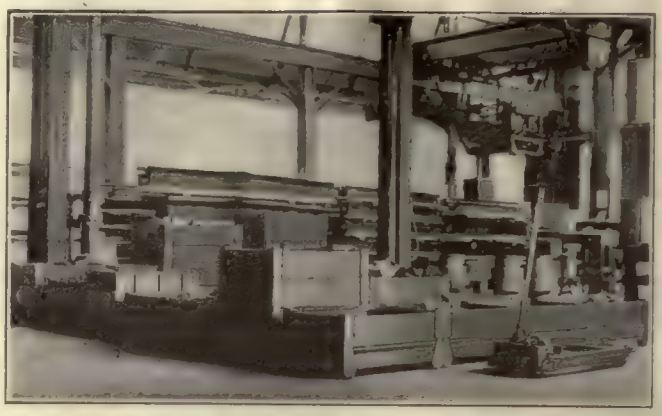


FIG. 3. TRAYS NESTED TO FORM BOXES OF VARYING HEIGHT



FIG. 4. HEAVY WEIGHTS TRANSPORTED ON PLATFORMS

The tray is made of ⅞ x 8-in. poplar, of the same over-all dimensions as the platform. The sides and end pieces are rigidly held by angle irons of the same height as the boards. These irons are screwed into place in such manner as to allow the bottom of the tray to fit into the corners formed by the platform feet, and to provide corners at the top to hold the next tray. As can readily be seen, the trays may thus be placed one on top of the other with perfect security, as shown in Fig. 3. When not in use the height to which the trays may be stacked is limited only by the height of the storeroom ceiling.

An idea of the strength of the platform may be had from Fig. 4 which shows an electric tractor hauling two elevating trucks coupled together, each carrying a platform with a 36-in. lathe headstock casting weighing 1,975 pounds.

The use of the "tote boxes" permits materials to be stored in any location until wanted, and the ease with which the boxes can be picked up and moved saves considerable labor and expense.

The Prodigious Cost of Industrial Accidents

Statistics on the Cost of Accidents—Instances of Reductions in Absenteeism and Monetary Losses—Examples of Simple but Efficacious Safety Methods and Appliances

By SANFORD DeHART
Director of Hospital, R. K. LeBlond Machine Tool Co.

OVER a billion dollars a year. This is the stupendous sum, which statisticians figure industrial accidents are costing this country annually. There are 22,000 workers killed and 600,000 injured each year. The 600,000 injured are of a major character and incapacitate the worker on an average of four weeks a year. On a basis of 300 working days, of eight hours each, this country has the unenviable record of having a workman killed every six minutes, and one injured every fourteen seconds. Is it any wonder that one statistician dubbed us the most careless people in the world?

It is almost inconceivable that 1,000 persons should be killed each year in the United States by simply falling off ladders, but it is nevertheless true.

It is estimated that 15,000 persons in the United States are at the present time blind as a result of industrial accidents. The financial cost for maintaining these workers is $10,000,000.

In 1919 Wisconsin alone had 14,495 industrial accidents per month, or about one accident every twelve minutes during working hours. There were 2,870,438 days lost, but this total is incomplete for the reason that it does not include the cases involving a disability of less than seven days. There were thousands of minor cases which did not extend over the minimum period of one week. The compensation for indemnity and medical aid for the year, reached the princely figure of $2,163,354 for the year. The average time lost was 192 days. The indemnity and medical aid averaged $144 per injury. S. W. Huels, educational deputy of the Industrial Commission of Wisconsin, in an article in the "National Safety News," says that the 1919 accidental death and disability record is the worst in the history of the state.

High frequency and severity accident cases are not confined to Wisconsin. From July 1, 1918 to June 30, 1919, Massachusetts had 178,045 accident cases reported. There were 5,178 cases of infection, of which 19 died. Compensation for injured employees cost $5,219,760.24. Approximately $401,921.57 was paid out for infections incurred during this period.

Pennsylvania had 668,340 accidents and 9,143 deaths, during the years of 1916, 1917 and 1918, for which the cost was $9,158,833.

California had 100,000 accidents reported and 440 deaths from July 1, 1919 to June 30, 1920. Compensation was awarded 25,754 cases and amounted to $5,621,-828.

For the year ending July 30, 1919, New Jersey had 350 deaths and 17,304 non-fatal accidents reported.

The lost time due to accidents in these five states represents the productive capacity of 39,000 men working a full year. These states are fairly representative of what is occurring in other large industrial states.

To suggest accident reduction is not to theorize fantastically as the following statement will show: the accident mortality rate in the United States in 1914 was 2.8 per thousand workers, while in Germany it was only 0.68 per thousand.

What is this great Moloch that causes so many industrial accidents? A recent investigation shows that accidents are due to man's failure and not directly chargeable to machinery. In a survey made last year by a large automobile company, it was found that fifty per cent of the total accidents was neither the employee's nor the employer's fault. Thirty per cent was due to the employee's fault, ten per cent was due to a fellow worker's negligence, and the remainder was chalked up against the company's fault.

It makes no difference in most states who is to blame for accidents; the fact that the injured was employed at the time of the accident is prima-facie evidence that he is entitled to compensation.

Safety Work Economic and Humane

Realizing not only the economic but the humane importance of safety work, a great many of the larger corporations have gone into accident prevention work on a colossal scale. The United States Steel Corporation is spending a million dollars a year for safety work to protect its 270,000 employees. Between the years of 1906 and 1912 this company reduced its accidents 43 per cent, and in the past fourteen years has saved over 29,500 of its workers from accidental death. It is conservatively estimated that 1,034,250 days were saved as a result.

Other concerns which have reduced their absenteeism due to acidents are the Raritan Copper Works, 81 per cent; Pennsylvania Salt Manufacturing Co., 93 per cent; and the Four Wheel Drive Auto Co., 83 per cent, in the past two years. Another company invested $6,000 in safety and saved over $14,000 in doctor's bills and compensation payments, and as a result saved 310,000 hours of labor in one year, or the equivalent to the production of more than 300 automobiles.

The safety department of the Colorado Fuel and Iron Co. was able to keep its fatal accidents down to one death to 296,515 tons of coal produced. Other mines in the state of Colorado, not operated by the Colorado Fuel and Iron Co., had one fatal accident to every 146,628 tons produced.

The Pennsylvania Railroad Co. has spent enormous sums in the safety movement. A report that I saw recently showed where they had reduced acidents 63 per cent.

Accident prevention is curious in its manifold angles. For instance, a factory employing many thousand persons considers $2,000,000 a year spent on keeping the plant clean a good investment. They are of the opinion that cleanliness and safety are analogous. Another instance is that of a manager of a machine shop, who was experiencing considerable trouble with a department in which several boring mills were located. The employees were reluctant to work in this department, because they were suffering from acute respiratory conditions, superinduced by inhaling the dust of this department. The company installed a blower system costing $12,000 and all complaints ceased, and as a

result the labor turn-over of this department was considerably reduced. If you have read this far you will say, "That sounds all very well for the big corporations, but where does the employer come in who is employing less than a thousand persons?" The company with personnel of less than a thousand has an easier proposition with reference to accident prevention than the employer who is employing many thousands. He has two great advantages over the large employer, viz., the personal touch, and a knowledge of the idiosyncracies of the employee. Take the R. K. LeBlond Machine Tool Co., as a concrete example. They have normally on their pay roll one thousand persons. This company has never employed a full time safety engineer, and has never had an organized safety committee. Their accident rate is low. In fact, so low that two years ago during the busy time, they were able to hold their absentee rate due to accidents down to sixty hours, for a period of five months, among a thousand men. The total compensation paid out for accidents incurred during that period was only $6.25. In this connection, I might add that the LeBlond company operates under what is known as Section 22, Ohio Industrial Commission, by which the company is permitted to carry its own insurance.



FIG. 1. WASH ROOM, WHERE SAFETY LECTURES ARE GIVEN TO THE EMPLOYEES

Every foreman has been vaccinated with safety serum, to the extent that they are intensely interested in preventing accidents. The foremen have sprung up from the ranks. Most of the workmen have been with the company a year or more. Many of the workmen have been with the company over fifteen years, and what is most important, all of the employees speak English.

The employees are given safety lectures, generally being assembled in the wash room, shown in Fig. 1. These lectures are supplemented by bulletin board propaganda.

The apprentices are taught in the instruction room and the shop training room, Fig. 2, how to avoid accidents. Accident prevention in the LeBlond Apprentice School is considered one of the most important parts of the whole curriculum. When an apprentice's time has expired in a department, he is returned to the shop training rooms for intensive training, before entering a new department. This is what we call taking the "rough edges" off the apprentice. It has greatly minimized accidents among the apprentices. These youngsters have become so imbued with the safety idea that they frequently report to the hospital a hazardous condition, which has been unnoticed by the foreman. Like most great things, some of our safety appliances are absurdly simple, but exceedingly efficacious. For instance, a "Breathing Process or Suction Device," in our paint department, Fig. 3, rendered this department 70 per cent less hazardous, with reference to eye work

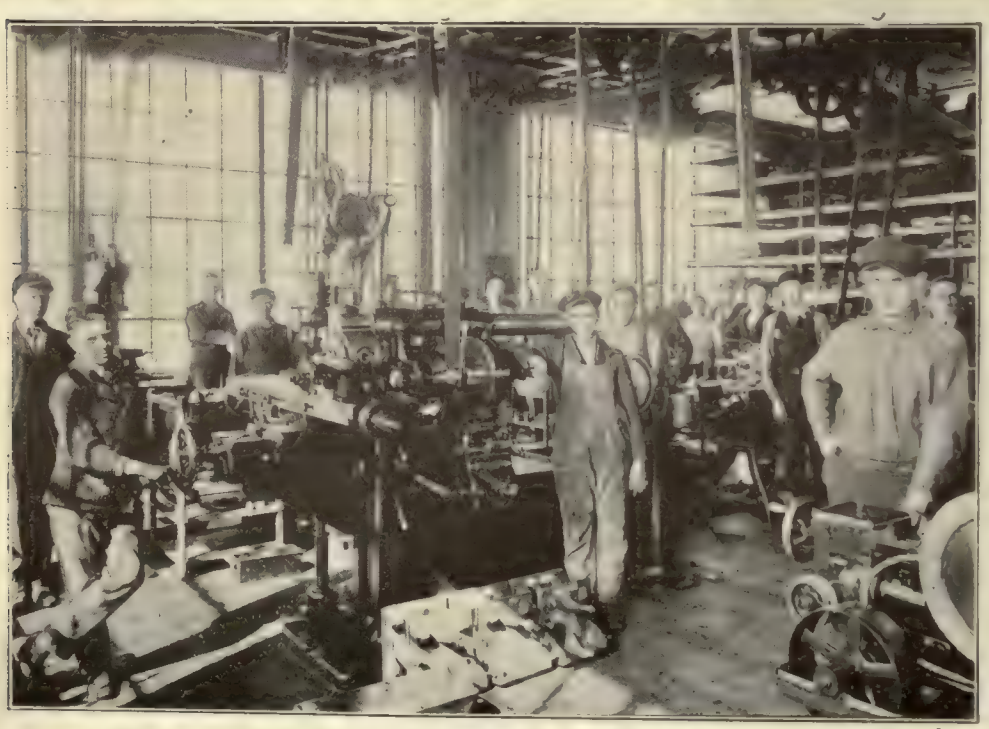


FIG. 2. ADJUSTING THE APPRENTICE TO HIS NEW ENVIRONMENT

and respiratory diseases. A small filtration and sterilizing plant entirely eliminated oil boils from the machine shop. An eye room and facilities for treating the eye, in connection with our hospital, reduced our eye cases from 5,016 to 742 in three years, and reduced the cost in these years from $1,052 in 1917, to $7.50 in 1920.

We have had but one infection in three years and it did not terminate disastrously. In this connection it is hardly possible to over-estimate the importance of prompt and efficient first aid to shorten and minimize the effects of accidents. We have used Mercuro-chrome 220, a preparation developed at Johns Hopkins University, with considerable success as a prevention of infection. It possesses all of the advantages of iodine and none of the disadvantages.

Change of Environment a Benefit to the Employee

The LeBlond company is of the opinion that the employee is benefitted mentally and physically by a change of environment. Proceeding along these lines, they have provided ample recreational facilities, such as a swimming pool, recreational park, orchestral entertainments, motion pictures and the different games, this list being more suggestive than exhaustive. Most



FIG. 3. SUCTION APPARATUS REDUCES HAZARDS IN PAINT DEPARTMENT

of these recreational activities are pursued during the noon hour.

That a change of environment has an important bearing on accident prevention is attested by the fact that our records show that we have not had a single serious accident for the past five years, between the hours of one and two-thirty p.m.

It is interesting to note in connection with accidents, that the LeBlond company has had only two deaths in the history of the concern, which was established in 1887. The major injuries are few and far between. The company has had occassion to send only one man to the city hospital in the past ten years.

In compiling this article, I have not attempted to formulate a panacea for the prevention of accidents, as I fully realize that it takes more than two bones to make a dinosaur. But we must not lose sight of the fact that a coral reef starts from a very small insect.

Non-Productive Costs

By A. L. De Leeuw

There is, perhaps, no more unthankful task than to call attention to terms which are misused. It does seem very much like splitting hairs to point out that a term or phrase which we all know is, after all, not correct. It seems so non-essential that we are instinctively inclined to shrug our shoulders and consider the thing not worth while wasting our time on. And so I hesitated before I finally made up my mind to say something about the series of comments on an editorial that appeared in the *American Machinist* under the heading of "Non-Productive Costs." I felt again the effects of an old grudge which I thought I had cast off. That word "non-productive" always irritated me, probably because I have always been a "non-producer" myself.

Before anyone starts shrugging his shoulders, let me say that this old grudge of mine would never have induced me to write about it if it were not that "non-productive" is taken at its face value, not merely by the casual reader but by a large percentage of business managers. Of course, many readers will say, "Well, we all know what non-production or non-producer means, and we are making allowance for it," but are we? My own experience leads me to believe that we are not, at least, not always; and that it is about time to throw the term overboard and substitute other terms which we can use without danger of being misled.

Though fully in agreement with practically all that was said in these various comments, I am struck by the fact that the various writers on the subject have, to a large extent, entirely different things in mind about which they are writing. Take, for instance, the article by C. R. Snoke, and particularly the latter part of it. No one will disagree with him that we should not be extravagantly using telephone calls, telegrams, office supplies, etc., and I, at least, fully agree with him. But all these things he mentions do not come under non-productive costs, because they are not *costs* in any sense of the word. They are merely expenses.

If I buy a tie for one dollar and drop a dime while I am pulling out my money, can I say that the tie now costs $1.10? In my opinion the tie cost one dollar and I have suffered a loss of ten cents. If a manufacturing concern has $20,000 in cash in a certain bank and the bank fails, can it be said that the cost of production has gone up $20,000? In my opinion, it cannot. The concern merely suffered a loss. If the employees of a concern have the habit of using telephones freely, thus necessitating the installation of an extra trunk line, can it be said that the manufacturing costs have gone up? In my opinion, it cannot. There was no increase in *costs*, but there was an increase in *expenses*.

Thoughts along an entirely different line struck me when I read the comments by R. E. Flanders. Here again I agree with the writer. He points out that the labor cost was very much less than some other expenses and that, therefore, these other expenses were the most promising field on which to hunt for economies. But this does not prove that there were any real non-productive costs. Maybe there were, maybe there were not; the article does not point this out.

It seems to me that much good could be accomplished if all of us were to think and talk on this important subject of economy in the shop in the same terms and phrases. If we define the word "costs" to mean all

expenses which go into the manufacture (or manufacturing, handling and selling) of a product, then there cannot be any non-productive costs, but there may be non-productive expenses. If we define things this way, then of course we will all agree immediately that non-productive expenses must not be *cut down* but should be *cut out*. The fact that all other expenses are costs, that is, that they are really incurred in the manufacture of the product, does not necessarily mean that they cannot be cut down. Nevertheless, all such expenses are productive costs; they may be *more* or *less* productive. It is up to the managers to select the most productive methods, that is, those methods which will give the greatest amount of results with the least amount of expense.

As I said before the great objection to the terms "non-productive" and "non-producer" is the fact that so many managers take these terms at their face value and as a result they go with might and main after the non-productive costs and non-productive labor, and they keep constantly before them a comparison between the amounts of money spent for productive and non-productice labor. Many managers think that if the percentage of money spent for non-producers becomes greater as compared to that spent on direct labor, there must have been a step backward. Now, as a matter of fact, our entire industrial development has been in the direction of increasing this percentage of overhead and future development will lie in a still further increase. We would not willingly go back to the Egyptian method of building or even to the methods of as early as fifty years ago when overhead was quite small. Our best engineers, our keenest managers are always on the lookout for a reduction in the amount of direct labor or skilled labor required for an operation. They accomplish this by substituting machinery or less skilled help or special tools. In other words, they substitute non-productive for productive costs and, of course, their aim is to reduce the total.

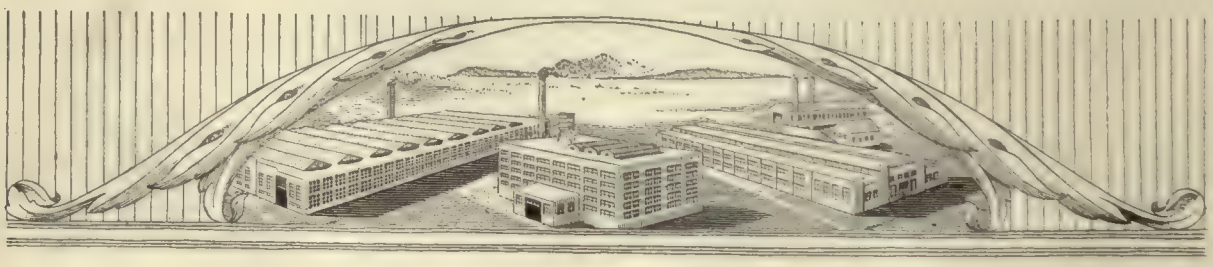
Not so many years ago, if we wished to keep a stock of coal on hand we would get a carload on the ground, send a man with a shovel to the car and have him shovel the coal out. We were not able to pile it up very high and needed a large amount of ground for a moderate amount of coal. When the coal was needed in the power plant we sent somebody out, possibly with the same shovel, and a wheelbarrow and had him wheel the coal into the boiler room where it was dumped on the floor. Another man with a shovel would then dump the coal into the furnace. This was practically all direct labor and no overhead. Now we use a coal-handling device. The mere pulling of a lever dumps the coal, an electrically controlled device piles it up, and another device carries it into the boiler room, lifts it up, puts it in the storage bins, from where it is automatically taken to the grates, with practically no direct labor. The direct labor cost in this case is almost nil, the overhead several thousand per cent. Does the fact that the overhead is so enormously high induce us to go back to the old system? Not at all, because we realize that the overhead is high simply because the direct labor is low. Now, after all, the manager should be concerned with the final costs only, and not with the proportion between the elements of this cost.

Apparently then, Mr. Snoke is thinking of useless expenses while Mr. Flanders is considering indirect labor and possibly indirect materials. The writer of the editorial in the *American Machinist* which provoked the various comments seems to have had something different again in mind. He was probably thinking of selling expenses, advertising, displays, and what-not. Such expenses are truly non-productive from the standpoint of the shop, but they may or may not be productive from the standpoint of the business as a whole. As a rule it is very easy to say whether expenses incurred in the shop are productive or not; it is not so easy to say the same about expenses incurred for advertising, display, etc. Such expenses are more or less of a speculative nature. When a new display room is opened it is always doubtful whether it is going to be productive, and, if so, whether it will be sufficiently productive to justify the expenses. Of course, the manager hopes and even expects that this will be the case, but he cannot be sure about it. On the other hand, he has means of finding out whether certain improvements made in the shop are productive or not. Notwithstanding the fact that advertising, etc., is of a speculative nature we should not consider the money spent for it as a non-productive cost, because if we did consider it such we would cut it out. However, I do think that the expenses of the shop and those of the sales department should be kept entirely separate, and that for the very reason that direct results are observable in the one case and not in the other.

There is another reason why I strongly object to the term "non-producer" and that is that it casts a slur upon the effectiveness of some of the most valuable men in an organization. Not only that, but it provokes the idea among those men who perform the direct labor that all other men in the organization are more or less parasites. I have often wondered lately how much of the Bolshevik ideas prevailing at the present time are due to this misnomer—"non-productive labor" or "non-producers."

I would suggest that we speak of direct and indirect labor and material, and that we do so in the sales department as well as in the shop. In addition to these four items, we would also have the item of general overhead.

Any other set of terms which would express the real meaning of the things they are supposed to indicate would be equally acceptable to me; but I do wish we would get away from the term "non-productive" except when we intend to indicate *rank waste*.



Salvaging Industrial Wastes

Metal Wastes—Salvage in Maintenance and Repair—Advisability of Permanent Reclamation Service—Importance of Saving Time and Human Effort

By J. A. SMITH
General Superintendent, General Electric Company

THE term "salvaging" has become a world-wide slogan. Industrial managers are studying operating conditions as never before in the history of business, and among the various phases of the subject which relate to the reduction of operating expense, the salvage of factory wastes comes in for a large measure of attention.

Let us first consider the question of salvaging metal wastes—for every factory in the country manufacturing a mechanical or semi-mechanical product produces metal scrap of one kind or another. It is essential that a system be set up whereby the various grades of metal chips and turnings will be kept separate in the shops during machine processes in order to save time and labor sorting and segregating in the scrap or salvage department. Non-ferrous metals should always be kept separate from steel and iron. When the parts machined consist of a non-ferrous metal with steel or iron, the chips should be run through magnetic separators.

In some of the bigger industries, chips and turnings are pressed into briquets of suitable cupola size, but this practice has not as yet become general throughout the country, and is carried on chiefly where the tonnage of chips and turnings is normally large. The process results not only in higher market value, but also in a material saving in transportation charges. Sheet-metal punching scrap, metal strips, trimmings, wire, etc., should always be put up in bundle form and in cupola size before being loaded for shipment, for the same reasons.

All the various classes of miscellaneous scrap metal, such as cuttings and trimmings from bar, rod, and heavy sheet stock, small castings, forgings, and solid pieces of every kind, should be accumulated in separate containers in the shop, for this class of scrap has a higher market rating than is obtained for chips and turnings.

Laboratory processes are often productive of valuable wastes either in the form of metals, such as tungsten, molybdenum, etc., or in the form of various chemical residues which may, through conversion or combination, become the basic elements of new preparations and compounds.

There is a wide variety of miscellaneous wastes which require our attention, and in this field a great amount of salvage work can be profitably done. Lumber, boxes, rope, rubber, fiber, cotton and woolen fabrics, cotton waste, paper, insulation materials, chemicals, etc., constitute some of the items which can be salvaged with profit in the modern industry. As an example, incoming boxes can be repaired and put in shape for future use either for storing materials, or as tote boxes in the shop. When too large to be suitable for these purposes, the lumber can be utilized for repairing and making tote boxes, temporary platforms, stagings, concrete forms, etc. The salvaging of lumber and making of boxes from this second-hand material in some of our large industries represents a saving of many thousands of dollars yearly in the purchase cost of new lumber. Even sawdust, usually considered of little value, can be used for the packing of porcelain and similar products, and the finer grades for the drying of metal parts in the dip shop. There is scarcely an item that we can name in the list of industrial wastes that has not some value either in its present state, or in the production of raw materials for the manufacturer's use. Even what is known as shop refuse may be burned in a destructor's plant under boilers, and produce steam for heating and manufacturing.

A careful system of segregation is essential in the salvaging of metals, as well as of all other kinds of factory wastes, and this should be carried to the highest standard consistent with local conditions and without defeating the purpose of securing the highest market prices by undue expenditure for labor and equipment. It is well to have all scrap weighed and credited to departments for the twofold purpose of correct acounting and inculcating an interest for salvage work in all department heads.

Salvage Work in Maintenance and Repairs

But we must carry our salvage work into other branches of shop activity, such as maintenance of property, repairs to machinery and tools, handling of stocks, and upkeep of all the various classes of small tools, including lathe and planer tools, high-speed steels, etc.; and here is where the expenditures in big industries begin to mount up to vast sums, to hundreds of thousands and even to millions of dollars, during the course of a year. It is essential, therefore, that systems be set up whereby all these items of maintenance will receive the most careful scrutiny and the expenditures will be adequately limited and controlled. Systems must be set up governing the distribution and repairs of the various classes of small tools so that the consumption of these will be regulated within certain defined limits of economy and efficient service, in accordance with production requirements in the shop. It is good practice to make regular monthly inspections of machine tools and equipment, and make a record of the same, in order that repairs may be made promptly at a minimum of cost before the damage becomes more serious or breakdown ensues with increased repair expense and added delay to production. The record is valuable as showing the relative cost of maintenance and relative life of service of various makes of tools. It is often good economy to replace a tool showing high maintenance cost with a new tool of some other make, and thus save both expense and delays to production. In all cases of replacements and repairs, valuable parts should be salvaged and made use of on other jobs of repair work, wherever practicable.

In the supply of small tools to the shop much can be accomplished in the way of reducing expense by efficient methods of distribution and collection. A system of regular inspection of toolrooms, tool cupboards, benches,

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and areas around machine tools should be established in all departments. Tools not needed for immediate or current use should be cleared up promptly and returned to stock, and those needing repair put into shape for further requirements. This is particularly important in the case of high-speed steel tools where the cost is relatively high by comparison, and a single idle tool may represent a good many dollars of tied-up capital. Nearly all the various small shop tools, such as wrenches, vises, hammers, drills, cutters, pliers, files, and numerous others can be repaired to good advantage and thus be made to give greatly lengthened service and reduce the number of purchases of new tools. By a properly organized system of distribution and collection the inventory of tool stocks carried may be greatly reduced, expenditures for new tools curtailed, and those in use in the shops kept more constantly in active service.

The subject of lubrication both of machine tools and of cutting tools affords opportunity for valuable reduction in the operating expense of the shop. With modern storage equipment and modern facilities for distribution to the shops, also proper feed pipes and oilers for regulating the supply to tools, a material saving in consumption of oils and cutting compounds can be made. Selection of oils is most important, and this should always be made with a view of reducing friction load on bearing surfaces and of keeping tools properly cooled and lubricated during the process of cutting, and not primarily in reference to cost. Valuable work has been done in recent years in the substitution of mineral oils and mineral lard oils for pure lard oil in a variety of processes where formerly pure lard oil was felt to be necessary. In fact, a heavy-body mineral oil of correct specifications will do the greater percentage of jobs commonly done with lard oil without any material increase in consumption, and with greatly reduced cost. A high-grade light-body mineral oil will also do many processes, such as turret-lathe work, milling high-carbon steels, etc. Soluble cutting compounds also have their place in machine-shop practice, and their use in a great variety of processes, such as drilling and milling, plain lathe work, cold cutting, etc., results in a greater economy than can be secured with oil. Attention needs to be given to the handling and distribution of oils in order to avoid waste. Machine tools should be equipped with proper tanks, drip pans, and aprons, in order that nothing may be lost. Reclaiming oil from production parts and from chips and turnings is a part of the salvage work of every up-to-date factory and need not be enlarged upon here.

We hear much talk these days on the subject of reducing inventory, and it is essential that the work be carried forward intelligently and earnestly in order to put industry on its feet. The present is the time to make thorough investigation of every department and storage space, and to gather up all surplus or idle materials and effort made to put them into service, or otherwise dispose of them to advantage. Analysis must be made of the methods of handling and distributing materials in order to establish improved systems, reduce labor, and avoid delay or damage. Special attention should be given to cutting raw materials to required dimension or multiples of required dimension in order to save waste; and to the salvaging of all left-over pieces and parts for further use in some portion of the factory, wherever practicable. For this purpose the central storehouse should act as a clearing house, and thus aid in the general work of salvaging.

The human element enters into salvage work, as into all other industrial operations. If we can get department heads, and employees as well, interested in saving everything of inherent value, we will perform a valuable service in helping to re-establish industry on a firm and stable basis. Not only industrial managers, but the public as well, are more and more becoming interested in this most vital of human problems. One of our big industries salvages annually, in normal times, more than eighty million pounds of factory wastes. The railroads also have caught the spirit of thrift and are establishing new practices which are showing greatly improved conditions as regards operating expense. The country at large in a recent year saved scrap, consisting of several items—metals, paper, rags, wool waste, cotton fabrics, etc.—aggregating more than one and a half billions of dollars.

In the years immediately before us, industry will be called upon to bear a large portion of the burden in the vast and arduous work of reconstruction. As engineers and managers we need, therefore, to be strongly imbued with the vital principles of economy and thrift, and with the importance of greatly increased effort along the lines of salvage work. The question of profit must not always be a deciding factor, but we must conduct our operations with a broader view of saving everything which may be of value to others in the production of raw materials or finished fabrics, whether we gain immediate, direct profit or not. The manufacture and supply of raw materials depends so often upon the supply of various kinds of scrap and waste that it is most essential we give consideration to the country's needs as a whole and do not limit our efforts at salvage work to our own desire for immediate profit. Indirectly we shall receive benefit through reduced cost of the raw stocks we purchase for our own manufacturing purposes because of the abundance of original materials which we have helped to create.

No appeal to the manufacturer to save the waste products of industry can be made too forcible or too strong, nor can we lay too much emphasis upon the necessity for every individual joining earnestly with us in this great work of universal benefit to the country at large. Every pound of junk saved at our homes and turned over to the junk dealer in the end reaches the great melting pot, and finally the marts of trade, in the form of raw materials to be of definite value to some one; and that one, incidentally, may be any one of us here engaged in the profitable manufacture of fabrics which serve a public need. The nations of Europe, through the very exigencies of the war, were forced to carry on the work of salvaging to its greatest limit in order to sustain the people at home and the armies in the field; and now, during the period of reconstruction, they appear to have doubled their effort and to have gone beyond this limit in the struggle to rebuild government and business and industry on a stable and enduring basis. We in America are gradually becoming more and more aroused to this big problem in our public and private life. We have been given to waste and extravagance in the past, but we are gradually awakening to the fact that it is not so important what we have or what we produce as what we are able to save and reclaim from all the various processes of production. What we need to learn as a nation and as individuals is the vital importance of practicing the simple precepts of economy and thrift and of guiding all our actions both in business and private life to that essential end.

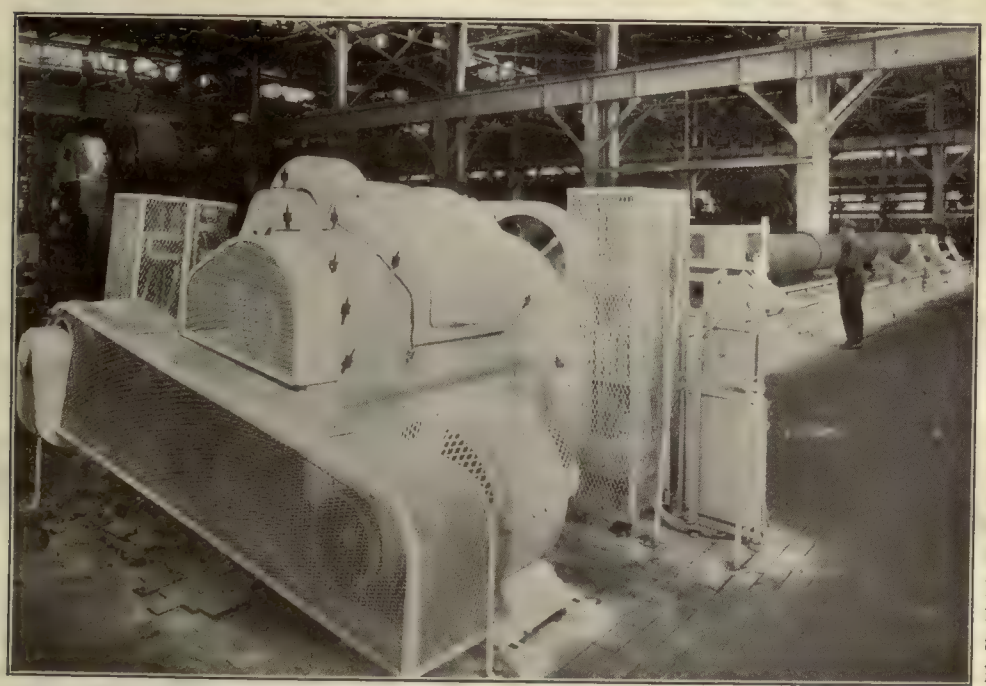
We need to learn to save everything of inherent value, and in doing this we ourselves shall derive a benefit in the general public good.

We ought to have a permanent reclamation service, fostered and maintained by our National Government as other public services are fostered and maintained. Through this office practical appeal could be made to the governors of states, through the governors of states to mayors of cities and presidents of villages, and through these latter to the heads of boards of trade and to public-spirited citizens, to co-operate in the great work of saving the nation's waste. Through this channel also could be disseminated much useful knowledge and instruction relating to the work of reclamation, which would thus reach in a helpful way not only the populous industrial centers but the outlying districts as well, and by this means bring about a widespread, concerted action for the public good. No one may attempt to predict the full extent of the value or the aggregate return of such a movement to the Government and country at large.

Still another phase of salvage work which is distinct and apart from the field of salvaging metal scrap and other factory wastes, is the saving of time and of human effort, the harboring of mental and physical energy, and the devoting of all our effort to the highest purposes and the highest aims. Profitable manufacturing requires that we build up our organizations both in offices and in the factory with a view of concentrating directive effort, eliminating duplication of orders and instructions, establishing unity of purpose, system in method of procedure, and co-operative effort on the part of all employees, whether serving in official capacities or in the lower grades of mechanical and physical labor.



A TOOL ROOM MADE LIGHT AND CLEAN BY PAINTING THE MACHINES WHITE



A BIG MACHINE WAS IMPROVED IN APPEARANCE AND LIGHTING WAS INCREASED BY THE USE OF WHITE PAINT

The two illustrations on this page show the use of white paint under widely different conditions

It is essential that we organize departmental forces in such manner as will secure systematic control of all the functions of labor and consumption of materials, and the keeping of manufacturing expenses within the budget provided for conducting shop and office work. We must build our organizations with a view of attaining the highest standards possible, in order to re-establish business on the high plane of influence which it must always occupy in the successful upbuilding and support of our Government and nation, and in the permanent establishment of the normal pursuits of industry and peace.

How to Lower Coal Costs

The Importance of Proper Selection, Buying and Tests—Getting the Most Out of the Dollars Paid for Coal—A Few Notes from History to Aid the Coal Users

By C. E. LESHER
Editor, *Coal Age*

IT IS HARDLY necessary to say that when one buys coal he buys heat, but pays for coal, service and transportation. There are almost as many different kinds of coal as there are coal mines, and of the service that follows the coal from the mine to factory siding there is infinite degree and variety. Even freight rates vary, for the rate structure on coal is a wondrous creation with many quirks and turns.

So, to get the most out of coal costs the buyer must take into account quality of coal, preparation (the freedom of the coal from impurities), dependability of supply and freight rate, for it is delivered cost that goes on the balance sheet.

Selecting the proper coal for each boiler plant may be left to the hit-or-miss judgment of the boiler room foremen or the firemen, but the best practice today is to depend on tests by combustion engineers. The problem is not simple because the variable factors are numerous. Possibly the first consideration is the absolute limiting factor of fusing point of ash, which in turn depends on percentage of ash and of sulphur in the coal as received. If a low grade coal can be used, the field from which to select is much broader than where, because of furnace conditions and load factors, nothing but high-grade fuel can be satisfactory.

For each plant can be determined the limits of ash, sulphur, and volatile within which coal suitable for use must fall. The next step is buying such a coal most advantageously. It may have been ascertained, for instance, that in a particular plant the load can be carried with a coal having as much as 14 per cent ash, so long as the sulphur does not exceed 2.0 per cent and the heat value is not less than 12,800 B.t.u. The buyer may then advertise for bids or he may put his requirements in the hands of one or more wholesalers with instructions to find the right coal and submit bids.

If some one in the company has sufficient knowledge of coals to select from the bids the best value, which may not be the lowest bid in dollars per ton, the problem is solved. More often, however, this is a task of no mean proportions and many consumers call for car-load samples for test purposes. Coal companies welcome this kind of test, for each knows that if his coal proves the best for that plant, he will secure a good customer.

Careful boiler tests should be made on each kind of coal; the kind of test that tells the value of the coal in terms of steam, figured to delivered cost. For those not equipped to do this sort of work, there are many engineering laboratories that make a business of conducting tests and rendering impartial advice. The more progressive coal selling companies have combustion engineers who not only represent them at such times but who make it their business to see that their customers are getting the most out of the coal furnished.

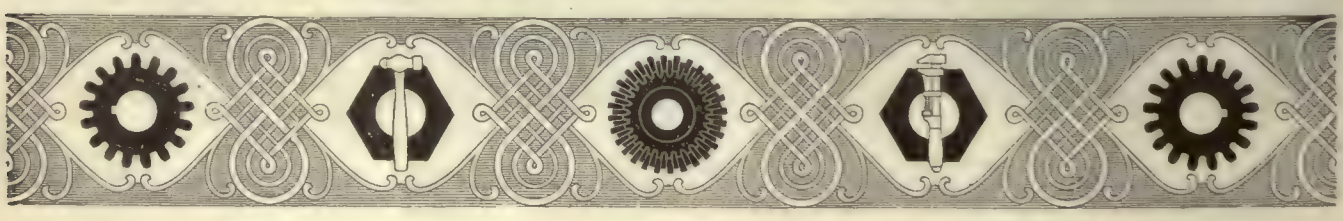
Getting the best coal for a given plant is not the hardest task. Competent tests by competent engineers can determine this. But a mistake in buying at the wrong time can undo the best work of the technical man. Business judgment of the highest order is called for in buying coal at the right time. In the last five years this country has collectively gone on one coal buying spree after another.

The point is well illuminated by a few notes from history. On April 1, 1916, stocks of bituminous coal in the United States were 50,000,000 net tons, sufficient on the average for five weeks' consumption. Anticipating a strike of coal miners on April 1 that year, consumers had anticipated their needs by about 12,000,000 tons in the first three months of the year. The strike did not materialize and buyers forgot to look at their coal piles until late in the fall, after April 1, having ceased to buy even for current consumption and having drawn on their storage for 23,000,000 tons, or nearly half the total. All during the summer and early fall of 1916 the mines were running on short time because they could get no orders. As a penalty for this short-sighted policy the coal buyers paid heavily. The spot or open market price of soft coal doubled from April to June, 1917, and was only stopped by the action of the coal operators themselves in June, 1917, after we entered the war.

The story was repeated again in 1919 and 1920. With 63,000,000 tons of stocks in their bins on Nov. 11, 1918, consumers ceased the purchase of coal, apparently thinking that what they had would last forever. From that figure they allowed stock piles to diminish by 40,000,000 tons, or to 23,000,000 tons by the first of July, 1920. By the time the miners' strike was settled, stocks in the hands of consumers were down to about 18,000,000 tons.

When the majority go wrong in their judgment, conditions are imposed that the lone individual cannot meet. But it is not always that good judgment in buying coal does not carry its reward in both better coal and cheaper coal. In the early months of 1921, the buyer of coal for industry was called on to decide whether to contract for a year's supply, or buy currently to fill his requirements. Prices on forward delivery were higher by at least a dollar a ton than the spot market. He who elected the spot market is money ahead of him who contracted.

Thus we conclude that getting the most out of the dollars paid for coal means buying the right coal at the right time, and calls for a combination of engineering knowledge and business judgment in a large degree.



Supervising the Power Plant

The Relative Importance of Power Cost Has Increased—Adequate Records Are Necessary in Proper Power Supervision—Where To Look for Waste

By A. D. BLAKE
Managing Editor, *Power*

THE extent to which the item of power enters into the cost of the manufactured product varies with the character of the product, but, in general, it is small compared with that of raw material and labor. When fuel was cheap and business brisk, a reduction in cost of power, relatively speaking, was not such a big factor—often considered as not sufficient to warrant the management's giving more than cursory attention to it. Even in the period following the war when fuel went soaring, just as long as business was good and when the manufacturer received high prices for his product, it mattered little to him if the power cost did rise, as it could be tacked on to the selling price and passed along to the consumer. But with the readjustment of business, the falling off of sales and keener competition, it became necessary to carefully scrutinize every item entering into the cost of manufacture, to discover where possible savings might be effected. It became necessary to do business on a smaller margin of profit and any saving in the power cost became relatively larger.

Raw material in a manufactured article may run from 40 to 50 per cent of the production cost. In the power plant, fuel, which is the raw material, will run from 70 to 80 per cent of the power cost; hence the importance of preventing its waste. Manufacturers, having their own power plants, therefore, were brought to a realization that it is in the boiler room that money can be saved or wasted. In this connection, the boiler plant may be pictured as a produtcion department in which fuel is the raw material and steam the manufactured product.

Adequate Records Necessary

The first step toward better supervision is provision for securing and maintaining adequate operating records; the second, an intelligent use of them. Too elaborate a system is often as bad as none at all and the expense and time consumed in keeping it defeat its real purpose. In some large establishments considerable detail in power plant accounts pertaining to the various services may be warranted, but for the average case it is necessary principally to know at all times the evaporation per pound of fuel, the cost of producing a pound of steam and the cost of producing a horsepower or a kilowatt-hour at the switchboard. This entails the use of scales for weighing the fuel, meters for measuring the feed water, flow meters for measuring the steam supply to various departments where process steam is employed, and electric meters for determining the current supplied to the departments. Labor, fixed charges, maintenance and supplies must, of course, be included, but their cost can readily be obtained from the accounting department. It is also well to keep a card for each piece of power equipment, on which will be noted its date of purchase, cost, repairs, approximate use factor and notes on performance.

Such operating records will show whether or not the performance of the power plant is what might be expected for one of its size and operating conditions. Comparison of records from month to month is also useful when interpreted in the light of load conditions, as indicating improvements or falling off in efficiency; if these governing conditions be neglected, however, the results may be misleading. On the other hand, such comparisons may indicate where a readjustment can be made in the shop load to raise the load factor or permit more economical handling of the power plant units so that each may be operated at its most efficient capacity during as much of the time as possible.

But this is not all. The operating force, if it is to be held responsible for results, must be provided with such instruments as will enable it to detect losses in the boiler plant and engine room. Among such instruments may be mentioned the CO_2 recorder, thermometer, draft gage and steam-engine indicator. Only such instruments and meters as are necessary for determining the cost of power or that will improve the operation of the plant should be procured, and the management should insist, after having purchased them, that they are made full use of. Too often such intsruments are found poked away in dark corners or on dust-laden shelves. The fault in such cases can usually be traced to lack of understanding of their working by the operating force or to failure on the part of the management to insist on their use and to give the records proper attention.

Where to Look for Waste

Prolific sources of waste in the power plant are improper firing methods leading to low CO_2 in the flue gases, too much excess air, boiler settings not in good condition, dirty boilers, steam traps that are not piped back to the hotwell or are out of order, feed water too cold and engines improperly adjusted. Money invested in pipe covering is well spent. In many plants it is possible by slight alteration of the equipment to employ exhaust steam in processes where live steam is now being used. Back of all, however, is the importance of securing the fuel best adapted to the boiler room conditions. This can be determined only after carefully noting the evaporation, the cost of handling ash, furnace repairs, etc., and striking a balance with the price of the fuel.

Establishments whose power plants have been definitely designed to meet present manufacturing requirements will find it comparatively easy to keep a proper check on the operation. Many, however, are not so fortunate. Their business has expanded and necessitated extension of the power plant from time to time, such additions often being made through expediency without regard to the general plan of the original layout. The result is a rather miscellaneous collection of equipment, a complication of piping and inadequate facilities for arriving at operating results. Such a plant affords a splendid opportunity for the engineer to make a showing if he be competent to locate conditions leading to waste and to point out where improvements can be made. However, it is always well for the management to be sufficiently conversant with the possible

sources of waste so that it can intelligently check the efforts and recommendations of the engineer. If the latter requests additional instruments or apparatus or a change in layout he should always be prepared to show that the savings effected will pay a return upon the money invested in the apparatus.

Moreover, should the question arise as to the advisability of changing over to central-station service a complete system of operating records will obviate or combat assumptions and assist the management in arriving at an intelligent decision.

A word in regard to the engineer and the operating force is pertinent. Best results are invariably obtained when the management is prepared to take the engineer into its confidence, to lend an attentive ear to his recommendations and to be prepared to enter into a sympathetic discussion of his problems, at the same time insisting that his propositions be presented in a logical business form and on the basis of dollars saved. Moreover, there should be established among the members of the operating force a feeling of responsibility and a spirit of loyalty to the business. Make them feel that they are an integral part of the manufacturing organization just as are the employees of any other department and not merely tolerated as an adjunct to the establishment. The effort will bring a handsome return.

Proper Maintenance of Electrical Equipment Saves Cost of Shutdown and Repair

Organization of Maintenance Force with Details of Methods Used to Forestall and Locate Trouble and Schedules for Inspections

By E. H. HUBERT
Assistant Editor, *Electrical World*

MANAGEMENTS are coming to realize that it is more economical to forestall trouble in electrical equipment than to suffer the expense of interruptions and repairs. However, in organizing an inspection and maintenance department a proper balance between possible good and the expense of running the system must be obtained. The two organization charts shown herewith illustrate respectively a small, simple system and a large complicated one, both of which have proved successful. An idea of the organization necessary for any plant may be judged by comparison with these two examples. The smaller organization is for a factory with 2,200 hp. in 1,500 motors ranging in size from ½ to 225 hp. These are 220-volt, 60-cycle motors working eight hours per day six days a week.

The larger organization is for a plant working 24 hours a day, except Sunday, and having 500 power motors aggregating 9,000 hp. not including numerous smaller motors for portable tools, desk fans, etc. This is a system described by C. A. Cowdery, electrical engineer of a large New England plant, in ELECTRICAL WORLD. In this system each branch of the organization is in charge of a foreman or leader to whom the men report, and the leader in turn reports to the general foreman on important matters, or for advice.

Duties of Different Inspection and Repair Crews

Motor inspection and repair includes inspecting, repairing, oiling and cleaning all motors and starting apparatus in the main buildings, except the forge shop and exclusive of some synchronous motors which will be dealt with later. Certain men were assigned to inspect the motors in one section of the factory. Whenever a motor was taken down it was thoroughly inspected and cleaned and, if necessary, the coils were varnished and the motor was baked.

In any plant the inspection of motor equipment should include observation of the following points suggested by Sidney Fisher of the Bridgeport Brass Co.: (1) On the motor; oil supply, freedom of oil rings, gaging of air gap, main-drive belt tension, slip-ring surface, speed, frame and bearing temperature; (2) on the control apparatus; condition of make-and-break switches, condition of overload release on compensator, compensator contacts particularly on the running side, inspection of overload relays (timing, damping etc.), oil supply in compensator, temperature of compensator and no-voltage release coil, operation of no-voltage release.

A logical method of procedure to determine the cause of motor breakdown is as follows:

Test Temperature of Motor by Hand

(1) If temperature of frame including bearing is uniform, examine fuses or relays; replace blown fuses and examine relay timing adjustment and damping device.

Start Motor and Stand By

(2) If temperature of bearing is abnormal look in oil chamber. If full of oil examine ring to see if it revolves freely. Reset relays or replace blown fuses. Jerk starting lever and observe motor shaft and chain or belt. If there is no motion the bearing is seized. Put in spare motor.

(3) If temperature of frame is uniform but abnormal, replace blown fuses or reset relays and start motor. Take speed. If speed is less than full-load speed, motor is overloaded. Inquire of floor foreman and look for seized shaft bearing. If either is the cause notify chief electrician immediately. Overheating of a three-phase motor may be caused by running single-phase. Therefore compensator contacts on running side should be examined and repaired if necessary.

The department in the large organization referred to called "general and lighting" was responsible for inspection and maintenance of the entire lighting system. The maintenance of lighting circuits, replacement of lamps, fuses, etc., during the day was carried on by a group of men who also served as helpers to other departments, repairing miscellaneous equipment such as lighting fixtures, extension cords, renewable fuses, sockets, etc. The seven-day men in this group were used on apparatus which required a stand-still inspection on Sunday. This plan of course would not be necessary if such inspection could be done by night shifts.

The night men did no permanent repair work except the replacement of lamps and fuses. One man of each shift stayed at headquarters to answer calls while the other men were on inspection trips, battery charging, changing time recorders and turning on or off stairway, exit and yard lights, as per schedule. If serious trouble developed the qualified day men were sent for. Three seven-day men were responsible for the inspection and maintenance of lighting and power equipment in the

forge shops. The synchronous motors driving exhaust fans required careful inspection as they were installed on the roof and vibrated excessively. These were patrolled during each shift. Between inspections all the men attended to cleaning motor houses, repairs and clerical work.

The lamps were all cleaned on schedule. Those in particularly bad locations, such as those used for certain woodworking operations, were cleaned daily, while those in other places were cleaned every two weeks.

The elevator upkeep was done by one man and an oiler. Cables, contactors, brakes, drums, and hydraulic gates were maintained and pits and cars were kept clean. Written reports were made on most of the parts twice a week and on other parts once a month.

Twenty-one battery-type trucks were inspected and maintained as to batteries, motor controllers and bells, motor-generator sets and charging panels. Numerous small motors such as those used on tabulating machines, adding machines, desk fans and other miscellaneous equipment of this character were regularly inspected, oiled and cleaned. Card records of this apparatus were kept.

Telephones, fire alarms, buzzers, time system, and other low-tension equipment were cared for by five men.

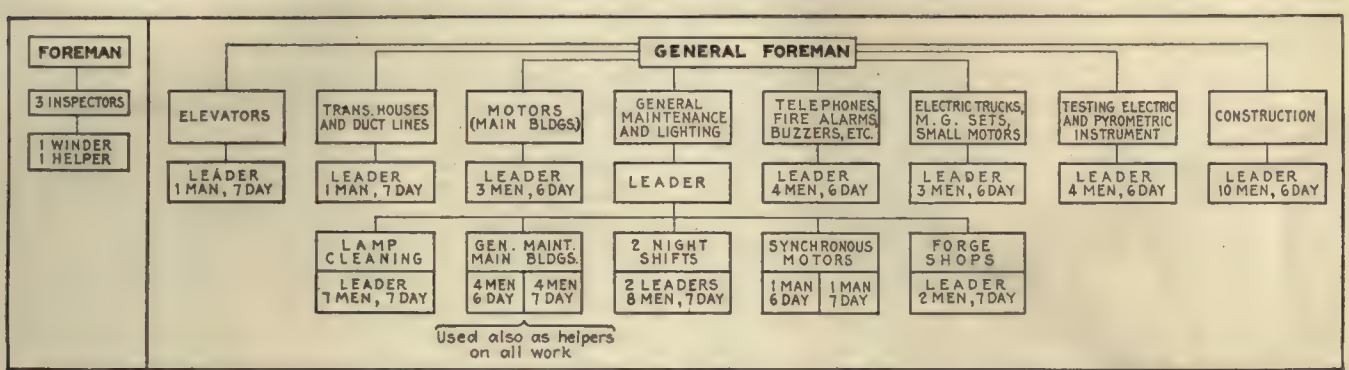
other copy given to the proper man for attending to the trouble.

At the maintenance headquarters was kept a record of the location of every piece of apparatus with the nameplate data and other descriptive matter which would help in identification and in ordering new parts.

A card record used in one plant contains the following data for each motor: Number of motor, department, motor driving horsepower, make, type, serial number, revolutions, phases, voltage, diameter of pulley, face of pulley, size of key, diameter of shaft, length of shaft, size of fuses, type of fuses, size and number of brushes. The cards are arranged according to departments. Another set of cards was filed according to the motor number. Some systems include even more complete data, as for instance the kind of coils, the type and size of control apparatus, etc.

Frequency of Inspection

The frequency of inspection varies with the class of apparatus, its use, importance, location and certain constructive features. With the small maintenance system first mentioned the motors, averaging five years old, are inspected twice a week with certain exceptions. Some synchronous machines driving air compressors are



MAINTENANCE ORGANIZATIONS WHICH HAVE PROVED SUCCESSFUL IN TWO WIDELY DIFFERENT PLANTS
Left—A six-man crew for a plant working eight hours per day and having 2,200 hp. in 1,500 motors. Right—A large organization for a plant working twenty-four hours a day and having 500 power motors aggregating 9,000 hp.

The factory had a 300-line automatic set. This crew did installation work which would not be required where a permanent system was already working.

A division made regular inspection of transformer houses and high-tension duct systems. Semi-weekly reports were turned in as to the conditions of houses and apparatus.

Testing is necessary because of variable loads on motors, feeders, etc. Moreover all instruments must be checked periodically. The organization shown also spent much of its time checking pyrometer instruments which are not found in many industrial plants.

The construction crew installed all new apparatus requiring wiring and piping or change of location of any equipment. The organization was especially large because the factory was new and frequent changes were necessary. As the average maintenance man does not qualify as a wireman who can do pipe fitting economically, regular wiremen were employed.

The engineer or general foreman was notified as soon as any trouble occured, such as motor shut-down, overheating of apparatus or any other trouble out of the ordinary, after which he immediately endeavored to find the cause. When trouble was reported a record was made at the office, one copy of which was kept and the

inspected only once a week while some important blower motors running at 3,600 r.p.m. are looked at four times daily.

In the large factory mentioned operating 24-hours per day motors in operation are checked daily as to the following conditions: Bearings and frame temperatures, oil level, connections, condition of drive, cleanliness and excessive vibration. Those in dirty places such as forge shops are cleaned by use of compressed air every week, while those in better locations are cleaned once a month. At this time the motor is not operating and the air gap is gaged to determine the condition of the bearings. If low, they are replaced. Once every month the compensators are examined as to condition of contacts, height of oil and loose connections. Overload relays are inspected at this time as to proper setting and proper oil level. On the Monday following this inspection the no-voltage release coils are tested by lifting the relay plunger while holding the handle of the compensator so that it will not shut down the motors. All section circuit breakers are inspected monthly regarding tripping mechanism and condition of contacts. Safety switches are inspected each month. Meters in the powerhouse are tested every four months and less important meters around the plant at longer intervals.

Campaigning for Economy in Tool Consumption

A Scheme that Could Be Followed to Advantage in Many Shops—Education in Care of Tools Aided by Bulletins and Illustrated Posters

By RAY ANGOVE

ARE the workmen economical in the use of tools? Do they use tools efficiently and carefully, getting maximum production with a minimum of tool breakage? Do they know how to use tools and how to take care of them? Do they return them to the toolcribs or do they keep them lying in the drawers of the workbenches indefinitely? If they do return them, are they returned in good condition?

These and many other questions were discussed at a meeting of the employees welfare committee of a large mid-western electrical industry at its regular monthly meeting, held on Sept. 5, 1921.

When the discussion was opened the majority were of the opinion that little could be done in saving tools; that the workmen in the factory were of a higher than average intelligence, and that it would be nearly impossible to make any improvement along this line.

Bit by bit, however, facts came to light which proved to the satisfaction of the entire committee that the loss occasioned by the misuse and breakage of tools was not a necessary loss and that a substantial saving could be made. Accordingly, it was decided to stage a campaign for the "Better and More Efficient Use of Tools" and a committee was appointed, whose duty it was to spread the gospel and put the campaign across. This committee was cautioned to keep a careful record of all visible results and report to the present committee at intervals. The campaign, it was decided, was to run from the fifteenth of September until the same date in October.

A few words regarding the committee that undertook this work will give a clearer idea of the campaign. The committee was composed of assistant shop foremen, office employees, the director of safety and welfare and the editor of the employees' magazine. The first step of the committee was to come out openly with an announcement of its plans and a statement showing just where and how it hoped to make improvements.

Accordingly the following notice was placed on the bulletin board and while it was intended merely as an announcement of the campaign, created a good deal of interest and accomplished some good.

THE SALVAGE COMMITTEE SAYS YES—

Can the life of the tools we use in the shop be prolonged by proper use and care?

Can we prevent much or any of the breakage of tools?

Can we do better work by using tools properly?

Can we eliminate some of the waste in the use of tools?

The Salvage Committee says yes and will tack up some paper dollars on this bulletin board during the next month to prove it—keep your eyes on the bulletin board.

The writer recalls the following conversation he overheard between an employee and a foreman a few hours after the notice had been placed on the bulletin board:

Employee: "Give me an order for a three-cornered file."

Foreman: "Have you noticed that the committee is trying to make a saving in the use of tools? It has just posted a notice on the bulletin board. We must help it out if we can. We drew several of these files the other day, and I notice that we are drawing them right along. See if you cannot look up some of them and keep them where they will not be mislaid."

The foreman was ready and willing to help and so was the workman, for after looking over the notice, he gathered up, not one three-cornered file that had been mislaid, but six of them, and four were returned to the toolcrib.

The day after the first notice was up, the committee received a letter from the factory superintendent which read as follows:

"Salvage Committee:

"I have heard of the campaign you are conducting for the better and more efficient use of tools.

"Your idea is a good one and your reasoning is sound.

"A saving in the use of small tools will result directly in benefit to every man and woman on the plant payroll.

"One who follows the practice of saving in connection with small tools is certainly a workman to be desired.

"Superintendent."

This letter was immediately put in bulletin form with the heading in bold type, "The Superintendent is with us—Are You?" and pasted on the bulletin board.

On the following day, the employees' magazine, a semi-monthly paper, was distributed. This paper explained fully just what the campaign was expected to accomplish, just how it came to be started and how all the employees could help.

It was at this time that the plant really woke up to the fact that something unusual was going on. Foremen who did not want to be left behind began telephoning to the committee chairman, employees' magazine editor and the superintendent for additional information. The following multigraphed letter was immediately rushed out to every foreman in the plant putting him "in the know" on the campaign.

To All Foremen:

Perhaps you have been wondering what the salvage committee has been trying to get at with its campaign for the "Better and More Efficient Use of Tools."

Briefly, it is going to run several campaigns each of a month's duration, covering nearly every detail of production and shop work. Among these campaigns it expects to hold the following:

For the elimination of fire hazards.

For the elimination of material waste.

For the elimination of accidents, and many other campaigns of like nature.

Perhaps you can suggest some more fields it can cover.

Knowing that every foreman will be glad to help the committee in this work it is going to send you at the beginning of each campaign, a list of suggestions of the ways you can help.

The present campaign for the "Better and More Efficient Use of Tools" will close Oct. 15. Some suggestions as to how you may help to get this idea across are as follows:

(1) Have the men clean up their benches and bench drawers and return the tools they do not need to the toolroom.

(2) See that the men are not using mushroomed tools or tools damaged so they are dangerous.

(3) Talk about the proper use of tools to your men as much as possible.

(4) Put a couple of samples up on your bulletin board showing the tools you use in your department—correctly and incorrectly sharpened, with a few notes on how to care for them. The committee will gladly help you make up this display. The committee thanks you for your interest and hopes you will see the possibilities of its present work and help put it across.

Campaign Brings Results

By noon on the day following the day this letter was sent to the foremen, nearly three thousand dollars worth of tools had been returned to the toolcribs. This was gratifying to the committee, but it was not sure that all the employees were favorable towards the campaign and it decided to make an effort to get everyone helping. The committee agreed that the best way to assure full co-operation was to assume that it was already getting it. This argument resulted in the following notice being placed on the bulletin board:

THANK YOU—

THEY KNEW YOU'D BE WITH THEM

When the members of the Salvage Committee asked all employees to help them in their campaign for The Better and More Efficient Use of Tools, they were confident that everyone would be glad to help.

They are glad to know that their judgment was right.

THEY KNOW YOU ARE WITH THEM BY THE RESULTS OF THE CAMPAIGN

While the campaign is just starting, the wonderful results shown thus far prove that everyone is helping.

Thousands of dollars worth of tools were returned to the toolcribs during the first ten days of the campaign and more are being brought in every day.

They want to thank you and ask you to continue to give them a helping hand until the campaign closes, Oct. 15.

About this time some calls came in for specific information as to what tools were broken? How were they broken and how this breakage could be prevented? To take care of these requests for information, the committee called upon the men in the plant who were most familiar with tools, and from them the desired information was obtained. Pictures were taken of many broken tools, and twenty different posters, of which the following is a sample, were made up and mounted on heavy gray cardboard and sent from one department to another:

One day a member of the Salvage Committee took a stroll to a scrap heap where old tools were thrown and picked out a half dozen to take pictures of.



Take a look at those shown above. Can you imagine how they were broken? Some through carelessness and some through inefficiency.

It cost a good deal of money to replace these tools.

Now do you know why the committee is campaigning for

BETTER AND MORE EFFICIENT USE OF TOOLS?

Will you Help?

It soon became noticeable that the number of broken tools was decreasing rapidly, and the percentage was but a small fraction of what it had been during the month preceding the campaign. The number of tools being drawn from the toolcribs was falling off, and boxes of tools that accumulated in different departments were coming in every day.

While the posters containing the pictures of broken tools made a lasting impression on the majority of the workers, the committee agreed that a display of the tools themselves would be still more interesting. Carrying out this idea, a large cabinet was built with a glass front and about a hundred samples of damaged and misused tools were securely mounted within. Below the glass a paper dollar was pasted together with a short note stating the exact amount of money which had been expended in replacing the damaged tools. This display cabinet made the rounds of the plant, stopping for a day or two in each department.

Foremen in different departments meanwhile had built up little displays of their own and had done much to advance the work of the committee.

When Enough is as Good as a Feast

In every campaign there comes a time when additional work produces but little good and often spoils much of the good work that already has been accomplished, and the committee decided that the saturation point had about been reached.

"What we need," said one member, "is a neighborly, good-humored, confidential poster, which will hurt no one's feelings, but which will help to knit us all together into a happy group, ready to do what we can for the good of each other, and the company." His idea struck a responsive chord with the committee, and his ideas of a "neighborly poster" resolved themselves into the accompanying bulletin. This bulletin was tacked up on the same day the employees' magazine was issued.

LET'S TRY TO BE GOOD NEIGHBORS

When you borrow a lawnmower, hatchet or some other tool from your neighbor, do you return it in good order?

You should at least try.

When you draw a wrench, drill, tap or any other tool from our toolcrib, do you return it in good order?

You should at least try.

Other material regarding the campaign printed in this issue of the employees' magazine consisted of a brief summary of results as far as they had been ascertained up to the time of going to press; a list of "Machine tool DON'TS" compiled by the committee and a word of appreciation from the committee to every employee.

This proved to be a happy conclusion to the campaign. It accomplished the desired result and left everyone with a clean taste in his mouth and no discussion of ulterior motives on the part of the committee was heard. It was quite evident that nearly every employee had realized that the committee was working for the general good of all concerned in trying to lower overhead costs, and they put their shoulders to the wheel and helped in every possible way. A campaign of this sort can be successful only when the motives are clearly established by proper publicity and any campaign which does not enjoy the confidences of all the employees is doomed to failure.

Actual results are always hard to measure but the salvage committee submitted the following items to the parent committee:

(1) There has been a decrease of 75 per cent in the number of small tools drawn from stock.

(2) There has been returned to our toolcribs, nearly $5,000 worth of tools of all sorts which had been lying around in bench drawers and miscellaneous places. With these tools in the cribs it will be unnecessary to re-order in order to keep up a stock of tools, which while depleted in the crib, are lying about the plant not being used.

(3) The number of broken and damaged tools returned for replacement has decreased two-thirds.

(4) Workmen in drawing tools are now very careful to specify the exact tools desired and the kind of material they are to be used on.

(5) Injuries due to the use of mushroomed and damaged tools have very nearly disappeared.

(6) Uses have been found for broken tools that have heretofore been scrapped. As an instance of this, broken hacksaw blades have been found very convenient in performing a certain operation in one department.

In the estimation of the executives of the company, the results are wonderful and they were not slow to appreciate the value of the work carried on by the committee.

The cost of the campaign did not exceed fifty dollars, while the returns ran up into thousands.

Economy in Gaging—And in Gages

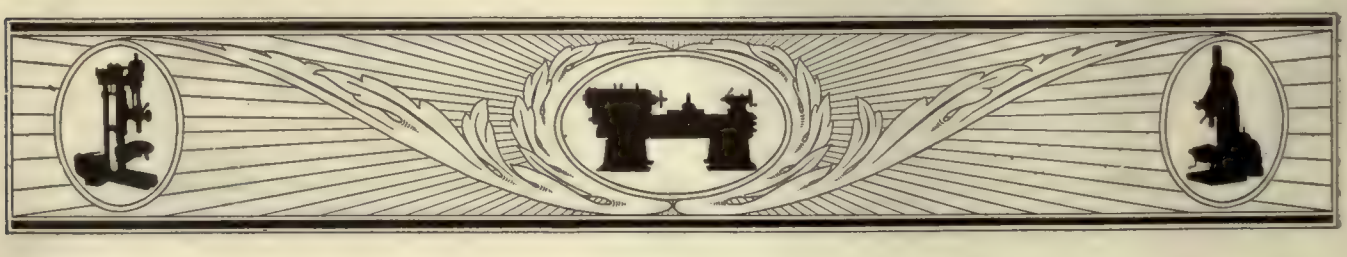
By James Parker

While the economies of manufacture made possible by the use of gages is being increasingly recognized, economy in the purchase and use of gages does not always have the consideration it deserves. The writer visited one plant which required 100 per cent inspection on some parts with tapped holes. The gages were chucked in a reversing speed lathe and the work, held in the operator's hand, was run on and off very rapidly. The gages were discarded after two or three hours' use, by which time they had worn about 0.001 in. It was figured that this paid because of the low labor cost of inspection. But the concern was buying gages made to an accuracy of 0.0001 in. in pitch diameter, and the method, depending upon the judgment of the operator as to the amount of "shake" permitted, held the work to a tolerance of about 0.002 in., which met all requirements.

For another job which required close fits the manufacturer was paying a fancy price for taps selected to 0.0005 in. in pitch diameter and 0.001 in. per inch in lead, and inspecting the holes with thread gages purchased to the same specifications—or lack of specifications. To the manufacturer a thread gage was a thread gage, and its accuracy was assumed as a matter of course. The gage-maker held all thread gages to master-gage tolerances unless otherwise specified. After some discussion the two got together, and for the first job agreed upon a gage-maker's tolerance of +0.00025 to +0.0005 in., at a reduction in price of twenty per cent. The gages lasted 25 per cent longer before discarding, and the sacrifice on component tolerance was not noticeable.

On cylindrical plug and ring gages where the component tolerance is as much as 0.002 in., it is economical practice to allow one-tenth of this on "Go" gages, so placed as to allow for wear, but not on "No Go" gages which get but little wear. A "Go" gage made to exact size wears beyond tolerance almost immediately. A "Go" plug on which the gage-maker takes even a slight minus tolerance is partly worn out before it is first used. The purchaser of gages can usually save money, both in first cost and in maintenance, by specifying tolerances when ordering.

The greatest economy, however, may be realized by correct placing of tolerances on component. Some draftsmen think that 0.001 in. tolerance is enough for anything, and if they give more it suggests sloppy work. There is no greater source of waste in the shop than close limits which are unnecessary. Even when parts require very close fitting, it is usually in one or two points only. Economy requires the widest permissible tolerance on every dimension which requires gaging, followed by strict adherence to them when established. If liberties with given tolerances are permissible, it shows at once that the tolerances should be widened.



The Dollars and Cents Value of Safety

What Industrial Accidents Cost the Employer, the Employee and the Country—Savings Possible Through Proper Guarding—Present Best Time To Install Guards

By JOHN A. DICKINSON
Mechanical Engineer, Bureau of Standards

THESE are overall days, not alone for the employee but for the employer as well. The munition worker's silk shirt has disappeared along with the "Near-oriental" rugs with which the boss was wont to deck his private office; today the worker is wondering when the factory will be put on full time again and the employer is scratching his head, metaphorically at least, over the question of money with which to keep things going until "good times" come again.

Practically every plant in the country is face to face with the problem of lower production costs. Reduction of wages and salaries, the elimination of bonuses, the closer buying of necessary supplies are remedies that have been applied in hundreds of instances. The non-productive departments of most industries have been pared to the bone, or done away with altogether. This, on the face of it, seems logical, but in many instances it will prove to be poor economy. Some of the wiser concerns are increasing their research and engineering departments and are using men and machines, which otherwise would be idle, to develop new products or cheaper methods of manufacturing existing products.

It is unfortunate that safety organizations are generally classified as non-productive, and as such are being sacrificed on the altar of economy. Let us see if the assumption that such organizations are unproductive is correct.

First let us see what accidents are costing industry. There is not a large manufacturing state in the Union where the compensation payments do not *exceed a million dollars a year.* In such states as New York, Pennsylvania, Illinois and Ohio the sum is several times this figure. Dr. L. W. Chaney, of the Bureau of Labor Statistics, gives an estimate of fifty millions as the annual bill for compensation for the entire United States. As a check, the workman's compensation insurance premiums for 1919 were totaled and showed over one hundred millions paid in premiums for workman's compensation insurance. With a loss ratio of fifty per cent this would indicate that Dr. Chaney's estimate is approximately correct for concerns that carry insurance, but is probably low when the large number of concerns which carry their own risk is taken into consideration. For the sake of argument, let us assume that this figure is correct. *Fifty million dollars!* That's a pile of money! Think what that would mean if spent on research for the benefit of industry—imagine the thousands of miles of improved roads that this sum would build and the value to industry of such highways for trucking!

But what becomes of this enormous sum? Does the employer receive any return for it? No, it does not represent one hour of productive work—as far as value received is concerned, it might as well be thrown down the sewer.

To the injured worker it does mean enough to keep body and soul together, but represents less than a third of his potential earning power if he were not disabled. Labor, then, stands to lose not fifty millions but double that sum each year through industrial accidents.

The direct money loss to employer and employee, then, will total not less than one hundred and fifty million dollars but this is not the whole bill; far from it. There are other less obvious losses which in the aggregate are tremendous financial losses. Among these may be mentioned the time lost by other workers in a room or department when a man is injured; the interruption of the factory routine; the cost of investigating, recording and reporting of accidents; the replacement of injured men by less skilled workers with the attendant lower production and higher spoilage; these are a few of the indirect losses which add millions to the total bill.

The Country's Loss From Accidents

Statistics of themselves are stupid things, but properly used they sometimes help in picturing conditions when our ideas are vague and nebulous. The statement that 25,000 men are killed annually by industrial accidents has been made so often that it has lost much of its meaning. If, however, we stop to consider that the average age was 37 with a life expectancy of 30 years, which at an average of $1,000 a year would mean the loss of $30,000 earning power for each man killed, we have here a definite unit of measure. Multiply this sum by the number killed (25,000) and you get a total of $750,000,000, three quarters of a billion dollars lost to the country through its annual death toll from industrial accidents. Add to this a similar sum to indicate the lost earning power of the vast army of totally or partially disabled men turned out by industry each year and you will begin to realize what the effect of industrial accidents is in this country, considered from the financial standpoint alone.

A logical question for the factory executive to ask is how much can this total be cut down if guards are installed? The answer is a difficult one; for years it has been stated, frequently by men who should have known better, that guards will eliminate only 25 per cent of the accidents. From the standpoint of the *number* of accidents occurring in a given plant this may be true, although personally I believe the estimate is low, but a completely guarded plant will eliminate most of the *serious* accidents—those that lay a man up for weeks or months.

To put it another way, it may be true that guards will only reduce the frequency (i.e., the number of accidents per year, per unit number of working hours) 25 per cent, but it will reduce the severity—which is the ratio of disability hours to the number of hours worked—to a much greater extent. If engineering revision in its broader aspect is included under the general heading of safeguarding, the resulting decrease in accident severity and its attendant money loss will be still greater.

Anyone investing money naturally asks what return may be expected. A plant installing new machines

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logically expects the increased production or the reduced costs to pay a fair return on the money invested. Money invested in plant safeguards is frequently considered in the light of a permanent investment and it is but natural that a fair return should be anticipated.

The plant which carries insurance finds that, as a result of the installation of guards their basic manual rate has been reduced a certain amount. At the time the rating schedule was prepared, this reduction was computed so as to repay the assured for the cost of guards in from five to eight years, giving a return of perhaps 15 per cent on the money so invested. While the cost of fabricated guards, or of the material and labor necessary to make them, has increased considerably, the amount saved on insurance premiums through the reduction of rates due to the installation of guards still gives in a majority of cases a fair return on the money invested.

Certain extreme hazards are severely penalized in the schedule, for example, each exposed setscrew adds approximately one dollar to your premium *each year.* Obviously the replacement of such projecting setscrews with safety setscrews will pay for itself several times over the first year and, what is of still greater importance, the reduction of rate due to the elimination of this hazard will continue in effect year after year.

Where large concerns have organized safety departments and have kept accurate record of costs of all expenditures logically charged against such departments, they have invariably found that the saving in accident costs has paid big dividends on the money invested. One of the large steel companies estimates that through the reduction in accidents effected by their safety engineers, they are saving *a million dollars annually over and above the cost of all safety work.* A return of over 100 per cent a year looks like pretty good business. In a recent interview the superintendent of one of the largest high-explosive plants in the world (the du Pont plant at Repauno, N. J.) estimated a saving of 10 per cent over and above the entire cost of the safety department, a return of 110 per cent per year. The examples might be easily multiplied indefinitely.

Besides this direct financial return there is the improvement in the morale of the plant that is bound to follow any honest effort to better conditions under which men work. Safer machines generally mean more production, for the operator can work at the top speed without fear of injury. The installation of punch-press guards in a large plant manufacturing electric flashlights increased production 8 per cent with no increase in the number of machines or operators. The money value of this increased production and the improvement in morale must be added to the already large return on the investment in "safety preferred."

As a business proposition, safety work means just this: that dollar for dollar, money so spent will yield as big, if not a bigger, dividend than any other investment you can make. Safety is not a non-producer; it is a big money maker and will help you cut costs and keep down production overhead.

Now is the logical time to do safety work; skilled men are available, materials used in the construction of guards have been reduced in price, and the machines to be guarded can be spared more easily now than they can in times of full production and, best of all, the reduction of accidents will help curtail the overhead expense.

Using Conveyor Belts to Speed Up Service in the Lunchroom

By Sidney M. Crosset

One of the big features of any industrial lunchroom is low price. Generally speaking, employees expect that in any proposition of this kind conducted by the company the prices charged will be lower than elsewhere. The reason for this is that an industrial organization ordinarily does not conduct such a commissary for profit. And it is highly desirable to watch closely the costs in the industrial kitchen and dining room, in order that expenses may be kept down.

In our dining hall, here at the Bausch & Lomb Optical Co. plant, we have at least two things that seem to help in our service and in eliminating useless expense. One of them is a device that speeds up the service in the dining hall and keeps the lines of patrons moving without interruption at a regular speed. Belts were placed along the outside of the four counters. Each belt is stretched from one end of its counter to the other. While lunch is being served the belts are put into motion by small electric motors and kept moving at about the speed of a loitering walk. The upper part of each belt travels over a long shelf about waist high and about 15 in. wide. As the dining hall patron picks his knife, fork and spoon from the trays at the entrance end of the counter he places them on a tray selected from a convenient rack. He then places the tray upon the moving belt.

As he passes along the counter he must either travel with the tray or hold the tray back with one hand. The tendency is very strong to move with the tray and to speed up his selection, materially aiding in giving those behind him quicker service. This enables us to serve a great many people in a brief period of time, and therefore permits the chef to dismiss his extra noon help within 15 or 20 minutes after the service begins. The speeding up is confined to selection and does not extend to eating.

The entering ends of the four counters are to the outside. The lines move toward the center of the hall, and as the patrons leave the counter in the center, they can very easily select tables in that vicinity or at either end of the room. An iron rail about waist high along each counter makes it necessary for all patrons to pass the entire length of the counter, entering at a certain place and leaving at a certain place, permitting proper collecting for the food. As the patron reaches the counter at the entering end the regular 25c. lunch ticket is taken. If he does not have the 25c. lunch ticket he may not enter the regular dinner counter line, but is in that case directed to the a la carte counter. After the 25c. lunch ticket is taken, the patron makes his selection and as he leaves the counter at the center of the hall the checker collects for any extra dishes. All payments are made by checks purchased before the patron enters the line, a feature that eliminates delays that would be caused by making change.

Another point that saves time and eliminates superfluous help during the lunch hour is the layout of our serving counters. In our dining hall, all dishes are kept under the counter in steam heated tables and everything is within very easy reach of those dishing up the food. The chefs do not have to leave their posts or even turn around. None of the heated food has to be dished up very far ahead of time in order to present an adequate supply.

Oil Conservation and Better Lubrication

Getting the Greatest Service Out of Lubricating Oils—Necessity of Selecting Oils According to Service Desired—Economies of Reclamation

By R. E. LANGSTON*

NO INDUSTRIAL plant is so small that it can afford to neglect any part of its costs, and in these days special care should be given to the costs of lubrication. Included in this cost must be considered not only the actual cost of the oils, but also the cost of extra power necessary to overcome the friction loss, the labor of the oilers, and the wear and tear on the machinery which can be traced to faulty lubrication.

Almost every employer uses some method to note whether or not his workmen are putting in a full day. It is just as important to the user of industrial machinery to know whether the lubricating oils he is using are giving him their full value, or putting in their full effectiveness, as it is to know whether an employee is careless and wasteful or whether he is alert and capable.

Competition in modern industry demands a greater reduction in the cost of manufacturing power. One of the biggest factors entering into the reduction of power costs is the further elimination of friction by scientific lubrication. Means for reducing the frictional resistance in all machinery and moving parts has been the study of engineers for a long time. The elimination of long, heavy transmission shafting; the adoption of individual drives for machines; the ever increasing size of power units; the very extensive use of ball and roller bearings; the demand for better oil and its use in stream feed and force feed lubrication; all point to this effort.

Frictional loss can be reduced to a minimum only by the most liberal use of the correct grade of good oil. The oil bath or flood lubrication represents the most perfect lubrication possible, as well as the limit beyond which friction can be reduced by lubrication. Stream feeding by gravity or force feeding of oil is the best example of flood lubrication, while scanty, insufficient lubrication is represented by all hand or drop feeding of oil.

With the ever increasing cost of oil to be met, stream feeding of oil to engine and machine bearings would be almost entirely out of the question if it were not possible to collect this used oil, thoroughly cleanse and purify it, and return it to its original state, using it over again many times. Lubricating oil does not wear out. It becomes foul with impurities which must be removed. The lighter volatile elements in its make-up often evaporate due to its contact with the heat of the bearings, but otherwise its composition is not changed. It is a most extravagant idea to believe that bearing oil is consumed or destroyed through use.

Executives are requiring that a closer account be kept of the cost of oil expenditures, and that every possible means be resorted to for its most efficient use without that prohibitive expense. The following suggestions will be of special interest to all owners and operators of industrial machinery and if put into practice will return large earnings in proportion to the investment:

In the first place, there is a proper oil for every duty. Be sure that you are using the oil best suited to your particular requirements. Commercial lubricating oil, as it is manufactured today and sold under different brands, is the product of a long series of complicated operations and treatments. Every grade of every brand is manufactured to possess certain physical qualities. Distinctive characteristics are purposely placed in each grade in order that it may be especially adapted to perform a particular duty.

Selection

Next, the selection of a proper oil for a specific duty should be made by a lubrication engineer, who is not only familiar with every operating condition under which the oil will have to work, but with the specifications and qualities of the different oils as well. Let him make a survey of the plant and its requirements and co-operate with the chief engineer in making his tests. Be governed by their decision alone and not that of your purchasing agent when you select your oil. Great care should be taken in making this selection. The price of the oil should never enter into the consideration of its fitness for the best of service. It is not cheaper oil you need, it is cheap lubrication.

In changing from a machine oil priced at 32 cents per gallon to a 39 cent machine oil, properly selected for the particular set of conditions found in its machines, one very well known manufacturing concern is reducing its oil expense 36 per cent.

Oils are subject to vaporization, and when storage facilities are provided care should be used to locate them where vaporization and deterioration will be the least. It is always advisable to distribute oil from a central station, oil room or distribution point, with a responsible man in charge to keep a strict record of receipts and to accurately credit each delivery. Sloppy methods of storing and handling subjects the oil to too much unnecessary waste. Provide fireproof steel tanks for your oil house storage, with a correct measure delivery pump on each tank. Self-measuring pumps for your oil house are the same as cash registers for the merchant—they are time savers, waste eliminators and are reliable automatic accountants. Modern oil storage and dispensing apparatus are among the most valuable equipment used in any industrial plant. It prevents those small leaks in profit and losses in time and labor, which in the aggregate amount to many times its original cost.

Ample Lubrication

See that all oils are delivered to the surfaces requiring lubrication. The effectiveness of an oil in reducing friction depends as much upon the manner in which it is applied as upon its quality. To obtain the best results there must be an abundant supply of the lubricant. With a circulating oiling system to feed the oil to the bearing, oil of lower viscosity can be used on account of the increased amount of oil reaching the bearing and compensating for the oil that has been squeezed out. This flood of oil tends to reduce the temperature of the

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oil film and keeps the bearing cool. The working temperature is lower and the working viscosity is higher than where less oil is fed. Too much emphasis cannot be given to the importance of ample lubrication, such as afforded by flooded bearings, and by bath lubrication, because of the great reduction obtained in friction losses through the free use of an oil of proper viscosity.

Oil Reclamation

Provide arrangements for collecting and recovering every drop of your used oil. It is correct to say that a mineral lubricant never wears out, and that if it were possible to protect the oil from the invasion of foreign particles—dust matter, sediment, water, etc.—and to prevent slow evaporation at running temperatures, a given quantity of oil might furnish perpetual lubrication. While it is almost impossible to prevent foreign impurities from getting into the oil and contaminating it enough to make it unfit as a correct lubricant after it has once been used, it is possible to circulate that oil through a filter that will remove all of that dust matter, dirt, water and sediment and make the oil just as good as new.

A first-class oil filter, regardless of its size, whether it be used to purify a continuous stream or whether it be used to reclaim the oil from the drip pans, engine beds, sumps, etc., is an almost indispensable piece of engine room equipment. Good oil costs too much to be thrown away. Purchase a small portable filter in which to pour all of your hand-caught oil drips—one which will deliver a continuous supply of pure, clean, reclaimed oil. As an auxiliary source of oil supply an efficient portable filter is indispensable in an engine room. It will pay for itself in about three months time in the saving of oil alone. The up-to-date oil filter is the greatest exponent of modern oil conservation.

Filtration Systems

Arrange your engines or machines for stream feed lubrication. Install a properly designed oil circulation and filtration system to serve each individual engine or group of engines or machines. In a circulation system delivering flood or force feed lubrication to bearings we have the ideal method of providing perfect lubrication. If we add to this system an oil filter that will keep every drop of oil pure, clean and cool, we have a combination that will produce this perfect lubrication at a cost that is inappreciable. The correct oil for your special requirements may be had in an unlimited supply regardless of its cost per gallon. Buy the correct oil at any price. Supply to every bearing all the oil it will take. There will be no waste, for the filtration and circulation system permits no loss by leakage or spillage and makes it possible for you to use your oil almost an infinite number of times.

In a prominent industrial power plant generating 1,500 kw. electrical power the installation of an automatic oiling and filtering system, supplying lubrication of vertical engines, reduced the monthly oil requirements from 650 to 25 gallons, which represented savings of $187.50. It saved the labor of one oiler at $115 per month, and increased the power output nearly 1 per cent. The actual total saving in labor, oil and coal was $367 per month, or more than $4,400 per year. The oiling and filtering system to accomplish the economies in expenses and conservation of valuable oil cost in the neighborhood of $1,500 completely installed. This is a typical example of better lubrication combined with oil conservation.

Improved arrangements for the storage and handling of oils will eliminate much of the expense charged to plant maintenance. Better lubrication will have a very large influence on operating costs. It is a long step in the direction of increased engine room economy. The seizing of one bearing, or the shut-down of one machine, with its accompanying loss of service, represents a great deal more than the difference between the cost of poor, unreliable systems of hand feeding of oil and a dependable system delivering correct lubrication. It represents the most economical production of power, uninterrupted service, reduction of maintenance costs, the elimination of waste, and clean, efficient engine rooms, all of which are essential to meet keen competition.

Oil conservation not only means the prevention of unnecessary leaks and losses in the storing and handling of oil, but it means better lubrication or a more effective use of these valuable lubricants through a scientific knowledge of their correct application.

Where the Suggestion Plan Pays

Suggestion contests are given credit by the Franklin Motor Car Co. for bringing out many valuable ideas. The suggestors are divided into three classes—workmen, foremen and salaried staff employees.

Any hourly workman is entitled to submit to the suggestion department suggestions along the line of improving the quality of the product, improving the quality of work, decreasing the cost of production without lowering the quality, eliminating unnecessary work, better plans for shop work, cutting the cost of tools and operations, better plans for office work, etc.

The prizes for this group are: First prize, $400; second, $300; third, $200; fourth, $100; fifth, $50; sixth, $50; seventh, $50; eighth, $50; ninth, $25; tenth, $25; eleventh, $25; twelfth, $25; twenty-five prizes of $10 each. Three dollars will be given for any adopted suggestion not winning a prize.

Suggestions from foremen and master workmen will not be adopted which might ordinarily be interpreted to come within the scope of a foreman's or master workman's regular line of duty.

The second group prizes are: First prize, $400; second, $200; third, $100; fourth, $50; fifth, $50; sixth, $25; seventh, $25. Three dollars will be given for any adopted suggestion not winning a prize.

All salaried staff employees in any department, except major department heads and assistant department heads, are eligible to participate under Group III. In this group suggestions will not be considered which might be interpreted as coming within a man's regular line of duty through special assignment or otherwise. There will be no reward given in this group as in the others for adopted suggestions which do not win one of the three prizes.

These prizes are: First prize, $400; second, $200; third, $100.

The substantial awards for prizes bring out the best ideas and make the men feel that they are well worth while. So far the system is new, but judging from the success it has been, and the money it has saved the company, it will be continued. The prizes are awarded every six months at present, the last award totaling over three thousand dollars. If found desirable, future contests will be held quarterly.

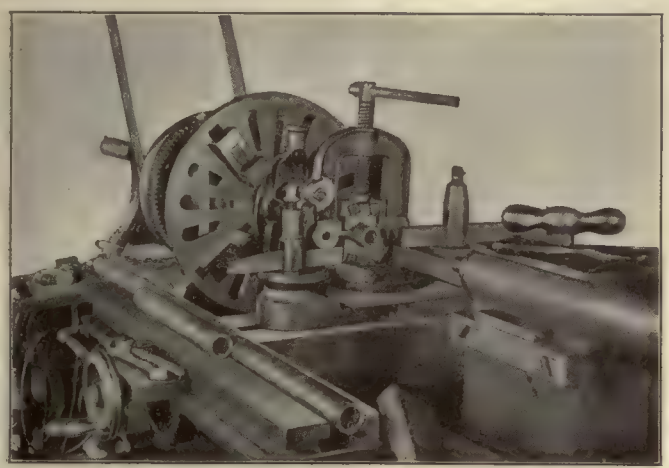
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Threading Pipe in the Lathe

By Tommy Weeks

When the boss goes away and leaves a fellow all alone to thread up a stack of short lengths of pipe by hand, the job soon becomes very tiresome and monotonous, even if the pipes *are* only 1 in. in size; larger sizes would be proportionately worse.



THREADING PIPE ON THE LATHE

Being in this fix one day I conceived the idea that led to the development shown in the picture, a device doubtless well enough known to other fellows who have been longer in the business, but which I invented on the spur of the moment. I bolted a portable pipe vise on the cross-side of an old lathe and, after unscrewing the handles from the die stock, carefully centered up the latter in the chuck.

This being done, all that remained was to let the engine do the work while I bossed the job and directed an occasional squirt of oil into the die at proper intervals.

When the boss goes away again under similar circumstances I am going to take the tailstock off the lathe; then I can thread long lengths too, by letting the pipe hang out of the window.

Making a Tap from an Old Screw

By Gus Haessler

During the late war we had a small bench milling machine in our shop, which from almost constant use, day and night, had one of its feed screws and nut so badly worn that the machine was put out of commission.

Local conditions were not favorable for replacements and the manufacturer was requested to supply these parts, but he was able to furnish the feed screw only. While waiting for delivery of the latter the screw was examined and found to be worn mostly in the middle, and gradually less as it approached the shoulder end of the screw. A few threads adjacent to the shoulder were not worn any, while a few more beyond were but slightly so.

The screw was ½ in. in diameter with a 10-pitch square thread. It seemed possible with a little machining to form a tap out of the worn screw, so it was cut off at a favorable point and finished to pass through the hole in a new bronze nut which was prepared. The flutes and relief were filed.

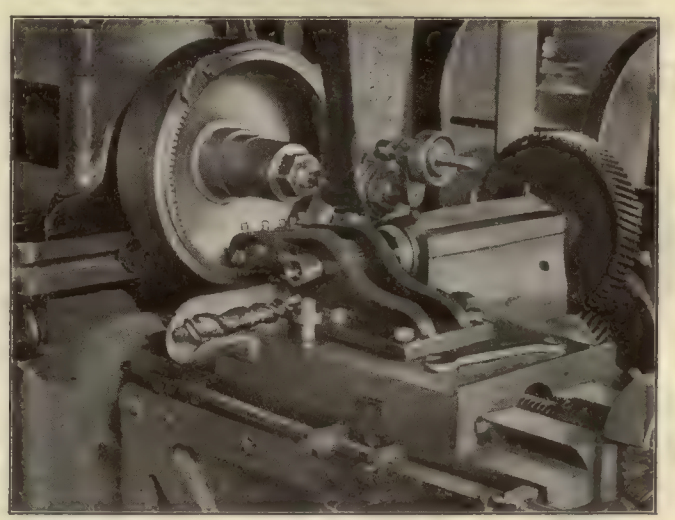
After tempering the tap we started in to face the music both of the skeptics and the tap; nevertheless the tap made the trip through the nut, making a job which the new screw, upon arrival, showed to be practically perfect.

Home-Made Internal Gear Cutting Fixture

By Milton Wright

Having a number of internal gears to cut, and having nothing in the shop with which to cut them except an old Brainard automatic which would cut spur gears very nicely but would not handle the internal ones, we made the attachment shown in the accompanying illustration.

We were fortunate in having sufficient room between the web of the gears and the ring upon which the teeth were to be cut to clear the attachment, but as the latter does not project beyond the cutter, it will easily take



ATTACHMENT TO BRAINARD AUTOMATIC GEAR CUTTING MACHINE TO CUT INTERNAL GEARS

cars of any internal gear that can be cut with a rotary cutter.

The casting which forms the housing of the device bolts to the cross-slide of the Brainard with the first pair of holes in the webs in line with the cutter spindle, so that all that is necessary is to put in an arbor with a spur gear of the proper size upon it instead of a cutter. Two other pairs of holes accommodate plugs upon

which the intermediate gears revolve, the plugs being held against endwise movement by setscrews, while a fourth pair of holes provide bearings for the actual cutter arbor upon which the cutter and the final gear of the train are keyed together.

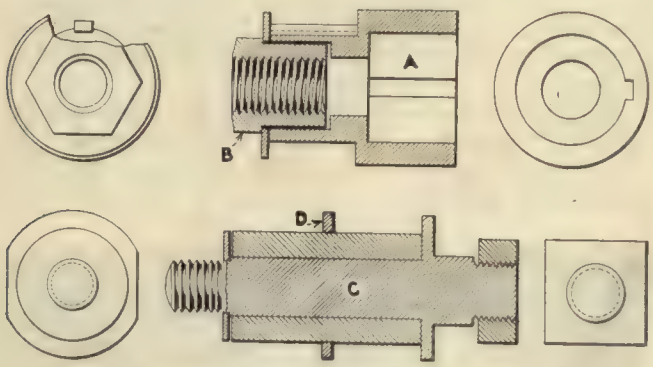
The indexing and feeding mechanisms of the machine were not disturbed or disarranged in any manner, and it is therefore possible by selecting the right cutter and intermediate gears to cut any internal gear within the range of the machine as readily as a corresponding size of external gear would be cut.

Extending Lead Screw of Lathe To Use Compound Gearing

By Martin H. Ball

It sometimes happens that to compound the change gears on a plain lathe—that is a lathe without quick-change gear equipment—would be an advantage to obtain a desired feed, or a necessity in order to cut a certain thread. Such a need prompted the design of the lead screw extension shown in the illustration, for use on a 48- and 26-in. McCabe double-spindle lathe. The scheme can be applied to any lathe with plain change gears, making the dimensions to meet the requirements.

The parts required are an extension sleeve *A* and a special nut *B*. This nut serves the double purpose of binding the extension to the lead screw and of holding the change gear in place, thus holding the three members



EXTENSION FOR LEAD SCREW

firmly together. A stud with loose bushings, as shown at *C*, is also required for the intermediate gears.

The spacing collar *D* is made of the same width as the thickness of the wall between the shoulder at the base of the thread on end of lead screw and the shoulder on the extension against which the gear hub seats.

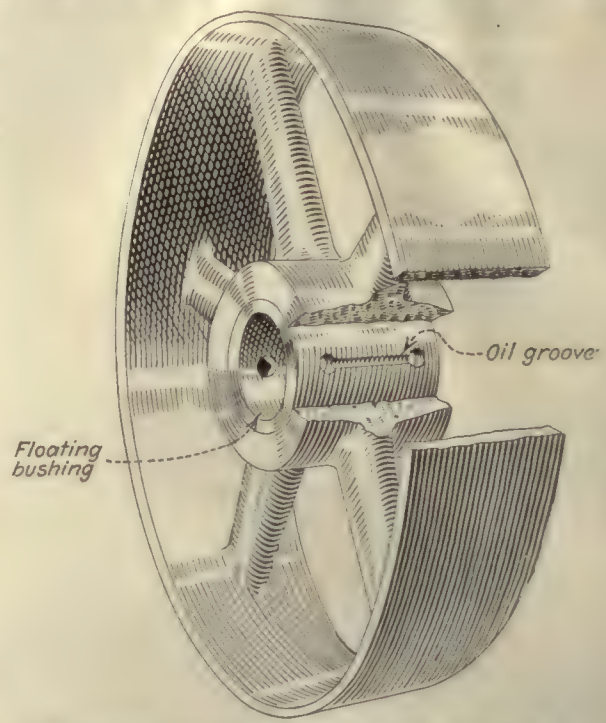
Abating the Nuisance of the Loose Pulley

By F. W. Coleman

I have read with interest the numerous schemes published in the *American Machinist* for doing away with the annoyance of loose pulleys that become *too* loose, and am inspired to submit a method by which I overcame the difficulty.

As shown in the sketch, I made a bushing of good clean cast iron that was bored to a running fit on the shaft and likewise turned to a similar fit in the bore of the pulley, so that it acted as a floating bushing. With suitable oil holes and grooves in the bushings, pulleys fitted in this manner have run for several years without causing trouble.

In some places we had conveyor or transfer chains running under special furnaces for removing clinkers, and these chains ran over 8-in. flanged wheels. Owing



FLOATING BUSHINGS FOR LOOSE PULLEYS

to the heat to which the parts were subjected, oil would not remain in the bearings of the pulleys. Fitting the latter with these floating bushings removed a great deal of the trouble.

Special Tools for a Drilling and Tapping Machine

By H. E. Jewett

The writer is connected with a company whose product consists mainly of optical machinery, the parts of which require the drilling and tapping of many small holes.

Up to about a year ago all of this drilling and tapping had been done, one hole at a time, mostly upon four-spindle gang drilling machines, but at that time the company installed a twenty-four spindle automatic

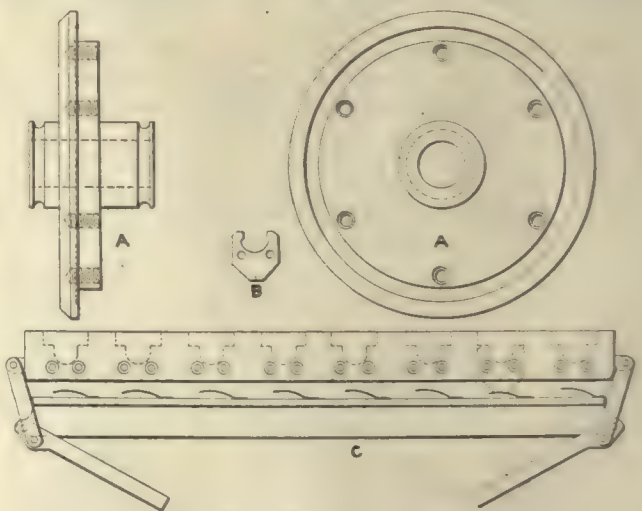
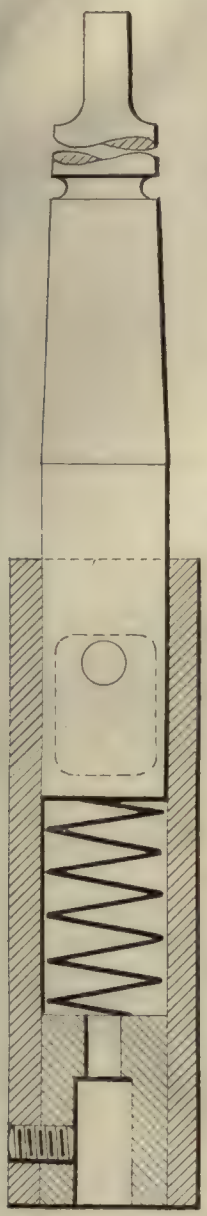


FIG. 2. EXAMPLES OF THE WORK

drilling and tapping machine the spindles of which were adjustable for center distances.

The minimum distance in this respect was ¾ in., but we could not find on the market a tap holder that was less than 1⅜ in. in diameter. We therefore designed the holder shown in Fig. 1. It permitted us to use the minimum adjustment provided by the machine and at the same time enabled us to use taps as small as 10-30 without serious loss from breakage.



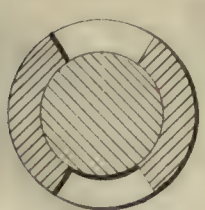


FIG. 1 THE TAP HOLDER

This holder consists of a sleeve driven by a floating connection from the shank and having a bushing with a hole part way through to fit the body of the tap and a square hole for the remainder of the distance to do the driving. A setscrew passing through both sleeve and bushing served to hold the tap in place and a coil spring above the bushing compensated for any variation in lead.

With this holder we were able to use taps of different diameters at the same time, a thing which the makers of the machine believed to be impossible. On one job we are using eight ⅛-in. taps and four ¼-in. taps at a single thrust. We then turn the piece one-quarter way over and tap four ⅜-in. holes before removing it from the jig.

The agent for the machine told us that in order to drill at one end of the table and tap at the other we would have to place the jig on a block of sufficient thickness to prevent the reverse on the tapping attachment from striking the trip while drilling. To overcome this difficulty we removed the setscrew that secures the tapping attachment to the head and substituted a pin which is controlled by a lever and spring; enabling the operator to disengage the tapping attachment while drilling, and when the head is raised it automatically snaps in again.

We are now able to drill two pieces, like that shown at *A* in Fig. 2, having six blind holes in each, and, after drilling to remove the bushing plate, move the jig to the other end of the table and tap them. The old time with a single spindle was from six to seven minutes each; the new time is less than one minute each.

We make a great many pulleys 5 and 5½ in. in diameter, and for these we have a jig that holds four pulleys. The operator recently drilled and tapped 200 of these pulleys in 3 hr. and 54 min., including the set-up time, and we believe this time can be materially reduced.

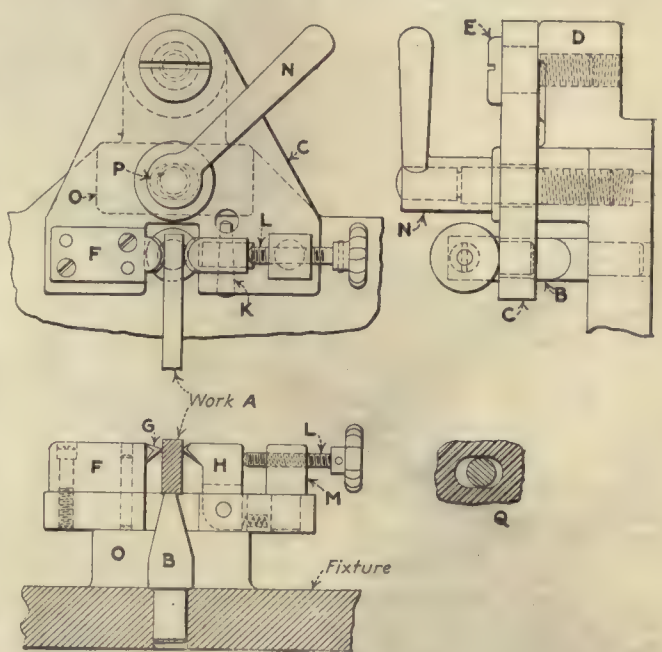
For drilling and tapping the piece shown at *B*, in Fig. 2, we have a jig which is bolted to the table, having locating plates beneath the bushing plate as shown at *C*. Eight pieces are held in this jig by springs attached to a bar, which is controlled and locked in place by two levers. No more time is consumed in loading this jig than was required to secure one piece in the old jig and the saving is more than 90 per cent after the job is set up. A very similar device is used for drilling ¼-in. holes near the end of pieces of ½-in. cold rolled rod, fourteen pieces being drilled at once. So far as possible we build our jigs to standard set-ups with 1⅜-, 1⅝-, 2-, 3- or 6-in. centers. This method frequently allows us to use the same set-up for several jobs.

A Floating Clamp

BY GENE PHELPS

A floating clamp is often needed in fixtures for work that is permanently located on one end and having a projecting member requiring rigid vertical support with a variation in sidewise location.

The illustration shows a design for a floating clamp with knife edge contact that can be adapted to many varieties of work. The end of the work *A*, which requires clamping, rests on the stud *B* pressed into the fixture body as shown. The floating member of the clamp *C* is fastened on the projecting boss *D* by means of a shoulder screw *E*, made so as to allow the clamp to swing free. The block *F* has a knife edge *G* and is held firmly on the clamp on one side of the opening shown. On the other side a block *H* is fitted in a slot and pivoted on the pin *K*. The screw *L*, attached to *M*, strikes the block *H* which in turn clamps the work securely and holds it down on the locating stud. It is evident that the clamp has now aligned itself to the position of the work and it is ready to be located by the binder screw N which clamps directly over the supporting pad *O*. This pad supports the clamp and also avoids any springing action when the binder pressure is applied. The amount of float required can be governed by the elongated slot *P*, shown in detail at *Q*.



A FLOATING CLAMP

This design of clamp can be changed in various ways, such as using a button in place of the block F, and having a screw with a swivel come directly against the

work. A spring plunger can be used in place of the stud *B* providing the work is of such a nature that a vertical adjustment is necessary.

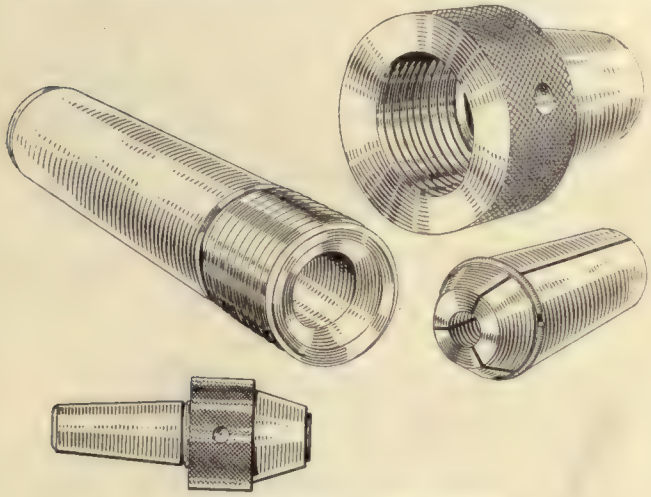
Collet Chuck for Lathe

By Fred S. Harger

The illustration shows a collet chuck that the writer made to use in lathes that had no draw-in attachment. It should be made of tool steel, hardened and ground, but the one I have is made of ordinary machine steel, left in its natural condition of hardness (or softness), and it has given me good service for the last four years.

The taper shank is first fitted to the lathe in which it is to be used and all subsequent operations upon this part should be performed while in place. The thread should be of a rather fine pitch (mine is 12 pitch, 2 in. diameter) in proportion to the diameter in order to give good gripping power.

The collets should have an abrupt taper or beveled end where they bear against the corresponding part of the shank, as this assists in bringing all parts into alignment when the chuck is closed. My collets are split in three pieces after finishing to size and shape, and are held together by a ring of spring wire snapped



COLLET CHUCK FOR LATHE

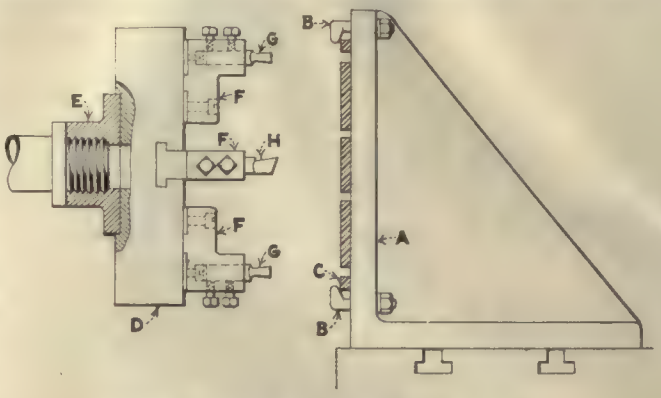
into a groove turned at the point of largest diameter. This ring is not absolutely essential but it is mighty convenient in keeping parts of a size together when out of the chuck.

The taper of the outer end of the collets and the corresponding taper bore of the shell should not be too sharp or it will cause trouble in releasing. Mine has a taper of $\frac{1}{16}$ in. in 2 in., which is the length of this part. Care should be exercised at this point, as upon the accuracy of this fit the working qualities of the chuck in a large measure depend.

A Trepanning Tool for Boiler Plate

By Alex Dowel

The trepanning tool illustrated on page 357, Vol. 55, of the *American Machinist* reminds me of one that I built some years ago for very much the same sort of work. We had to make from 50 to 100 collars of each size ranging from 4 to 8½ in. o. d. Each collar had a hole in it and the holes ranged in size from 2 to 5 in.; the thickness varied from $\frac{1}{16}$ to $\frac{1}{2}$ in. There were about a dozen different diameters yet not more than 100 of any one size and only 50 of most sizes. I rigged up an angle plate as shown in the sketch at *A*, and set it up on an old boring mill at right-angles to the spindle. I slotted the plate vertically so that I could use hook bolts *B* to hold the boiler plate *C* firmly. A 12-in., 4-jaw independent chuck *D* was obtained and fitted with an adapter *E* which was bored out and threaded to suit the



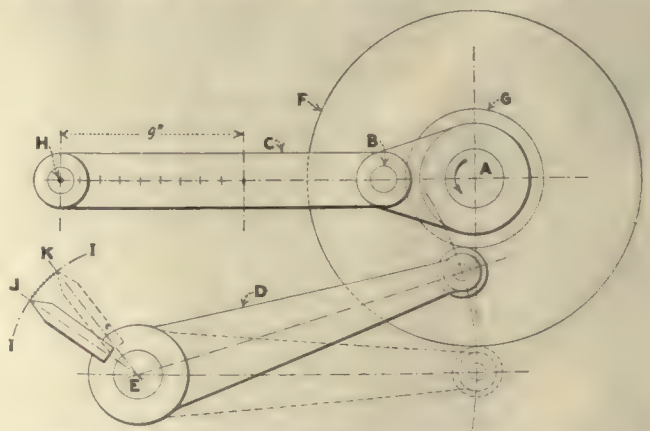
TREPANNING TOOL FOR BOILER PLATE

spindle of the boring mill. Four special jaws *F* were made and screwed to the sub-jaws of the chuck as shown. Grooving or parting tools *G* were set in the two outside jaws so that they could be adjusted easily by means of setscrews. Tools *H* were fitted to two other jaws for boring the inside hole. In cutting out any given size of washer the tools were set progressively, the first tool removing the stock nearest the center, the second finishing the hole and the third and fourth cutting and truing the outside diameter. This tool worked very well and as far as I know is still in use on the same kind of work.

Practical Method of Laying Out a Cam

By M. H. Snow

In the accompanying diagram *A* is a shaft, driven at a constant speed, on which is a crank *B* moving an object by means of the connecting rod *C*. A lever *D* is swung from the center *E* carrying a suitable roller in contact with a cam, the outside diameter of which



GRAPHICAL METHOD OF LAYING OUT A CAM MOVEMENT

is the circle *F*, the base diameter being represented by the circle *G*. The shaft *E* is to be oscillated in exact harmony with the speed of the object that is moved by the crank and connection first mentioned.

The procedure of laying out the cam was as follows:

A cardboard disk was cut to the outside diameter of the cam and, at the crank distance from the center, the connecting rod (also made of cardboard) was pivoted. At the point *H* a small hole was punched. On the center line was laid off the distance the object was to be moved (in this case 9 in.) and divided into a number of equal spaces. Now a cam arm and roller were made from cardboard and pivoted at the center of shaft *E*. (It is understood that all this procedure was carried forward on a drawing board, with thumbtacks for centers.)

Now a piece of cardboard of a convenient length was made with a pointed end and fastened to the hub of the arm *D*. At the point of this card the radius *I* was scribed. The cam roller was then placed in contact with the line representing the base of the cam and a mark made at the point *J*. The same thing was done with the roller on the outside of the cam and a corresponding mark made at *K*. The space thus marked off on radius *I* was divided into the same number of spaces as were previously made upon the center line.

The cam disk was moved around until the hole *H* coincided with the first division on the center line. The arm *D* was moved until the pointer lined up with the first division of the radius *I*. With a sharp pencil a line was then scribed around the cam roller. This operation was repeated for each division until the crank had made one-half revolution when the procedure was reversed.

The cam thus formed is practically correct. The larger the number of divisions, the more accurate it will be. This method can be applied to many different constructions.

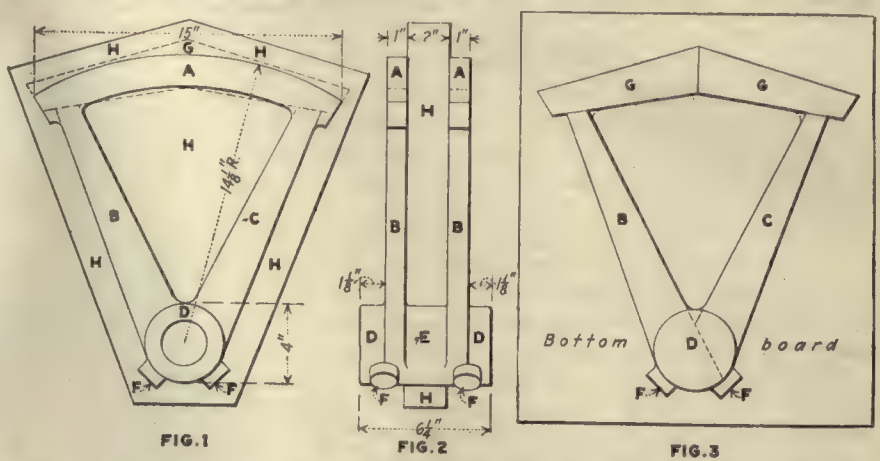


FIG.1 FIG.2 FIG.3

FIG. 1. PLAN OF PATTERN. FIG. 2. EDGE VIEW OF PATTERN. FIG. 3. ASSEMBLED PARTS OF FIRST PATTERN ON BOTTOM BOARD, READY FOR THE "MOLDING" IN DRY SAND

A "Pattern" Made of Core Sand

By M. E. Duggan

A broken casting in a special machine required immediate replacement. It was a long way to where the machine was built, and to obtain a duplicate casting from the original pattern would have taken a prohibitive length of time, even if the pattern were in existence.

The facilities of the "home town" comprised a small jobbing foundry and a machine shop, but no pattern-making establishment—not even a man who was a good whittler. The job was put up to the old foundryman who, after giving the broken part the "once over" said: "I can produce a casting that will answer every requirement without the necessity of making a special pattern of wood, provided you are not too particular about exact duplication." Here is the way he did it:

The casting was a double sector, or "A-frame" as it was called, with a connecting hub 4 in. in diameter. The "pattern" was made entirely of core sand, as shown in Figs. 1 and 2. *A*, *B*, *C*, *D*, *E*, *F* and *G* represent the various parts of the pattern, while the letter *H* indicates the piece that was first a part of the pattern and afterward the separating core between the two sectors in the mold.

The education of the old foundryman in matters geometrical had been sadly neglected and he was at a loss for means to produce the curved portions of the sectors, so he compromised by making them up of straight pieces as indicated at *G*; the outer surface of the casting being afterwards turned to the required radius in the machine shop, while the inner contour was allowed to remain as he left it.

Parts *B*, *C* and *G* were then cut from slab cores 2 in. thick by means of a hack saw blade and finished up with a coarse file. The hubs *D* and the bosses *F* were made from stock round cores.

Assembling the parts on a bottom board, as shown in Fig. 3, a light frame, or temporary flask, was tacked together around them and a mold made of core sand, which was then baked in the usual manner. Returning this "mold" to the core-maker's bench, two "patterns" were made from it that were to constitute the *real* pattern from which the casting was to be molded.

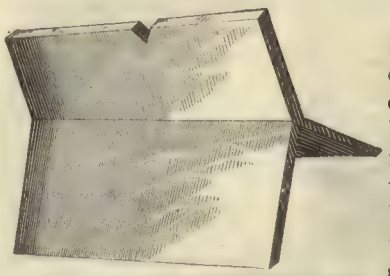
A slab core 2 in. thick, indicated by the letter *H*, was now made with a 4-in. hole through it where the connecting hub is shown in Fig. 2. The two patterns were temporarily fastened to this slab with the hubs in alignment with the 4-in. hole. The bosses *F* were "slip pieces" attached to the main pattern in the usual way so that they would be left in the mold when the pattern was drawn, and afterward fished out when the pattern was out of the way.

The completed pattern as shown in Fig. 2 was then rammed up in the regular flasks and, after being drawn, the sectors were removed and the part *H* replaced in the mold where it became the separating core; the 4-in. hole serving to form the connecting hub.

A Useful Thread Tool-Setting Gage

By E. Lytton-Brooks

London, England



THREAD TOOL-SETTING GAGE

The accompanying sketch shows a useful center gage for setting outside threading tools. Unlike many on the market, it has the advantage of being easily held in position on round stock without slipping off. I have not yet seen one of this type manufactured or in use. The V-grooves, 55 and 60 deg., may be cut near the edge for threading short lengths.

EDITORIALS

1921—1922

WE HAVE come through a hard year together, not entirely unmarked, but still full of fight. If any far-seeing prophet toward the end of 1920 had predicted truthfully what was to happen in the twelve months to follow, his popularity would have suffered severely. That the machinery industry has withstood so well such a period of depression speaks well for its inherent soundness. There is also this to be said—all the frills and useless appurtenances of boom times are gone and our shops are ready to produce on a basis of rigid economy.

Unfortunately, such a sweeping statement cannot be applied to all of our merchandizing and distribution methods. During last year we brought out the big spread betwen the selling price and the cost of materials and direct labor in the case of one of our most efficiently built automobiles. Later investigations show the figures to have been typical, not only of automobiles, but of other products of the machine shop. In 1922 we shall give consideration to the sales problems which are engrossing the attention of executives everywhere.

The natural result of the slowing down of production was the release of the designers and engineers to complete the many projected innovations and developments which have been conceived during the war and in the boom following the armistice. Our columns reflected this condition by containing a number of new tool descriptions some 30 per cent greater than that of any previous year—in round numbers 650. Many others have been held back by the manufacturers and will be described in 1922 in the AMERICAN MACHINIST.

Features for 1921 were three big series—Metal Cutting Tools, Modern Production Methods and Tool Engineering. Next year we shall publish a strong series on machine tool designing by the author of Metal Cutting Tools. Tool Engineering will probably run through most of the year. Only one or two more installments of Modern Production Methods remain unpublished, but as soon as they have appeared we will commence a number of articles on two of the most interesting phases of modern management.

Sufficient automotive material is on hand for a number of issues and more is constantly being gathered. The railroad and car and locomotive shops are being visited by our field editors and will receive their share of attention. Other repair shop articles will come from the service stations and from machine shops of all kinds everywhere. Much of the material from the latter source will be published in the form of practical letters. Textile and paper machinery, small parts, press work—all will be covered in our "first thirty-two" pages.

Arrangements are being made to add to the value of the news pages. New correspondents, both at home and abroad, are being appointed, men who know the machinery industry and can sense news values. No stone is being left unturned to make the AMERICAN MACHINIST an absolute necessity to the progressive men of the machinery industry whether they sit behind the executive's desk or direct the operations in the shop.

It will take real ability to keep up with the procession in 1922. Business is coming back, but not the kind of business that knocks at the door and begs to be admitted

Prosperity lies just ahead for the fellow who is ready to meet it with a well-equipped shop, a good product, up-to-the-minute information and good old-fashioned push.

Resolve To Show Your Faith in the Future

NO MATTER how difficult the past year may have been, we believe every red-blooded American looks to the future, not only with hope for better business, but with an abiding faith that it cannot fail to come. Not a faith that expects miracles, not the kind of false optimism that looks for the overthrowing of all economic laws, but faith that this and other countries can and will overcome the causes of business depression and once more enjoy the prosperity that comes with earnest endeavor.

We have had severe and expensive lessons in the economic evils of over expansion. We have learned of the evils of combining speculation with manufacturing industries, frequently because of borrowed money being too easy to secure. But we also learned that united effort toward a common goal could work wonders in production; that real co-operation could be secured. The live, forward looking business men are not going to forget any of these lessons. They can and will be applied to secure the victories of peace as well as of war.

Normal prosperity, real prosperity means that when manufacturers are studying economic laws and are abiding by them, they secure an adequate return for their efforts. No one who has studied the past—who has faith in himself or in his fellow men—can doubt that this prosperity is on the way. Just when it will come no one can say. But its coming is sure and it will be hastened by those having the real faith putting their shoulders to the wheel and helping to start the load.

Let those who can, show their faith by beginning to buy the things they need, but which they have been putting off. If every man with faith in the future will resolve to buy what he can the tide of prosperity will begin to lap our shores in an incredibly short time.

Let your New Year's resolve be to show the faith that is in you by beginning to buy—NOW!

Comparing Prices With 1914

IN MAKING comparisons of machine tool or other prices with pre-war days, it is always well to consider values as well as prices. We should remember that over seven years have elapsed since the 1914 prices we talk about, and that in many cases the present machine bears very little relation to the old.

The changes in weight, design and efficiency should be carefully considered in making comparisons with 1914 prices, as is constantly being done. Buyers have a perfect right to demand a fair price—but they should consider all conditions carefully so as to know what a fair price really is.

Competition and the Cost of Selling

WE HAVE heard much about competition being the life of trade and about reducing prices to the consumer, but it doesn't always seem to work that way if we judge by the automobile industry. There is no lack of competitors and the real weeding out has not proceeded very far, but the cost of sales competition makes the buyer pay far more than he should for nearly every car at the present time.

With few exceptions the sales costs run from 35 to 70 per cent, averaging about 50 per cent, when everything is considered. There is one low-priced car on the market on which the labor cost is under $50, and which has never made a profit for the manufacturer on account of the cost of selling.

As a contrast to this let us look back at the boom days of bicycles. The large companies made millions at the high price charged. This induced competition in every cross-roads shop, so to speak, and the sales competition became so keen that most of them went broke, even the larger ones. At the present time, with a demand much larger than most of us realize, bicycles sell for not over 25 per cent of the former boom price and with only a very few builders in the field.

It seems to be possible for selling costs to increase with competition. Unless these costs can come out of production or profit the articles cost the consumer more than they would with fewer competitors in the field. And when the consumer knows this to be the case, as at present, he delays buying as long as possible.

The quickest way to remedy the situation seems to be for those with low production costs and good sales organizations to put their prices down to bed-rock. The price level must be based on replacement values and not on the cost of materials bought at high rates. This will shake out the weaker concerns, eliminate sales competition and cost, and benefit everyone but those who cannot stand the pace. It must be remembered that any undue rise in prices always induces more competition with its attendant ills.

Buying Machine Tools a La Automobile

THE machine tool industry has learned much from the automobile designer in the way of centralizing machine controls. In the modern car we have perhaps a seventy-five horsepower motor and a machine weighing two tons. Yet a slip of a girl, often weighing less than one hundred pounds, sits behind the wheel, controls the motor speed, operates the clutch, shifts gears and guides the car through crowded traffic while she calmly chews gum and discusses the latest play with her seat mate. It is the acme of centralized and convenient control and we are copying it in many ways.

The automobile industry might also be copied to advantage in some of its business methods. Not its high finance which is beginning to totter, but its methods of marketing. In most cases you pay a substantial deposit when placing the order—and you are not apt to cancel without a very good reason. The parts made by the car builder are guaranteed against defects for ninety days. Auxiliaries, such as starting motors, are not included—you go to the maker for adjustments on those.

You get a definite amount of service free—inspection and adjustment for perhaps the ninety days of the guarantee. On the ninety-first day you begin paying for service—as you should.

Another example is with tires. Most tire makers give some sort of a guaranty because it is demanded. Many adjustments are made in which the fault is with the drivers.

The newer method is to buy a tire with or without guaranty. If you want a guaranty you pay an added price to cover it, as an insurance premium. This is a business proposition. The man who wants a guaranty —or mileage insurance—pays for it. Those who prefer to depend on their own carefulness in avoiding rim cuts, bad roads, etc., buy tires at a lower price.

Storage battery makers are beginning to follow the practice of the tire makers.

Machine tool builders, but more particularly machine tool buyers, should study this problem carefully, for it resolves itself into a buyers' problem in both cases. If buyers want to secure machine tools at a *reasonable* price they must help the builders to remove *unreasonable* costs. They must face the facts that the unreasonable costs are not labor or material but the costs due largely to unreasonable demands for service, both before and after selling.

The whole matter is in the hands of the buyer. If he wants machine tools without service, or any but a reasonable guaranty that the machine is commercially perfect, he has only to refuse to pay the same price as the man who demands it. The cost of material, labor and overhead is not a mystery. Likewise the cost of service and guaranties can be readily figured.

This is a good time to begin a reformation in machine tool buying—and selling.

The Price of Special Machines

ONE of the most attractive fields of machine building is that of special machinery for doing unusual work. The high-grade machine designer revels in such opportunities and grasps them as an artist does a commission to paint a great picture. But from the financial side they are serious problems and are apt to leave a sad and sickening tale if on the wrong side of the ledger.

Unless the manufacturer who uses the machine has it built to his order he rarely realizes the costs that go into it and even then he is apt to consider them exorbitant. But when a machine already built is presented for his consideration he too often sets his valuation at the usual rate per pound, regardless of the production it can secure for him.

A good illustration is in some of the machines which have been designed for machining crankshafts and camshafts. Much ingenuity, as well as time and money, has been expended along this line and yet, even for the successful ones, the field is limited by the number of motor shops having a sufficient output to require one.

The price of such machines then must, in all fairness, be set at a figure which will reimburse the cost and leave a fair profit on the limited number which will probably be sold. If for example, there was a field for but ten machines, the total development cost must be paid for by these ten, regardless of the fact that a regular machine of similar size, weight and workmanship could be sold for a tenth of that sum.

Unless this is thoroughly understood there are very apt to be unpleasant recriminations and financial loss. And in cases where the field is necessarily limited, it is seldom wise to spend time or money on machines of this kind except on a definite order which covers all development expenses.

Shop Equipment News

Fellows High-Speed Gear Shaper

The Fellows Gear Shaper Co., Springfield, Vt., has recently placed on the market a spur-gear shaper intended for large-production work at high speed on

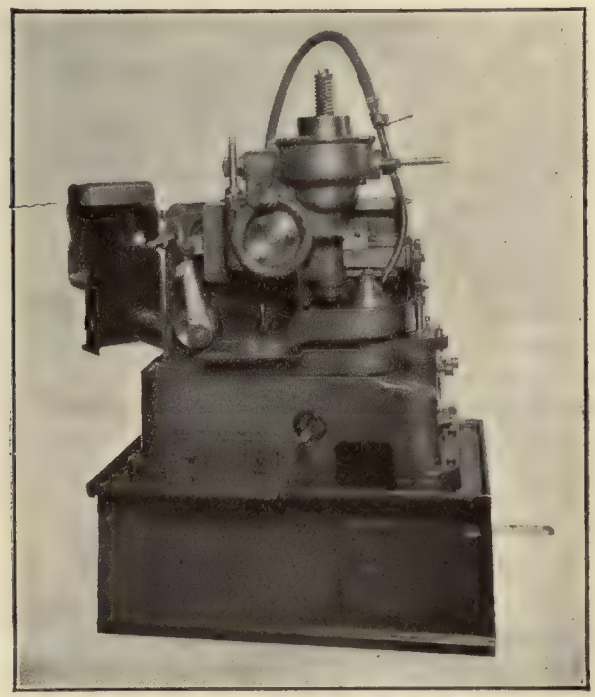


FIG. 1. FELLOWS HIGH-SPEED GEAR SHAPER

such gears as are ordinarily employed in automobiles. The machine, shown with the guards removed in Fig. 1, can perform roughing and finishing cuts automatically at the same setting and with the same cutter. Second-operation work is thus eliminated.

The principle of operation of the machine, which is designated as the No. 7, is fundamentally the same as in the Fellows standard gear shaper, in that a gear-type cutter is used to generate the teeth. Owing to the high speed at which the cutter is operated, and also to the short stroke of the machine, the cutting of gears in gangs is unnecessary, except for very thin gears. This is claimed to be an advantage, because it is difficult to secure accurate gears when holding a large number of blanks on an arbor or in a fixture at one time.

Because of the speed, the cutter remains in contact with the work for a very short period of time, and is said on this account to remain cool. Since the work also is kept cool, considerable changes in temperature do not occur to affect the accuracy. A large cutting-compound tank is furnished, so that sufficient coolant may be pumped to the cutter and work to keep them cool. The machine is intended to operate at exceptionally high speeds, so that by taking fine feeds the life of the cutter can be increased and its cutting edge not impaired, making it possible to use the same cutter for roughing and finishing. The method of obtaining the rotary feed for the cutter differs from that in the standard machine, in that this function is taken care of by gears.

The cutter spindle is of light weight, and is held in a straight path by guides. It is reciprocated by a light-weight connecting rod and crank arm. The operating end of the crank arm is provided with a hardened steel segment gear meshing with rack teeth in the cutter slide. The crank arm is bronze bushed at the fulcrum, and provided with ball bearings where it is attached to the connecting rod. The latter is operated through a crankshaft carrying an adjustable crankpin, the position of which governs the length of stroke of the cutter. The lower end of the connecting rod is mounted on a self-aligning ball bearing on the crankpin, permitting the use of high reciprocating speeds.

The crankshaft is made from an alloy-steel forging, and is driven from the rear by a single-pulley drive, so that the machine can be arranged for group drive through a jackshaft without need for a countershaft. Provision has also been made for the installation of individual motor drive, as shown in Fig. 2, a bracket being fastened to the top of the machine. A 1-hp. motor provides sufficient power. A more economical method of operation, however, when a group of the machines is installed, is to bolt the machine bases together and operate them as a unit. When this is done, one 6-hp. motor furnishes ample power for ten machines.

The saddle carrying the cutter slide is adjustable for different diameters of gears, and can be withdrawn to permit of locating and removing the work. For the depth feed, the saddle is advanced towards the work by means of a feed cam, provision being made on this cam

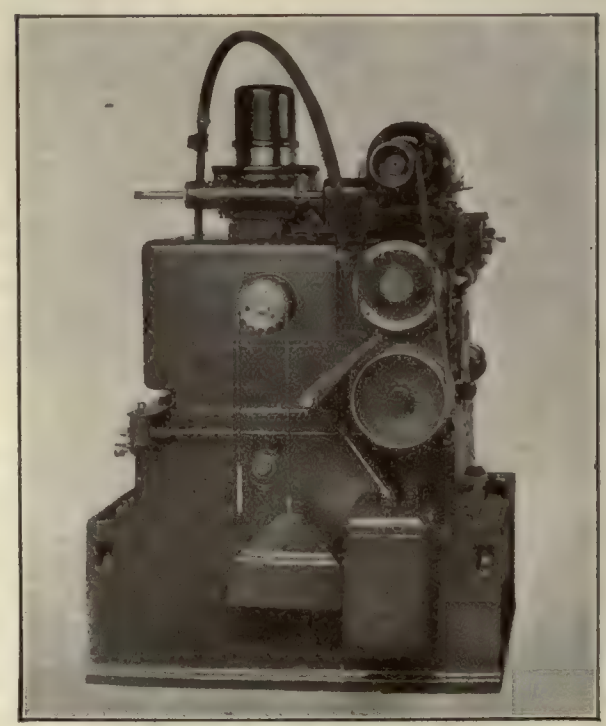


FIG. 2. REAR VIEW OF NO. 7 GEAR SHAPER

for taking both roughing and finishing cuts. The cutter is gradually fed to depth as the blank and cutter are rotated together, and the cutter overlaps on the finishing cut, so as to prevent variation in the thickness of the teeth around the gear.

The work spindle carries a reverse-taper arbor, and is held in an apron. It is rotated by means of a worm and index wheel, which are, in turn, directly connected to the upper worm and index wheel operating the cutter. The work is withdrawn from the cutter on the return stroke by a relieving mechanism, a cam located at the rear of the machine operating the apron lever through a connecting rod. The proper relation between the number of teeth in the cutter and that in the work is secured through change gears. Owing to the fact that the upper and lower worm wheels have the same number of teeth, the speed ratio between the cutter and work spindle is unity.

The time in which the gear will be completed is controlled by the speed at which the cutter spindle is operated, in conjunction with the feed gears located inside the machine, the latter being accessible by removing a plate. The rotary feed is expressed as so many strokes of the cutter per revolution, and gears are provided for securing seven feeds. The coarsest feed is 435, which means that the cutter makes 435 strokes for one revolution of the cutter; the finest feed is 1,735. Roughing and finishing cuts are taken at the same feed and speed.

The machine is intended to run with but little attention to the oiling. All the high-speed shafts are mounted on ball bearings, and are automatically lubricated. A reservoir in the bed holding 2½ quarts of machine oil is connected to additional auxiliary reservoirs, from which wicks carry the oil down to the different bearings. The cutter-spindle shoe and guide are oiled from a reservoir in the saddle housing. The only other reservoir is the one on the apron. There are only three grease cups on the machine, these being used because grease is considered more satisfactory than oil when there is an oscillating movement.

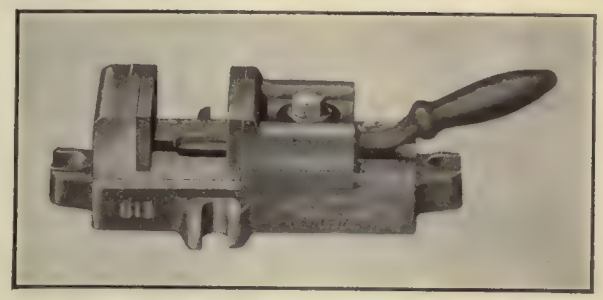
The shaper is intended to handle any form of gear entering into a standard automobile transmission, as well as some of special design. In adapting the shaper to the cutting of internal gears, a slight modification is necessary in the design of the machine, owing to the fact that for cutting an internal gear, the cutter must work on the right-hand side of the center of the work spindle, instead of on the left-hand side. For this reason, a special crank-arm is necessary.

By a slight modification in design, the shaper can be adapted to the cutting of helical and herringbone gears. Practically the only change is the use of helical in place of spur guides, the use of helical instead of spur cutters, and provision for changing over to cut either right- or left-hand helices.

Athol Milling Machine Vise

The Athol Machine and Foundry Co., Athol, Mass., has recently placed on the market the quick-acting vise shown in the accompanying illustration. The vise is particularly adapted to use on drilling and milling machines, the movable jaw being quickly operated by means of a lever. It has a range of from ⅛ to 5 in. The jaws are 3 in. wide, and consist of hardened steel plates held in place by screws. Special jaws can be furnished to suit particular work, so as to enable the more rapid and accurate clamping of the parts.

The bed is made of cast iron, being 10 in. long, 6 in. wide, and 2¾ in. high. Four lugs are provided for



ATHOL MILLING MACHINE VISE

clamping the vise to the table of the machine, and keyways are cut in the base to enable the proper registering of it. The clamping lever, which is made of cast steel, acts on a ⅝-in. steel bolt. The vise weighs complete 10¼ pounds.

Precision Permanent-Alignment Wheel-Truing Head

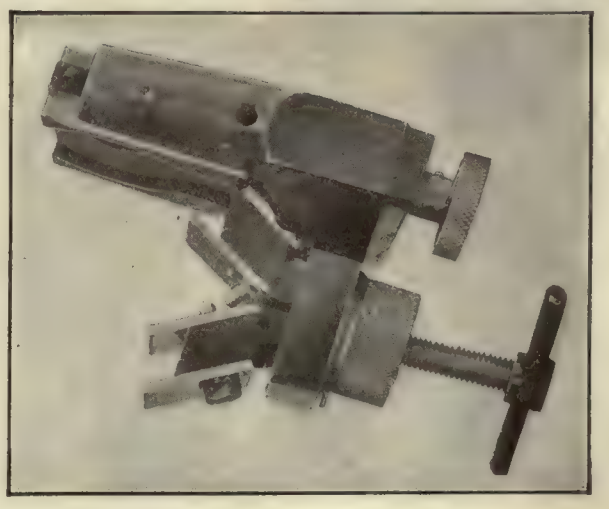
The Precision and Thread-Grinder Manufacturing Co., 1 South 21st St., Philadelphia, Pa., has added to its line the permanent-alignment wheel-truing head shown in the accompanying illustration.

The diamonds are simultaneously traversed by turning the T-handle shown at the right, but as one diamond is set in advance of the other they do not cut at the same time. The diamond holders are set at an angle of 10 deg. to the planes of the slides so that as the diamonds become dull, the holders can be turned to present new and sharp points to the wheel.

A stop provided for positioning the main slide, can be utilized for predetermining the amount of flat to be left on the face of the wheel for grinding U. S. S. threads.

Since, in grinding threads it is necessary to have the axis of the wheel inclined to the helix angle of the thread, provision has been made for inclining the truing head to the same angle so that the wheel will be formed to the proper shape.

The head is attachable to all models of "Precision" thread grinding machines by using an extended cap for the front bearing to which the head can be attached.



PRECISION WHEEL-TRUING HEAD

Gleason 4-In. Spiral Bevel Gear Generator

The Gleason Works, Rochester, N. Y., has recently placed on the market the spiral bevel gear generator shown in Fig. 1, the machine being intended especially

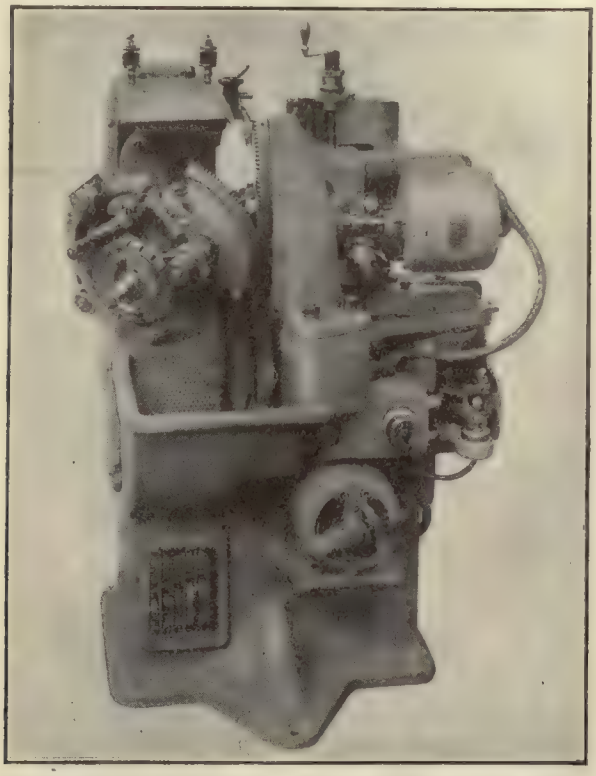


FIG. 1. GLEASON 4-IN. SPIRAL BEVEL GEAR GENERATOR

for the manufacturing of small gears in large quantities. The generating motion or roll is imparted to the work spindle and its carrier. The feed motion is given to the cutter spindle carrier only. The relative roll between the work spindle and the cutter is controlled by a crown gear and segment. Two motors are used to drive the machine, one driving the cutter and the other the feed and roll. Indexing is automatic and is actuated from the roll motion.

The machine is intended especially for finishing the teeth from the solid, finishing both sides of a tooth space with one generating cut by the "duplex spread-blade" method. A "completing cam" is used in the feed. The cycle of operations is as follows: The cutter, just before reaching the top of the up roll of the work, starts to withdraw. On the down roll, the cutter is swung clear of the work while the indexing takes place, and then is gradually advanced into the work during the remainder of the down roll. The cutter reaches the full depth of the tooth just after the beginning of the up roll, and the remainder of the up roll finishes the profile.

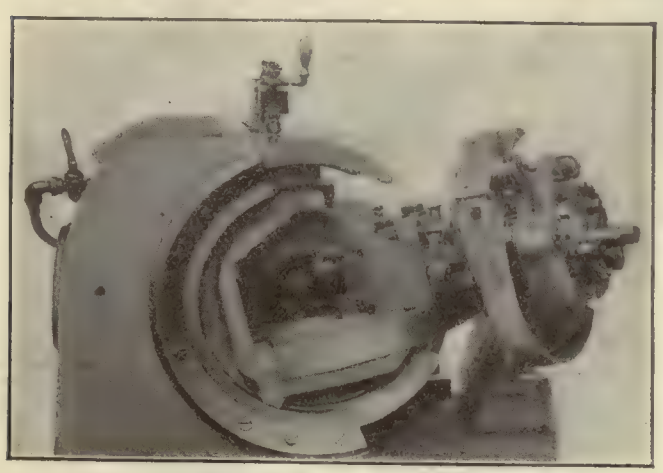


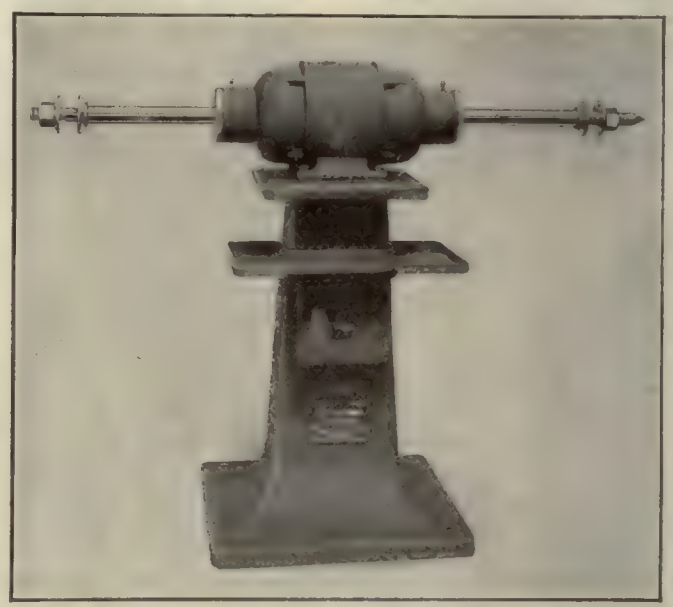
FIG. 2. POSITION OF WORK IN GLEASON GENERATOR

The machine can also be used with a reduced roll to rough out gears of the larger pitches, and then to finish the roughed blank by either the duplex spread-blade, or the single-side method. The position of the work and cutter is shown in Fig. 2. The cutters range in diameter from 1⅛ to 3½ in. The small cutters are made solid, and have four blades, two cutting on the inside, and two on the outside. The larger cutters have eight adjustable blades, four cutting inside and four outside.

The regular equipment consists of feed and speed change gears, eleven segments, an index plate, cutter gage, an automatic stop and a gear-driven coolant pump. Floor space is 33 x 46 in., and net weight 2,000 pounds.

Blount A.C. Motor Buffing Machine

The alternating-current-motor buffing machine shown in the accompanying illustration has recently been developed by the J. G. Blount Co., of Everett, Mass. The machine is built in four sizes, ½ hp. for wheels



BLOUNT A.C. MOTOR BUFFING MACHINE

6 x ½ in., 1 hp. for wheels 8 x 1 in., 2 hp. for wheels 10 x 1½ in., and 3 hp. for wheels 12 x 2 in. S.K.F. ball bearings are mounted in dust-proof housings. The spindle is of high-carbon steel.

The head or motor unit is regularly mounted with a pan on a column, but may be supplied on a bench base. A tool tray is bolted to the column. A safety switch having a thermal cut-out is mounted on the column beneath the tool tray, which serves to protect it from the buffing compounds and also from abuse. The motor is of Westinghouse design. The entire machine is finished with an oil-proof enamel, thus making it easy to keep a clean, bright surface. The machine is regularly supplied for the following currents: The ½-hp. motor for 110 or 220-volt, 60-cycle, single phase current, and the 1, 2 and 3-hp. motors for 220, 440 or 550-volt. 60-cycle, two or three-phase current.

Gordon Crankcheek Turning Lathe

The special purpose lathe illustrated has just been brought out by the Willard Machine Tool Co., Cincinnati, Ohio. It is the latest development in the line of

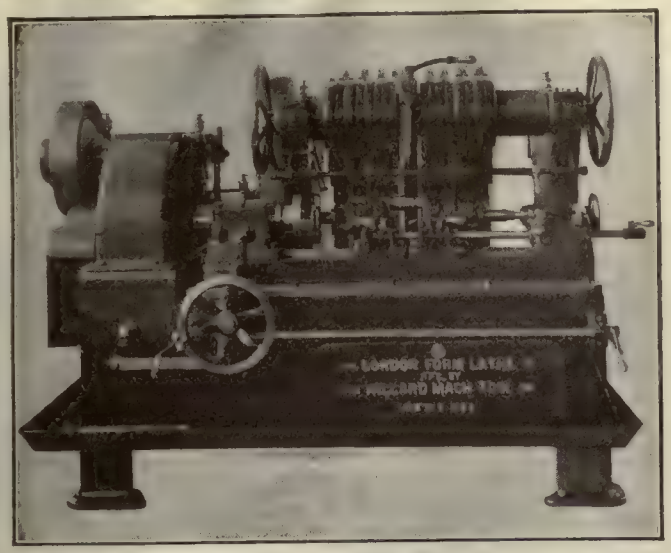


FIG. 1. GORDON CRANKCHEEK TURNING LATHE

lathes for turning cams and other irregular surfaces, built by the Gordon Form Lathe Co. for the past four years. The machine is designed to turn all the crankcheeks of a six-cylinder crankshaft simultaneously, the time for the whole job being only that required for one tool to traverse the width of one cheek. The particular lathe shown is one used by the Studebaker Corporation for turning up its four-bearing crankshaft which has eight cheeks.

In Fig. 1 are shown the relation of the various parts and the heavy construction made necessary by the simultaneous action of the eight cutters. The circular cutting tools are held in toolblocks which rotate in rocker arms swinging about the overarm shaft shown at the top of the figure. The oscillation of the rocker arm to permit the tool point to follow the contour of the work is controlled by the lower row of cams shown in the back view of the lathe, Fig. 2. Rotation of the toolblock to maintain the proper relation between the cutting point and the work is controlled by the upper row of cams.

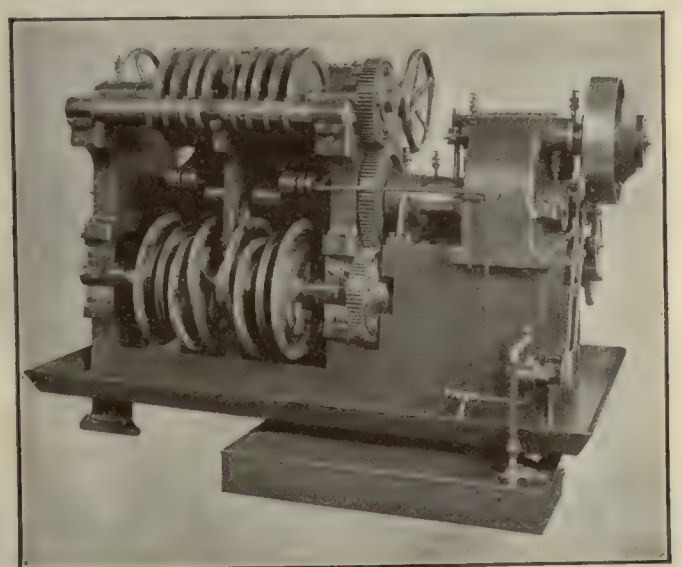


FIG. 2. REAR VIEW WITH GEAR GUARD REMOVED

The work is fed past the cutting tools by a screw which slides the platen longitudinally along the bed. A large range of feeds is provided through the gear train shown at the extreme right in Fig. 2.

The machine is started and stopped by either of the two horizontal levers at the ends of the shaft extending across the front of the bed just above the nameplate, Fig. 1. The feed is thrown in by the vertical lever just behind the handwheel at the left center of the bed, and is thrown out by an automatic trip. The handwheel returns the platen to the original position. The headstock, tailstock and steadyrests are bolted to the platen and travel with it as a unit.

Eccentric bushings at the ends of the overarm shaft may be rotated by the handwheels shown in Fig. 1, against stops which determine the position of the cutters for rough and finishing cuts. The lever above the middle support of the overarm shaft locks the shaft in position.

Drive is through a friction clutch and two intermediate gears to the main intermediate shaft, which is

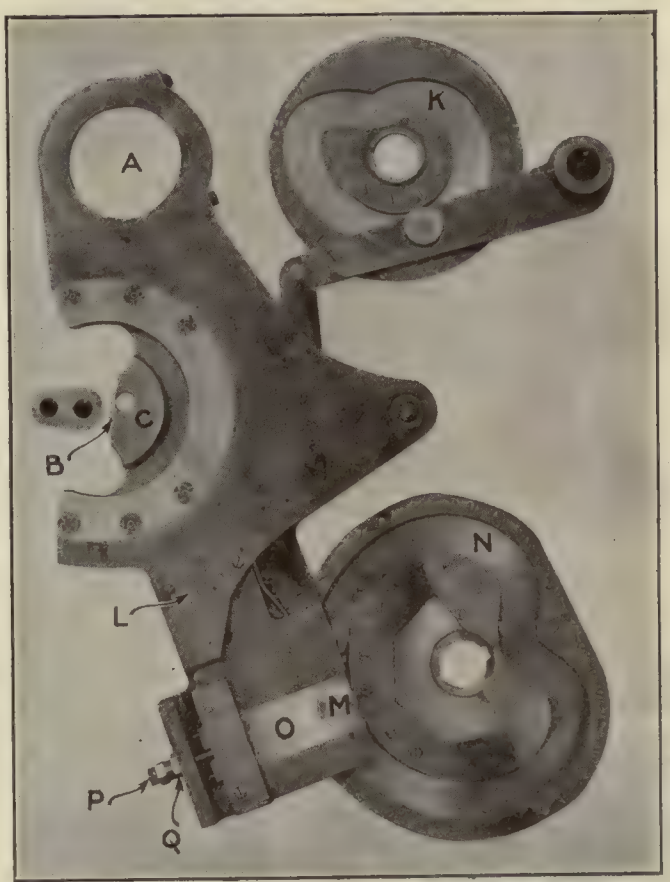


FIG. 3. ROCKER ARM AND CAMS

geared to the main spindle and the two camshafts by the gears shown uncovered in Fig. 2. These three shafts operate at the same speed. Gears run in oil.

The cutting lubricant is supplied by a No. 3 Brown & Sharpe pump through leads to the cutting points. Ample chip clearance is provided between the bottoms of the rockers and the platen. The chips fall into a chip pan and are removed through the large nameplate door in the front of the bed.

In Fig. 3 the relative positions of work, tool, toolblock, cams, rocker arms, etc., are shown. Fig. 4 shows the mechanism that rotates the toolblock. Returning to Fig. 3, *A* is the center of the 6-in. overarm shaft on

which the rocker arm swings, *B* is the cutting point which is at the center of the toolblock *C*. Rotation of the toolblock, therefore, does not change the position of the cutting point but does change the clearance angle. In Fig. 4 it will be seen that the toolblock *C* has gear teeth cut upon its outer edge which mesh with the teeth of the gear sector *D*. The gear sector pivots on a pin in the rocker arm and is actuated by the links *I* and *G* which get their motion from a roller at *J*. The links are fulcrumed on a shaft at *H* and the cam roller *J* is raised and lowered by the track cam *K*.

Motion of the cutting tool to conform with the contour of the crankcheek is secured by the action of the cam *N* on the hardened roller *M* in the foot of the rocker arm *L*. The roller *M* is adjustable by means of the screw *P* and locknut *Q* which move the slide *O* on which the roller is mounted. Spacing collars on the overarm shaft position the rocker arms above the crankcheeks and large guide plates fixed in the main frame guide the lower ends of the rocker arms and restrain their motion to a vertical plane at right-angles to the work centerline.

The circular cutter is 3 in. in diameter and is mounted

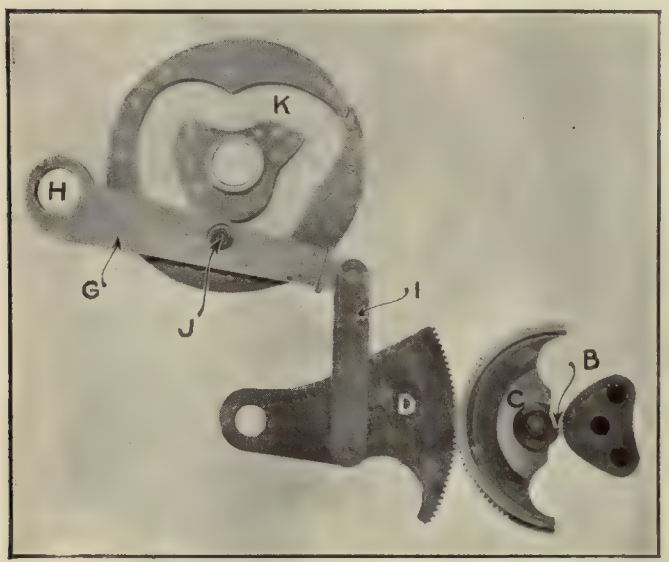


FIG. 4. CUTTER ROTATING MECHANISM

on a ⅜-in. stud. It is adjusted by means of a worm locked in the toolblock which meshes with hobbed teeth in the cutter. A gage is provided to facilitate setting of the tool after it has been reground. The toolblock is 14 in. in diameter and is guided between two plates, one of which appears in Fig. 3. The plates are doweled in place and locked by six flush locking nuts.

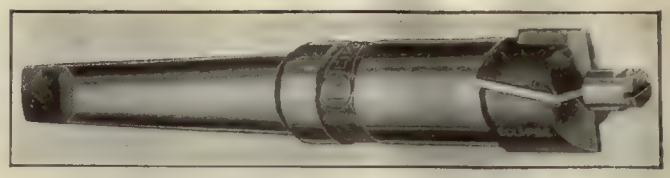
The cams are steel castings, machined all over, and the tracks are hardened and ground tool steel, made in sections and attached to the cams by dowels and filister head capscrews. The 3-in. camshafts have 7-in. plain end bearings and anti-friction center bearings.

Eclipse Junior Spot-Facing Tool

The Eclipse Interchangeable Counterbore Co., 1618 St. Aubin Ave., Detroit, Mich., has recently added to its line the spot-facing tool illustrated herewith.

The tool comprises a nickel-steel shank and holder, an externally and internally threaded pilot-nut (screwed into the holder), a high-speed steel facing cutter and a machine-steel pilot. The facing cutter is provided with a shank, ground to fit the hole in the holder so that when assembled both holder and cutter will be in alignment. The cutter is positively driven by flats on the shank engaging with a slot in the holder.

The pilot nut is screwed into the nolder and the threaded end of the pilot is screwed into it, binding the



ECPLISE JUNIOR SPOT-FACING TOOL

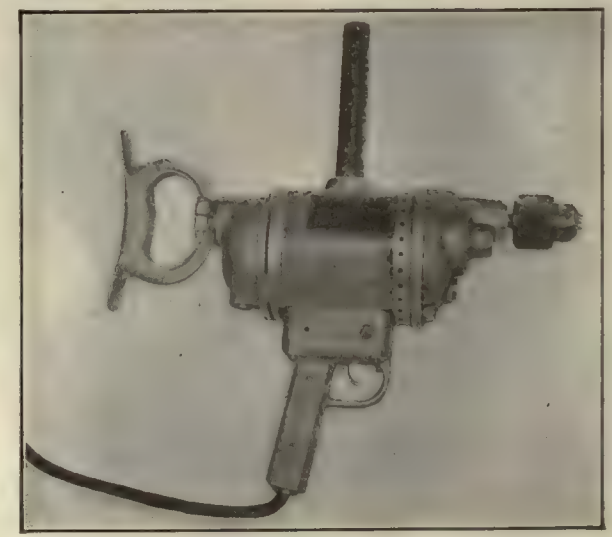
cutter securely in place. Pilot nuts having a variety of sizes of internal threads, enable the use of many sizes of pilots with the same holder. Holders are made having Morse tapers Nos. 2, 3 and 4 for facing cutters from ½ to 1⅛ in.; 1¼ to 1¾ in. and 1⅞ to 3 in., respectively.

To enable users of Eclipse pin-drive holders and pilots to use the interchangeable spot-facing tool without the purchase of new equipment, adapters can be furnished.

Black & Decker Special ½-In. Portable Electric Drill

The accompanying illustration shows a portable electric drill, having a capacity of ½ in., recently placed on the market by the Black & Decker Manufacturing Co., Baltimore, Md. The principal features are the pistol grip and the trigger switch.

The housing is made of an aluminum alloy, and incloses a universal motor intended for operation on either direct or alternating current. It is ordinarily supplied for 110-volt current, although it can be furnished for 220 or 32 volts. A cooling fan is keyed to the armature shaft. The reduction gears are of chrome-nickel steel, are of stub-tooth form, and run in grease. By removing the cover plate on the switch handle, the terminal block and the motor leads may be quickly exposed, this feature being particularly useful when changing the cable. A three-jaw geared nut chuck, capable of holding straight-shank drills up to ½ in. in diameter, is furnished. The drill is provided with 15 ft. of electric cable, attachment plug, combination spade handle and breast plate, and detachable side handle. It weighs complete 15 pounds.



B. & D. ½-IN. PORTABLE ELECTRIC DRILL

Barber-Colman Automatic Hob-Sharpening Machine

An automatic machine for sharpening hobs and formed cutters, and intended to reduce the time of sharpening as well as to make possible the performance of such work by an ordinary operator, has been developed by the Barber-Colman Co., Rockford, Ill., and is shown in Fig. 1. The machine was designed primarily for sharpening hobs up to 4 in. in diameter and 4 in. in length, but it is applicable also to the sharpening of formed cutters.

The hob being sharpened is indexed at the end of each complete to-and-fro stroke, the mechanism provided to index for different numbers of gashes being adjustable and providing a means of easy change. The mechanism used to give the desired helical angle on the hob permits of ready adjustment. The feed provided is adjustable and actuates once for each revolution of the hob, regardless of the number of gashes. The faces of the hob teeth are ground or sharpened truly radial with the hob center, irrespective of whether the gash is straight or helical.

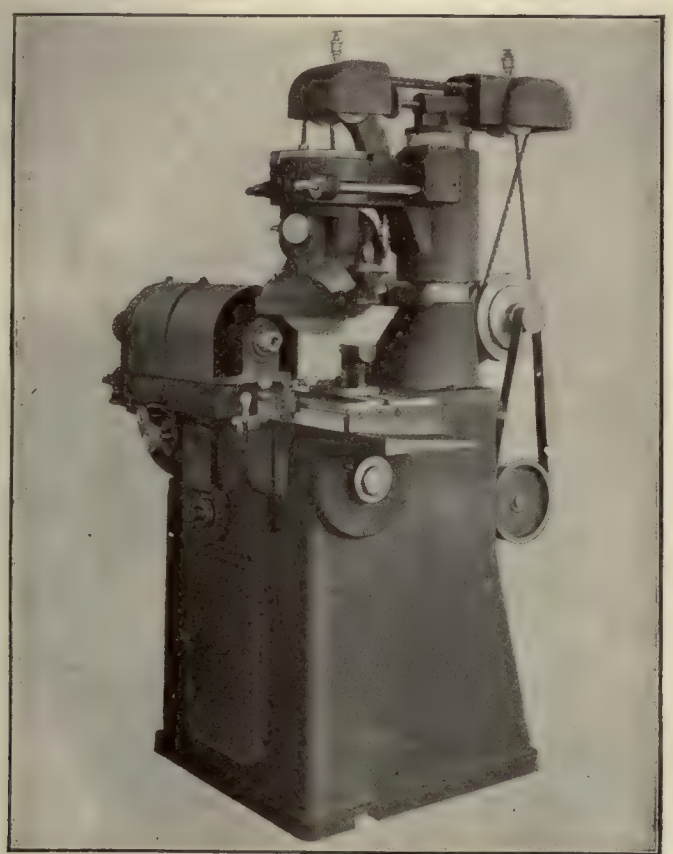


FIG. 1. BARBER-COLMAN HOB-SHARPENING MACHINE

The hob to be sharpened is mounted on a mandrel, carried in the headstock spindle, the outer end of the mandrel being supported by a sliding tail center. Both the spindle and tail center are mounted on a table which travels past the grinding wheel, having a fixed stroke of 7¾ in, and being actuated by means of a friction clutch. The operation of this clutch is at the control of the operator at all times, and can be thrown out of engagement at the end of any stroke.

The work-arbor spindle is provided with a No. 8 B.&S. taper hole, and runs in ball bearings. The rotating and indexing mechanism is located at the tail end of the spindle, being shown in Fig. 2. The index plate, which is the notched plate clamped and keyed to the tail end of the work spindle, may be quickly removed and replaced. It is made of hardened steel, the notches being ground. Indexing is positive and automatic.

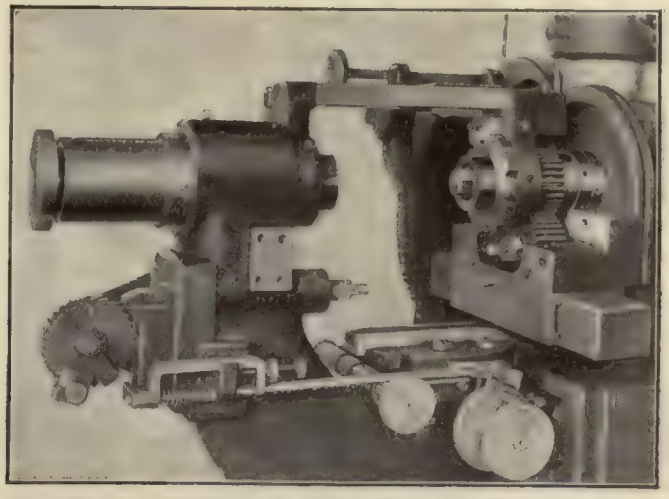


FIG. 2. FEED AND INDEXING MECHANISMS

The rotary motion for helical work is imparted by means of an adjustable swiveled guide actuating a rack under the sliding work table so as to turn a gear on the tail end of the work spindle. This guide is carried in a swiveled and graduated plate, which can be set at any desired angle by means of a knurled handwheel and worm. A fine-tooth ratchet can be seen on the tail end of the work spindle, with a counterpart at the extreme left end of the machine. The overhead bracket connecting these two ratchets is really a slide, and is fastened on the right to the arm on the tail end of the work spindle. It keeps the indexing parts on the spindle and the actuating parts at the left end of the machine in proper relation to each other. As the table moves toward the left, the two ratchets engage each other; and the dog, which until now has been engaged in the index plate, is lifted clear of the plate, leaving the latter free to rotate. Immediately after rotation begins, the dog is released and ready to snap into the next notch on the index plate. From that point to the end of the stroke, the left-hand ratchet together with the nut in

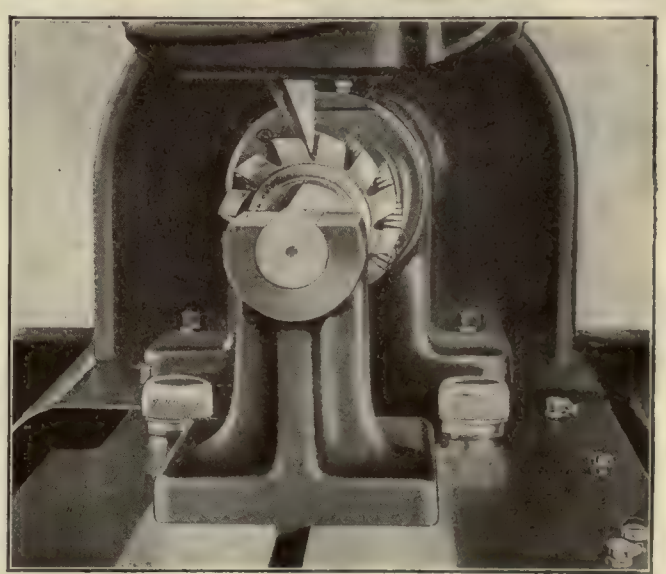


FIG. 3. SHARPENING A HELICAL-FLUTE HOB

which it turns, is pushed endwise against a strong spring; and is returned to its former position as soon as the table moves toward the right.

The mechanism which feeds the work against the grinding wheel is actuated only at the completion of each revolution of the hob, and is controlled by means of a thumbscrew regulator. The feed is adjustable to provide a motion of 0.0005 to 0.002 in. at the periphery of a hob 3 in. in diameter. Provision is also made for setting the feed so as to stop automatically after grinding any predetermined amount, so that a hob will not be spoiled should the operator be called away from the machine. A hood covers the entire indexing and feed mechanism, to protect it from flying grit and dust.

The grinding wheel is driven by means of an endless belt, provided with adjustable idler pulleys for keeping the belt at the proper tension. The wheelhead is carried on a heavy arm mounted with a vertical adjustment on the column. The grinding-wheel spindle is mounted in ball bearings which are carried in a sleeve, the whole unit being easily adjustable to bring the wheel to the diamond for truing. The wheel spindle is driven at the rear end through a pair of spiral bevel gears, which tend to eliminate vibration.

One feature of the machine is its provision for grinding a true radial face on the cutter teeth regardless of whether the cutter is straight or at an angle. This is accomplished by mounting the wheel spindle at an angle, as shown in Fig. 3, so that the vertical convex element of the saucer-shaped grinding wheel is directly over the center of the work mandrel; and also by having the wheelhead mounted in a swivel, so that the necessary angular adjustment may be obtainable for helically gashed hobs. The range of this angular adjustment of the wheelhead is the same as that provided for the work spindle, accommodating any angle, right or left, up to 70 deg. on hobs 3 in. in diameter.

A diamond dressing device built onto the head of the machine enables true radial grinding of the teeth, being so arranged that by means of a graduated stop the diamond can be set to the zero position regardless of its wear. However, if it should be desired to grind either a hook or a rake on the face of the cutter teeth, it can be done by setting the diamond forward or back of the zero position the desired amount and dressing the wheel in that position.

The machine is regularly belt-driven and a countershaft is furnished. When motor drive is desired, the countershaft is supplanted by a motor base and pulley. The regular equipment furnished includes one ¾ and one 1¼-in. work arbor, one 7-in. grinding wheel, a set of seven index plates for hobs having 10 to 16 gashes, table-drive and grinding-wheel belts and the necessary wrenches. The floor space of the machine is 42 x 50 in., and the height 72 in. The net weight is approximately 2,250 pounds.

Athol U-Beam Bench Vise

The Athol Machine and Foundry Co., Athol, Mass., has recently placed on the market the U-beam bench vise show in the accompanying illustration. The vise, which is stated to be more rugged than the oval-slide vise formerly made by the concern, is bolted to the top of the bench. It has a screw of the buttress type, operating in a malleable-iron nut. The jaws are of tool steel. The beam, eye and ball are unfinished, but the general overall finish of the vise is said to be smooth. The vise is made in four sizes, having widths of jaws of 2½, 3, 3½ and 4 in. The jaw openings are, respectively, 3½, 4½, 5½ and 6 in., and the weights 13, 21, 30 and 37 pounds.

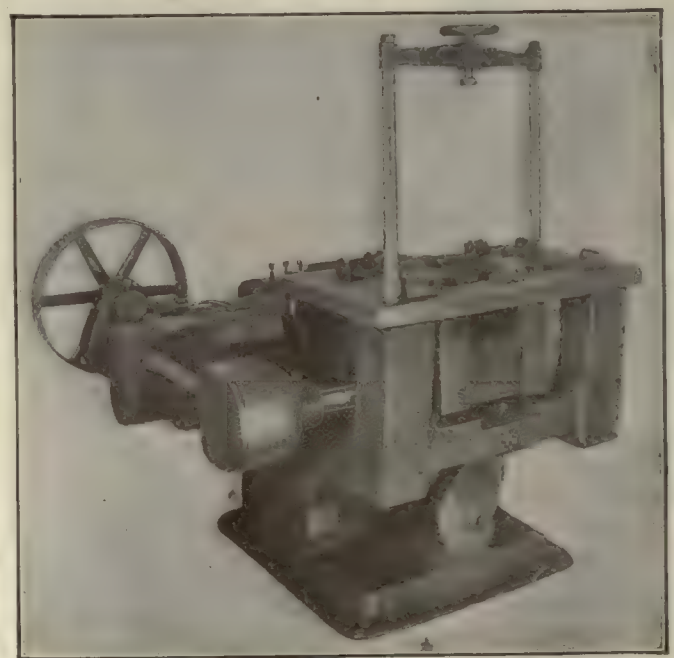


ATHOL U-BEAM BENCH VISE

Newton Model C-75 Straddle-Milling Machine

The accompanying illustration shows a cycle-feed-type, straddle-milling machine recently placed on the market by the Newton Machine Tool Works, Inc., Philadelphia, Pa. The machine is intended for facing the bearings for crankshafts in automobile cylinder blocks. The drive is by belt, and is transmitted through gears inclosed and running in oil.

The two spindles are mounted in substantial housings, and have individual hand adjustment to permit of regrinding the face-milling cutters. The motion of the table consists of a rapid advance downward, a slow feed for the cut, and an upward quick return to the loading position, where the table automatically stops on the level of the conveyor rolls. The table is provided with hardened steel jig plates. The clamping is done from above by a double-post beam clamp hinged at one end and supplied with a central clamping screw operated by a handwheel. Provision is made so that the rate of feed, or the time of one cycle, may be varied.

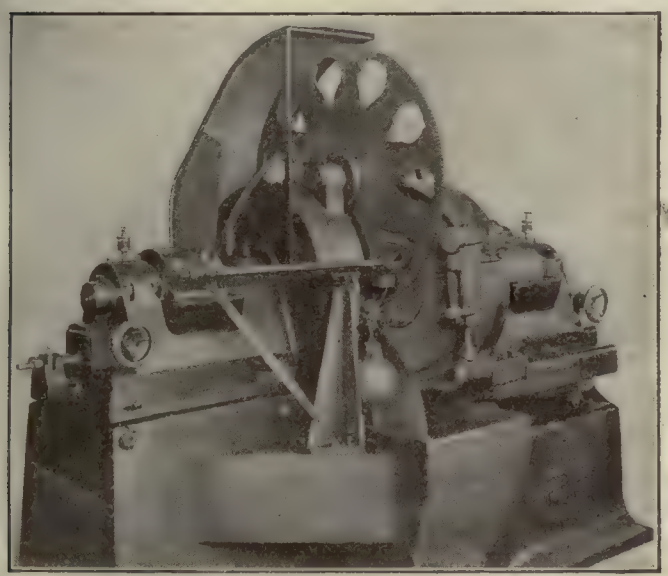


NEWTON MODEL C-75 STRADDLE-MILLING MACHINE

Gardner No. 1 Automatic Double Grinding Machine

The Gardner Machine Co., Beloit, Wis., has recently placed on the market the two-spindle automatic grinding machine shown in the accompanying illustration. The machine, which is known as the No. 1 double grinding machine, is intended for the rapid grinding of pieces having two parallel sides that require finishing, being adapted to the grinding of piston rings, ball and roller bearing races, sad-iron sole plates, thrust washers and similar parts. The openings in the work carrier, the large disk on the top of the machine, are made to conform to the shape of the work. They are here made to fit ball-bearing races and sad-iron plates, although by the use of inserts they may be made to conform to the shape of other pieces.

The spindles of the machine are offset with relation to each other. When the grinding requires the use of a coolant, the grinding members consist of two 24-in. abrasive ring wheels carried in "Perfection" chucks. For dry grinding, steel disk wheels 24 in. in diameter are employed. The parts to be ground are carried into the grinding position by the work carrier, which is a



GARDNER NO. 1 AUTOMATIC GRINDING MACHINE

large circular disk passing between the grinding members. In order to accommodate a variety of work, the carrier is provided with a range of feeds from six to forty pieces per minute.

The position of the grinding members may be adjusted by means of a handwheel operating through a worm gear and screw, graduations being provided up to 0.0001 in. Provision is made for accurately aligning the spindles of the machine. The work carrier is ordinarily provided with either five or ten openings for work. As it brings a piece of work into the grinding position, one of the grinding members automatically advances until it reaches a positive stop. Since this member approaches the work under spring pressure, it advances only as rapidly as the stock is removed, thus preventing danger from over-feeding. The member is returned to its open position by the action of a cam, and the work as it passes from between the wheels is automatically unloaded. Thus, clearance is provided for the entrance of the next piece of work.

Each grinding member is mounted on a head, which slides upon ways to provide the feeding motion just mentioned. Steel collars carry the thrust. When grinding small work that permits of a high rate of feed, an automatic feeding device for the carrier is employed.

Devices for trueing the grinding members are integral with the machine, although they do not interfere with the action of the machine and are brought into use only when desired. The spindles are made of alloy steel and mounted in bronze bearings adjustable for wear. Shields are provided to exclude dirt from the ways. Gibs are provided to take up the wear on the sliding parts, and means of lubrication are provided for all bearings.

S-P "American" Air Chucks

The S-P Manufacturing Co., 872 East 72d St., Cleveland, Ohio, has recently placed on the market the air-operated chucks formerly made by the American Air Chuck Co., Chicago, Ill. The standard sizes of the chucks range from 6½ to 18 in. capacity, although larger chucks can be furnished. At the left of the accompanying illustration is shown the three-jaw combination chuck, while at the right is shown a two-jaw chuck. Both types are intended for general manufacturing purposes, holding work either internally or externally. Special jaws or master slides to take false jaws can be furnished. The chuck bodies are made of one-piece semi-steel castings, and resemble those ordinarily employed in lathe chucks. The chuck is heavily built; because of its short length, it tends to eliminate chattering.

The sector levers are made of alloy steel, and operate the chuck slides to obtain the universal movement of the chuck. They are fastened to steel blocks which fit in the body proper. Heavy ribs running the entire width of the body reinforce the chuck and provide seats for the sector block to fit in. Since the nose of the machine spindle, or the faceplate, rests against the back of the sector blocks, the strain of the work bears on the end of the machine spindle. A flanged steel dust bushing is riveted to the body of the chuck, and prevents it from spreading in the front.

To obtain the gripping action, a roller movement is employed. A cam movement is used at the outer end of the sector lever. The air may be shut off in the cylinder and the work still firmly held. Where a very long pilot bar is used, the pilot bushing can be employed to guide the bar, and the cam bushing can be made any desired length. The sector levers operate in a pocket of the jaw at a ratio of 2½ to 4½. Should the air supply fail entirely, the chuck can be hand operated merely by placing a bushing between the cam bushing and the faceplate.



S-P "AMERICAN" AIR CHUCKS

"Tri-Way" Universal Horizontal Boring Machine

A horizontal boring machine, shown in Fig. 1, has recently been completed by the Universal Boring Machine Co., Hudson, Mass., and is now ready for the market under the trade name, "The Original Tri-way Universay (Horizontal) Boring Machine." From a feature of the bed the machine derives its name "tri-way," there being three instead of two guiding ways provided for the carriage. The latter is gibbed to the center and front ways, while the rear way supports what would otherwise be overhand, and enables the table to hold longer and heavier pieces. The levers controlling the various movements are grouped so as to be within easy reach of the operator.

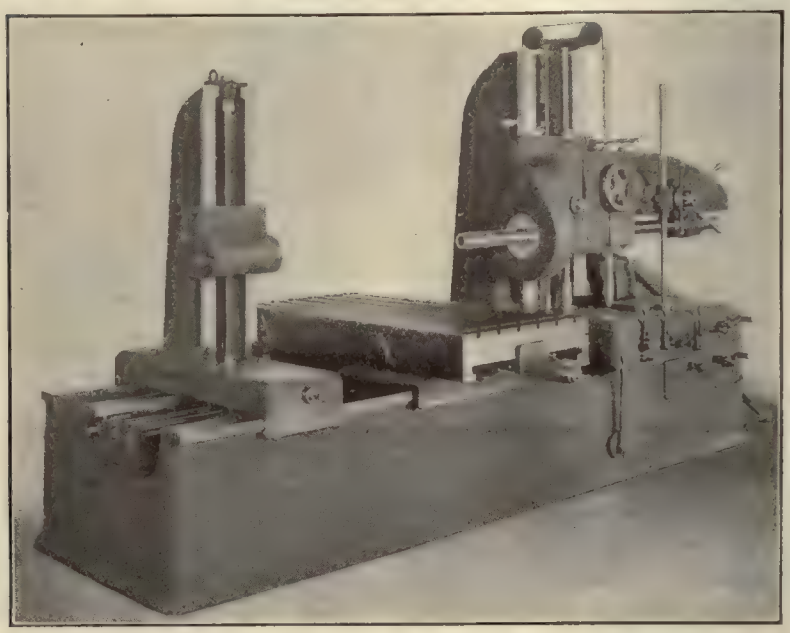


FIG. 1. "TRI-WAY" UNIVERSAL HORIZONTAL BORING MACHINE

A pump may be attached when it is desired to use cutting lubricant, and troughs or sluice-ways are provided to carry the overflow to a settling basin and tank. The tank is inside the base and contains the pump, which is completely enclosed, with only the driving shaft and pulley extending. Access to the tank and pump is provided for by a large door in the back of the base, and clean-out spaces allow the removal of chips without interfering with the progress of the work.

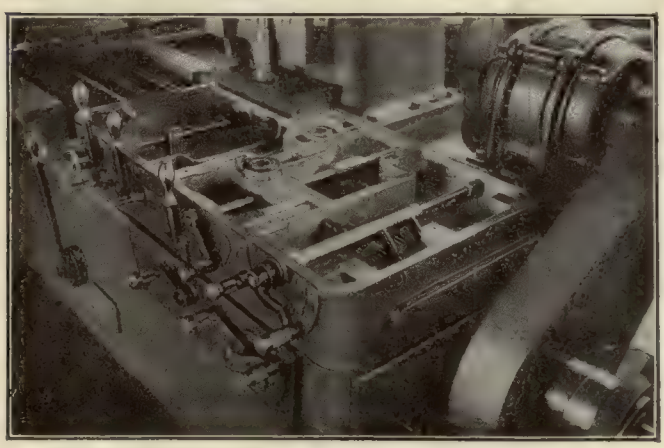


FIG. 2. GEAR TRAYS WITH COVER REMOVED

The base extends beyond the head and provides a rigid support for the motor, which drives the main shaft through a Morse silent chain, thus making the machine self-contained. All speed and feed change gears are located in two flat trays, one above the other, and also supported upon the extension of the bed. By removing the cover of the upper tray, as in Fig. 2, the feed gears and their related parts are easily accessible from above, while by withdrawing six capscrews the entire tray may be lifted off, giving access to the parts of the speed-change mechanism. Both trays may be removed as a unit without interfering with other parts. All the gears are of steel and run in oil.

The machine carries a 4-in. bar. The bar-carrying heads are moved up and down simultaneously and may be fed by power in either direction. Power crossfeed in either direction is provided for the table, as is also power traverse to the carriage. Any movement to which power feed is applied has also a rapid movement. The lever which operates this rapid movement must be held in engagement by the hand of the operator. Automatic knockouts are provided, to prevent over-running. The mechanisms of the levers interlock to prevent the engagement of opposed movements. A friction slip is interposed in the drive to prevent damage from the accidental blocking of any movement.

The outer support for the bar is made in two sections, so that the upper part may be unbolted and removed from the machine when it is desired to place long work on the table, while the lower part is not disturbed. The upper part is doweled to the lower and can be replaced without the necessity for realigning the bearing for the bar.

The machine is made in two sizes, with three lengths of bed. The distance from the faceplate to the outer support is either 72, 96, or 120 in., and the vertical travel of the bar heads is 30 or 36 in. The table has a working surface of 30 x 36 in. or 36 x 75 in. The spindle speeds range from 7 to 284 r.p.m. in geometric progression, and the feeds may be from $\frac{1}{8}$ to $5\frac{5}{8}$ in. per minute, irrespective of the spindle speeds. The machine shown covers a floor space of 17 ft. x 9 ft. 5 in., and is about 8 ft. high. The weight is approximately 20,000 pounds.

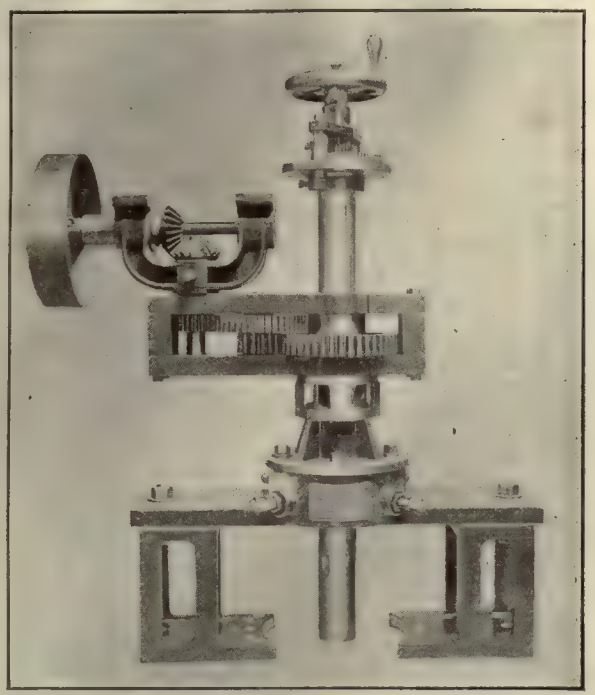
Pedrick Boring Unit

The accompanying illustration shows a portable boring unit recently placed on the market by the Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa. The device is very similar in construction to the driving end of the portable taper boring bar described on page 903, Vol. 55, of the *American Machinist*. It consists of four members, the bar, the feed mechanism, the driving gear and the crosshead mechanism.

The bar is of the standard type. It is 3 in. in diameter and 3 ft. long, having a travel of 18 in. The lower end of the bar is bored out with a taper hole to permit of holding tools. A feed screw having a square thread is embedded in a groove almost the full length of the bar. The outer end of the bar carries the feed case. By blocking the motion of the handwheel, the feed becomes automatic. Two changes of feed are ordinarily

provided, although three may be furnished for special work. The compounded driving gearing is enclosed in a strong frame. Power may be applied by belt, by motor, or if necessary, by hand.

The crosshead supports the guide for the bar. Space

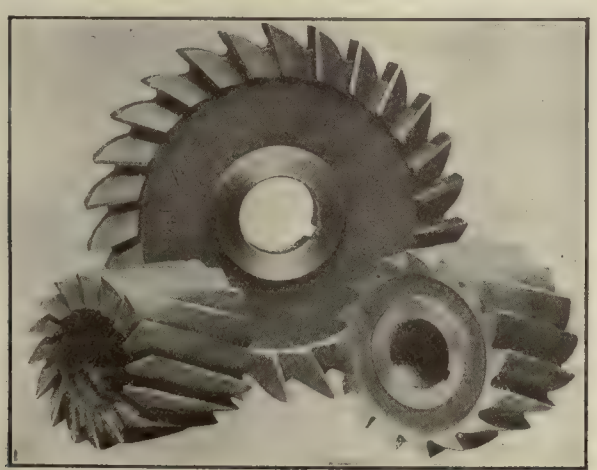


PEDRICK PORTABLE BORING UNIT

blocks provide room between the work and the end of the bar, and permit of different arrangements so as to fit work of different types. Setscrews are provided for centering the bar in the hole. The unit may be operated in any position.

National "Parabolic" Milling Cutters

The National Twist Drill and Tool Co., Detroit, Mich., has recently placed on the market milling cutters of the type shown in the accompanying illustration, and designated by the name of "Parabolic." In order to make the cutter tooth of uniform strength throughout its length, the shape adopted is that of a parabola slightly modified at the small end. The number of teeth used is nearer to that of the conventional fine-tooth cutter than that of the coarse-tooth type. In order to get the most effective chip thickness per tooth without excessive peripheral speed, a fairly large number of teeth was found desirable. Considerable research work on the action of milling cutters was done in order to ascertain the most efficient form of tooth.



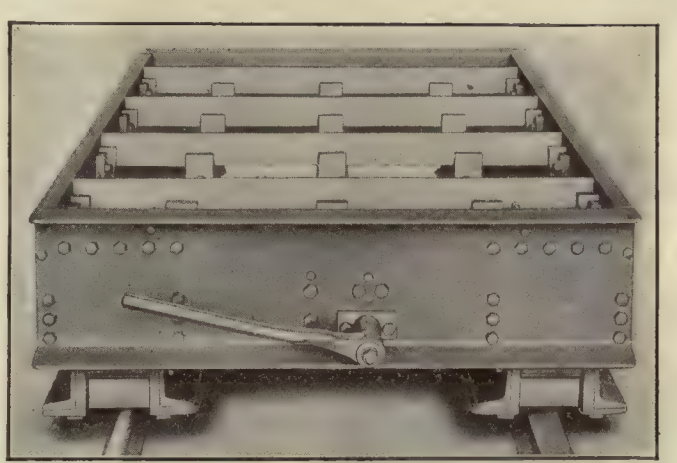
NATIONAL "PARABOLIC" MILLING CUTTERS

The parabolic cutters are made in plain-side and end-mill types, as well as in special designs to suit particular purposes.

Harrington Truck Tables

The illustration shows a truck table recently placed on the market by Edwin Harrington, Son & Co., Inc., Philadelphia, Pa., for the handling of large work. The tables are particularly adapted to use with straight-rail or fully adjustable multiple-spindle drilling machines, as they permit of moving the work all the way out from under the machine for changing it, or of moving it in small steps to obtain any desired indexing. The device is made in a standard design, although features may be changed to permit of any surface dimensions, number of wheels, character of top surface or method of movement.

The frame is ordinarily made of channels with the flanges turned out, and with the trucks and the intermediate supporting I-beams bolted on the inside. Cast-iron members fastened on the inside of the frame have vertical slots to hold 4 x ½-in. work-supporting bars. Ordinarily, these bars are covered with planks, so that the cutting tools may easily penetrate. The wheels are mounted on roller bearings carried in cast-iron housings.



HARRINGTON TRUCK TABLE

Two trucks are ordinarily employed, but a greater number of wheels can be used for a table of great size or weight. The front and rear wheels of one truck are turned with double flanges having angled sides in order to mate with the head of the rail, which is planed to V-shape and guides the table in a straight line. The other wheels have smooth unflanged treads.

Movement of the table is usually accomplished by means of a hand ratchet lever at the front, which drives the front wheel of each truck through gears. When desired, a compound-wound, direct-current motor is mounted below the table and geared to the drive wheel shaft, so as to move the table at a rate of about 60 in. per minute. It is controlled by means of a push-button automatic starter, and is said to be controllable to give movements as small as 0.01 in. The table can be supplied with a cast-iron top having T-slots and pin-holes, if desired.

Pratt & Whitney Die-Sinking Machine

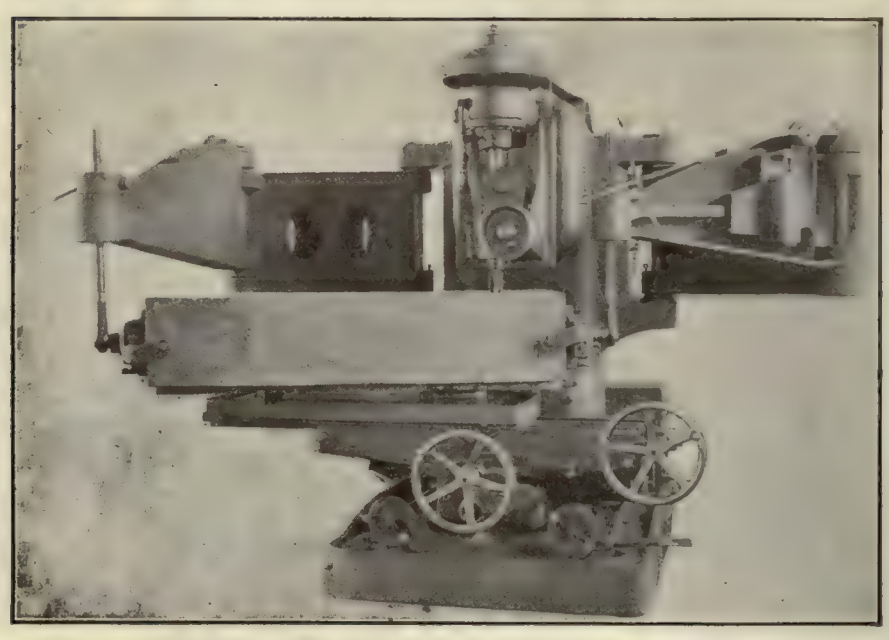
A die-sinking machine intended especially for work on large dies has recently been placed on the market by Pratt & Whitney Co., Hartford, Conn. By means of the "Bayrer's compensating arms," as shown in the accompanying illustration, a die weighing four tons may be suspended by elevating screws, and readily placed in position on the table, then swiveled, tilted or turned on edge by the operator. The hand feeds are thereby rendered sensitive to light cuts and the die may be fed over to the extreme limits for cutting the gates. The compensating arms may be folded back and latched against the sides of the column. They are carried on roller bearings supplemented by ball bearings, so that the die can be very easily moved.

Both of the outer carrying arms are provided with balancing beams and adjustable weights, by means of which the load of the die can be approximately balanced and thus relieved from the table. Clamps are attached to the end of the die block to provide trunnions by which the die may be supported. When it is desired to tip the die, the table is lowered so that the arms sustain the entire load. The machine is of the knee type, so that the die can be elevated by power to bring the cut to a level convenient for the operator. The table ordinarily is very low, so that platforms are unnecessary.

The cutter spindle is mounted in a counterweighted vertical head provided with hand feed. There is also a rapid traverse for the quick adjustment of the head. Power is transmitted through a quarter-turn belt from the gear box in the rear of the machine. All changes of speed and feed are made by levers in front. Hand and power feeds are provided for both the longitudinal and crossfeeds of the table. In addition, a rapid power traverse is provided for all movements of the table. The mechanism driving the power movements operates through a friction clutch to prevent injury in the case of over-running.

A cherrying attachment may be readily applied to the cutter head, the drive being effected through gearing to the nose of the cutter spindle. When not in use, the attachment is swung back out of the way and does not interfere with the operation of the machine. The machine may be driven either from a line shaft or from a motor mounted on the rear of the base. If desired, it can be supplied without the die-carrying arms.

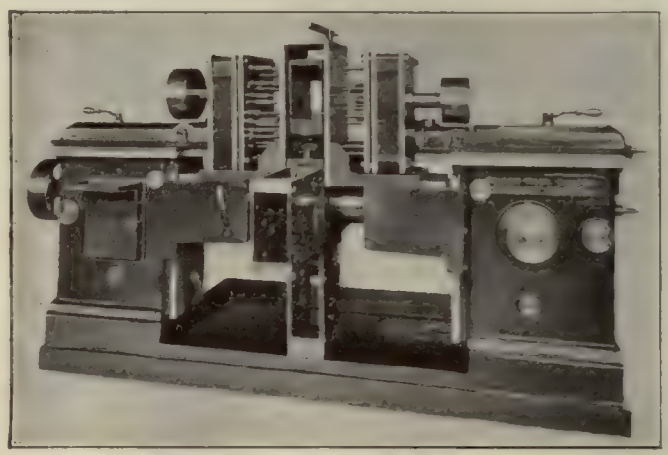
The dimensions of the table are 22 x 48 in. It has a longitudinal feed of 48 in., a crossfeed of 17 in., and a vertical feed of 15 in. The vertical feed of the cutter head is 12 in.; and the spindle speeds twelve in number, ranging from 27 to 790 r.p.m. The floor space required is about 10 x 10 ft., the height of the machine 9 ft., and the approximate weight 15,000 pounds.



PRATT & WHITNEY DIE-SINKING MACHINE

Sellew Automatic Drilling Machine

The Sellew Machine Tool Co., Pawtucket, R. I., has recently placed on the market an automatic drilling machine for production work on parts requiring multiple drilling on opposite sides. In the accompanying illustration, the machine is shown at work with 60 drills upon a box casting 24 x 18 x 6 in. in size. The work is changed in one arm of the work holder at the front of the machine at the same time that drilling is being performed on the work between the heads. During the period when the drill heads are in the withdrawn position, the work holder is revolved to bring a new piece in position in the jig. Both heads move forward simultaneously. The operation of the machine is continuous and automatic, the operator merely changing the work at the front station and indexing it through the jig. The drill spindles are mounted in radial and thrust ball bearings and the drills run at speeds proportionate to their diameters, each kind of work requiring different heads.



SELLEW AUTOMATIC DRILLING MACHINE

The feed is arranged so that its movement is similar to that obtained by hand feeding; that is, the drill is slowed at its entrance into the work and also when it breaks through. The heads have a quick return. The drill head slides are arranged to carry different heads, which can be changed very quickly. The saddles on the table for carrying the jig are adjustable to provide for a wide range of work. The machine is about 10 ft. long and weighs about 5,000 pounds.

Harrington No. 19 Multiple Drilling Machine

A multiple drilling machine of the rail type is shown in Fig. 1. It has been placed on the market recently by Edwin Harrington, Son & Co., Inc., 17th and Callowhill Sts., Philadelphia, Pa. The chief feature of the machine is the in-and-out movement provided for each spindle to permit of drilling irregular patterns, the construction of the heads being shown in Fig. 2. The machine is shown with only two spindles, but four are ordinarily furnished, the construction being such as to permit of small distances between centers. Any type of table may be used, either as a component part of the frame or as a separate unit to stand or roll on the floor. The driving pulleys will transmit 25 hp., which is said to be ample for the driving of four 2-in. drills.

The transverse movement of each spindle head on the

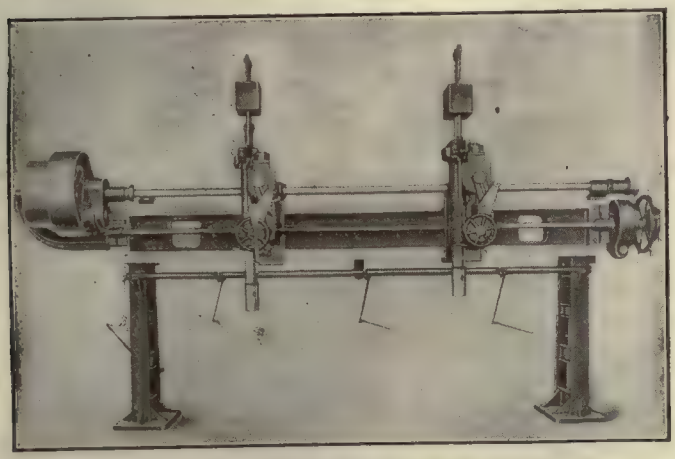


FIG. 1. HARRINGTON NO. 19 MULTIPLE DRILLING MACHINE

small arm is operated by means of a screw. Ball bearings are provided for spindle thrust and also under the counterweight yoke. By means of a clutch on the driving gear, any spindle may be stopped independently of the others. The arms are provided with rollers to take both the downward and the overhanging loads, so as to permit of easy movement on the crossrail.

The feed may be operated universally for all spindles from the right-hand end of the machine, or separately for each spindle at the end of each arm. The feed motion is driven by belt from the top shaft and operates on all spindles at the same rate. There is a large conical friction clutch at the end of the crossrail to provide quick vertical movement for the spindles. A handwheel on each head provides means for moving the spindles up and down independently and for setting them at the proper height when universal feed is used. Automatic stops are provided to disengage each spindle at any predetermined point.

When belt drive from an overhead countershaft is used, a two-step cone pulley and back gears are provided, giving four spindle speeds. Motor drive of different types can be used, although an adjustable-speed motor driving by belt to a single pulley is stated to be preferable.

The crossrail is of heavy box section. The uprights are I-sections securely bolted to the crossrail and base members. A table suited to the type of work to be handled can be furnished. A pump and distribution manifold are provided to give continuous supply of cutting lubricant. The dimensions of the machine can be made to suit the requirements. Ordinarily the greatest distance between the end spindles is 10 ft. 9 in., the vertical traverse of the spindles 15 in., and the in-and-out movement of the spindles 14¾ in. The floor space

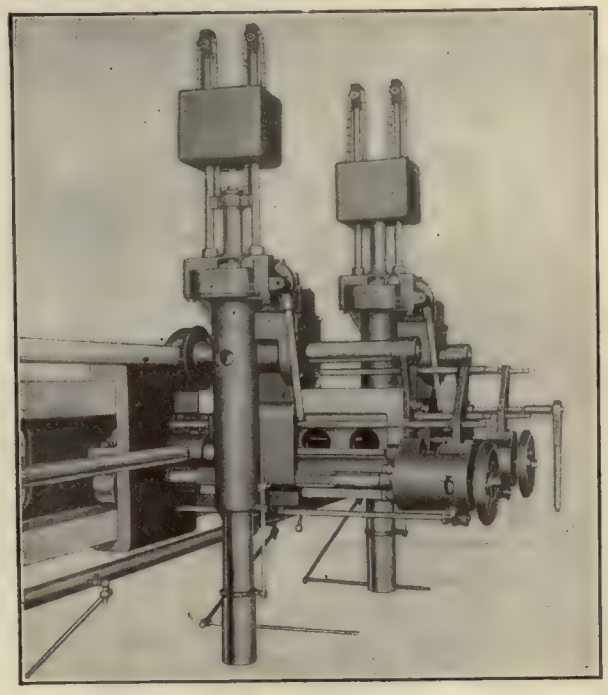
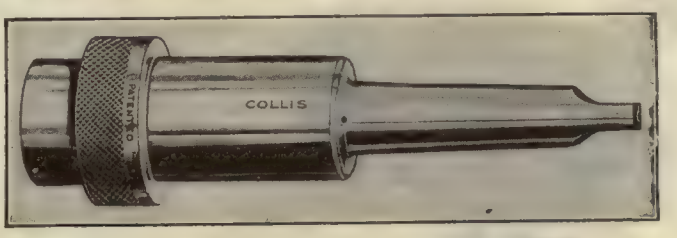


FIG. 2. HEADS ON HARRINGTON DRILLING MACHINE

without a table is 17 ft. 10 in. x 7 ft., the height overall 10 ft. 2 in., and the weight with belt drive 14,850 pounds.

Collis "Wonder" Quick-Change Chuck

The Collis Co., Clinton, Iowa, has recently placed on the market the quick-change drill chuck shown in the accompanying illustration, and sold under the name "Wonder." The chuck is adapted to use on drilling machines, lathes, screw machines and other machines having revolving spindles, and it permits of the rapid change of tools without stopping the rotation of the spindle. It is said that the chuck can be easily op-



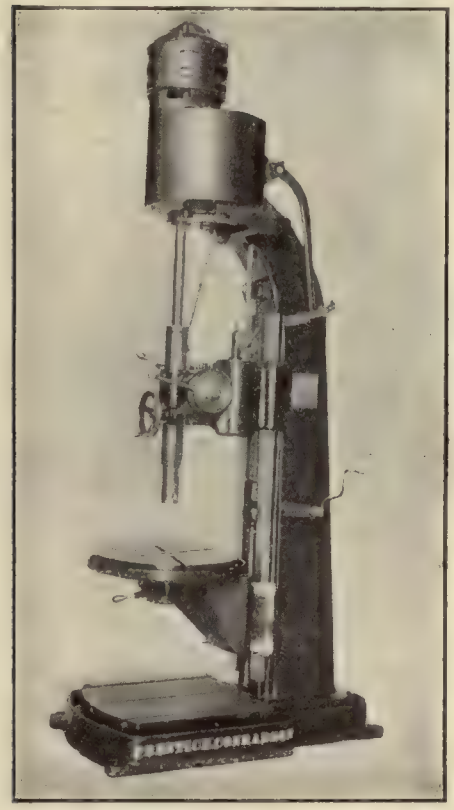
COLLIS "WONDER" QUICK-CHANGE CHUCK

erated with one hand, and that collets can be inserted without the necessity for the operator's hand touching the chuck itself even when revolving at 1,500 r.p.m.

The collets have taper shanks, thus enabling accurate fitting in the chuck. Collets for holding different tools, such as taper shank and straight-shank drills and hand taps, can be furnished. A special collet is provided for the holding of drills having twisted tangs or broken shanks. The chucks are made in six sizes, having standard taper shanks from Nos. 1 to 6, and outside diameters from 1⅛ to 5¼ in. The collets are also made in a range of sizes to fit the chucks, and to permit of holding drills and tools of different sizes.

Prentice Conradson 32-In. Vertical Drilling Machine

The vertical drilling machine shown in the accompanying illustration has recently been placed on the market by Prentice Conradson, Green Bay, Wis. The machine shown has a swing of 32 in., although the maker states that it will also be built in 25- and 36-in. sizes. The frame of the machine is cast in one piece, the headstock, column and base being a single casting. The table is ordinarily 24 in. in diameter, but rectangular and sliding tables can be supplied. The principal feature of the machine is in the mounting of the driving motor, the arrangement being such as to eliminate all moving parts possible The hollow armature of the motor, the two intermediate shafts carrying gears and the spindle sleeve are mounted in ball bearings, and are oiled continuously from an oil bath. A ball thrust bearing is provided for the spindle. All the gears used are heat-treated alloy steel. There are nine spindle speeds ranging from 34 to 500 r.p.m., and obtained by means of sliding cluster gears mounted on splined shafts. Six feeds are provided, the range being from 0.006 to 0.035 in. per revolution of the spindle. Rapid hand traverse is provided, as well as the usual hand feed, stop and depth gage.



CONRADSON 32-IN. DRILLING MACHINE

Both the motor and the controller are fitted to the machine. It is stated that the controller gives quick starting and reversal, as well as protects the motor against accidental overload. The controller is automatic in that the small master drum operates a clapper switch through a magnet, and at the same time the inverse-time-element protective device prevents abuse for short overloads without stopping the motor. A no-load protection is also included. For tapping purposes, the motor is merely reversed. Either a.c. or d.c. motors can be supplied.

Ordinarily a 3-hp. motor running at 1,200 r.p.m. is used, although for extra heavy work a 5-hp. motor running at 1,800 r.p.m. can be employed. It is stated that the machine can drive a 3-in. high-speed-steel drill in steel. The floor space required is 30 x 54 in., and the height of the machine to the top of the spindle 11 ft. 8 in. The net weight is approximately 3,700 lb., and contents boxed for export 135 cubic feet.

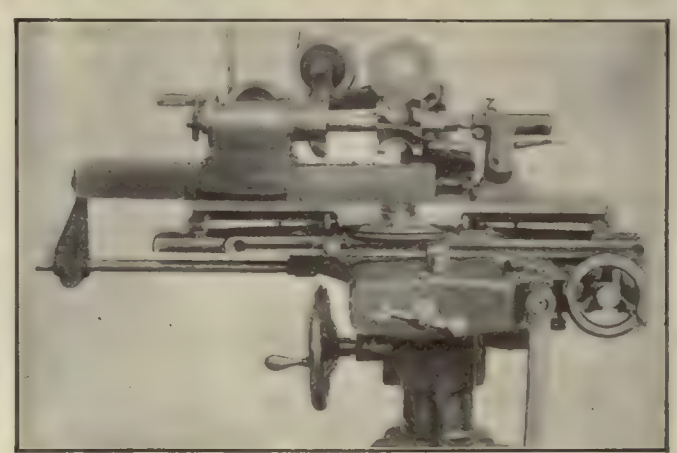
Le Blond Attachment for Grinding P. & W. Curvex Cutters

The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio, has recently placed on the market an attachment for application to its universal toolroom grinder, so as to enable the grinding of helical hobs and the "Curvex" cutters made by the Pratt & Whitney Co., Hartford, Conn. The cutters can be ground in diameters up to 5½ in. and lengths up to 7¼ in. The maximum travel of the attachment is 8⅜ in. A wheel 5 in. in diameter and having a 15-deg. side is recommended. Since the flutes of the Curvex cutters are helical, the attachment is arranged to grind leads of from 9⅛ to 172 in. per revolution.

The cutter to be ground is mounted on an arbor between the centers of the attachment, as shown in the accompanying illustration, the machine table is set to zero, and the taper guide bar of the attachment is set to the required angle. This guide bar is located under the long housing on the left of the machine table. As the table of the grinder is fed horizontally, the cutter spindle is automatically revolved in proper relation to the lead and helical angle. The cutter is indexed by means of the plunger and index plate at the left of the arbor, any factor of ten, twelve, fourteen or sixteen being obtainable by means of the indexing device. A rest to support the tooth from the back is not used.

The wheelhead is mounted on an angular raising block, giving the wheel spindle an angle of 15 deg. from the horizontal center line. The front face of the wheel is dressed vertically, the diamond being clamped to the table for this purpose and the vertical feed being used. A single line of contact between the wheel and the work is thus obtainable, and the work can be fed vertically onto the wheel to the entire depth of the tooth.

The knee is swiveled on the stump to an angle corresponding to the helix angle of the cutter, and the table is reciprocated past the wheel by the regular rack and pinion movement, the work being rotated in the meantime at the proper relation to the lead and helical angle. The grinding plane is always on a true radial line of the cutter, and the wheel clears itself in the work.



LE BLOND ATTACHMENT FOR GRINDING CURVEX CUTTERS

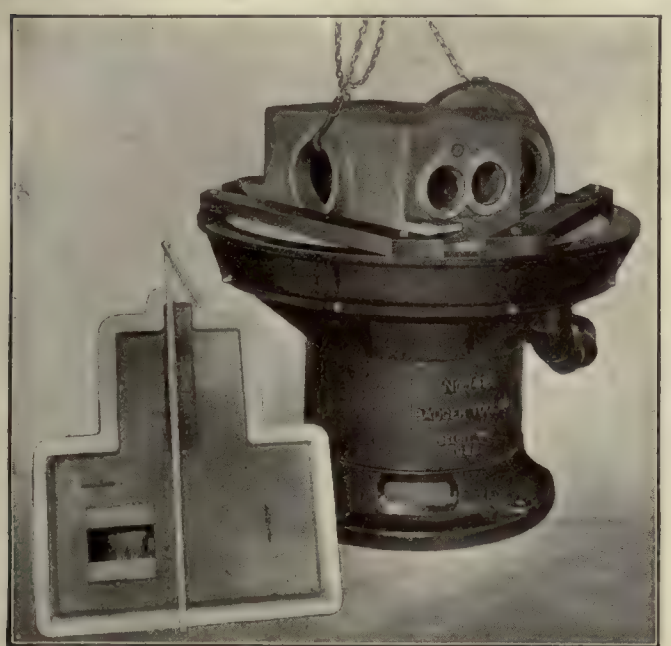
For the grinding of helically grooved hobs, the angular raising block and the belt sheaves are not required. The work-holding parts of the device can be furnished, however, for this purpose. The weight of the attachment for hobs only is 90 lb., while that of the complete attachment is 110 pounds.

Badger Vertical Spindle Disk-Grinding Machine

The illustration shows the No. 142 vertical spindle disk-grinding machine recently placed on the market by the Badger Tool Co., Beloit, Wis. The steel disk wheel is 42 in. in diameter and is faced with a layer of abrasive material ½ in. thick which is molded directly upon it.

Direct drive is secured by using the motor shaft as the wheel spindle. The end yokes are designed to be dust proof and very rigid, and positive forced-feed lubrication is supplied to both the radial and thrust ball bearings. A circular dust channel completely surrounding the wheel periphery terminates in two openings to which the dust exhaust system is attached. The dust channel can be entirely exposed by removing the guard ring which forms the outside wall. The open construction makes it possible for more than one operator to work at the machine at a time. The large transmission case and cover shown give an idea of the type of work that can be taken care of.

The No. 142 grinding machine complete with one



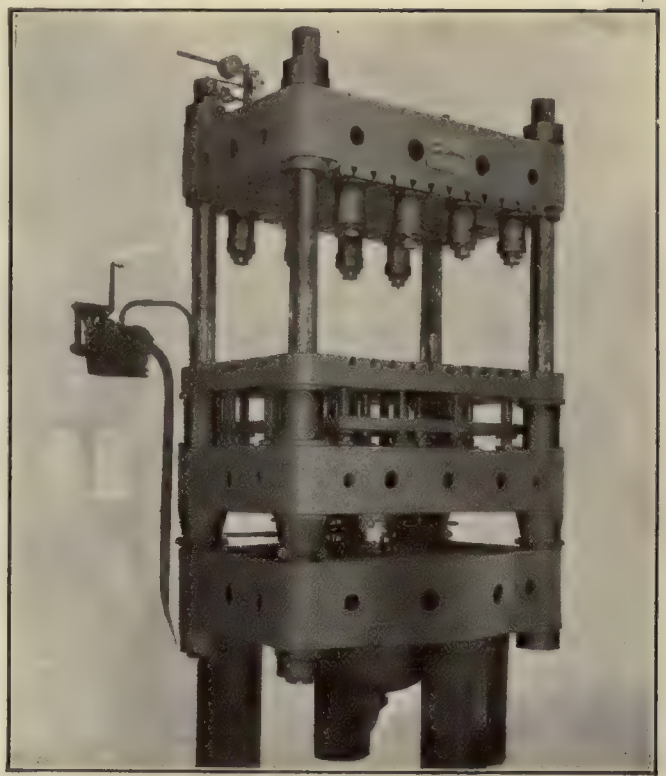
BADGER NO. 142 VERTICAL-SPINDLE DISK-GRINDING MACHINE

disk wheel weighs 3,800 lb. A 20-hp. motor running at 600 r.p.m. is used and stop bars as shown are provided to prevent the work from rotating with the wheel.

Southwark Automobile-Body Press

The Southwark Foundry and Machine Co., Philadelphia, Pa., has recently developed the all-steel hydraulic press shown in the accompanying illustration, particularly for use in the manufacture of automobile bodies. The press has a capacity of 450 tons. The main ram is located in the lower base, to which are secured the four columns. One clamping platen and one stripper platen are provided.

The stripper platen carries four hydraulic cylinders, which act upon a forged steel plate, which in turn carries sixty stripper pins 1¼ in. in diameter and projecting through the clamping platen. The clamping



SOUTHWARK AUTOMOBILE-BODY PRESS

platen itself is a solid steel casting, and is provided with T-slots. The top platen carries eight hydraulic jacks used for clamping, each having a 5-in. ram and 5-in. stroke. The position of the top platen is adjustable, so as to suit various sizes of dies.

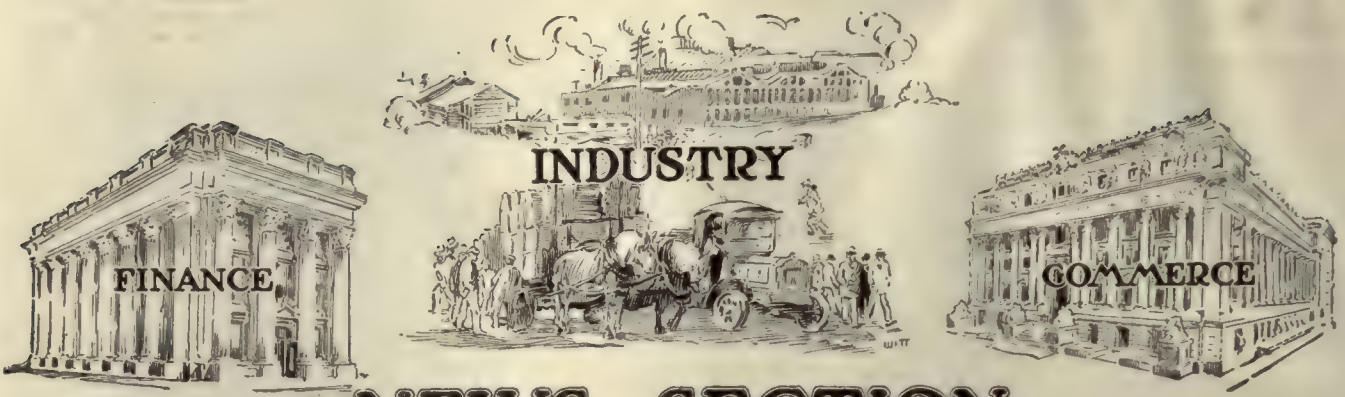
The press is controlled by a single-lever operating valve, which first admits low pressure to the four jack cylinders and at the same time low pressure to the main ram. As soon as the dies come together, high pressure is admitted through the steel operating valve, thus forming the work to whatever shape is given it by the dies. The clamping cylinders are controlled automatically from the low-pressure filling tank, and are capable of standing an hydraulic pressure of 5,000 lb. per square inch. The press has a die space of 7 x 5 ft., and the vertical opening between the platens is 18 in. as a minimum and 4 ft. as a maximum.

Canada To Build Railroad

The Ontario government has decided to extend the Temiskaming & Northern Railway northward about 70 miles toward its final terminus at tidewater on James Bay. This extension will involve an expenditure of about $3,500,000, and it is planned to award the work as a single contract which will provide work for the unemployed of this region.

Bids for the construction of this extension will be received by the Temiskaming & Northern Ontario Railway commission, and the data required for submitting bids have been ready since Dec. 1.

The above is from a report submitted by vice-consul J. H. Wetmore, North Bay, Ontario, who will see that the bid requirements are furnished, as soon as prepared, to any responsible contracting firm requesting them. The vice-consul at North Bay will also arrange to deliver to the commissioners any and all bids sent in his care.



NEWS SECTION

Penn R. R. Buys Harley Cycle Plant

Arrangements were completed last week for the sale of the plant and equipment of the Harley Company, manufacturers of motorcycles and parts, to Pennsylvania Railroad interests.

It is understood that the plant will be operated by a subsidiary of the Pennsylvania system and possibly continuing the old name of Harley Company. It is further stated that a variety of parts and accessories will be made there for the railroad, and that the project calls for the erection of large additional shops next summer. The site occupied by the plant covers forty-two acres, of which the present buildings utilize less than one-tenth. This move by the Pennsylvania is regarded as pointing to a largely increased interest on the Pennsylvania's part in New England affairs, with virtual absorption of the New Haven system foreshadowed, unless some new developments should interfere with the present trend. Hitherto the Hendee Manufacturing Co. has controlled the Harley Company, owning most of the common and preferred stock.

British Produce Nine-Cylinder Airplane Motor

The Bristol Airplane Co., of Bristol, England, the oldest established concern of this kind in the United Kingdom, has developed a nine-cylinder engine, known as the "Jupiter," which has been tested recently by the British Air Ministry. The test has shown very favorable results. A description of the engine and a "Digest of the Bristol Jupiter-Type test report" have been received from Consul Robertson Honey, and are on file in the Automotive Division of the Bureau of Foreign and Domestic Commerce, whence they may be obtained on request for Exhibit No. 41299.

Car Loadings Drop

Loading of revenue freight during the week which ended on Dec. 17 totaled 727,003 cars compared with 742,926 the previous week, or a reduction of 15,923 cars, according to reports filed by the railroads of the United States with the car service division of the American Railway Association. This was a reduction of 75,268 cars compared with the corresponding week last year and 79,731 cars, compared with the corresponding week in 1919.

War Department Adopts A.E.S.C. Specifications

Secretary of War Weeks has directed that the supply branches of the Army utilize in connection with their specifications the standards that have been or may be adopted by the American Engineering Standards Committee.

This is part of a general policy of the War Department to co-ordinate its whole supply system with the best commercial practice, and to support a national program of the engineering and industrial standardization, according to Colonel George S. Gibbs, of the General Staff.

The essential needs of defense are men and supplies, or personnel and material. The men must be trained and have the will to win. The supplies must be suitable for their uses and adequate in quantity. That is where standardization comes it. It represents the difference on the one hand, between being able to get the needed quantities of uniform articles of tested usability, and on the other hand, of being restricted and harrassed by a hodge-podge of varieties, the usable quantities of which are always insufficient.

The importance of standardization of war supplies cannot be exaggerated. In these days war involves the united effort of an entire nation and the combined employment of all of its principal industries. How is it possible to harmonize the use of thousands of articles to a common end except by the adoption of a far-reaching and effective program of standardization?

There are seven supply branches of the Army—the Quartermaster Corps, which purchases all general supplies of a commercial character, Ordnance Department, Medical Department, Corps of Engineers, Signal Corps, Chemical Warfare Service and Air Service.

Molding Sand Research

The Bureau of Standards of the Department of Commerce has been invited to take an active part in organizing and executing a comprehensive series of investigations relating to the properties, testing, and standardization of molding sands. The bureau has done considerable work on this subject in the past, and it is to be expected that with the active co-operation of the American Foundrymen's Association, the National Research Council, and others, considerable progress will be made in this important subject which has hitherto been in a very unsatisfactory condition.

Sale of Machinists' Dividers by Navy

The Navy offers for sale approximately 3,810 machinists' dividers, in sizes and quantities. Inspection of this material which may be seen at points of stock locations is invited. No samples, however, will be furnished free of cost. Informal bids on all or any number of these dividers will be considered up to 10 a.m., Tuesday, Jan. 10.

In the event of two or more bids being equal, but for unequal quantities, the bid covering the larger quantity will be given preference. In case of equal bids on the entire quantity, or on equal quantities, the matter will be decided by lot or by agreement of the bidders.

Successful bidders will be notified promptly and award will then be made after receipt of deposit by certified check or postal money order, of 10 per cent of the total amount offered. Bids in order to be considered must be forwarded to and received at the Board of Survey, Appraisal and Sale, Navy Yard, Washington, D. C., on or before the time stated above and marked "Informal offer on Machinists' Dividers."

Holiday Greetings Received

The *American Machinist* gratefully acknowledges the receipt of the season's greetings from the following:

Queen City Machine Tool Co., Auburn Ball Bearing Co., Bound Brook Oil-Less Bearing Co., Standard Engineering Works, Arva Stroud, Woodward & Powell, Barnes Drill Co., Bloomquist-Eck Machine Co., The Norma Company of America, Allied Machinery Company of America, E. C. Atkins & Co., Inc., Detroit Twist Drill Co., Moltrup Steel Products Co., Kempsmith Manufacturing Co., National Lead Co., and the Associated Business Papers, Inc.

Edison Medal for C. C. Chesney

The Edison medal for meritorious service in electrical science engineering or art for 1921 has been awarded to Cummings C. Chesney, general manager of the Pittsfield Works of the General Electric Co. Former winners have been Elihu Thomson, Frank J. Sprague, George Westinghouse, William Stanley, Charles F. Brush, Alexander G. Bell, Nikola Tesla, John J. Carty, B. G. Lamma, W. L. R. Emmet and Michael G. Pupin.

Huge Stocks and Exchange Cause Stagnation in British Market for American Machine Tools

The trade information committee of the American Chamber of Commerce in London has issued a special review of the conditions prevailing in Great Britain for American machine tools. Some interesting facts are disclosed and suggestions are offered for the American manufacture to think over.

American machine tools enjoyed a good market in Great Britain before the war, particularly in the heavy types. But due to the huge stocks held both by the Government and by dealers, to the war time expansion of the domestic machine tool industry, and to the handicap of exchange, the present condition is one of stagnation, and it is considered doubtful having regard to the expanded facilities of the domestic manufacturers whether the market for American tools will ever again be what it was.

The heavy types always sold well in pre-war days owing to the fact that the American manufacturer backed by a big home market was able to produce in large quantities and thus sell on favorable terms.

In 1909, 84 per cent of the total British imports of machine tools were from the United States. In 1911 this per centage had increased to 93, and in 1915 to 99. In 1918 it had slightly decreased to 98 per cent. Now, not only are British imports of machine tools as a whole much lower, but the percentage brought in from the United States has again decreased.

During the first ten months of 1920 British imports of machine tools were 11,718 tons, whereas during the same period this year they have fallen to 2,704 tons.

As mentioned above it is regarded as extremely doubtful whether American tools will ever again be in such demand in Great Britain. In any case it is certain that competition between British and American machine tools will be much keener in the future.

The war has caused a revolution in the British machine tool industry. Great expansion has been made and more up-to-date methods are being used. Manufacturers have increased their capacity of production both in quantity and quality and are likely to be less dependent on American tools in the future.

During the war the British government was compelled to help manufacturers in order to get the kind of machine tools it wanted. It also imported large quantities from America, and British manufacturers copied the designs and manufactured for war purposes.

This experience has led to the development of the British machine tool industry to an extent formerly undreamed of, with the result that Great Britain will be more self-supporting in the future.

Handicap of Exchange

At present American machine tools, in common with most American goods in Great Britain, are greatly handicapped by the rate of exchange. German tools are coming on the British market in increasing quantities helped, of course, by the depreciated state of the mark.

One manufacturer stated that he was offered a choice of three machine tools of similar design, one American, one British and the other German. The price of the American and the British was practically the same, roughly about £1,000, while the German, very slightly inferior, was only £275.

Many American importers state that neither American or British manufacturers can hope to compete with German machine tools in the present state of the exchange.

It is reported that German manufacturers have made quite good copies of American models and are able to sell them in Great Britain at roughly one quarter of the cost of American tools. Although these are not so good as British and American machine tools, they are said to be of fair quality and to be reliable. In any case it cannot be said that because British and American tools are four times the price they are also four times as good.

It is believed, however, that German competition will be most severely felt on the Continent. This is borne out by official returns for 1920, which show that German machine tools were exported to the value of 1,324,093,000 marks, the metric weight being approximately 949,212 quintals (a quintal is 220.46 lb.). Of this quantity 190,000 quintals went to Holland, 130,000 quintals to France and 120,000 quintals to Switzerland.

Stocks Held by Government

There is undoubtedly a great deal of fear in the minds of manufacturers and importers as to the large stocks still held by the Government. One American importer of machine tools states that he does not think these stocks are so large or in such good condition as to constitute a really serious factor. On the other hand the majority of British manufacturers and American importers agree that the stocks in the hands of the Government are not only large, but consist of much valuable material which will take some years to absorb.

It should be remembered too that many firms have bought large quantities of machine tools from government stocks, and also from dumps abroad at very low prices, in the hopes of selling them at higher prices. But so far these hopes have not materialized, prices realized being usually so low that the goods have been withdrawn from sale.

The stocks held by the Disposals Board are valued at between 1½ and 2 millions sterling, which is exclusive of the stocks in the hands of other dealers.

Ridiculous prices are being offered for machine tools at various sales which have taken place. For example at a recent sale at Coventry American milling machines normally selling at £115 were *sold* for £5.

It is rumored that the Disposals Board has been approached by British manufacturers and asked not to unload its stocks in the present state of trade, as it would only have the effect of closing down the few firms still working.

Among the large quantity of machine tools advertised for sale by the Disposals Board are lathes of all kinds, milling, grinding, drilling, profiling, planing, screw-cutting, shaping, slotting, boring, cold-sawing, engraving and gear-cutting machines of both British and American manufacture.

At present the British machine tool trade is practically dead or, as recently described in the House of Commons, in a state of "paralysis." Very few firms are working full time, many are working short time, and a good number are closed down altogether.

It is true that a small amount of business is still being done chiefly for railways where replacements are absolutely necessary, and in the lighter and less expensive makes of machine tools, but practically all business is in replacements.

British manufacturers have always had good markets for machine tools in India and Japan and are still doing a fair amount of business there and also on the Continent, chiefly in the devastated regions. It is reported, however, that Japan is now beginning to manufacture machine tools to a much greater extent than formerly and is endeavoring to become independent of imports.

During the first ten months of 1913 British exports of machine tools were 13,464 tons; in 1920 they were 18,438 tons, and for the same period in 1921 they were 18,055 tons, which is much higher than in 1913 and practically as high as in 1920. The 1921 exports are understood to consist mainly of Indian orders which could not be executed in the early part of 1920.

British manufacturers are hoping that the Government Trade Facilities bill, by opening up and expanding various industries, will increase the demand for machine tools and so result in increased business.

Although at present there is no market in Great Britain for American machine tools, some hints as to entering the market may be useful for future use. The best way, and practically the only successful way, is undoubtedly to open up a branch in Great Britain, put it in charge of an American who thoroughly understands his business—but employ British salesmen who understand British prejudices and methods.

Agencies of various kinds have been tried in the past, but are regarded generally as not having proved so successful as a branch house. Prominent American firms who are already well established in Great Britain are all agreed that nothing gives such all round satisfaction.

Chamber Can Help

In conclusion, it can be said that until the exchange becomes more favorable to business very little will be done in the way of selling American machine tools in Great Britain. Another element in the situation is the fact that many British firms which expanded largely during the war are now running only about 25 per cent of their capacity.

What the future for American machine tools will be cannot be predicted. Opinions are divided on the subject. Some American importers state that there will be a good market once trade conditions are more normal, but others think that American tools will no longer enjoy the free field they formerly did, and that there will be bitter competition.

American manufacturers proposing to enter the British market seriously and permanently are advised to take up the question with the American Chamber of Commerce in London.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The detachment of the United States from the economic involvements of Europe is shown by the fact that the suspension of the Banca Italiana di Sconto had hardly any effect here, except as it compelled the Italian Discount and Trust Co., of New York, to close its doors pending definite news from the Banca di Sconto with which in the course of its business it had accumulated a large credit. The deposits of the New York concern are about $12,000,000 and those of the Italian bank stood at 3,538,745,327 lire, according to its statement of May last. Its paid up capital was 315,000,000 lire and it had a reserve of 68,000,000 lire. Marconi, of "wireless" fame, was its president and it had 150 Italian branches and offices in Paris, Marseilles, Barcelona, Constantinople, Tiflis, Tunis, Massowah, Rio de Janeiro, Santos, Sao Paulo and many other foreign cities. The Italian government has declared a moratorium applicable only to the debts of the Banca di Sconto. It is not as was at first reported a moratorium which applies to all debts due in Italy and its purpose appears to have been to camouflage the bank's embarrassment by legalizing its suspension.

The affair would seem to resolve itself into a highly speculative episode, but as (calculating the lire even at its presently depreciated value of 4.30 cents) the liabilities involved exceed $160,000,000, it is not to be lightly regarded.

Every one realizes that at some time not far distant the fool's paradise of paper money in which Europe is now living will be wiped out and we shall be fortunate indeed if no repercussion of its collapse is felt in this country. The French national debt which is now about 328 billion francs stood at about 28 billion francs before the war, and has been increased by 146 billion francs since the armistice. The German bank statement of Dec. 22 shows a further increase of about 6 billions in the paper marks outstanding, the total being now 109 billion. Austria has trillions of paper crowns in circulation that are almost worthless, and in Russia the situation is even worse for the Soviet government admits having issued 11,152,000,000,000 paper rubles in the last four years.

Deflation Must Come

To hope that this mass of paper obligations can ever be redeemed at their theoretical value in gold is fatuous and foolish. Sooner or later they must be scaled down or formally repudiated and it remains to be seen what the result will be in this country. The best opinion is that since it is generally realized here that many European governments are practically bankrupt a confession of insolvency is discounted and the effect will be negligible.

But it is just as well that we should not be over confident for it is quite possible that European deflation, when it comes, will develop sporadic cases of financial weakness here similar to the suspension of the Italian Discount and Trust Co. in New York.

By being prepared for such occurrences we shall protect ourselves, and this word of caution is written because the attitude of France in refusing to accede to the proposals made at Washington for limiting the construction of submarines and auxiliary vessels, is creating a somewhat difficult situation when taken in conjunction with Germany's announcements that she cannot and will not make any further reparation payments after meeting the installment due on Jan. 15. She claims to have paid the equivalent of 200 billion gold marks, equal to 47,000,600,000 gold dollars during the year 1921 and insists that this is all she can do for the present. The total of the payments chronicled in the American newspapers is, however, much less than the sum mentioned.

The spread of Ghandi's "non cooperative" movement in India, a serious uprising of the natives in Egypt that the English had to suppress by the use of arms, an anarchistic outbreak in Portugal, and Lenine's boast that the Russian "Red" army of 1,500,000 men will be largely increased by next summer that it may contest with the "Imperialistic Entente" for the domination of the Eastern world complete the transatlantic picture, which has for its gruesome background the story that the starving peasants in the valley of the Volga have become cannibals and are eating the flesh of their companions as they die.

The Bright Side

Turning from this gloomy portrayal which, I repeat, is exhibited only in a spirit of caution, it is pleasant to contemplate the cheerfulness which appears to be felt on this side of the Atlantic. The holiday sales are said to have been even larger than was expected last week but no precise figures are as yet available. Railroad net earnings for November are also better than had been anticipated. It is estimated that they will be at the rate of 4 per cent upon the valuation of $18,900,000,000 that the Interstate Commerce Commission has put upon the roads, whose market value as indicated by the prices at which their securities are selling is less than $12,000,000,000.

Logically these figures would indicate an advance in railway securities were it not that the gain in net revenue is mainly due to a reduction in operating expenses. Gross earnings are still poor. They are not likely to improve until rates are reduced and the traffic movement is thereby stimulated. The public are meantime protesting, the motor trucks are capturing much of the short haul freight the railroads formerly carried, and Mr. Walker D. Hines, formerly director general of the United States Railroad Administration has made a speech predicting a compulsory unification of the railroads because the public will be unwilling to pay the cost of maintaining so many different systems.

In the commodity markets the only important change in value is a decline in sugar. Refined granulated has sold at 4.80 cents and Cuban Raw at 1.75 cents, cost and freight New York. These prices which are the result of Cuban liquidation are nearly the lowest on record and will no doubt lead to an early distribution of the well advertised surplus. They should and probably will attract investment buying.

A Boston report says that "in all the markets of the world the price of wool is rising." The reason seems to be that the British Australian Wool Realization Association has the market well in hand and that there is a possibility of under production in the future.

Cotton has been very steady with a rising tendency as the time for planting next year's crop approaches. If the world should conclude that we are not likely to make more than 8,500,000 bales in 1922, extreme prices might be seen. Henry Hentz & Co., well known authorities on the subject, estimate the production of refined cotton oil for the current season at 2,050,807 barrels of 53 gallons each, as against the previous season's production of 2,927,673 barrels. It is to be inferred that they regard present prices as reasonable considering the reduced supply.

Future Looks Good

The reports from the steel industry are distinctly optimistic but they appear to reflect a hope of future business rather than present activity. Copper is steady at 14 cents for January delivery. Coffee has maintained most of the recent advance and those who think they have knowledge of the plans of the Brazilian government expect much higher prices soon after the first of the year.

The reserve ratio of the Federal Reserve system has risen from 70.7 to 71.1 per cent during the week. The gold held shows a loss of $1,400,000. The money market is unchanged but in some quarters a further reduction in the rediscount rate is expected next week. The bond market has been quieter. Recent offerings are not fully digested yet but prices are not quotably lower. The stock market has been dull but the stolidity shown in the face of the Italian news has been very impressive and there are many who predict activity and rising prices early in the new year.

The steadiness of foreign exchange is also impressive for there is but little change in quotations. Italian lire declined to 4.19¼ on the bank suspension but quickly recovered most of the drop.

Summarizing the situation it may be said that the barometer seems set for fair weather in the United States, unless the European area of low pressure shall extend itself westward across the Atlantic, and that the most reassuring development of the week has been our apparent insensibility to the economic unsettlement abroad.

Sidelights on Metric Hearings—Senator McNary Against Compulsion

After listening to much testimony, pro and con, on the Ladd metric system bill, Senator McNary of Oregon, who is conducting the hearing, revealed some of his personal conclusions, during the session on Dec. 23. At one point in the hearing he said:

"The element of compulsion is the most important element in the whole scheme—the setting arbitrarily of a certain period of time, of telling the American people they will have to change about on this subject, to face about on a matter that is in everyday use. That does not coincide with the temper of the American people as I have seen it manifested. That element to my mind is one of the most serious things in the bill."

This comment came during the testimony of Justin W. McEachren, editor of the *Valve World*, who appeared to present his own views and those of the president of the Crane Company. Mr. McEachren declared that the Crane Company is interested in the metric bill, not only as a manufacturer but as a distributor. He stated that the company has sixty-five branch houses in the United States, in addition to the maintenance of extended activities abroad. "Through this widespread organization," said Mr. McEachren, "we have made a study of the trade field, both domestic and foreign. We are here as supporters of this measure as a result of our experience. We do not believe the expense involved in a change to the metric system would be great. Even if it should be proposed to make the international decimal system the sole system of weights and measures for the United States and for the world, and the expense of such a change should be considerable, the Crane Company is quite willing and ready to make the change in company with the other manufacturers of the United States. The bill as it stands is acceptable to the Crane Company."

When Mr. McEachren referred to the necessity of looking at this matter in an international way and declared that "we are getting ready for a world condition, not a local condition," Senator McNary said:

"That is what some thought a year ago when we had the League of Nations up. I notice the American people are still holding to the American view, not to the international view, as may be judged from the votes that were cast. The lack of the enforced use of the metric system in this country is not stopping one pound of exports, in my judgment. In my opinion this system would not bring about the sale of another pound of hops, another bale of cloth, or another pair of shoes.

"I believe in the system but the question with me is how are we going to fasten it on the public. I am inclined to believe that it will not be by compulsory action, in ten years in any event. If the present system is impeding our foreign commerce, I think the law of economics would apply to bring about a voluntary change. When I find that the tool I am using is not as effective or as efficient as another, I discard it and take up the new one. I do not need legislation to compel me to do it. If the commercial interests of our country are suffering, why do not the interests that make use of this system take it up and adopt it among themselves so that they may be able to expand their foreign trade, as you say? Why force it on someone, or some class who will derive no benefit at all from it? In that category is the great mass of the people."

At another point in his testimony Mr. McEachren said:

"In our Chicago shops Crane Company employs 7,000 men. Out of that number there are not more than 300 who handle tools of precision, or who would have to be concerned with the system of measurement. These few selected, trained and skilled workmen make the tools, gages, templets and jigs. All the man knows who represents the larger mass is that there is a 'go' or a 'no go' gage. The man who is operating the machine knows only that about it. We can change the gage as often as we like. All the men have to do is to say that it goes on or it does not go on. There will be no scrapping. Gradually the manufacturer in his replacements will change his gages, and when sizes are changed they will be changed to the international or national agreement."

Germany Must Seek Export Market for Automobiles

In Germany the automobile industry has lately taken a prominent place among those industries of the country dependent to a very high degree on the export of their products, according to a report by Howard W. Adams, representative of the Commerce Department at Berlin. This situation has been brought about by the extremely restricted domestic market, which in turn is due to the soaring domestic prices of automobiles, the high cost of maintenance, and the heavy burden of taxation which is threatening automobile traffic in this country.

About 150,000 employees are engaged in Germany's automobile and allied industries. The automobile plants, which were considerably enlarged during the war, represent an investment of many millions of marks. This investment would be lost, in part, were not the continued operation of these plants assured; and that assurance appears to lie in a large scale expansion of Germany's automobile export trade.

According to figures published by the Federal Bureau of Statistics, Germany exported during 1920 a total of 17,534 automobiles and 3,541 motorcycles. This total export of motor vehicles in no way represents cars manufactured in 1920. In it is included a considerable number of used automobiles, for the most part former army automobiles.

It is interesting to note the proportion of the total representing export by the industry itself and that part representing export by automobile dealers. Figures published by the Association of German Automobile Manufacturers show that the manufacturers themselves exported about 8,000 motor vehicles. Leaving out of consideration the very insignificant number of those occasional exporters not falling within the category of dealers, the number of cars exported by the automobile trade can be said to have attained a total of about 9,500.

Southern Industries Look for Big Business in 1922

While 1921 is regarded as being a very slow year for industry in the Southern field, the outlook for the future is many times better than it was at this period one year ago. Southern industry turns its eyes toward 1922 with every confidence that the early part of the new year will witness a full return to normal conditions.

The greatest improvement experienced by any of the southern industries during the last three months of 1921, was in the metal trades, including foundries, machine shops, blast furnaces and iron and steel plants of every description. The greatest activity is noted in the cast-iron pipe, sanitary pipe and fittings plants, radiator plants and structural steel. In the Alabama district improvement has been more rapid than in any of the other Southern states, but the outlook is bright for increased activity in the metal trades plants of Georgia, Tennessee and North Carolina.

Export business from South Atlantic and Gulf Coast ports has improved to some extent in the past two or three months, but the business is still well below normal. There are excellent prospects, however, for much greater activity after the first of the year. So far as the products of the foundries and machine shops are concerned the biggest demand is expected from South and Central American countries, Mexico, Cuba, China, and Japan. Considerable sugar machinery will be taken by Cuba next year, coming mainly from the plants of the Birmingham district, while Argentina is expected to take considerable high pressure cast-iron pipe. A large amount of pipe will also be taken by cities along the Pacific coast, shipped by way of Mobile and the Panama canal. Principal demand from South and Central America and from Mexico will probably be for wire and wire products, while considerable tonnage of steel rails will go to Japan and China.

Georgia Taxes Lower

Tax values of foundries and machine shops in Georgia for the present year, as compared with 1920, show a reduction of 42 per cent, which aggregates $1,185,451, according to the State tax department. A decrease also is shown in textile plants, mining properties, mineral leases, and other important industries. Products manufactured by Georgia foundries and machine shops in 1920 were of an aggregate value of $33,480,955.56.

P. & W. Xmas Party

The publicity and engineering forces of the Pratt & Whitney Co., had a real honest-to-goodness Christmas party at the office of the company in Hartford on Dec. 23. Santa Claus, who, except for his snowy locks and flowing white whiskers greatly resembled the genial Mr. Henry of the publicity bureau, arrived as per schedule with his little red sleigh (the latter looking much like one of the factory trucks), laden with gifts for everyone. Besides the presents there was considerable original Christmas literature of a somewhat personal nature that added to the merriment of the occasion.

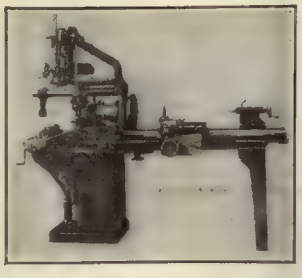
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Combination Machine, Lathe, Milling and Drilling Machine

Dalton Mfg. Co. Sound Beach, Conn.

"American Machinist," August 4, 1921.

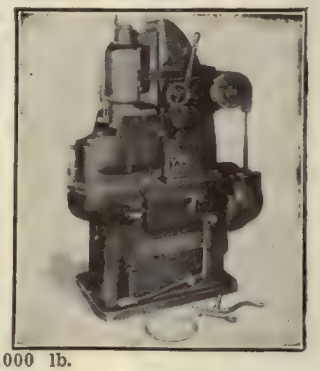


This combination machine is designed primarily for use where a rather complete equipment is required and floor space is at a premium. A single hollow spindle serves both the lathe and the milling machine. The lathe swings 18 in. over the shears, and will take 37 in. between the centers. The head has a three-step cone, and is provided with a single back gear, giving a speed range from 20 to 441 revolutions per minute. The milling machine table has a working surface of 24 by 7½ in., and a longitudinal feed of 15 in. The transverse movement is 6½ in., and the knee can be adjusted vertically 13¼ in. The machine will drill to the center of a 16-in. circle, and the spindle has a vertical travel of 9 in. Net weight, 2,000 lb.

Grinding Machine, Surface, Rotary-Table, 8-Inch

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," August 4, 1921.

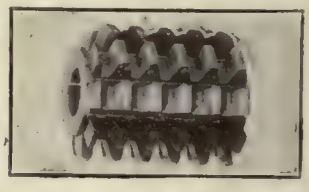


The machine is intended primarily for the grinding of disks, rings and cylinders requiring flat and parallel surfaces. Means are provided for grinding concave or convex surfaces. The spindle is mounted on ball bearings. The wheel is cemented in a holder screwed to the spindle, and a band clamped around the wheel guards against breakage. The wheel feed is controlled by a hand lever and a positive stop is provided for grinding to a specified thickness. The rotary magnetic chuck has two speeds. The machine is equipped with a pump, and the tank is located within the column. Belt drive is regularly furnished, all necessary guards being provided, but individual motor drive can be supplied. Net weight, 3,000 lb.

Hob, Generated, Simmons Method

Simmons Method-Hob Co., 2nd St. and Duncannon Ave., Olney, Philadelphia, Pa.

"American Machinist," August 4, 1921.



The hobs are claimed to be mechanically accurate, as they are produced by a generating action, a feature which makes it possible to duplicate them absolutely. The generating of the hobs is perfectly practical, the maker states, because the method follows "the law of the involute." No forms or templates are used to determine the tooth contour. Hobs for different forms of involute tooth, both standard and stub, can be furnished, the cutter being made to suit the requirements in such matters as pitch, pressure angle and number of threads. The importance of hardening is recognized, as a special method of hardening is said to be employed.

Hob, Worm

Gould & Eberhardt Co., Newark, N. J.

"American Machinist," August 4, 1921.



This hob has been developed for automatically hobbing worms. In the hob the fundamental principle is that of a broach coiled around a cylinder. The progressive removal of metal makes possible the use of heavy cuts and feeds. The hob can be used either to finish the teeth of worms, or for roughing them preparatory to final grinding. It can be furnished to cut worms with teeth of any desired contour. The hob teeth have their tops cut down in regular steps, and also have their sides recut to different leads. There are about fourteen roughing and three finishing teeth, which can be made either hooked or radial.

Lathe, Turret, Combination, No. 20.

Alfred Herbert, Ltd., Coventry, England and 50 Church Street, New York, N. Y.

"American Machinist," August 4, 1921.

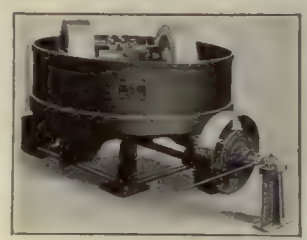


This larger size of machine has been added to the line of all-geared combination turret lathes. The machine is made with a hole through the spindle to accommodate stock 7 in. in diameter. The head-stock provides sixteen spindle speeds in each direction. All the shafts run on ball bearings, a ball thrust bearing being used for the spindle. The machine allows a swing of 28 in. over the bed. The maximum distance from the flange of the spindle to the face of the turret is 72½ in. The feed box under the headstock gives eighteen feeds to the turret slide. Nine feeds are provided for the saddle, which carries a square tool-holding turret. The main turret is horizontal, hexagonal in shape and is indexed manually.

Mixer, Sand, No. 3, Simpson

National Engineering Co., 549 W. Washington Blvd., Chicago, Ill.

"American Machinist," August 4, 1921.



The mixer has a pan 8 ft. in diameter. The machine has been developed particularly for steel foundry purposes, but it can also be used where large capacities are required in gray iron, malleable fron, brass and aluminum foundries. It is claimed that the time for mixing is brought down to a minimum, because of the mixing action, which is done by a combination of plows and mullers. Most of the parts are made of cast steel. The machine is strongly built and intended to give continuous service with a low cost for maintenance.

Universal Joint, Screwless

Apex Machine Co., Dayton, Ohio.

"American Machinist," August 4, 1921.



The joint is intended especially for use in driving the spindles of multiple-spindle drilling heads, although it can be adapted to all sorts of light and medium-duty drives. The maker claims that the device will fit all multiple-spindle drilling and tapping machines, and that it will drive with the shafts at angles of 35 deg., or in special cases on light drives at 45 degrees. The principal feature of the joint is its simplicity of construction, there being no screws used in it. The parts consist of one cup end, one ball end, one journal rocking pin, one driving pin, and one locking ring. The joint is made in all sizes from ⅜ in. in diameter up to any required.

Toolholder, Floating

McCrosky Tool Corporation, Meadville, Pa.

"American Machinist," August 4, 1921.



The holder is intended for correcting for both angular and parallel mis-alignment of the machine spindle with the hole being machined, being adapted to use in drilling machines, boring mills, lathes and automatic screw machine for the driving of reamers, taps and counterbores. The holder is composed of three principal units, a driving member, an intermediate floating member and a driven member. In the center of the floating member is a hole in which is placed a hardened steel ball, taking the entire thrust of the cut and acting as a pivot. The holder is regularly made in three sizes and both the driving and driven members are made in different styles and sizes to suit the requirements of the work. It can be used either horizontally or vertically.

Clip, paste on 3 x 5-in. cards and file as desired

Trend of Business Improvement —Plants Resuming

The Willys-Overland Co., Toledo, Ohio, is taking on additional tool and die workers at its plant. The working force in other departments of the automobile works will be increased at an early date.

The American Car and Foundry Co., Jeffersonville, Ind., is planning for the resumption of operations at its local plant this month. A large repair order for the New York Central Railroad will be handled at the shops.

The Lebanon Iron and Steel Co., Lebanon, Pa., is making improvements at its plant at Duncannon, Pa., including machinery repairs, prior to the resumption of operations early in January.

The Franklin Manufacturing Co., Syracuse, N. Y., adopted a full time working schedule at its automobile manufacturing plant on Jan. 3, giving employment to about 3,000 men.

The Waltham Watch Co., Waltham, Mass., has resumed operations at its branch plant at Quincy, Mass., devoted for the most part to assembling work.

The Chicago Pneumatic Tool Co., Chicago, Ill., has advanced production gradually at its plants and is now operating at about 40 per cent of normal.

The Weatherly Foundry and Machine Co., Weatherly, Pa., has adopted a full time working schedule at its plant, following a curtailment under reduced operating basis for more than twelve months past.

The Hays Manufacturing Co., St. Louis, Mo., manufacturer of wheel hubs, etc., has resumed production at its plant at Timbo, near Calico Rock, Ark., after a four-months' shutdown. Present orders on hand insure continuous operations for at least three months to come.

The Southern Transportation Co., Chesapeake City, Md., is adding to the working force at its local shipyard and operations are being increased at the plant.

The National Transit Pump and Machine Co., Oil City, Pa., has increased its working force by about 200 men. An increased production schedule has been adopted at the plant.

The A. S. Hecker Co., Huntington, Ind., operating the car shops of the Erie Railroad under lease, has added to the working force and is now giving employment to about 125 men.

The Laconia Car Co., Boston, Mass., with plant at Laconia, N. H., has received an order from the Boston & Maine Railroad for the rebuilding and repair of freight cars, the contract totaling $1,000,000.

The Seabord Air Line Railway, Norfolk, Va., has inquiries out for 2,000 freight cars and will place orders for the equipment at an early date. The contract is expected to total close to $3,000,000.

The United States Steel Corporation, New York, has taken an order for 15,000 tons of rails from the Texas & Pacific Railroad.

The Urbana Tool and Die Co., Urbana, Ohio, is operating at full time with a complete force of workmen. The company is building tools for the production of a new model automobile.

The Bridgeport Manufacturers' Association, Bridgeport, Conn., recently announced a marked improvement in working hours for Bridgeport factories. According to figures gathered the average factory is now working 44.6 hours a week, or 91 per cent of normal, the highest weekly mark of the year. Figures from thirty-one plants show that 13,987 are employed, which is 54.8 per cent of normal. The number employed at the factories is much larger than that, however, as all the factories are not included in the tabulation. There is constantly increasing employment in the plants about the city.

Ordnance Department Must Have Aid of Manufacturers

With the passing of emergency, the Ordnance Department of the Army, which during the war was able to enlist close and hearty co-operation from manufacturers of ordnance material and mechanical engineers generally, is now finding it difficult to secure from private industry the assistance which is so necessary if the most practical types of ordnance material are produced. It is essential to the national interest that this apathy on the part of outside manufacturers be broken down, in the opinion of Brigadier General W. S. Peirce, assistant chief of Ordnance, in immediate charge of the work which involves this problem. He is at this time making a renewed effort to solve this problem.

The Ordnance Department must look largely to industry to criticise its designs from the point of view of ease and cheapness of production. Since most ordnance material has little or no parallel in articles manufactured for peace-time uses, its designs do not have the constant and wide study which is constantly being given the ordinary machinery and appurtenances of commerce. Moreover, ordnance material must be built with the idea of meeting the severest requirements. Every effort must be made to obviate a failure of material at the critical moment when there is no time to install spare parts or undertake repairs. As a result the physical quality of the metals used must be unusually high.

General Peirce believes that a widely held view that ordnance specifications are finical and too theoretical, can be offset entirely if machinery and material manufacturers can be interested sufficiently to go into the subject deep enough to understand the military problems involved. At any rate it is the policy of the Ordnance Department not only to invite suggestions from men engaged in practical manufacture, but to carry their suggestions into effect wherever it does not defeat a well-established military necessity. The Ordnance Department is particularly anxious to have the benefit of the advice of the private manufacturers. General Peirce states that ordnance officers realize that the study of designs from the point of view of shop production involves considerable expense on the part of manufacturers, in that they demand considerable time from the highest salaried men in their organizations; but he is hopeful that industry will contribute that much toward the national defense, and in turn he believes that manufacturers will find no inclination on the part of the department to insist on tolerances being smaller than necessary, quality higher than necessary, or features which tend unduly to interfere with the ease of manufacture or speed of production in time of urgent need.

Japan's Steel-Encouragement Act

H. A. Butts, acting commercial attaché at Tokio, has submitted the following translation from the "Official Gazette," of July 19, 1921, outlining the leading features of Japan's steel industry encouragement act, in which Japanese manufacturers of steel materials will participate:

The following amendment shall be made to the regulations relative to the application of the steel industry encouragement law.

Paragraph 3, article 5: The subsidy provided for in paragraph 2 or article 7 of the steel industry encouragement law shall be granted only in such cases as the following steel materials, manufactured after the present law has become effective, are used in the construction or repair of steel vessels by the manufacturer or the purchaser of the materials, and not including steel materials manufactured in foreign countries:

(1) Steel ingots and steel slabs for tempering.
(2) Bars and rods including tees, angles, and turbine blading.
(3) Sheets and plates.
(4) Tubes and pipes, not including those of cast iron and steel.

Manufacturers of steel materials mentioned in item 1 of the preceding clause are entitled to subsidy thereon as for raw materials, even if they sell them after improving.

Persons desiring to receive the subsidy shall submit to the Minister of Agriculture and Commerce a notification stating the kind, quantity, purpose, date of manufacture, and the factory in which the steel materials are manufactured before actual use if intended for shipbuilding or repairs and before delivery if intended for other uses. The notification shall be accompanied by a document certifying that the constructor or repairer of the vessels has obtained permission from the proper marine authorities in case the steel materials are to be used in the construction or repair of other than naval vessels. Any change made in the items stated in the notification shall immediately be reported to the Minister of Agriculture and Commerce.

Paragraph 4, article 5: Those persons desiring to receive the subsidy shall make application to the Minister of Agriculture and Commerce, accompanied by (1) a document certifying that the steel materials have been used by the naval authorities in the construction or repair of naval vessels or by (2) a document from the proper marine authorities certifying that the steel materials have been properly used and that the construction or repair of vessels upon which used has been completed, by the constructor or repairer of the vessels, when they have been used in the construction or repair of vessels not belonging to the Navy.

Paragraph 5, article 5: The amount of the subsidy shall be 12 per cent of the value for steel ingots and slabs and 15 per cent of the value for other steel materials. The value shall be determined by the Minister of Agriculture and Commerce by fixing the standard on the basis of the imported price of the same steel materials as those for use and delivery mentioned in clause 1 of paragraph 3 of article 5.

The amendment went into effect on July 20, 1921.

Allied Machinery Co. Elects Officers

At the annual meeting of the board of directors of the Allied Machinery Company of America, held in New York on Dec. 23, the following officers were elected for 1922:

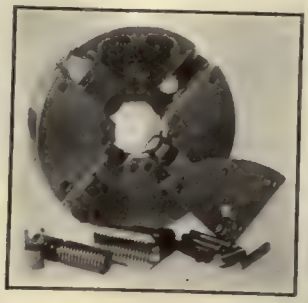
J. W. Hook, president; I. T. Henry, vice-president; E. M. Hartridge, vice-president (in charge of European interests); T. G. Nee, vice-president (in charge of business in the Orient); W. H. Gilbert, treasurer; and G. C. Carson, secretary. The only new addition to this list is Mr. Gilbert, who takes the place of F. S. Pease, who resigned a few months ago to join the Eagle Silk Co. of Shanghai.

Directors chosen for the year are: J. W. Hook, M. C. Brush, J. E. Gardin, T. W. Streeter, H. A. Arthur, G. H. Balch.

Condensed-Clipping Index of Equipment

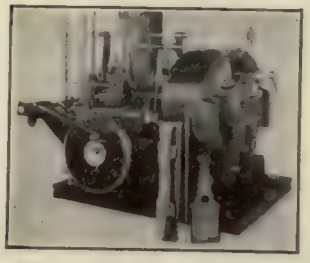
Patented Aug. 20, 1918

Chuck, Lathe, Independent, Four-Jaw
Alfred Herbert, Ltd., Coventry, England, and New York, N. Y.
"American Machinist," Aug. 4, 1921.



The chuck, having four independently operated jaws, is similar in principle and construction to the three-jaw chuck made by the concern, the strength and long life of the tool being the features emphasized by the maker. The body of the device is thick and heavily made, so as to prevent breakage due to excessive pressure at the jaws. The front of the chuck is made in the form of detachable sectors secured to the body by means of screws passing from the front to the back. The illustration shows one of the plates removed. The chuck can be furnished in a range of sizes.

Grinding Machine, Surface, Automatic
William Osterhom, 2301 N. Knox Ave., Chicago, Ill.
"American Machinist," Aug. 11, 1921.



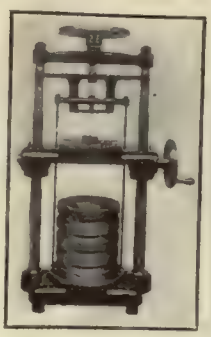
The machine is intended for the rapid surfacing of parts up to 12 x 40 in. made in large quantities. It is fully automatic, with the exception of locating the work and locking it in the fixture. The fixture is mounted on a table pivoted on a swinging arm and moved across the surface of the abrasive wheel by means of a cam. Upon the completion of the cycle of the cam, the fixture is tilted back 45 deg. away from the wheel, allowing the operator to remove the work. The machine can be equipped with automatic magazine feed. A cylinder wheel, 20 in. in diameter, 8 in. thick and having a 10-in. hole, is used. Weight 7,800.

Testing Machine, Hardness, Power-Operated
Alfred Herbert, Ltd., Coventry, England and New York, N. Y.
"American Machinist," Aug. 11, 1921.



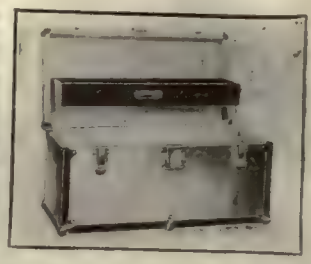
The machine operates on the Brinell principle, using a 10-mm. ball and employing the standard pressures of 500 or 3,000 kg., as required by the material being tested. The chief features of the machine are power operation and automatic application of the pressure. It is claimed that the time required to apply the load, the duration of the load, and the time taken to remove the load are uniform for all tests and do not depend on the operator and his physical effort. Apart from the main frame, which carries all the mechanism, the machine consists of two elements, a weighing element and a straightening element. Weight, 1,680 lb.

Testing Machine, Hardness, Small-Ball
Alfred Herbert, Ltd., Coventry, England and New York, N. Y.
"American Machinist," Aug. 11, 1921.



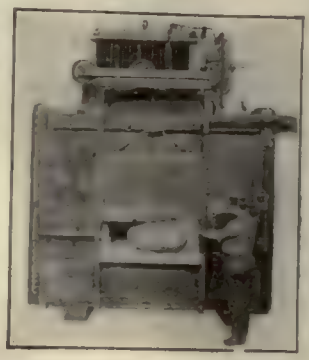
The machine is a development of the Brinell method of determining hardness, the difference being in the use of very small balls, with correspondingly small loads. It is intended for determining the hardness of thin specimens, such as the walls of small-arm cartridge cases, and of finished articles which cannot be subjected to the pressure of the ordinary hardness-testing machines, either because of their small size or because of the injury caused by making a large impression. The load is applied by dead weight. The balls used are 1 and 2 mm. in diameter, with loads up to 50 kg., although balls of 5-mm. diameter are supplied for testing extremely soft material. Weight, 210 lb.

Tool Chest, Zinc-Covered
Union Tool Chest Co., Inc., Rochester, N. Y.
"American Machinist," Aug. 4, 1921.



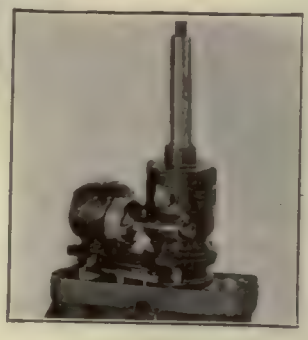
The chests are made in a number of styles and intended for the use of machinists, patternmakers, carpenters, electricians, garage mechanics and the like. The illustration shows a general service chest, opening at the top, although side-opening chests can also be furnished. The frame of the chest is made of wood, a lock-corner being used for the joints. The outside is entirely covered with lacquered sheet zinc, which is formed over all of the edges. The chief advantage of the covering is said to be the fact that it will not rust nor corrode. The chest can be furnished in various sizes, either with or without trays, ranging in length from 13 to 32 in., and in weight from 5 to 21 lb.

Furnace, Sheet-Heating, Electric, Bailey
Electric Furnace Co., Alliance, Ohio.
"American Machinist," Aug. 11, 1921.



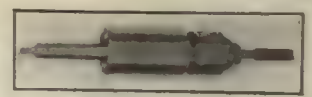
This resistance-type electric furnace is intended for use in the heating of sheet metal when forming parts of automobile bodies and fenders. It is portable, being handled by a crane and taken from place to place as the work requires, so that it need not be idle while one batch of material is receiving its cold runs. The transformer and control equipment are located on the top of the furnace. The furnace is rated at 100 kw. in electrical capacity, and has a hearth 3 ft. 4 in. wide by 6 ft. 5 in. long, with a door opening 3 ft. 4 in. wide by 2 ft. 2 in. high. It has a capacity for heating 750 lb. of material to 1,800 deg. F. per hour.

Boring Tool, (Re-), Cylinder, Electric-Driven, Van Dresser
International Purchasing and Engineering Co., Inc., Detroit, Mich.
"American Machinist," Aug. 11, 1921.



The device, formerly intended for drive by hand or by means of a drill press, has been fitted with individual motor drive. The motor is mounted as a part of the tool, no flexible shaft being employed. A friction clutch is incorporated between the motor and the tool, so that slippage is possible in the event that the cutter head becomes wedged, thus protecting the motor. Without making any disconnections, the tool can be operated by hand or by the spindle of a drill press. The tool has a range of from 2⅜ to 5⅛ in. The solid feed bar has no threads, and the bearings are 10¼ in. long. The quick-return mechanism allows for raising the boring head.

Holder, Tap, Friction-Slip, Safety
Apex Machine Co., Dayton, Ohio.
"American Machinist," Aug. 11, 1921.



The principal feature of the device consists of the arrangement which permits of slippage within the holder itself in case the tap becomes wedged or strikes the bottom of the hole. Because of the small outside diameter of the device, use on multiple-spindle machines is quite easy. The holder will operate in any position. It is made in two sizes. Type A will tap holes up to ¾ in., and type B holes from ¼ to ⅜ in. in diameter. The amount of friction may be quickly adjusted when changing from one size of tap to another. The holder embodies a ⅛-in. vertical float movement, to allow for a slight variation in the lead of the tap. There is also a lateral float of ⅛ inch.

Clip, paste on 3 x 5-in. cards and file as desired

Business Items

The Ladel Manufacturing Co. made its first casting this week in its new foundry and machine shop at New Philadelphia, Ohio. The operation marked the completion of a building operation started last June. The new addition encloses the largest and best equipped foundry and machine shop in eastern Ohio with a capacity for employment of 150 men. Two features of the plant are the powerful electric crane able to carry 15 tons from one part of the plant to the other, and the seventeen unit electric blowing machine. Edward Miller is superintendent of the new shop.

Plans are now under way for the operation of the foundry plant at the Freemans Ferry Landing, New Cumberland, W. Va. The new industry will be known as the Resistent Alloy Casting Co., incorporated under laws of Delaware with a capital stock of $10,000. The plant will produce gray iron and alloy castings.

The Stanley Dewsnap plant, Springfield, Mass., has been reorganized and will now be operated as the Highland Motor Grinding Co.

The Greenfield Grinding and Machine Co. has been organized in Greenfield, Mass., to make automobile parts and do general machine work. Machinery is being installed. Officers are: President, George W. Wilcox; vice-president, A. T. Ritchie; treasurer, R. F. Stearns.

After being closed for nearly a year, the car repair department of the Lake Erie & Western Railroad, at Lima, Ohio, was reopened this week, with a large force of men.

Control of the Carnahan Tinplate Corporation, of Canton, Ohio, has passed to the Falcon Tinplate Co., of Niles, Ohio. The combined organizations will continue to manufacture under the management of Lloyd Booth and Paul Wick.

The Exeter Machine Works, Inc., of West Pittston, Pa., announces the appointment of J. E. Holveck as district sales representative for the Exeter Rotary Pump line in the Pittsburgh district. Mr. Holveck was until recently connected with Crawford & Cameron of Pittsburgh, and was formerly designing engineer for the Aldrich Pump Co., of Allentown, Pa.

The Wilson Welder and Metals Co., Inc., of New York City, has moved its general office and factory to 132 King St., in that city.

The Surface Combustion Co., Inc., of New York, has been awarded the contract to build an automatic heat-treating furnace for the naval ordnance plant at South Charleston, W. Va. The furnace is for heating 16-in. armor piercing shells.

The Photostat Corporation of Providence, R. I., has announced the construction of an all metal photostat in all sizes and having a number of new features.

The Boston office of the Cutler-Hammer Manufacturing Co., has been removed to 403 and 404 Harvey Bldg., Chauncy., C. W. Yerger is in charge.

William H. Keller, Inc., is the new designation assumed by the Keller Pneumatic Tool Co., of Grand Haven, Mich.

The W. B. McCarthy Metal Co., Railroad Ave., Milford, Conn., manufacturer of metal goods, recently filed a final certificate of dissolution with the Secretary of the State of Connecticut.

The Sheehan Machine Co., Norwich, Conn., has recently filed a certificate of organization and incorporation with the Secretary of the State of Connecticut, to engage in the manufacture of textile machinery, etc. The incorporators are: J. F. Williams, T. P. Sheehan and Earl Matthewson, Thayer Building, Norwich, Conn.

The Thomaston Knife Co., Thomaston, Conn., recently filed a certificate with the Secretary of the State of Connecticut, increasing the company's capital stock from $20,000 to $75,000. The company manufactures knives of various kinds.

The Riverside Bronze and Aluminum Co., River St., New Haven, Conn., recently filed a certificate of incorporation with the Secretary of the State of Connecticut, to engage in the manufacture of aluminum and bronze articles. Thomas E. Hyde, of Bridgeport, Conn., is president; John F. Strong, New Haven, secretary; and Harold S. Brown, New Haven, treasurer.

The Bridgeport Machine and Tool Manufacturing Co., Inc., 304 East Washington Ave., Bridgeport, Conn., has filed an involuntary petition in bankruptcy. Arthur Klein, of Bridgeport, was appointed receiver.

Announcement of a wage reduction of 10 per cent for mechanical employees of the United States Armory in Springfield, Mass., was made last week. This action was taken following an inquiry into wages paid in other machine shops in that section. It is an average rather than a uniform reduction, the cuts varying with different lines of work. Plans are under consideration for temporary abandonment of the Armory's hill plant and concentration of operations at the Watershops. If this is done the hill shops will be used for storage. Present requirements call for a production of only seventy-five rifles a day, with a prospect of the number being reduced to fifty a day.

Judge D. C. Westenhaver in Federal Court at Cleveland, Ohio, has approved the sale of the Canton Drop Forge plant of the Standard Parts Co. to Fred A. Poor and Phillip Moore, of Chicago, at their offer of $293,500. In accordance with their proposal to the court, the purchasers will form a corporation with a capital stock of not less than $300,000. It is understood that the new company will operate the drop forge factory within the near future. All machinery not included in the sale is being removed to another part of the plant.

The property and assets of the Ashland Iron and Mining Co., at Ashland, Ky., has been purchased by the American Rolling Mill Co., of Middletown, Ohio. The deal represents an expenditure of about $5,000,000. The manufacturing plants at Ashland comprise two blast furnaces, eight open hearth furnaces—each of 100 ton capacity, an electrically driven blooming mill, a slab billet and bar mill, and six sheet mills.

The United Engineering and Foundry Co., of Canton, Ohio, has filed a complaint with the public utilities commission in Columbus, against the Pennsylvania Railroad, charging that rates on pig iron from Leetonia to Canton were excessive.

Announcement is made that the Cortland Steel and Tube Co., Cortland, Ohio, will begin operations immediately. The plant is said to be complete in detail. Officers of the new company are: President, B. G. McCurley; secretary and treasurer, Ben Spender; vice-president and general manager, L. A. Hansen.

ERRATUM: In our Dec. 15 issue we published a Business Item to the effect that the Whiting Corporation had combined with the Grindle Fuel Equipment Co., and that "a reorganization of the companies had been effected." We desire to correct this statement. The Whiting company has purchased a controlling interest in the Grindle company, but there has been no change in the organization of the Whiting Corporation.

Personals

C. F. ROGERS, formerly with C. E. Johansson, Inc., has joined the sales force of Purinton & Smith, Edwards St., Hartford, Conn.

A. H. BAUMAN has been elected vice-president of the Cleveland Duplex Machinery Co., Cleveland, Ohio. Mr. Bauman was formerly sales engineer of the company and was at one time an executive with the American Brake Shoe Works, Erie, Pa.

CHARLES G. SCHWARTZ, formerly a partner in Schwartz & Land, has organized the Acme Machinery Exchange, located at 196 Centre St., New York City.

WILLIAM S. DICKSON has been appointed assistant manager of the Crane Machinery Co., of Buffalo, N. Y. Mr. Dickson was formerly connected with the Cincinnati Planer Co. and Acme Machine Tool Co.

EARL B. STONE has been appointed advertising manager of the Cleveland Tractor Co., Cleveland, Ohio, manufactures of "Clectrac" tank-type tractors. Mr. Stone succeeds G. B. Sharpe, who has resigned.

E. T. VOGEL, superintendent of the byproduct plant of the Youngstown Sheet and Tube Co., Youngstown, Ohio, has been elected vice-president of the Eastern States Furnace and Coke Oven Association.

ARTHUR H. SONNEBORN has been placed in charge of the Chicago offices of the Osgood Company of Marion, Ohio, manufacturer of steam shovels and dredging machinery.

G. H. REHLING has been appointed district sales manager for the Wykoff Steel Co., Pittsburgh, Pa., with offices in Dayton, Ohio.

WALTER FERRIER has resigned his position with the Elyria Iron and Steel Co., Elyria, Ohio, to become general manager of the new Hudson City Steel Corporation, Beacon, N. Y. Mr. Ferrier

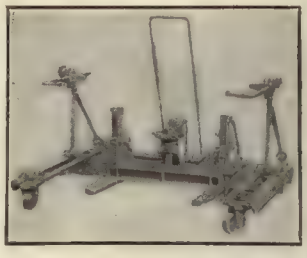
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Dolly, Truck-Wheel

Manley Manufacturing Co., York, Pa.

"American Machinist," August 11, 1921.



The dolly is intended both for conveying truck wheels and for raising or lowering them in a repair plant. It is mounted on ball-bearing casters, and provided with a handle by which it can be manipulated about the shop. The truck wheel is carried on two projecting forks, placed far enough apart to enable them to be put under a wheel standing on the floor. The forks have a vertical movement of 5 in., being operated by a crank. The device is particularly adapted to removing wheels from the spindle of the axle, or replacing them. Two adjustable arms are provided for holding the truck wheel from falling. Weight, 210 lb.

Watch, Time Study

Stein & Ellbogen Co., 31 North State St., Chicago, Ill.

"American Machinist," August 11, 1921.

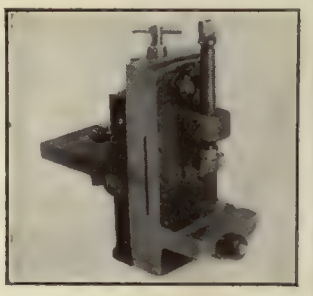


The double hands permit the timing of two closely related operations at the same time, or a comparative observation of two workmen or machines. In case of an interruption, the total time and the waste time entailed can be shown in figures of production as well as in decimals of a minute, thus simplifying computation. On the dial there are placed at intervals of 0.02 min., figures showing the rate of hourly production. Both hands are started by pushing down the crown. By pushing the button at the left of the crown, the under hand is stopped, while the upper one is allowed to travel as long as desired. In timing two workmen on the same kind of work, each hand shows the time taken by one workman.

Attachment, Milling, Lathe, "Gem"

Richard H. Kiddle's Machine Tool Works, Kinsman, Ohio.

"American Machinist," August 18, 1921.

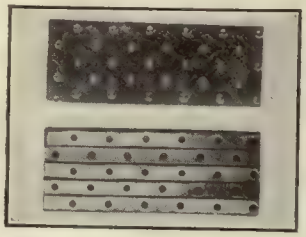


The device is intended for attachment to a lathe to hold the work while performing small milling operations. It is said to fit most lathes from 10 to 17 in. swing, the toolpost being removed and the attachment secured in its place. A tie bolt can be furnished to fasten the attachment to the cross-slide when it is used on the Gem lathe. The device has an adjustment to permit of moving it relative to the cutter. It is said to be capable of cutting keyways ⅞ in. wide, and 7 in. long without re-setting. An arbor 12 in. long and made to hold a 1-in. B. and S. cutter is furnished.

Belting, "Pieuvre"

J. L. de Rabot, 191 Greenwich St., New York, N. Y.

"American Machinist," August 18, 1921.



The chief claim made for the belting is its great power of adherence. The belt combines oak-tanned and chrome-tanned leathers, the oak-tanned leather taking the pull and the chrome-tanned giving the adherence. The belting consists of oak-tanned leather, to the under surface of which are attached narrow longitudinal strips of chrome leather, held by means of hollow brass rivets. The depressions surrounding the rivet ends, combined with the blind holes in the rivets, are said to act as suckers during use and to augment the adherence. The advantage which the high co-efficient of friction gives to the belt is that it can be run at a lower tension. Only tallow is used as a dressing.

Starter, Automatic, Squirrel-Cage Motor, No. 9604

Cutler-Hammer Manufacturing Co., Milwaukee, Wis.

"American Machinist," August 11, 1921.

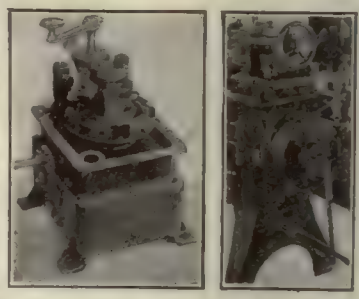


This starter is intended for use with small squirrel-cage motors of 7½ hp. or less. It allows a large starting current for several seconds, but at the same time gives protection against burning-out and prevents harmful overloading of the motor. The two mercury overload relays mounted below the contact fingers are intended to eliminate fuse troubles, while allowing overloads as high as 25 per cent for a limited period. It is stated that considerable time is saved by using the automatic starter in place of a manually operated one.

Control, Feed, Variable, Liquid

Oilgear Co., Milwaukee, Wis.

"American Machinist," August 18, 1921.



The system is especially intended for the control and regulation of speeds, feeds and motions on machine tools, using liquid under pressure for the purpose. The variations can be made smoothly in steps of any desired size without stopping the machine. The device consists essentially of a power-driven pump, shown at the left of the illustration and capable of being adjusted through a large range of delivery capacity, and a motor driven by the working fluid received from the pump. The speed of delivery of the fluid can be varied by adjusting the length of stroke of the pump. The motor is shown attached to the lead screw of a lathe on the right. The pump can be connected directly to an hydraulic press.

Solder, "Metaloid"

Cochran Metaloid Co., Moffat Building, Detroit, Mich.

"American Machinist," August 18, 1921.

The material is intended for repairing holes and cracks in metal, and is especially for use in garages in repairing cracked cylinder heads, water jackets and transmission cases. It is stated that the metaloid will fluxate with any metal that can be heated, including aluminum, brass, and gray and malleable iron. The part to be repaired is heated to about 200 deg. F., usually with a blow torch. The metaloid is rubbed into the crack or hole, the parts allowed to cool, and the excess material filed off. The metal will, after solidifying, withstand a pressure of 250 lb. per sq. in. and a temperature of 600 deg., it is said.

Hose Machine, Repairing and Dismantling

Covington Machine Co., Covington, Va.

"American Machinist," August 18, 1921.



The machine is intended especially for use in railroad shops for work on air-brake, signal and steam hose, replacing hand methods of performing such work. It is claimed that the machine does not damage the fittings and clamps when assembling and dismantling. The work is said to be better than that performed by hand, and to be done at a great saving of time and labor. The illustration shows the entire equipment of tools required for performing the complete range of work. The change from any operation to another averages less than two minutes. Air and signal hose are handled by the same tools, except the nipple puller, which can be quickly put in place.

Clip, paste on 3 x 5-in. cards and file as desired

was with the Steel Corporation plants at Homestead, Pa., and Gary, Ind., for eighteen years, and later for seven years with the Cambria Steel Co., at Johnstown, Pa.

JOHN P. ILSLEY, formerly with Niles-Bement-Pond Company, Inc., New York City, has recently been made New England manager of the Solvay Process Co., Syracuse, N. Y. The New England office is located at 60 State St,, Boston. Mr. Ilsley, was at one time identified with the Reed-Prentice Company, of Worcester, Mass.

WILLIAM SANGER, was recently elected treasurer of the Boston Pressed Metal Co., Union St., Worcester, Mass. Mr. Sanger, was formerly with the Clauss Shear Co., of Fremont, Ohio, as general manager.

R. W. WOODWARD, has been recently appointed metallurgist at the plant of the Whitney Manufacturing Co., Hartford, Conn.

DOUGLAS B. COOK, has been recently elected president and general manager of the Boston Pressed Metal Co., Union St., Worcester, Mass. Mr. Cook was formerly general manager and succeeds Herbert A. Pike, who recently retired from the firm.

THOMAS E. HYDE, factory manager of the National Pipe Bending Co., New Haven, Conn., has been elected president and general manager of the recently incorporated Riverside Bronze and Aluminum Co., of New Haven. Mr. Hyde will continue in his present capacity with the National company.

CARL H. PETERSON has been elected secretary-treasurer and general manager of the Maher Engineering Co., with offices at Chicago. He was formerly vice-president and general manager of the Viking Corporation, manufacturers of automatic fire protection apparatus, Hastings, Mich.

ROLAND H. BAKER has resigned his position as chief engineer for the United States Shipping Board to organize the General Construction and Repair Co., Cambridge, Mass., of which he is president and general manager.

EDGAR C. CUMMINGS, formerly of the Cummings Machine Co., Minster, Ohio, has severed all connections with that company and is now president of the Neidow-Cummings Company, Chicago, Ill.

E. H. EARNSHAW, JR., who until recently was with the Worthington Pump and Machinery Corporation, is now associated with the American Laundry Machinery Co., as salesman at the New York office.

J. E. SLIMP, formerly with the Ohio Brass Co., at Massillon, Ohio, has resigned as sales manager in the Chicago office of the E. T. Chapin Co., Seattle, Wash.

PAUL A. BILLINGS who was recently appointed representative of the Falcon Steel Co., Niles, Ohio, has announced the establishment of headquarters at 2306 Dime Bank Building, Detroit, Mich.

ALLEN BAKER, formerly with the Honeyman Hardware Co. Portland, Ore., has been appointed manager of a branch office opened in the Henry building, Portland, Ore., by John T. Rowntree, Inc., western representative of the Falcon Steel Co.

HARRY S. ALLEN, formerly sales manager of the machine tool division of the Fairbanks Company, is now associated with the D. Nast Machinery Co., of Philadelphia, Pa.

Obituary

WILLIAM S. MONKS, thirty-five years old, mechanical and refrigerating engineer, died at his home in Mt. Vernon, N. Y., on Dec. 28. He was an executive with the De La Vergne Machine Co., and a member of several engineering bodies including the New York Society of Mechanical Engineers.

WINFIELD E. HOLMES, treasurer of the Samuel M. Green Co., Springfield, Mass., died in that city on Dec. 25. He was secretary of the Engineering Society of Western Massachusetts and a member of the Engineers' Club of New York. He was rated as an authority on power plants and industrial equipment and processes, and was a consulting engineer for numerous large manufacturers.

ANTON MILL, SR., seventy-two years old, president of the A. Mill Engineering Co., died at his home in Mt. Washington, Ohio, a suburb of Cincinnati, after a prolonged illness. Mr. Mill had been in the engineering business in Cincinnati for more than twenty years. Previous to organizing the company bearing his name, Mr. Mill had an interest in the old Bickford Machine Tool Co.

Trade Catalogs

Die Heads. Eastern Machine Screw Corporation, New Haven, Conn. A one-hundred page catalog describing a comprehensive line of H & G self-opening die heads, and containing many pages of information valuable to the machinist. A feature is complete instructions on "How to Grind Chasers," and a description of the new die head for use with B & S automatics. The book is fully illustrated and indexed.

Bench Lathe. B. C. Ames Co., Waltham, Mass. Circular describing the Ames No. 3 bench lathe for precision work. Individual parts are illustrated.

Truscon Steel Sash. Truscon Steel Co., Detroit, Mich. A "Handbook of Truscon Steel Sash," 80 pages of standard dimension tables, details, specifications and illustrations of use of steel in window frames.

Drill Chucks. E. Horton & Son., Windsor Locks, Conn. A series of circulars describing several types of drilling machine chucks.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A firm of importers in CHILE desires to secure an agency for the sale of industrial machinery. Correspondence should be in French or Spanish. Reference No. 462.

A merchant in MEXICO desires to purchase and secure an agency for the sale of general hardware, wire products, iron pipe, sewing machines, machinery and agricultural implements. Quotations should be given f. o. b. Manzanillo. Cash to be paid. Reference No. 463.

An engineer in SWITZERLAND desires to secure an agency for the sale of steel wire and other articles in seel, iron, brass or copper; tools and electrical apparatus; construction for buildings, etc. Quotations should be given c. i. f. Basel or Zurich. Reference No. 467.

Book Reviews

Time Study and Job Analysis. By William O. Lichtner, consulting engineer in management and construction. Three hundred ninety 6 x 9-in. pages, 81 charts, tables and illustrations; blue cloth boards. Published by the Ronald Press Co., New York City. Price $6.

An able treatment of the application of time study and job analysis. These two subjects are explained in detail as to definition and use. Directions for training the personnel of the staff for time study and job analysis are given. A large part of the book is devoted to the detail of installing and maintaining the standard methods determined by job analysis. Chapters are devoted to the balancing of manufacturing and selling activities, and job standardization as a basis for labor mediation.

Headings of other chapters are: Job standardization defined; Method of procedure; Results of job standardization; Personnel requirements; Non-intensive course in training personnel; Intensive course in training personnel; Enlisting co-operation; Relation of phases in job standardization: Making the preliminary study; Taking the times; Computing and analyzing time values of elements; Determining standard time for the operation; Fatigue; Checking standard times; Deciding the rates on the operation; Summarizing the standards and instructions; Explaining the standards; Applying the standards; Perpetuating the standards; Scientific management and increased production.

Machine Drawing. By Carl L. Svensen, assistant professor of engineering drawing in Ohio State University. Two hundred nine 6 x 9-in. pages, cloth boards, 338 line drawings, tables. Published by D. Van Nostrand Co., 8 Warren St., New York City. Price $2.25.

A book intended for technical students and draftsmen, well written and arranged. The subject matter is comprehensive and is presented in the form of text and problems. Beginning with elementary principles, such as the use of the pencil, scale, pen, kinds of lines, the various views, etc., the following subjects are taken up successively: Fastenings for machinery, machine drawing, principles and practice of dimensioning, machine details, bearings, pulleys, etc., shafting and couplings, jigs, fixtures and details, gears and cams, piping drawing. The final chapter is devoted to problems and studies.

New England-Where is your Business Going? Prepared by C. H. Bunting of the staff of Walter B. Snow and published by Walter B. Snow and Staff, Boston, Mass. Fifty 5 x 8-in. pages.

This pamphlet is based on an analysis of the sales and advertising in several standard industries of the country, in which the New England states have taken a leading position. It shows the gains and losses of various parts of the country, and points out that in almost every case the rate of growth in New England has been far below that in other sections. The failure of New England manufacturers to hold their own is laid to their complacency and to their relatively small use of advertising. The analysis is an excellent piece of work and contains much valuable statistical matter.

Forthcoming Meetings

American Engineering Council: Annual meeting Jan. 5 and 6, Washington, D. C. L. W. Wallace is secretary.

Society of Automotive Engineers: Annual meeting Jan. 11 to 13, Engineering Societies Building, New York City. C. F. Clarkson, secretary.

American Society of Civil Engineers: Annual meeting Jan. 18 and 19, Engineering Societies Building, New York City. Charles W. Hunt, secretary.

United Engineering Societies: Annual meeting Jan. 26, Engineering Societies Building, New York City. A. D. Flinn, secretary.

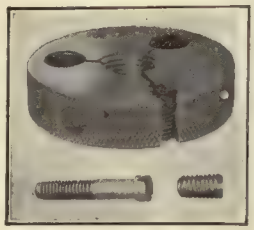
American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

Condensed-Clipping Index of Equipment

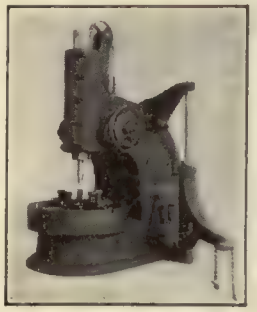
Patented Aug. 20, 1918

Gage, Templet, Thread
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," August 25, 1921.



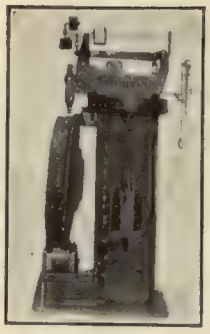
These thread templet gages are of the usual round adjustable type, but are said to incorporate improvements in the adjustment. One full turn of the tapered adjusting screw changes the effective diameter of the gage about 0.001 in., and adjustments finer than 0.0001 in. can be made. When the locking screw is tightened, the threads of the taper screw form a dowel. The gage is made in all sizes from 1/16 to 5 in. or larger.

Boring Machine, Car-Wheel, Railroad, 52-In.
Betts Machine Co., Rochester, N. Y.
"American Machinist," September 1, 1921.



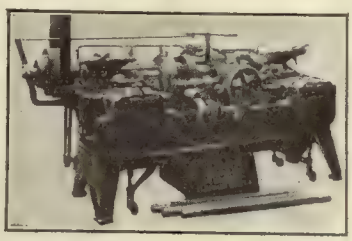
This 52-in. car-wheel boring machine is intended as a rapid production machine for both car-building and railroad repair-shop work. The boring ram has a long bearing in the frame and hand adjustment, which is facilitated by a counterweight. The machine can be equipped with a facing ram. The table is equipped with a five-jaw combination chuck. Six boring and facing feeds are provided. All control levers are within easy reach of the operator. The drive may be through either a single pulley or by direct-connected motor. The regular equipment includes a quick-acting air-operated crane for handling wheels.

Testing Machine, Hardness, Cimbination Brinell and Scleroscope
Riehle Bros. Testing Machine Co., Philadelphia, Pa.
"American Machinist," September 1, 1921.



The machine is intended for testing the hardness of chilled car-wheel treads. It is possible to employ both the Brinell and scleroscope methods on the same spot. The Shore scleroscope and Brinell weighing systems are carried by the same housing, which is bolted to a turn table so that the whole upper part of the machine can be revolved. An inclined track makes it possible to roll a wheel into place. After the scleroscope has been used, the turn table is revolved 180 deg., which brings the ball into position for the Brinell test. The rollers supporting the wheel rest on an hydraulic plunger, and a few strokes of the hand pump raise the wheel against the ball.

Lathe, Axle, Semi-Automatic
T. C. M. Manufacturing Co., Harrison, N. J.
"American Machinist," September 1, 1921.



This special semi-automatic machine is for machining automobile and truck axle shafts. The shaft is placed in the hollow spindle of the machine and is held by two scroll chucks. The machine squares the ends of the shaft to length and turns down each end to the correct diameter. The ends are then centered simultaneously. Two slides make several movements across the work, the tools being advanced the proper amount for the cut by screw adjustments. The cutting tools are either circular formed tools or solid rectangular tools. Three spindle speeds and three feeds are provided by quick-change gears. Shafts varying in length from 36 to 48 in., and in diameter from 1⅞ to 2¾ in. can be handled.

Gages, Plug, Reversible
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," August 25, 1921.



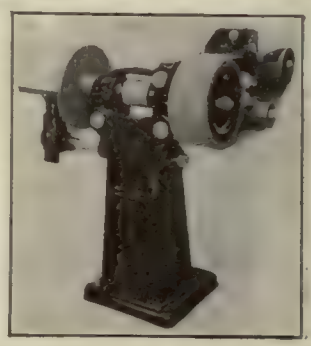
The cylindrical plugs are machine lapped by a modification of the Hoke process, and it is said that they are perfectly round and of uniform size from end to end. The handle is of hexagon stock. Three prongs on the handle, of 90-deg. included angle, engage three grooves of 75-deg. included angle in the gage end. By means of a single screw through the gage, the wedge-like prongs are forced into the grooves. The rigidity is said to be practically that of a solid gage. The range of available sizes is fom ⅛ to 2 in.

Broaching Machine, High-Speed, Heavy-Duty, No. 4
Velco Manufacturing Co., Inc., Greenfield, Mass.
"American Machinist," September 1, 1921.



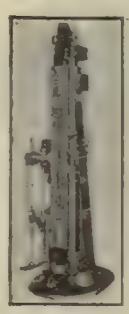
The machine is said to be very rapid in operation, making the cutting stroke at a speed of 15. and the return at 55 ft. per min. The broach holder is attached to a solid steel head, supported by bronze gibbed bearings sliding on steel ways. The broach is attached to the rack so that the pull comes directly on the rack pitch line. All vertical adjustments are made at the face plate. There are no friction clutches employed in the drive. Centralized control is provided, a single lever regulating every motion of the machine. The machine has only one speed, and 10 to 15 hp. are required.

Grinding and Polishing Machine, Combination, Utility, Type-R
Production Machine Co., Greenfield, Mass.
"American Machinist," September 1, 1921.



The base and head are one casting. The spindle runs in Timken roller bearings. Adjustment for wear is provided by a threaded sleeve and nut. One end of the spindle is furnished with a double-faced disk and the other with a leather-cushioned wheel, over which runs a 6-in. endless abrasive belt. A quick adjustment for tracking the belt and an idler for keeping it tight are provided. A table for surfacing work on the belt is furnished. The table for disk grinding has both vertical and circular adjustments, and is provided with a rocking seat to accommodate beveled work.

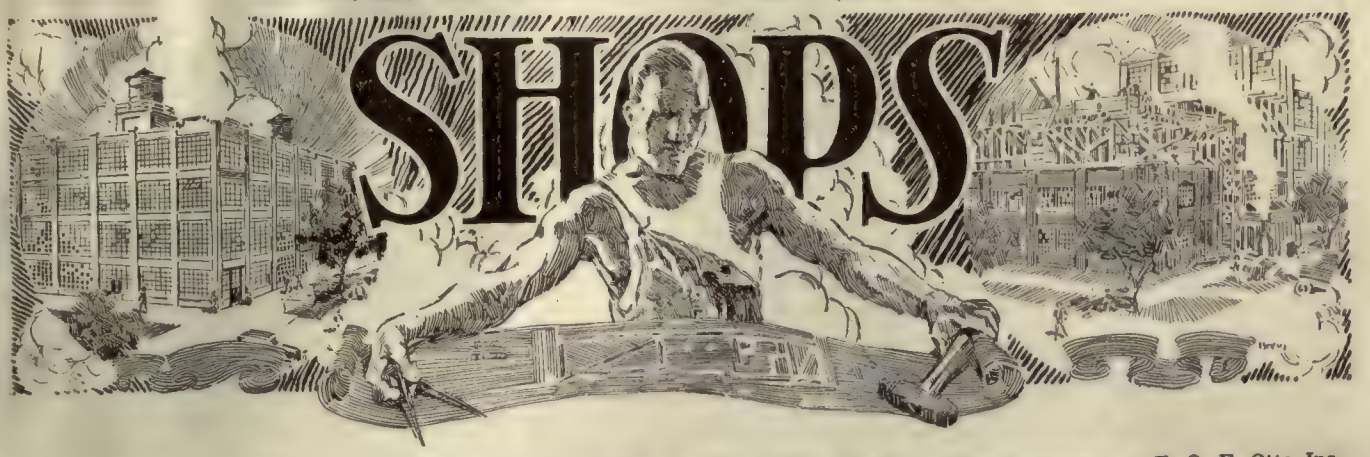
Straightening and Calibrating Machine, Gun Barrel
Fairbanks Company, Broome and Lafayette Sts., New York.
"American Machinist," September 1, 1921.



It is said that this machine will straighten rifled barrels as easily as smooth bores and that barrels can be straightened to within 0.002 in. for their entire lengths. The gun barrel is held in a vertical position in the machine, where it is rotated about its axis by the operator, thus bringing every part of the bore to pass by a fixed point or "feeler" within the bore. Whenever the feeler comes in contact with the bore it completes an electrical circuit which registers on a voltmeter. When the peak of the crook has been determined, two jaws are brought into contact with the barrel and the necessary pressure is applied to straighten it.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Pa., New Castle—The Bd. Educ., B. C. Graham, Supt. Schools—shop equipment for the manual training dept. of new high school now under construction.

Tenn., Ducktown—The Ocoee Copper Co., L. W. Hope, Genl. Supt.—small machine tools, pneumatic rock drills, mine hoist, screens, conveyor belts, motors and rock crushers.

Va., Keysville—J. L. Pearson—one 16 in. x 6, 8 or 10 ft. engine lathe with all attachments and screw cutting, also a 16 or 18 in. wood lathe with shears complete (new or used).

Va., Norfolk—The Sea Board Air Line Ry. Co., Boyster Bldg.—two 30 in. engine lathes, one 20 in. engine lathe, one portable crank for truing machine, one 36 in. draw cut shaper, one 3,000 lb. steam hammer, one 42 in. car wheel borer, one 48 in.-400 ton double end wheel press, one 2 in. x 26 in. turret lathe, one turret lathe arranged for bar stock, one 36 in. vertical turret lathe and one 28-48 in. Gap lathe.

W. Va., Bluefield—The Bond Motor Co.—complete machinery and equipment for automobile repair shop.

Ill., Beardstown—The Bd. Educ., H. E. Russell, Supt. of Schools—manual training and domestic science equipment.

Ill., Chicago—F. H. Noble & Co., 555 West 59th St.—one No. O. B. & S. automatic screw machine.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., R. Smith, Purch. Agt.—one 16 in. swing lathe, 10 ft. between centers; one No. 2 Universal milling machine; one punch and shear 12 in. throat for ⅝ x ¾ in. bars.

O., Cleveland—The Torbensen Axel Co., 115 East 152nd St.—multiple spindle drill head.

O., Portsmouth — The Wolford Machine Co., capitalized at $10,000, G. Wolford, Genl. Mgr.—machine tools.

Wis., Milwaukee—The Arpe Motor Co., 3811 Fond du Lac Ave. (garage and repair shop), E. Arpe, Purch. Agt.—lathe, arbor press, emery wheel and motors.

Wis., Milwaukee — Englert Bros., 1524 Vliet St., M. Englert, Purch. Agt.—power operated metal working machinery including square shear, brake, folders, beaders, etc.

Wis., Milwaukee—The Hercules Rack Co., 1566 26th St., F. J. Trapp, Purch. Agt.—four punch preses to punch ¼ x 5/16 holes through ⅛ stock.

Wis., Milwaukee—G. W. Neeb, 1104 Burleigh St.—speed lathe and drill press suitable for auto repair work.

Wis., Neenah—The Tri City Nash Co., 110 North Church St.—equipment for auto repair shop.

Wis., Sheboygan—The city, c/o C. Boley, City Engr. — machine tool and manual training equipment.

Wis., Viroqua—The Allen Machine Co., L. Allen, Purch. Agt.—medium size lathe, grinder and drill press.

Wis., West Allis — The Liberty Garage Co., 4908 National Ave. W. Breitman, Purch. Agt.—lathe suitable for repair work, drill press, grinders and motors.

Wis., West Allis—The Reliance Battery & Repair Co., 460 51st Ave., J. Pettigrew, Purch. Agt.—small lathe, emery wheel and drill press.

Mo., St. Louis—F. E. Palmer Supply Co., 2091 Ry. Exch. Bldg., manufacturer of railway, mine and mill supplies—one Hanna riveter 10 ft. reach to drive 1 in. steam tight rivets.

Neb., Lincoln—The Bd. Educ. is not in the market for equipment for shops. This corrects report in Dec. 15 issue.

Pa., Ellwood City — The Ellwood City Forge Co., 10th St.—one 15 ton crane with 60 ft. span.

Pa., Jeanette — The Elliot Co.—50 ton crane with 10 ton auxiliary.

Ala., Florence—The Muscle Shoals Rock Asphalt Co. 103 Court St., A. J. Bright, Ch. Engr.—four jaw crushers, 400 ton capacity, suitable for crushing rock asphalt quartz; four conveyors (from crusher to pulverizer); four steel rollers 48 in. diameter, about 30 in. long for pulverizing asphalt; several air compressors, jack hammer drills, also ½ ton revolving shovel dipper, prefer caterpillar (used dipper if in good condition).

Va., Richmond—Jerry Bros. Belting Co., 1823 East Main St.—14 to 20 in. lever leather belting presses, and a feed roll splitting machine (new or used).

Ill., Chicago—The Central Malleable Castings Co., 549 West Washington St.—air compressor.

Ill., Chicago—The Santa Fe R.R., 80 East Jackson Blvd.—one planer, 48 x 48 in. x 12 ft., two heads on cross rail and one side head, belt and motor driven.

Ill., Chicago—The Wahl Co., 1800 Roscoe St., E. R. Paffenrath, Purch. Agt.—hydraulic press and pump, pressure of which is to be 1,000 ton or more (used).

Ind., Vincennes—Vincennes Bridge Co.—one motor driven, 220 volt, rotary planer to mill ends of top chords, etc.

Mich., Detroit — The Aetna Portland Cement Co., 412 Union Trust Bldg.—equipment, including crushers, grinding mills and conveyors, for proposed cement plant along the Saginaw River at Bay City.

Mich., Detroit—The Natl. Portland Cement Co., 519 Book Bldg.—equipment for its proposed plant at Mt. Pleasant.

O., Columbus—The Columbus Milling Co., 304 West Mound St., organized with $150,000 capital stock, A. C. Smith, Genl. Mgr.—flour making machinery for plant which it has recently taken over.

Wis., Beaver Dam—The Bartelt Bros. Co.—several ice machines for proposed ice cream plant on South Division St.

Wis., Cudahy—Cudahy Bros.—woodworking machinery, planers, etc.

Wis., Madison—B. M. Backus, 102 State St.—paper cutting machine to cut ream 17 x 22.

Wis., Milwaukee — F. Matt, 1137 Grant Blvd.—Universal woodworker and band saw.

Wis., Milwaukee—H. B. Stanz Co., 312 Bway. (cheese manufacturer) — one belt driven steam mangler.

Wis., Oconomowoc—E. O. E. Otto Inc.—band saw about 30 in., rip saw, jointer with 12 in. table, mitre machine, hollow chisel mortiser and electric motors.

Wis., Oconto Falls—The Falls Mfg. Co.—paper machinery for proposed mill.

Wis., Waunakee — The Waunakee Milk Products Co., F. Whiting, Mgr.—dairy machinery, belt driven.

Kan., Topeka—The Seymour Packing Co., 200-202 North Kansas St.—ice machinery for proposed cold storage plant.

Cal., San Francisco—Shell Co. of California, 343 Sansom St. — equipment for proposed distributing station at Chico.

Ont., Chatham—The Union Natural Gas Co.—piping, tools, and drilling equipment for drilling wells.

Ont., Collingwood—J. Grey, Maple St.—equipment for proposed steel spring and steel specialty factory.

Ont., London—W. Ward & Sons, 19 King St.—machinery cutters and special equipment for the manufacture of cigars, to replace that which was destroyed by fire. Estimated loss, $25,000.

Ont., Ottawa—The Hamilton Tar & Ammonia Co., Lees Ave., W. M. Currie, Pres.—tar stills, tanks and all machinery and equipment for proposed tar and ammonia factory.

Metal Working Shops

NEW ENGLAND STATES

Conn., Hartford—The Charter Oak Machine Co., 438 Asylum St., has awarded the contract for the construction of a 1 story, 60 x 100 ft. factory for the manufacture of auto accessories. Estimated cost, $150,000.

Mass., Boston—M. Rudnick, 40 Court St., will build a 2 story, 100 x 120 ft. sales and service station at 872-8 Commonwealth Ave. Estimated cost, $120,000.

MIDDLE ATLANTIC STATES

N. J., Fernwood—(Trenton P. O.)—The State Hy. Dept., Trenton, will soon award the contract for the construction of 1 story 106 x 404 ft. auto service station here. Estimated cos, $94,300. C. A. Mead, 790 Broad St., Newark, Engr. Noted Dec. 15.

N. J., Jersey City — The Erie R.R., 50 Church St., New York City, has awarded the contract for the construction of a 1 story round house, machine shop and boiler plant, on Pavonia Ave. Estimated cost, $75,000.

N. J., Pleasantville — The Penn Motors Corp., c/o H. W. Sofield, 1719 North Broad St., Phila., Pa., will soon award the contract for the construction of a 1 story, 50 x 300 ft. factory and power plant here. Estimated cost, $125,000. C. Donehower, Pleasantville, Engr.

N. Y., Hornell—The Dairymen's League plans to construct a milk condensing plant here. Estimated cost, $200,000.

Pa., Phila.—The Allen Iron & Steel Co., 3rd and Venango Sts., has awarded the contract for the construction of a 2 story, 40 x 100 ft. addition to its mill. Estimated cost, $25,000.

Pa., Phila.—The Phila. Steam Heating & Eng. Co., Juniper and Cherry Sts., is having plans prepared for the construction of a 2 story, 57 x 120 ft. shop and office

The Weekly Price Guide

This Week's Market

Pig iron, Eastern Pa. No. 2X, is quoted in Philadelphia at $20.76 as against $23.26 per gross ton, one week ago. Steel prices remain unchanged at the Pittsburgh mills with $1.50 on structurals in 100 ton lots and $1.60 per 100 lb. on smaller tonnages.

The New York warehouses quote tin at 33¼c. as against 34c. and spelter at 5½c. as compared with last week's price of 5⅝c. per lb.

Cleveland quotes solder at 23½c. as against 21½c. and decreases ranging from ½c. to ⅝c. per lb. in tin plates (base size).

Linseed-oil declines 1c. per gal. in Cleveland, prices firm in New York and Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	20.76
Virginia No. 2	28.74
Basic	20 75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¾ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	1 to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.28
Spring steel (light) (base)	6.00	6.00	3.68
Coppered Bessemer rods(base)	7.00	8.00	6.03
Hoop steel	3.53	3.11	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.85	2.64@2.80	5.23
Cold finished shafting or screw	3.55	3.50	3.55
Cold finished flats, squares	4.05	4.00	4.05
Structural shapes (base)	2.78	2.61	2.88
Soft steel bars (base)	2.68	2.51	2.78
Soft steel bar shapes (base)	2.68	2.51	2.78
Soft steel bands (base)	3.28	....	3.48
Tank plates (base)	2.78	2.61	2.88
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.50		12@13
1/8	7.15		11@12
5/32 to 1/4	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.37½
Tin, 5-ton lots, New York	33.50
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 5.10; New York	5.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	16.50	17.00	16.25
Copper bars (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	21.00	23.50	19.25
Babbitt metal (best grade)	24.62½	43.75	36.00
Babbitt metal (commercial)	9.87½	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.50	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	7.00	6.50	8.50
Brass, light	5.00	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	2.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.76	.74
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per ton	$2.90@3.00	
Coke, prompt foundry, Connellsville	per ton	3.75@4.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	—50%	—60%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	—40%	-60-10-10%	-60-10%
With cold punched sq. nuts	—30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	—40%	.....	..$4.00 off
Button head bolts, with hex. nuts	—20%	$3.90 net	.....
Hex. head and hex. nut bolts	—20%	.....	-65-5%
Lag screws, coach screws	—50–10%	.....	—60%
Carriage bolts, all sizes up to 1 in. x 30 in.	—45%	—50-10-10%	50–5%
Bolt ends, with hot pressed nuts	—50%	.....	—55%
Tap bolts, hex. heads	—20%	.....	.....
Semi-finished nuts all sizes	—70%	—75%	—80%
Case-hardened nuts	—60%	.....	.....
Washers, cast iron, ½ in., per 100 lb. Off list	$5.00	$5.50	$3.50 net
Washers, cast iron, ⅜ in. per 100 lb. Off list	4.25	3.75	3.50 net
Washers, round plate, per 100 lb. Off list	3.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	–50-10%	60-10-10%	–65-5%
Rivets, tinned	–50-10%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅞ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	—60–5%	—40-10%	—50-10%
Copper burs	—40%	—15%	—10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	List $9.00 less 20-10-5%	50–10–5%'-20-10%	
Emery paper	List 11.00 less 20%	$11.00 net –20%	
Emery cloth	List 32.75 less 10%	32.75 net –10%	
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net		.....	list+10%
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	List $1.65 less 20%	.....	–10%
Cloth	List $3.55 less 10%	.....	–10%

building at 3316-20 Lancaster Ave. Estimated cost, $60,000. Private plans.

Pa., Phila.—C. Offenhauser, Wensley and Allen Sts., has awarded the contract for the construction of a 1 story addition to his machine shop. Estimated cost, $5,000.

SOUTHERN STATES

W. Va., Wheeling—The Wheeling Mold Fdry. Co., Peninsular St., has awarded the contract for the construction of a 1 story, 60 x 287 ft. roll shop. Estimated cost, $50,000.

MIDDLE WEST STATES

Ill., Chicago—R. H. Oliver, Archt., 115 South Dearborn St., is receiving bids for the construction of a 2 story, 42 x 71 ft. factory at 7512 Greenwood Ave. for the Dental Products Co., 623 South Wabash Ave. Estimated cost, $30,000.

Ill., Chicago — H. Salvat, 5322 Harper Ave., has awarded the contract for the construction of a 1 story, 100 x 180 ft. garage at 5018 Cottage Grove Ave. Estimated cost, $50,000.

Ill., Chicago—The Western Fixtures Mfg. Co., 3039 Elston Ave., manufacturer of store fixtures, is receiving bids for the construction of a 1 story, 80 x 119 ft. addition to its factory. Estimated cost, $40,000.

Ill., Rockford—The Allen Ice Cream Co., 327 South Winnebago St., has awarded the contract for the construction of a 2 story garage and warehouse. Estimated cost, $26,000. Noted Dec. 22.

Ind., Indianapolis — The Alena Steam Products Co., 208 Hume-Mansur Bldg., is having plans prepared for the construction of a 1 story, 60 x 60 ft. tractor and truck factory on Denny Ave. Estimated cost, $25,000. F. Hamilton, 208 Hume-Mansur Bldg., Engr.

Ind., Indianapolis—The Citizens Gas Co., South Pennsylvania and Maryland Sts., plans to construct a coke screening plant on Prospect St. Estimated cost, $40,000. Private plans.

Ind., Indianapolis — The Interstate Car Co., Sherman Drive and Massachusetts Ave., plans to build an iron casting foundry. Estimated cost, $25,000. Architect not selected.

Ind., Indianapolis — The Wayne Oil & Tank Co., 58 West New York Ave., plans to construct an addition to its factory, for the manufacture of pumps, tanks and water softeners. Estimated cost, $150,000. Private plans.

Mich., Grand Rapids—The Buick Sales Co. is having plans prepared for the construction of a 3 story, 70 x 160 ft. garage and sales station. Estimated cost, $75,000. Osgood & Osgood, Grand Rapids, Archts. W. H. Adams, Campau Bldg., Detroit, Engr.

Mich., St. Joseph—The Auto Specialty Mfg. Co., is having plans prepared for the construction of a 1 story, 80 x 325 ft. and a 1 story 80 x 162 ft. addition to its factory. Estimated cost, $100,000. Davidson & Weiss, 53 West Jackson Blvd., Chicago, Ill., Archts.

O., Cleveland — The Specialty Mfg. Co., 11414 Madison Ave., plans to construct a 2 story factory for the manufacture of wire brushes. Estimated cost, $50,00. Architect not selected.

O., Columbus—The Carroll Chain Co. has awarded the contract for the construction of a 1 story, 50 x 160 ft. chain factory on 7th and Hosack Sts. Estimated cost, $50,000.

O., Minerva—The Lewis Electric Mfg. Co. is having plans prepared for the construction of a 2 story, 60 x 400 ft. factory. Estimated cost, $75,000. Watson Eng. Co., 3614 Prospect Ave., Cleveland, Archts.

Wis., Fond-du-Lac—The East Wisconsin Electric Co., 15 North Main St., has awarded the contract for the construction of a 2 story, 50 x 90 ft. gas plant and foundry. Estimated cost, $45,000. M. H. Frank, Mgr.

Wis., Milwaukee—The Alliance Investment Co., 115 Wisconsin St., has awarded the contract for the construction of a 1 story, 60 x 120 ft. garage on Bway. Estimated cost, $40,000. Noted Dec. 8.

Wis., Neenah—The Tri City Nash Co., 110 North Church St., has awarded the contract for the construction of a 55 x 150 ft. garage on Commercial St. Estimated cost, $60,000. Noted Dec. 8.

WEST OF THE MISSISSIPPI

Mo., St. Louis — C. Remabecker, 4263 Juniata Ave., has awarded the contract for the construction of a 1 story, 120 x 160 ft. garage on Chippewa and Nebraska Sts. Estimated cost, $50,000. Noted Dec. 15.

WESTERN STATES

Cal., Burbank—C. F. Braun Co., 604 Mission St., San Francisco, manufacturer of factory equipment, auxiliary machinery, water heaters, water softeners, etc., is preparing plans for the construction of foundries, machine shops, pattern shop, etc., here. Estimated cost $400,000.

Cal., Chico — (Hamilton City P. O.) — Shell Co. of California, 343 Sansom St., San Francisco, has awarded the contract for the construction of a distributing station, to include garage, offices, wagon sheds, etc., here. Estimated cost, $30,000.

Cal., Los Angeles—The California Telephone Co. has awarded the contract for the construction of a 1 story, 250 x 250 ft. garage on 9th and San Pedro Sts. Estimated cost, $115,450.

Cal., San Francisco — The Bothin Real Estate Co., Atlas Bldg., has awarded the contract for the construction of a 2 story electric supply shop on Felsom St. east of 2nd St. Estimated cost, $31,000.

Cal., San Francisco—R. W. Kern, 1329 Sacramento St., is having plans prepared for a 1 story garage on the west side of Jones St., near O'Farrell St. Estimated cost, $40,000. O'Brien Bros., Inc., 240 Montgomery St., Archts.

CANADA

Ont., Collingwood—J. Grey, Maple St. has had plans prepared for the construction of a factory, for the manufacture of steel springs and steel specialties. Estimated cost, $15,000.

General Manufacturing

MIDDLE ATLANTIC STATES

N. J., Bloomfield—The Amer. Book Co., 100 Washington Sq. East, New York, plans to build a 222 x 502 x 616 ft. publishing plant on Bloomfield Ave., here. Architect not selected.

N. Y., New York—F. M. Schildwachter, c/o Koch & Wagner, Archts. and Engrs., 32 Court St., Brooklyn, is having plans prepared for the construction of an ice plant on Webster Ave. and 174th St. Estimated cost, $750,000.

N. Y., New York—The U-Need Ice Co., 2950 Amsterdam Ave., will soon receive bids for the construction of an ice plant on Inwood Ave. Estimated cost, $250,000. Koch & Wagner, 32 Court St., Brooklyn, Archts. and Engrs.

Pa., Erie—The Erie Brewing Co. has awarded the contract for the construction of a 1 story, 38 x 75 ft. ice plant (50 ton capacity) and a storage plant (4,400 ton capacity).

Pa., Harrisburg—The School Dist., 121-23 Chestnut St., will receive bids until Jan. 6 for the construction of a 2 story, 80 x 200 ft. school on 3rd and Division Sts. Bids now for two of three units of new senior high school to include superstructure and wing shop. Bids will be received later for boiler rooms, etc. Estimated cost $300,000.

Pa., Phila.—Grubnau Bros., 114 Arch St., manufacturers of woolen goods, have awarded the contract for the construction of a 1 story, 76 x 205 ft. factory on 2nd St. and Erie Ave. Estimated cost, $40,000.

Pa., Phila. — The Hulton Dyeing Co., Wheatsheaf Lane and Carrol St., has awarded the contract for the construction of a 2 story, 59 x 124 ft. dye factory. Estimated cost, $30,000.

Pa., Phila.—J. Turner & Co., A and Allegheny Aves., has awarded the contract for the construction af a 2 story, 68 x 113 ft. knitting factory on Ashmead and Wakefield Aves. Estimated cost, $20,000.

SOUTHERN STATES

Ky., Louisville — The Natl. Candy Co., Federal Reserve Bank Bldg., St. Louis, Mo., has awarded the contract for the construction of a 5 story candy factory (known as the Frank A. Menne Factory), 1456 Bway., here. Estimated cost, $600,000.

La., Bogalusa—The Bogalusa Paper Co., subsidiary of Great Southern Lumber Co., Whitney Bldg., New Orleans, plans to build an addition to its paper mill here. Estimated cost, $1,000,000. W. H. Sullivan, Genl. Mgr.

MIDDLE WEST STATES

Ill., Chicago—The Dubow Glove Co., 1911 Milwaukee Ave., has awarded the contract for the construction of a 3 story, 35 x 45 ft. addition to its factory. Estimated cost, $40,000

Ill., Kankakee—The Paramount Knitting Co., 337 West Madison St., Chicago, has awarded the contract for the construction of a 2 story, 50 x 80 ft. addition to its factory, here. Estimated cost, $40,000.

Ill., Rockford—The Hess & Hopkins Leather Co., c/o F. L. Morgan, Secy., is having plans prepared for the construction of a 1-story, 60 x 115 ft. tannery. Estimated cost, $40,000. Private plans.

Ind., Frankfort—Ingram-Richardson Mfg. Co., Walnut St., manufacturer of enamel specialties, plans to construct a 1 story, 60 x 160 ft. factory on Walnut St. Estimated cost $25,000. Architect not selected.

Ind., Franklin—D. M. Hoagland & Co., Scottsburg, has awarded the contract for the construction of a 3 story, 130 x 134 ft. canning factory here. Estimated cost, $75,000. Noted Dec. 15.

Ind., Indianapolis—M. Schussler, 407 East Washington St., plans to construct a 1 story packing plant on East Washington St. Estimated cost, $25,000. Architect not selected.

Ind., Lebanon—N. N. Smith Co., 407 Main St., Frankfort, is having plans prepared for the construction of a 2 story, 38 x 110 ft. cigar factory and office building here. Estimated cost, $25,000. Private plans.

Mich., Bay City—The Aetna Portland Cement Co., 412 Union Trust Bldg., Detroit, is having plans prepared for the construction of a complete plant to include 3 kilns, etc., along the Saginaw River, here. Estimated cost, $1,000,000. Private plans.

Mich., Mt. Pleasant—The Natl. Portland Cement Co., 519 Book Bldg., Detroit, plans to build a plant here, for the manufacture of portland cement using marl as raw material. Estimated cost, $500,000. H. C. Shields, Genl. Mgr.

O., Dayton—The Terminal Cold Storage & Ice Co., c/o B. & C. Baking Co., 233 Clinton St., is having plans prepared for the construction of an 8 story, 135 x 150 ft. refrigerating and cold storage plant on Eaker and Ludlow Sts. Estimated cost, $500,000. H. J. Brenner, Pres. G. B. Bright Co., 103 Marquette Bldg., Detroit, Archts.

Wis., Beaver Dam—Bartelt Bros. Co. has purchased a site on South Division St. and plans to build a 1 and 2 story, 40 x 140 ft. ice cream plant. Estimated cost, $100,000. Architect not selected.

Wis., Cudahy — Cudahy Bros. have awarded the contract for the construction of a 1 story, 80 x 190 ft. box factory. Estimated cost, $60,000. Noted Dec. 15.

Wis., Milwaukee — The Harsh-Chapline Shoe Co., 694 Hanover St., will soon award the contract for the construction of a 2 story, 32 x 110 ft. sole cutting factory on Maple St. Estimated cost, $25,000. H. J. Esser, 82 Wisconsin St., Archt. and Engr.

Wis., Oconto Falls—The Falls Mfg. Co., is having plans prepared for the construction of a 1 story, 60 x 200 ft. paper mill. Estimated cost, $150,000. Private plans.

Wis., Racine—The E. L. M. Tire Co., Deane Blvd., is receiving bids for the construction of a 2 story, 80 x 132 ft. addition to its tire factory. Estimated cost, $50,000. Private plans. Noted Dec. 8.

WEST OF THE MISSISSIPPI

Kan., Topeka—The Seymour Packing Co., 200-202 North Kansas St., has awarded the contract for the construction of a 3 story, 50 x 150 ft. cold storage plant. Estimated cost, $150,000.

Kan., Wichita—The Wichita Ice & Storage Co., 213 South Rock Island Ave., has awarded the contract for the construction of a 5 story, 75 x 90 ft. ice plant. Estimated cost, $200,000. Noted Nov. 3.

Mo., St. Clair—The International Shoe Co., 15th and Washington Sts., St. Louis, is having plans prepared for the construction of a 3 story shoe factory. Estimated cost, $75,000. H. Reinhardt, c/o owner. Archt.

Mo., St. Louis—J. H. Belz Provision Co., 2035 Gravois Ave., has awarded the contract for the construction of a 4 story, 36 x 46 ft. cooler building at 3601 South Bway Estimated cost, $40,000. Noted Dec. 22.

WESTERN STATES

Cal., Fresno—The W. P. Fuller Paint Co. plans to construct a 145 x 244 ft. paint factory. Estimated cost, $100,000. E. Mathewson, Cory Bldg., Archt.

CANADA

Ont., Toronto—A. E. Rea, 709 Continental Life Bldg., is having sketches made for the construction of a wool washing and combing plant on Bathurst St. Estimated cost, $200,000. B. H. Prack, 50 Bay St., Archt.

American Machinist

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Manufacture and Use of Diamond Cutting Tools

I. Diamonds Extensively Used as Cutting Tools—Study of the Structure Necessary to Secure Keen Cutting Edges—Cleaving the Diamond the Work of an Expert

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

THE use of diamonds as cutting points for rock boring tools, stone saws, etc., is a matter of common knowledge. As a tool for the cutting and drilling of glass, marking hardened steel, and similar jobs, where the material to be worked is too hard to yield to the cutting edge of steel, the superiority of the

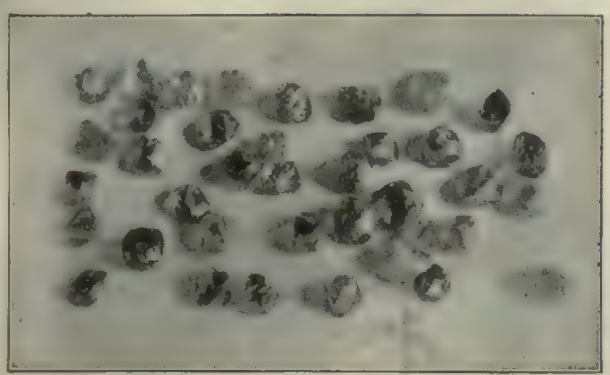


FIG. 1. GEM CRYSTALS

diamond has long been recognized. That the diamond as a cutting tool has a far wider application in certain of the industrial arts where the material to be worked is comparatively soft is not so generally known.

Every machine shop man is familiar with the diamond as a means of dressing grinding wheels; but that the same diamond may be converted into a cutting tool to do much of his work without having to be reground at all, and thus reduce the grinding wheel to a matter of secondary importance, is a fact that has yet to be demonstrated to him. There are many materials



FIG. 3. BLACK DIAMONDS

represented in modern manufactured products such as fiber, rubber, paper, bronze, etc., that of themselves offer little resistance to steel tools; yet they present certain characteristics that render the cutting and shaping of great numbers of pieces a difficult and annoying proposition because of their tendency to break down quickly and wear away the keen cutting edge of steel.

Let us consider the manufacture of small articles of fiber, or of the material that is so rapidly superseding it—bakelite. Millions of small parts are being turned out every day by automatic machines that drill, counter bore, form and cut off with tools of hardened steel which require constant attention, regrinding, resetting, and continual readjustment.

The cost of making a simple forming tool of steel for such a machine may be only a few dollars while a similar tool in which the cutting edge is a diamond might cost a hundred times as much; yet the life of the steel tool is a matter of days, at best, while the tool of diamond will run for months. When the number of replacements, the cost of skilled supervision, and the

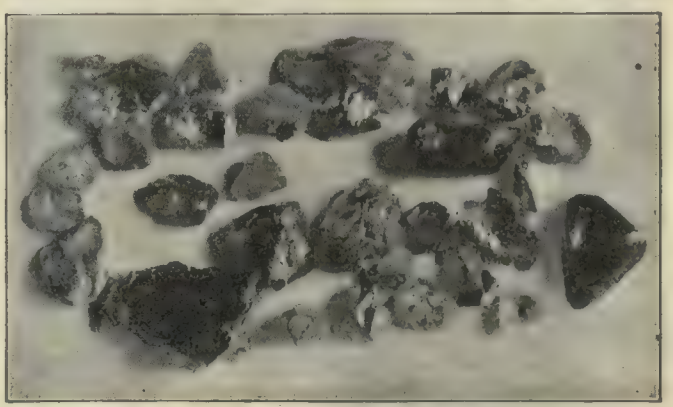


FIG. 2. CRYSTALS OF BORTZ

annoyance and expense due to variation of product are considered, it is evident that the diamond will repay its initial cost in a very short time and during the remainder of its long life will be earning a profit equal to the total of these expenses.

Another saving to be effected by the use of the diamond will come through doing away with the necessity for subsequent finishing operations. There are few products made by the use of steel tools that do not require filing, polishing, burnishing, or other methods of improving their appearance; while the product of the diamond in most instances is finished when it leaves the tool.

Brass may be considered a soft material indeed, and is readily worked with steel tools; yet all brass parts produced upon automatic machinery require finishing operations either to improve their appearance or to fit one part smoothly and snugly into some other part.

And the highly polished and smoothly sliding drawtubes of large telescopes and the equally exacting members of high-powered microscopes are regularly finished, ready for assembling, by turning them with a diamond. Parts of brass or composition that are to be plated with nickel or silver may go directly from the turning operation to the plating vats; polishing and buffing would be superfluous.

Hard rubber is by no means hard; but it is a very difficult material to finish with steel tools, and it is almost impossible to turn a piece parallel because of the rapid and uneven wear of the cutting edge. Parts of

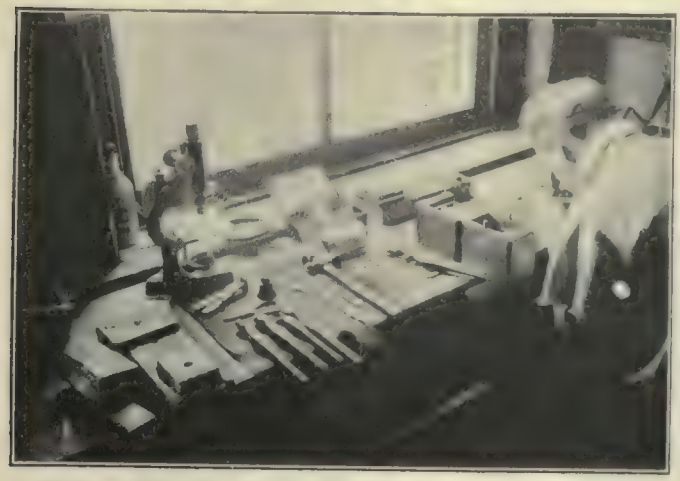


FIG. 4. EXAMINATION PREPARATORY TO CLEAVING

fountain pens have their surfaces left so true and smooth when turned with the diamond that no subsequent fitting is necessary, and the diamond runs for months upon this work without attention.

Electrical devices which have parts of brass molded into hard rubber or bakelite, have their composite surfaces left as smooth as though polished, when turned with a diamond, and the brass parts are not recessed or protrouding, as is quite likely to be the case when steel tools are used for the turning. The rubber rolls on typewriters are certainly about as soft as any material that is regularly worked by machine tools; yet there are but two successful means of finishing them—the abrasive wheel and the diamond.

The diamond is practically the only thing of which a tool can be made to cut materials harder than steel. Glass, marble and porcelain are but a few of them that are commonly cut with diamond tools. By the same means rubies, sapphires, and other so-called precious stones are drilled, cupped, and formed to take their places as bearings in intricate and precise mechanism.

The diamond is the hardest known substance. In the scale of hardness its number is 10, while carborundum, its nearest neighbor, stands at 9; but there is many times more difference in relative hardness between 10 and 9 than there is between 9 and 1. The diamond is also very brittle and in this characteristic may be found its limitations; it will not stand severe transverse strains or heavy pressure unless very well supported, and for this reason it is not suitable for turning tough, homogeneous material like iron and steel. It is, however, used upon this material to some extent for the purpose of marking scales, verniers, and other instruments of precision where the marking must be done after hardening to insure accuracy.

The average rough diamond presents a very ordinary and unattractive appearance, differing in no visible respect from millions of pebbles that may be picked up along any sea beach. Diamonds vary little in hardness but a great deal in color and structure. The gem that sparkles upon the shirt bosom of the millionaire (or the war-time mechanic) is not physically different from the stone that is sometimes used to turn off a grinding wheel, except that it is colorless and has been highly polished.

Both come from the same mines. Those stones sorted out as unsuitable for polishing into gems, due to undesirable color or to flaws in the structure, are called "bortz." The value of a crystal of bortz varies with the size and quality of the stone from fifty or sixty dollars per carat for a fine large stone down to about five dollars per carat for flawed fragments or small discolored stones. (A carat is only about the $\frac{1}{4}$ part of a Troy ounce). The majority of diamonds found unbroken are in the form of octahedrans (eight sided six pointed crystals). Fig. 1 shows a small lot of such

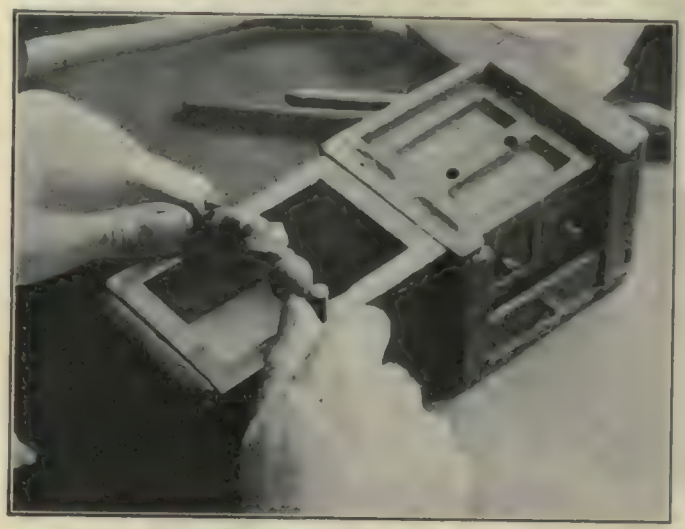


FIG. 5. STARTING THE GROOVE

crystals not quite good enough for cutting into gems because of color, but they are of flawless structure and represent the very best quality of bortz. Fig. 2 shows portions of exceptionally large crystals. Some were found in this condition in the mines, others sawed or cleaved in the factory where the material for this article was obtained. In the diamond trade this form is called "block." Incidentally, the cash value of the small handful of "block" shown in this picture is $6,440.

Black Diamonds

Chemically considered the diamond is pure carbon, but this element is somewhat peculiar in that it may exist in several forms without great difference in chemical purity. The final stage is reached in the colorless octahedral crystal, that is the diamond, but there seems to be many steps to the process as carried on in Nature's laboratories in converting the comparatively soft, amorphous material into the finished product.

One of these steps is represented by what is called the "black diamond." Black diamonds are but partly or imperfectly crystalized, are of a rather porous nature, and possess practically no cleavage grain. They are of about the same degree of hardness as the white diamond but as they do not lend themselves readily to the process of shaping, they are used principally as cut-

ting points in rock drills, marble saws, etc., where little alteration of the original form is necessary.

Black diamonds are at present found only in Brazil and are not nearly so plentiful as is commonly supposed. Because of this fact and, further, because they are in great demand for the above mentioned purpose, the market value is somewhat in excess of that of bortz.

To the diamond trade the black diamond is known as "carbon." A number of lumps—they can hardly be called crystals—may be seen in Fig. 3.

Lines of Cleavage

The structure of the diamond is of great importance to the manufacturer of diamond tools. The crystal



FIG. 6. CLEAVING THE CRYSTAL

presents a sort of grain, or line of cleavage, along which it may be split, and in making cutting tools it is necessary to study the structure in order to determine at what places the crystal may be cleaved to obtain in rough outline the shape desired. Owing to its brittleness, any attempt to divide it in a direction not in the line of cleavage is certain to result in shattering the stone, and since diamonds are worth much more per carat in large than in small pieces, this means reducing its value from forty or so dollars down to perhaps five dollars per carat, not an inconsiderable loss in a stone that may weigh upwards of twenty carats. For this reason the diamond cleaver must be a man of experience and sound judgment in this work. Such a man may study a crystal for hours under the microscope before making any attempt to cleave it.

Contrary to the commonly accepted notion, cleanliness and freedom from dirt is *not* characteristic of the diamond cutter's trade. Instead of the immaculate linen in which they are usually pictured, its devotees wear overalls and jumpers like any machine-shop employee and their hands and faces are apt to resemble those of a machinist's helper after a hard day's work. A great deal of their work is done with diamond dust suspended in olive oil and this mixture is as black as the combination of cast-iron dust and machine oil—and quite as pervasive. Fig. 4 shows a diamond worker's bench and tools, with the

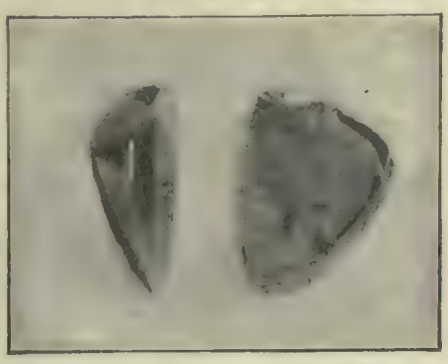


FIG. 7. THE CRYSTAL DIVIDED

diamond worker himself examining a crystal under a jeweler's glass preparatory to cleaving it. The implements at his left are not drumsticks, but are the holders with which he will later handle the stone to be cut as well as the stone with which he will cut it. They are of wood with a cup-shaped depression in the larger end, into which cavity the stone will be set and held by diamond cutter's wax; a hard yellow preparation resembling beeswax in appearance but much less pliable. This wax is softened by heat from a gas burner or alcohol lamp to a degree that enables the worker to mould it around the stone with his fingers, and when it is hard it will withstand any ordinary pressure.

The bortz crystals are but indifferently translucent before the rough skin is ground off, some of them being practically opaque. It is therefore necessary as a preliminary operation to polish off a small facet somewhere in each crystal to let in the light and permit the worker to examine the interior. Having determined the direction of the cleavage lines and the most advan-



FIG. 8. TOOLS WITH CUTTING EDGES OF DIAMOND

tageous place to start, the diamond worker mounts the stone in one holder, affixes to another a sharp splinter of diamonds and proceeds as illustrated in Fig. 5 to cut a groove in the stone at the place where he expects it to divide.

A characteristic peculiar to the diamond is that one diamond will cut another diamond. A man might take two pieces of steel of equal hardness and scrape them together until his hair was gray without affecting anything but his disposition; but let him, with proper knowledge of the art, scrape one diamond with the sharp corner of another and, although he will wear away the keen edge of the cutting diamond and have to turn it around from time to time to *keep* it cutting, it will not be long before he has an appreciable groove in the other stone. The groove need not be very wide or very deep but it must be in exactly the right place—it must coincide with the lines of cleavage.

Placing the holder containing the stone to be split in an upright position by sticking it through a hole in his bench block of lead, he sets the edge of a steel knife in the groove, as in Fig. 6, and strikes it a sharp blow with a hammer. The result is shown in Fig. 7.

The diamonds are seldom cleaved or otherwise divided solely for the purpose of getting smaller pieces. Usually a stone is selected as nearly as possible to the size of the tool to be made, in order to reduce the cost

per carat, but in the case of Fig. 7, a piece approximately ¾-in. square was needed.

In Fig. 8 may be seen some samples of diamond tools. If this picture be examined with a glass it will be noted that each tool has one or more cutting lips formed of pieces of diamond crystal brazed to the steel holder. The first tool to the right of the center of the group is a forming tool having an exceptionally large diamond, and it is for a duplicate of this tool that the stone in Fig. 7 is to be used.

The value of this particular tool is around three hundred dollars, but when one considers that its counterparts have run from six to nine months, forming the edges of thousands of fiber disks daily, *without resharpening and practically without readjustment*, one may see that the tool cost per piece is insignificant when compared with the performance that could reasonably be expected from a steel tool of similar shape.

The tool at the center of the group in Fig. 8 performs an operation similar to the one just described and upon the same material. This tool has two diamonds, set in inserts of steel so that they may be adjusted to form different curvatures by turning the inserts. Fig. 8 also shows drills, counterbores, side-tools, cutting-off tools, and plain turning tools; each with a cutting lip or lips made from a diamond.

Laying Out a Factory for Production Work

How Kind and Amount of Equipment Are Estimated—Arranging Machines—Uses of Operation Sheets—Equipment Records—Conveyors

By FRANK W. CURTIS
Chief Engineer, Dowd Engineering Co., New York City

THE ideal factory is so arranged that work in process passes through it with a minimum amount of handling. It is seldom however that the ideal is realized, although it may be approached closely. Under the very best conditions a factory may be built expressly for the manufacture of a certain product so that with proper planning and arrangement of machines, the routing of the work is in perfect accord with the system of handling. In a factory built for the production of a particular mechanism, a definite change in the arrangement of machines is often necessary if the factory is to be adapted to a different class of work.

A large percentage of the factories of our country were not specially built for the product now being manufactured. In many cases where the same variety of product is still made, it has been developed and changed to a great extent. Improvements have been made and refinements incorporated, so that it is quite different from its original form. Developments in machine tools have been rapid in the last few years and methods of manufacture have kept pace with the progress made in the designing of machinery. In some kinds of work the use of automatic machines of various kinds has revolutionized the entire industry, thereby effecting great changes in methods and in the handling of the product. In considering the possibility of changes both in product and methods, it will be obvious that factory arrangements should be of a flexible nature as far as possible. Consideration must be given to future activities, possible enlargement of plant, change in product, and any other matters likely to affect the efficiency of the factory.

If a factory is to be purchased and adapted to a new product, the location is important not only on account of shipping facilities but also in connection with the employment of labor and the housing situation. These matters are only mentioned in passing and will not be touched upon further in this article. Their importance, however, must not be overlooked in selecting a site for a factory.

In order to obtain efficiency from the human factor in production, the workman must be able to operate under conditions such that his bodily comfort is assured as far as possible. A poorly lighted, insufficiently heated and badly ventilated factory results in imperfect, inaccurate work, dissatisfied workmen, and low production. Men cannot be expected to do good work in a poorly lighted shop or in one not properly heated or ventilated.

Good lighting is essential in plant layout work and care should be taken to see that light of suitable quality and quantity is obtained. The direction of the light in its relation to the machine and the work is also important. Modern factories are so built that sufficient daylight is provided for the majority of the machines by the use of open sash windows and by constructing long, narrow buildings when several floors are necessary. Saw-tooth roofs are used when one-story buildings are required, the overhead lighting being ample for the majority of conditions.

The eye has adapted itself to daylight as a natural light, hence artificial lighting should approach that given by day-light as nearly as possible. When artificial light is used, if the lights are properly arranged, it will be found generally satisfactory. Care should be taken

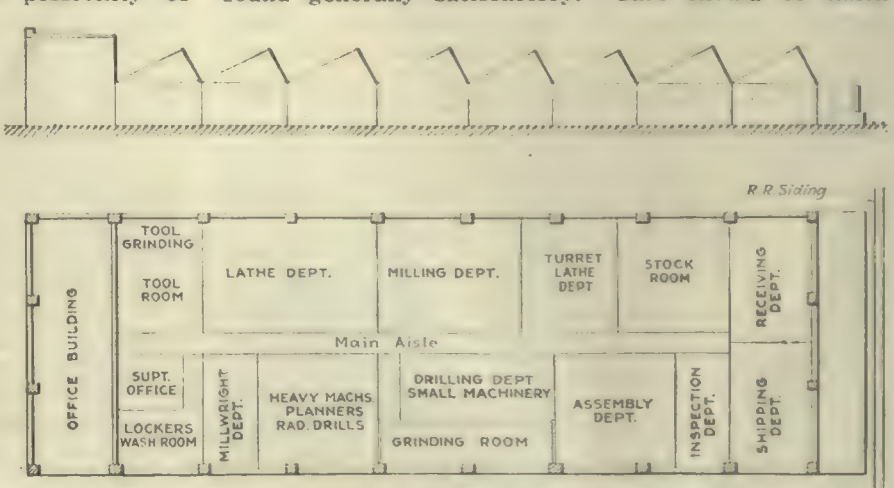


FIG. 1. PLANT LAYOUT FOR GENERAL MANUFACTURING

to avoid "glare" caused by poorly-arranged lights or when the location of lights within the field of vision, which causes discomfort and eye fatigue. The direction of light rays should be such that no deep shadows will be thrown on work which is to be machined or inspected. Shadows are very annoying if they are deep and sharp as it is then very hard to distinguish between shadows and objects.

Artificial lighting is of great importance in the proper operation of a plant. Proper lighting will not only increase production but will prevent accidents, improve health conditions and decrease spoiled work. It is the general practice to have walls and ceiling of a factory painted a dull white. Care should be taken not to use a glossy paint as this reflects light and causes trouble.

Accidents are often the result of poor lighting; records kept in one factory showed that 20 per cent of the accidents for a year were due to improper lighting

MACHINE Colburn Drill Pre... Nº T-558
SIZE #2 Heavy cuty manufacturing
DEPT. 16 PART Nº 1630 OPER. 23
PURCHASED April 19-1921
Drill capacity 1 1/4"
Distance center of spindle to column 10"
Max. distance, nose of spindle to table 28"
Length of power feed 12"
#4 morse taper shank
Table size 16" x 16" Floor space 24" x 46"
NOTE:- KEEP REPAIR RECORD ON REVERSE SIDE

FIG. 2. MACHINE RECORD CARD

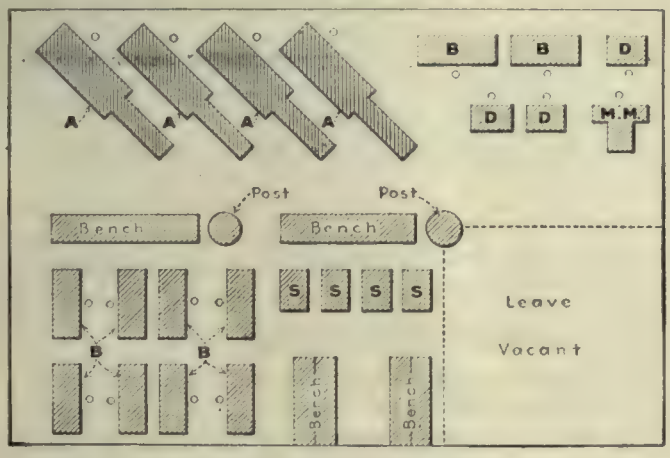


FIG. 3. SECTION OF FACTORY LAYOUT, SHOWING MACHINES CORRECTLY POSITIONED

facilities. Factories which have installed modern systems of lighting have found by their records that a great reduction in accidents has been made after the installation.

The method of heating a factory and its ventilation are important factors which are dependent to some extent upon the type and general features of construction. The writer will not go into this matter in detail as it is somewhat out of the field of this article.

Greater efficiency is obtained from workmen when a normally uniform temperature is obtained throughout the factory by judicious planning of the heating and ventilating facilities. Sanitary arrangements should be made and suitable washrooms provided with lockers or provision of some sort for the workmens' clothing.

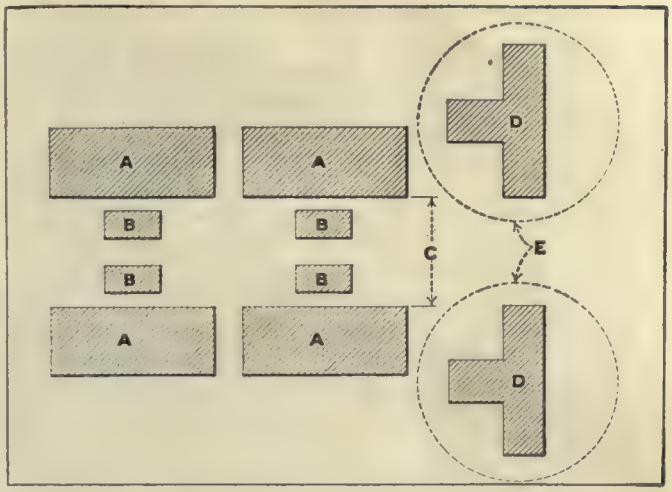


FIG. 4. SPACING AROUND MACHINES

These matters also, although they are important, will not be discussed in this article.

There are several factors to be considered when making a plant layout, the first of which is the product that is to be manufactured. It is evident that a plant for the production of a certain kind of mechanism and intended only for this purpose, could be designed and the equipment arranged to facilitate the production of this particular product. For general manufacturing, however, a different arrangement might be required, and for highly specialized work the arrangements might be very much changed according to the class of work to be produced. Fig. 1 shows a plant layout design for general manufacturing. The arrangement of the various departments is subject to more or less change according to the design of the factory, but in the example indicated a one story factory is shown with a modern saw-tooth roof construction and ample day-light lighting facilities. The foundry, patternshop and drop forging departments have not been considered in this layout as they would naturally be taken care of by means of other buildings. The office, though a part of the factory, is a separate building at one end of the main factory building. The superintendent's office has been partitioned off in the factory itself rather than to provide space for this in the office building. A railroad siding is arranged at one end of the building and here both receiving and shipping departments open on to a loading platform. A wide main aisle through the center of the building provides access to the various departments. There are no partitions to separate the various departments, with the exception of the grinding room which is partitioned off to prevent dust from the abrasives used being carried along throughout the shop and damaging other machinery. An arrangement such as that shown allows work to be taken from either receiving department or stockroom to any of the various departments by means of the main aisle. The assembling and inspection departments are close to the stockroom and shipping department, so that there will be as little handling as possible after the work has been completed. A department has been set aside for the millwright and his assistants, this being arranged close to the superintendent's office. The toolroom and tool grinding departments are also at this end of the building. The other departments are arranged conveniently with respect to the general run of manufacturing work.

In any sort of a factory it is important to have a

record of the machines, their location in the factory, and the work upon which they are engaged. A record of this kind can be most conveniently made by means of a card index such as that shown in Fig. 2. On this card can be recorded the important data concerning the machine, in such shape that it can be readily referred to when changes in design or in the production schedule requires a change in equipment. All machines should be given a factory number and their location specified according to department. It may be also advisable in factories where the same product is being manufactured continuously to make a cross index containing the number and name of the part manufactured so that each operation on the part can be identified along with the machine used in the production. Much depends upon the kind of work that is being done and records of this kind must be made to suit the particular condition involved. It is a good idea to include on the card index of machines such data as the date when the machine was purchased, the equipment that goes with the machine, general data regarding its capacity, condition of the machine and when it was last overhauled or inspected, together with any other matters of importance which will be of assistance to the engineering department when referring to the card.

Method of Making Factory Layouts

When a layout of machine tools in a factory is to be made it is essential that a list of operations together with the routing of the work should be furnished to the plant engineer in order that he may arrange the machines so that the work will go through the shop in a regular and orderly manner. With the operation sheets as a basis, the routing of the work is predetermined and machines can be arranged suitably without great difficulty. It is customary in preparing for work of this kind to make a brown paper layout of the factory showing location of all posts, pillars or other obstructions throughout the factory. This layout is made to a suitable scale according to the size of the factory. The various machine tools that are to be used are laid out in plan according to their outside dimensions. These are made to the same scale as the factory layout and are drawn up on cardboard and then cut out. By using these cardboard forms it is easily possible to arrange the machines in miniature and change them about here and there until the best possible arrangement has been found. A pin is stuck through the center of the cardboard form and fastened on the factory layout. Fig. 3 shows the general appearance of a portion of a factory with cardboard forms in their correct position. A layout of this kind often takes considerable time in order to obtain an arrangement which will give the best results. The superintendent, factory foremen, production superintendent and tool engineer frequently sit in a conference and make suggestions regarding arrangements. The position of line shafting and arrangement of motors for group drive are often considered at the same time.

After this layout has been approved, a draftsman traces the outline of the machine on the brown paper drawing, using the cut-out forms as a guide. The forms are then removed and a tracing is made of the whole layout. From this tracing the millwright works when placing machines in position. In many cases it is possible to put dimensions on the factory layout to show the positions of the various machines; this is more satisfactory than to allow the millwright to use a scale on the drawings. In the example shown the machines marked *A* are turret lathes, which are set at an angle in order to allow for the use of bar stock. *B* indicates the positions of lathes, *D* drill presses and *MM* milling machines. The positions of the benches are also shown and a group of shapers is marked *S*.

Spacing Around Machine.

One of the important points in connection with making a factory layout is the allowance of sufficient space around the machine so that the workman will have plenty of room, not only for himself but also for the work in process. Fig. 4 shows a diagram representing a group of machines showing the positions of the operators and the space required around the various machines. Several points must be considered in allowing space enough so that there will be no congestion. First, the operator must have room enough to get around the machine without approaching too closely to another machine or another operator and thus interfering with the other man's work or running into trouble by approaching too closely to moving parts of another machine. Engine lathes must be so spaced that the operator can change the gears at the end of the lathe without difficulty and he may also be obliged to get around back of the machine in certain cases so that it is always advisable to allow sufficient space for this also. Second, the piling up of stock around a machine is inclined to cause trouble unless provision is made for the purpose, hence on any kind of a machine which is producing work even in small quantities there should be places provided for "tote" boxes or other carriers or holders which will be used in the conveying of the work from one department to another. Third, the various movements of the machine must be considered and sufficient space left around it so that even when in the extreme position there will be sufficient room for an operator to work or for "tote" boxes to be stacked. In the example shown *A* represents the position of the engine lathe, *B* the operator and *C* the distance required between the machines. *D* shows a couple of milling machines and the dotted lines *E* show the amount of space necessary on all sides of them.

The Operator's Requirements

This same procedure should be followed out with all classes of machines, always keeping in mind the safety of the operator, his convenience in handling the machine, the material which is being handled and a place for it both before and after machining, and the necessity for space around the machine so that any adjustments which may be required can be easily made without interfering with any operator. The engineer who lays out the factory must have a considerable knowledge of the working of machine tools and the requirements of the operators. In an old shop where the line shafting is completely installed, when it is necessary to use this shop on a different kind of production than that for which it was originally intended, the position of the line shafting may be a considerable factor in determining the placing of machines. It must be remembered, however, that modern methods may require changes in line shaft positions and although the cost may be considerable the production will be improved if up-to-date methods are used.

(Continued in next week's issue)

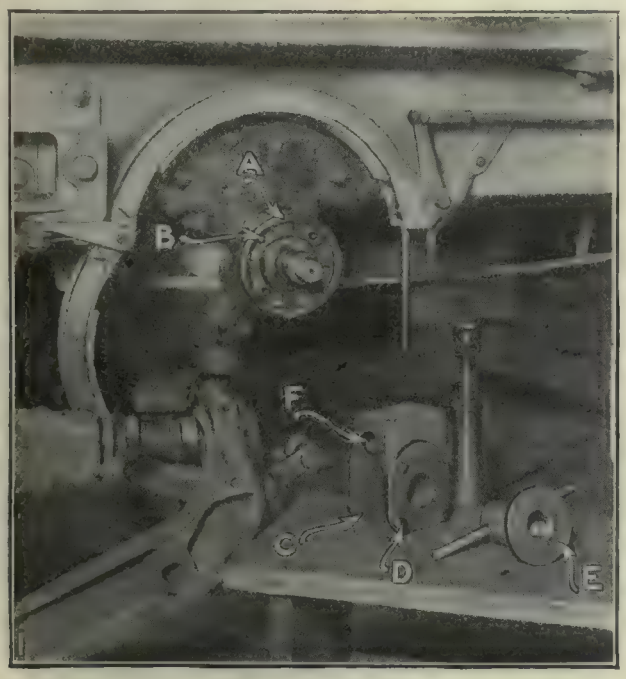
Automotive Service Methods and Equipment

VI. Tools in Use for Servicing the Mack Truck—Disassembling the Jack Shaft—Service Operations in a New York Taxicab Station

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

THE New York service plant of the International Motor Truck Co., builder of Mack Trucks, is well equipped with tools for service work, most of which were made in the plant. A number of these are described and illustrated herewith.

In Fig. 1 is shown a jackshaft and its retaining collar and the tools with which both shaft and collar are removed from the chassis, when it becomes necessary that they be disassembled. In the jackshaft retaining collar *A* are drilled four blind holes *B*, all being drilled on the same radius and equi-distant from each other. In the block *C* are four pins *D* which fit into these holes. To disassemble the jackshaft, this block is slipped over the shaft so that the four pins fit into their respective holes, the shaft projecting through the hole in the center of the block. The piece *E* is threaded inside so that it can be screwed on to the shaft, which is done. Then a bar is put through the hole *F* and block, shaft, collar and bearing are screwed out of the bearing hanger.



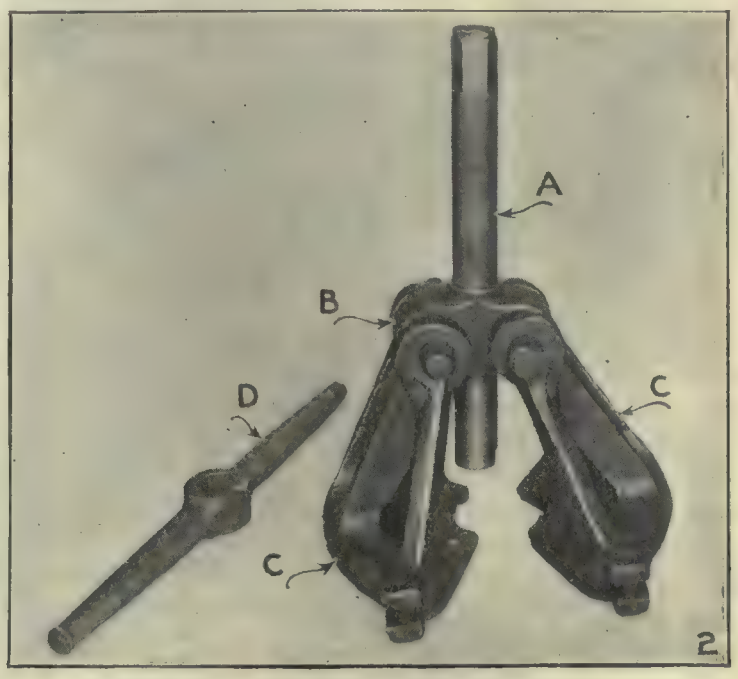


FIG. 1. END OF JACKSHAFT AND RETAINING COLLAR, WITH TOOLS FOR DISASSEMBLING.
FIG. 2. JACKSHAFT SPROCKET PULLER

A tool for pulling the jackshaft sprocket and brake drum is shown in Fig. 2. This consists of a threaded pin *A*, the piece *B* through which the pin is screwed, and the parts *C* which are hinged to the piece *B*. The handle *D* is used for turning the pin. The operation of the tool is shown in Fig. 3. Here the end of the pin *A* is placed against the end of the jackshaft and the two parts *C* engage the back side of the jackshaft sprocket. Then when the pin is turned, as shown in Fig. 3, the sprocket is pulled from the shaft, bringing with it the hub-end drum. This tool is very heavy and would undoubtedly be capable of pulling from 6 to 10 tons in the manner described.

A variety of "home-made" tools is shown in Fig. 4. The piece shown at *A* is a tool for seating bearing shells into the bearings and caps while they are being fitted. The piece *a* which has the same outside diameter as that of a crankshaft sets down into the bearing while it is being fitted to the cap.

The tool is long enough so that the studs pass the ends of the bearing and through the block *b*. Thus, when the nuts are pulled up on these two studs, the bearing shell is drawn tightly into its seat. At *B* is a piece which is clamped by bolts through the two holes shown, to the water-jacket cap of a motor so that the motor may be swung from an overhead trolley. A similar tool is shown at *E*, excepting that this eyebolt screws into the valve cap hole. A tool for pulling the camshaft gear is shown at *D*. The three long bolts screw into the three tapped holes in the camshaft gear and the end of the bolt centers in the end of the camshaft. Thus, when the bolt is screwed into the piece the gear is pulled off.

The rings *F* and *G* are test gages for fitting piston rings, the different sizes being for two different sizes of rings. Each gage is turned from solid steel and each is counterbored the depth of a ring and just large enough so that when a ring has been properly fitted, it will just fit into the counterbore. This eliminates the necessity of trying the rings in a motor cylinder while fitting them. At *H* is shown a tool for assembling connecting rod bearings to the rods. The part *a*, being cylindrical, seats into the bearing shell. The two screws shown are screwed against the back side of the section, thus pulling the bearing shell firmly into its seat. A similar tool is shown at *C*.

The crankshaft in a Mack truck motor is 3 in. in

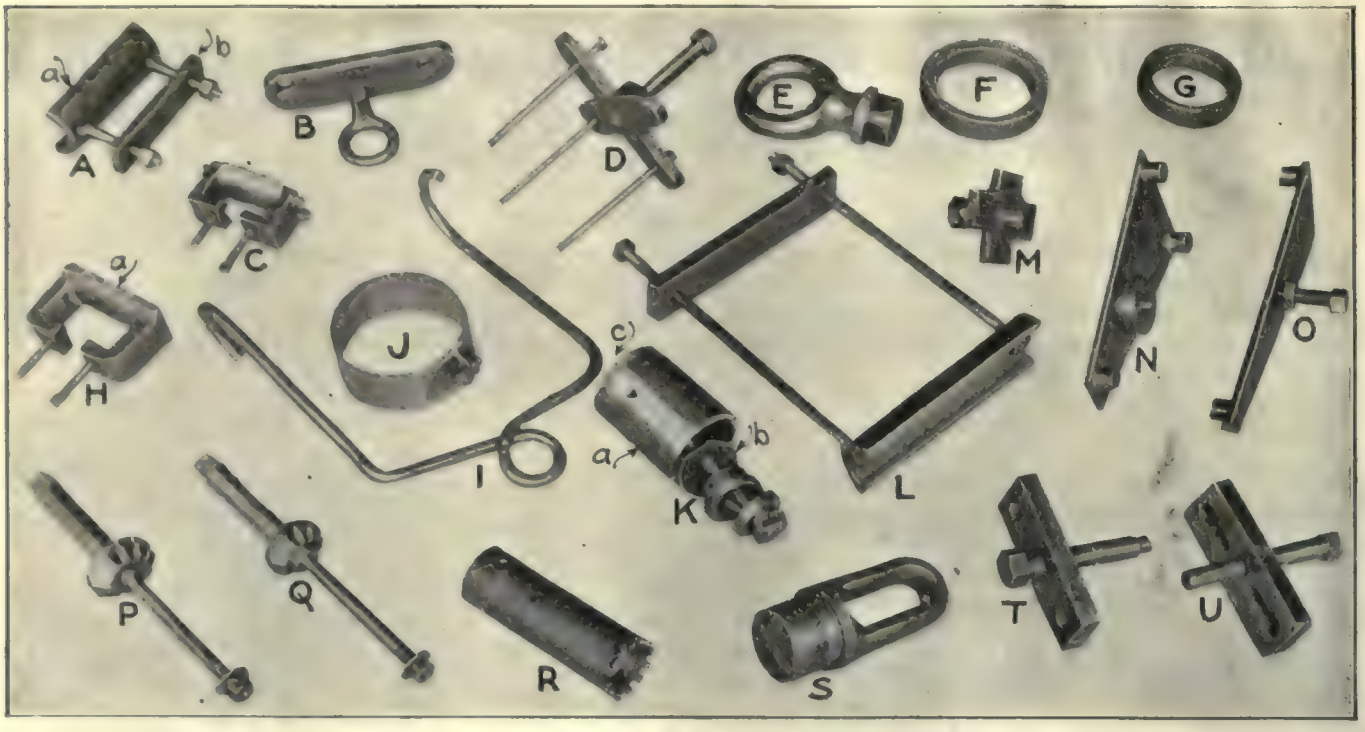


FIG. 4. TOOLS FOR USE IN SERVICING MACK TRUCKS

diameter at the bearings. Consequently the task of lifting it in and out as it is being fitted to the crankcase is rather laborious. To assist the workmen in this operation, a cable is arranged over two pulleys so that a counterbalance can be fastened at one end and the other end used to lift the crankshaft with the aid of the hook shown at *I*. The ring shown at *J* is clamped around the piston rings after they have been assembled to the connecting rod, so that the rod and rings can be inserted into the cylinder. This clamp compresses the rings as required, but the clamp is just large enough so that it will not enter the cylinder, hence as the piston and rings slide into the cylinder, the clamp is left behind.

The tool shown at *K* is for pulling the camshaft bushing from the crankcase. The cylinder *a* is large enough so that the bushing will very easily slip through it. The ring *b* is seated against the inner end of the bushing and the bolt run through it and out through the cylinder *a*, which rests endwise against the outside of the crankcase, the end of the cylinder encircling the end of the bushing. Then when the nut *c* is tightened, the bushing is drawn out of its seat in the crankcase into the cylinder *a*. Adaptions of this tool could be used in a variety of places. The tool *L* is for assembling large bearings to bearing caps, similar to the tools *A* and *H*. A tool for pulling a crankshaft gear from the shaft is shown at *M*. The action of this tool is similar to that of the camshaft gear puller *D*. Screws are put through the holes shown and screwed into holes in the gear. The end of the screw is placed into the center of the shaft so that the action of turning the screw draws the gear from the shaft.

When a crankshaft has to be fitted to new bearings, it is frequently necessary to do this while the camshaft is in place. As the crankshaft and camshaft gears are of the spiral variety, the action of turning the crankshaft over tends to work the camshaft out of its bearings. To avoid this, the piece *N* is clamped over the end of the camshaft. Screws are put through the

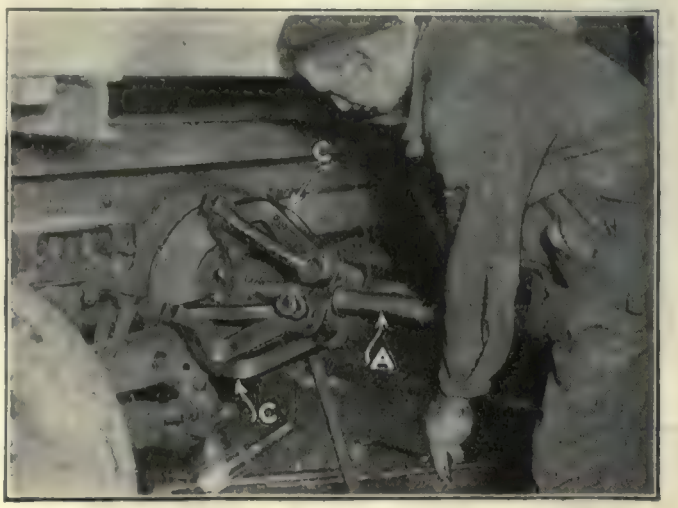


FIG. 3. PULLING OFF THE JACKSHAFT SPROCKET

three legs shown and screwed into three of the gear case cover holes, the thrust of the shaft being received on the end of a screw extending through the boss in the center of the piece. A similar piece, though for a different style of motor, is shown at *O*. The central screw is here shown in place.

At *P* and *Q* are shown two valve seating tools, the different sizes being for two different types of motors. The use of the tool is obvious. The point of interest here is that the washer at the lower end of the spindle is keyed to the spindle so that while the washer is loose and can slide up and down, when the tool is turned the washer turns with it. Thus the tool is fed into the work by tightening the nut with no fear of trouble due to the nut working either tight or loose.

The tool *R* is a special wrench for adjusting the motor cross-shaft roller bearings. This is made of a section of steel tubing of such diameter that when teeth are cut in one end as shown, these teeth will fit into corresponding holes or slots in the bearings. At *S* is shown another eyebolt for use in lifting motors. This is for

the same purpose as the tool *E*, screwing into a valve cap hole in the same manner. The difference in the sizes of the threads is accounted for by the difference in the design of the motors.

The pieces *T* and *U* are used to aid in assembling main bearing shells to their seats in the crankcase. Bolts are put through the two holes in the block and screwed into stud holes on opposite sides of the bearing. Then the bearing shell is put in and held in place by the central screw while the edges of the shell are being filed flush with the bearing. The two pieces are used in the same manner, except that while the tool *T* can be used on only one size of bearing, the slots in the piece *U* make it possible to use this on practically any of the bearings now in use.

The equipment described and illustrated below is in use in the service plant of the Black and White Taxicab Co. in New York City. The operator shown in Fig. 5 is welding steel on to the worn-out thread on the end of an axle shaft. After this is done, the end of the shaft is turned and threaded again. The keyway is also filled up and cut over again, using the equipment shown in Fig. 6. The attachment has a projection *A* which has a wide slot milled in it so that it will straddle the toolpost as shown. By putting a piece of steel in the toolpost, as shown at *B*, the attachment can be held securely. The handle *C* is used to raise and lower the piece, the action being similar to that of an ordinary slide-rest. It can also be swung at an angle, as shown, so that the keyway will be cut the same angle as that of the tapered end of the shaft. The cutter used is a $\frac{5}{16}$-in. side milling cutter, attached to a stub arbor, which is held in the spindle.



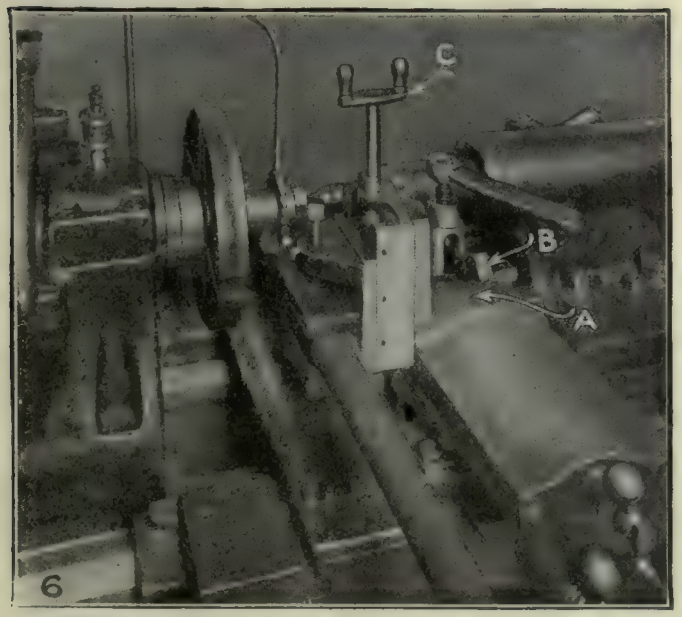
FIG. 5. WELDING METAL INTO THE WORN-OUT THREAD ON AN AXLE SHAFT



FIG. 8. REINFORCING A SIDE MEMBER

Another "home-made" tool is shown in Fig. 7. This is a fixture for holding differential carriers on the faceplate of a lathe in order to thread them for the drive shaft pinion adjusting nut. The fixture is made of two halves of Brown-Lipe clutch drums, welded together with the flanges out as shown. One flange is bolted to the faceplate and the other is drilled so that the differential carrier can be bolted to it. Two of the adjusting nuts are also shown in the photograph.

The use of the electric drill in service repair work is demonstrated in Fig. 8. Here one of the frame side members has broken so that it became necessary to weld the two pieces together again. To prevent further breakage at this point, a steel plate was also welded on, as shown, and the operator is further reinforcing the piece by drilling holes through the frame and plate, so that the plate can also be bolted on.



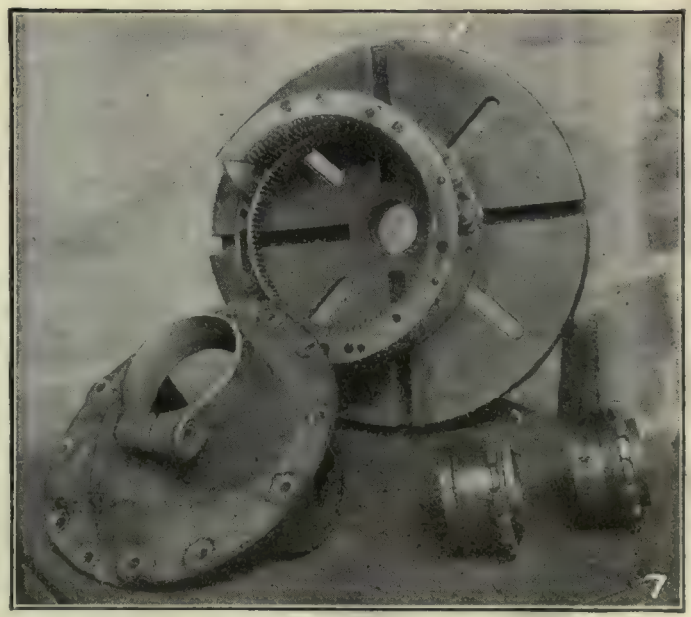


FIG. 6. MILLING KEYWAYS ON A LATHE. FIG. 7. A "HOME-MADE" LATHE FIXTURE

Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



XVIII. The Atchison, Topeka & Santa Fe Railway

Shops Widely Scattered—Shop Instructors Provided—Both School and Shop Work Given—Apprentice Board Handles Each Case—Course for Graduate Apprentices

THE Atchison, Topeka & Santa Fe Railway system offers the outstanding example of apprentice training in railroad shops. This railroad, as is well known, has a system traversing sparsely-settled and almost uninhabitable country, with no near-by roads, shops, or manufacturing plants from which to draw mechanics. Their scarcity in the face of rapidly expanding business in 1907 led the management to decide that if they could not hire the machinists needed they would train them. An apprentice system was forthwith inaugurated by the appointment of a supervisor of apprentices. At present in its thirty-six railroad shops scattered from Chicago to San Francisco over thirteen hundred apprentices are being trained in the following trades: Machinists, 795; boilermakers, 175; sheet metal workers, 79; car carpenters, 234; electricians, 12; blacksmiths, 22; painters, 13.

Shop Instructors

Under the direction of the general supervisor of the whole apprentice system in each center is found one or more shop instructor at the approximate ratio of one instructor to twenty-five apprentices. These instructors have general charge of the apprentices while at work, both instructing them and arranging their transfers from one type of work to another. It should be stated that in no case is the training and transfer of apprentices left to the shop foreman. It is believed that the use of shop instructors is a noteworthy feature of this railroad's apprentice program. They say of the instructor: "He is selected from the ranks, a man of character, skilled in his trade, patient in his teaching and capable of imparting his knowledge intelligently to the boys in his charge."

By the plan in force the shop instructor ranks along with the department foreman and both report to the same shop officer. If the foreman is temporarily absent, the instructor takes his place. If the shop is large enough to afford ample facilities, a fixed schedule is outlined for each apprentice to pursue. This is so arranged that he may complete the course in three years and six months, leaving six months for review or specializing.

In the midst of the shops, preferably in a separate building, there is fitted up a schoolroom for the supplementary instruction. The apprentices here assemble in classes at stated hours for instruction in mechanical and freehand drawing, practical shop arithmetic, mechanics, some descriptive geometry, algebra, etc. A treatise on the particular trade being taught, the materials used, and a little railroad business letter writing also form elements of the course. By a generous equipment of charts, working models and reading matter, different auxiliary devices are studied, such as injectors, lubricators, safety valves, and air brakes. The apprentice is also required to learn the company and Federal rules pertaining to his trade.

As this school is intended to be a center for the whole shop, where foremen, mechanics, officers, and clerks can and do obtain information and help upon any mechanical device or question, the school instructor must necessarily possess a good technical training in addition to an extended railroad and teaching experience.

Selection of Apprentices

Apprentices are selected in the order in which their applications are filed. Each boy applies to the local master mechanic or shop superintendent, who turns him over to the apprentice instructor for an examination. Educational qualifications of an applicant are not ironclad, as some of the applicants have had but limited opportunity and yet are considered good material if they are industrious, ambitious, and of good habits. If, on the other hand, plenty of opportunity has been available for schooling, the examination is rigid. In age the sixteen-year-old applicant seems to get the preference, except in California where a minimum age of eighteen is fixed by law. In freight-car work the minimum is, however, nineteen; but the course is only two and one-half years in length, instead of the four years required in other trades. The average

schooling for the machinist, boilermaker, and blacksmith is about eight and one-half to nine years, and in some places a little more; while the freight-car carpenters average in preparation between the sixth and seventh grades, and have probably been out of school since they were fourteen.

The pay of the apprentices is at the following rates per hour: 1st six-month period, 29 cents; 2nd period, 31½ cents; 3rd period, 34 cents; 4th period, 36½ cents; 5th period, 39 cents; 6th period, 41½ cents; 7th period, 46 cents; 8th period, 54 cents.

Apprentice Board

The successful fitting of apprenticeship into the production and maintenance work of the shop without friction is ascribed to the apprentice board, which is composed of the general foreman, department and gang foremen, the shop instructors and the school instructor. Every apprentice, either in person or by name is brought before this board every six months during his entire apprenticeship. Everything in reference to such matters as the progress, discipline and transfers of the apprentices are handled by recommendations from this board to the mechanical officer of the shop for his action, and finally by reference to the supervisor of apprentices.

This administrative plan is particularly stressed as essential to the successful working of the system, as it leads each shop officer to take a personal interest in the apprentices. It is also said to have "created an interest in the other shop employees by the foremen, a personal interest and desire upon the part of each foreman to treat all his men with that interest and feeling which begets loyalty and service." It would seem that this secondary function parallelled that of the foremen's school now found in so many progressive plants.

Special Course for Graduate Apprentices

Engineering college graduates are also admitted to a two-year course, one year on machines and one on the erecting floor. While in this course they are known as special apprentices.

A selected group is then made up of those who have made a satisfactory showing in this two-year course for college men, and of others from the regular apprentice graduates. These picked young men are put through a year's training for development into future company officers.

This year of training is made up as follows:

(1) The apprentices serve two months in the boiler shop, where they familiarize themselves with flues, patches, front end, Federal laws, etc., taking at the same time a course of reading and study on boilers and equipment.

(2) Following this, they enter the freight car shops to serve two months on trucks, bodies, air brakes and inspection, while at the same time pursuing a course of study of standards in car work.

(3) Their next appointment is for four months in a roundhouse, where they are taught the complete operation, from the time when an engine enters until it is headed out in good condition. This includes cleaning the fire, fueling, watering, repairing when necessary, and the "paper work" of despatching and handling reports. This is accompanied with the study of a text on locomotives.

(4) The traveling engineer next takes them in charge, teaching them to fire with a study of fuel economy, to operate the engine, make out the road foreman's report, and at the same time make a study of the individual parts of the machinery, such as lubricators and safety valves. Along with this they must be absorbing Federal and company rules for the inspection and care of locomotives.

(5) The last assignment is for one month each inspecting incoming and outgoing locomotives. This brings to a close the year's graduate apprentice course.

Every month each special apprentice must write a letter to the supervisor covering the work done and offering a criticism of shop methods when he can suggest some remedy. In each branch he must, in these letters, answer 150 questions bearing on the work.

Practical Knowledge the Result

While it is planned to be and considered a very difficult course, more than 80 per cent starting it complete it. It is advocated as providing the essential experience in the departments other than the one where experience through apprenticeship had already been gained. Thus, two months in the boilershop does not make a boilermaker, but it does provide knowledge essential to the future roundhouse or shop foreman.

To justify the apprentice system, the following figures were presented by the supervisor: 72 per cent of those graduated were still with the company; and 15 per cent had been appointed to some position of responsibility. For six years no mechanics have been employed other than through the apprentice route.

Apprentice wages are about one-third of journeymen's rates, while they produce about 75 per cent, on an average, of the amount accomplished by the adult workman. Much of the apparent profit, however, is absorbed in the increased and higher grade supervision, as well as in the somewhat greater amount of spoiled work, broken machinery, and general inconvenience attending the utilization of apprentices. The real profit comes through the building up of a superior group of responsible mechanics.



The Grinding Machine in the Railroad Shop

Advantages of Grinding for Finishing Parts to Size—Grinding Operations on Locomotive Parts—Increasing Efficiency of Motion Mechanism

BY FRANK A. STANLEY

ALTHOUGH the cylindrical grinding machine is used extensively in one type or another in the railroad shop toolroom, it has not as yet been adopted for general shop purposes to anything like the degree warranted by its usefulness as a time saving and accurate producer of various classes of work. The importance of the grinding machine as a piece of locomotive shop equipment makes it seem desirable that a brief article be devoted to some of its applications on engine parts. The following illustrations from different shops represent typical operations on cylindrical, internal and surface grinding machines.

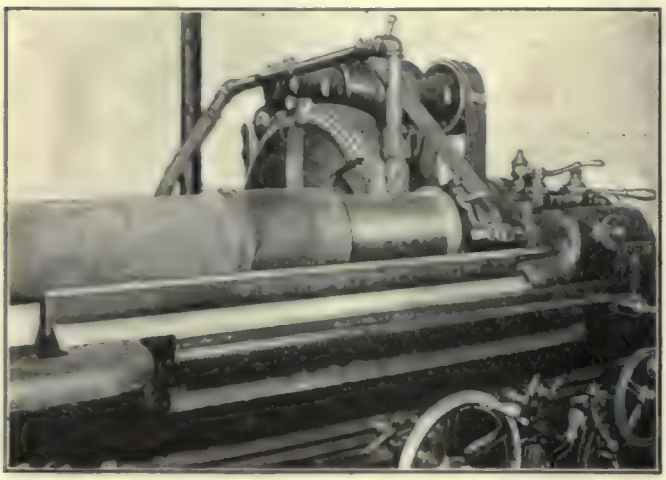
The halftone, Fig. 1, illustrates the grinding of an axle journal. Here the grinding wheel may be run across the straight portion of the journal and with suitable rounded corners on the wheel the fillets at the shoulders may be finished at the same time.

In grinding axles for wheel fits, the allowances for pressing on the wheels may be held to very close limits of accuracy. This is a marked advantage in that with a known diameter of wheel-bore, an exact allowance may be left in grinding the axle fit so that the axle will force into the wheel with the total pressure between the desired minimum and maximum figures. The same thing applies to crankpins and other press fits.

In Fig. 2 is illustrated the method of grinding a crankpin on a Norton plain grinding machine. This pin is 21 in. long and its diameters, of which there are four, run from 5 to 7 in. at the large end.

Ordinarily where such work is ground, it is unnecessary to hold the lathe turning operations closely to size or to give a particularly smooth finish with the lathe tool. The grinding wheel works satisfactorily on a roughly turned surface or even on a surface not turned at all. An allowance may be left in turning for removal by grinding amounting to $\frac{1}{32}$ in. or more under suitable conditions, and often this is exceeded. In other words the turning may be done very economically where the finishing is to be accomplished on the grinding machine, and once suitable allowances are established for removal by the abrasive wheel, the combination of lathe and grinding machine can be used most effectively.

Common practice with pins, axle journals, pistons and the like is to use a roller burnishing tool for finish-



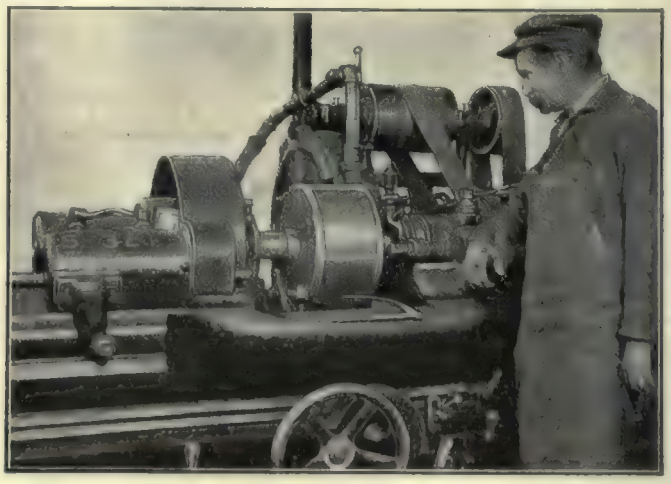
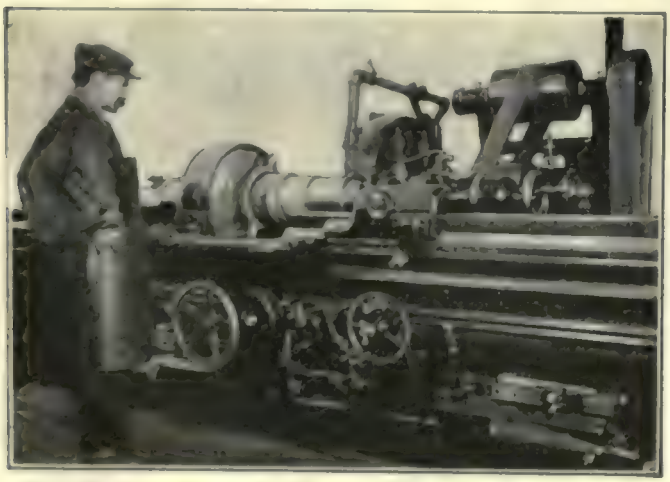


FIG. 1. FINISHING AN AXLE JOURNAL. FIG. 3. GRINDING PISTON RINGS



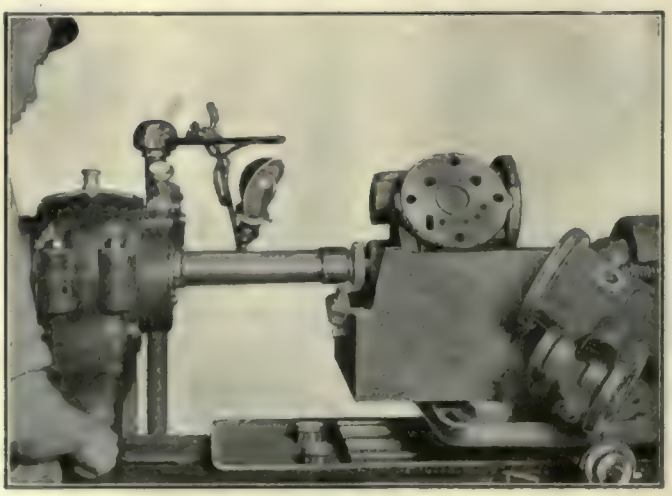


FIG. 2. GRINDING A CRANKPIN. FIG. 4. USING AN INTERNAL GRINDING MACHINE ON AIR BRAKE WORK

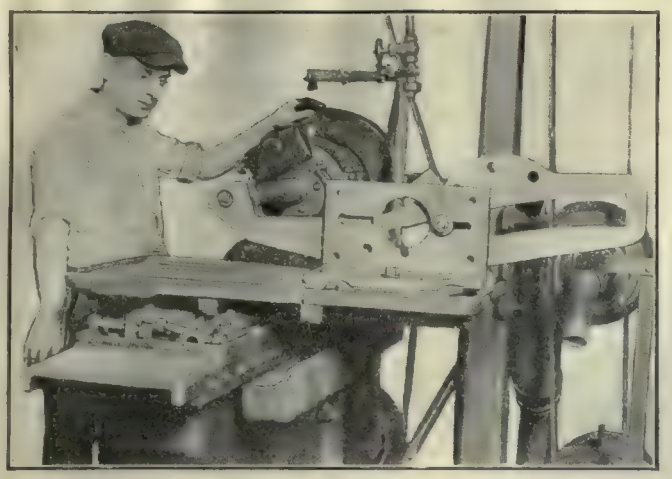


FIG. 5. THE INTERNAL GRINDING MACHINE ON LINK WORK

ing the surface, being adjudged by some authorities to be the best method of providing the desired finish and surface conditions for such work. It is maintained that the character of the surface thus produced is preferable for operating conditions, as a highly polished, tough surface is rolled down on the work, assuring smooth operation and long resistance to wear. On the other hand, even though the first condition of a crankpin, say, may have advantages due to rolling, the original surface is worn down in due course and when the job comes into the shop for re-turning it is usually impossible to refinish the pin except by the customary method of applying a crankpin turning device which does not ordinarily make use of a roll finish.

Rolling is necessarily somewhat slow, as the speed and feed must be within moderate limits. It is further maintained by advocates of grinding that any inequalities of the metal in the work, whether soft spots or extra hard portions, will cause the roller to sink into or ride over such places with corresponding irregularities in the finished piece.

The fact of the matter is that once a grinding machine is installed in a railroad shop, there are a multitude of jobs found that come naturally to the grinding machine, and even aside from pins, axles and the like, the machine is likely to be kept busy most of the time.

Another operation on the grinding machine, that of grinding piston valve rings, is shown in Fig. 3. The rings are held, a number at a time, on a special form of arbor made with two end flanges which, when the rings are centered over the fixture, are tightened by nuts on the through bolts in the flanges to draw them snugly against the rings and hold them for the grinding of the outer circumference.

This method of finishing rings gives uniform accuracy in the ring surfaces, making them clean, smooth and interchangeable. In some shops the rings are being finished on the sides or edges by surface grinding, an operation which is described at another point in this article.

A number of operations as done in different shops on the Heald internal grinding machine are illustrated in the halftones which immediately follow. Thus Fig. 4 shows a grinding operation on an air brake part, using the Heald machine. The operation shown is that of finishing the hole in the bronze bushing which is pressed into the equalizing cylinder used in connection with air brakes. The diameter of the hole is 3½ in., the length 1½ in., the metal removed from the bore, 0.003 in.

A special holding fixture is here used with a pneumatic clamp. The production is over 100 pieces in 10 hours.

The grinding out of a small hole in the radius rod for the valve gear is also done on this machine, an extension quill being applied for the small wheel. The work is strapped against the face of a knee on the grinder table and the overhanging end of the long bar is supported by a chain. The hole is ground dead true with

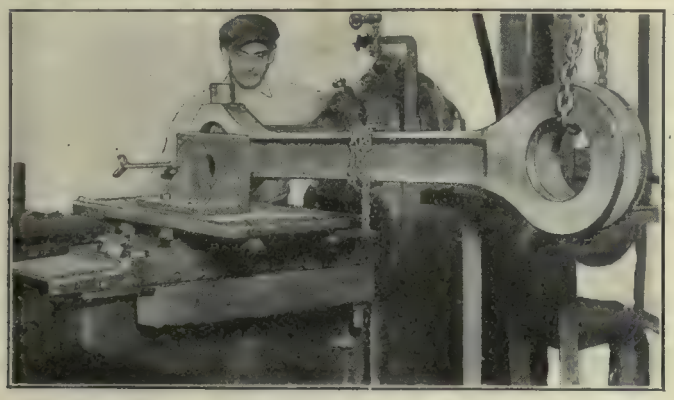


FIG. 6. TRUING UP A HOLE IN A SIDE ROD.

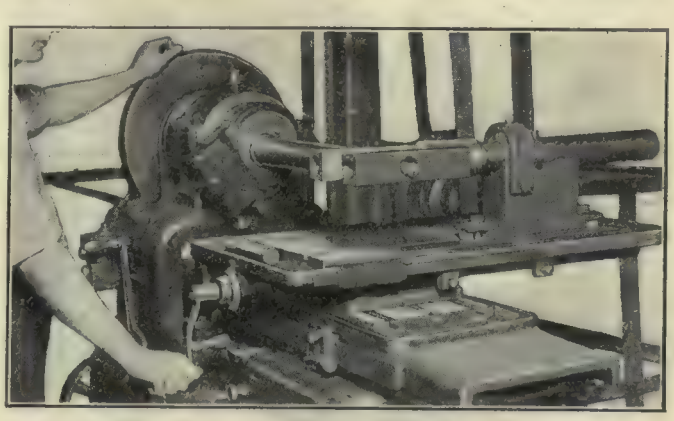


FIG. 8. ANOTHER INTERNAL GRINDING JOB

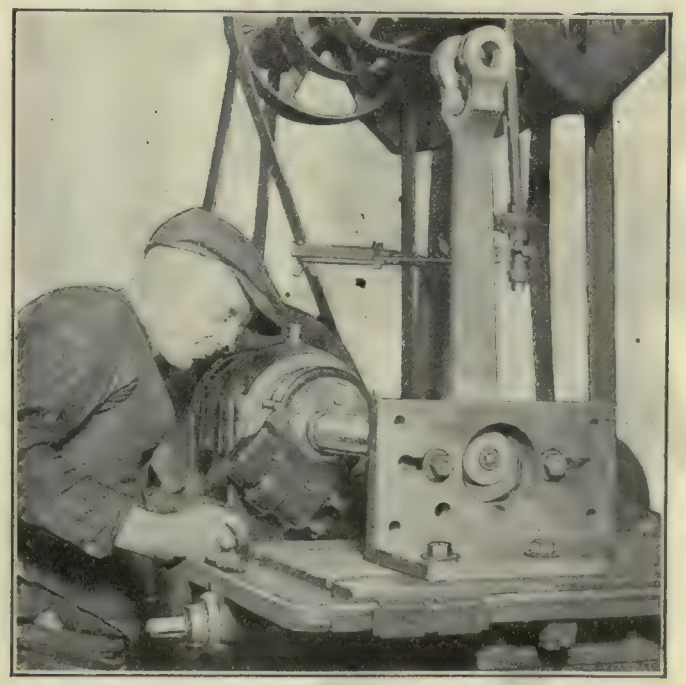


FIG. 7. GRINDING THE BUSHING END OF A VALVE-GEAR LINK

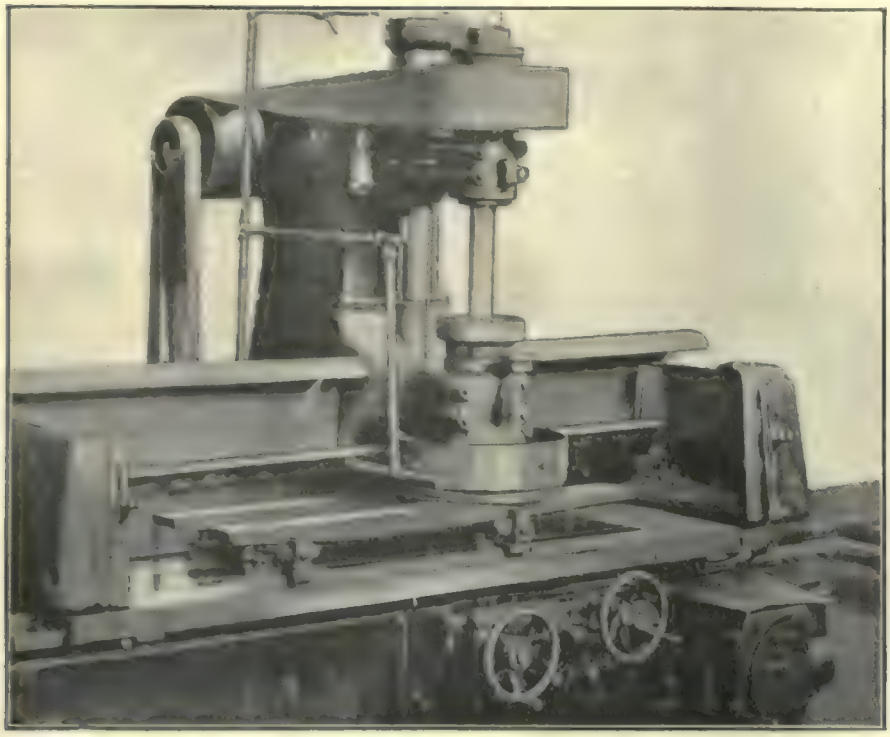


FIG. 9. FINISHING GUIDES ON A SURFACE-GRINDING MACHINE

the face of the work and is held to size by testing with a plug gage.

The link in Fig. 5 is secured by straps and bolts to the face of the angle plate on the grinder table while the hole in the hardened bushing is ground out to diameter. This assures a perfectly true and square job.



FIG. 10. FINISHING CRANKPIN WASHERS ON A VERTICAL SURFACE GRINDER

A side rod is shown in Fig. 6 clamped in the same way to the knee on the table and supported at the outer end by a chain sling as indicated. The old bushing has been pressed out of the rod, and before pressing in a new bushing the hole in the rod is trued up by the internal grinding process. This gives a true cylindrical hole for the new bushing and assures a perfect fit, thus giving added life in service to the bushing.

The work in Fig. 7 is one of the members of a Walschaert valve gear and the job is the grinding out of the bushing end of the rod. This operation gives a straight round hole and provides for a perfect pin bearing, thus increasing the period of operation on the road before overhauling.

Another internal grinding operation on motion work is shown in Fig. 8. Here the work is held in a V-block and the small hole ground with a wheel used with a special extension that is provided for small diameters of work.

The surface grinding machine is used in various railroad shops for such work as the finishing of side rods, slide valves, piston and valve rings, valve faces, crosshead guide bars, and similar parts. An illustration of an operation on guides on a Pratt & Whitney vertical spindle grinding machine is presented in Fig. 9. Special fixtures are applied to the table to hold the work and two bars are carried at once under the wheel, which is sufficiently large in diameter to cover the bearing faces of both bars.

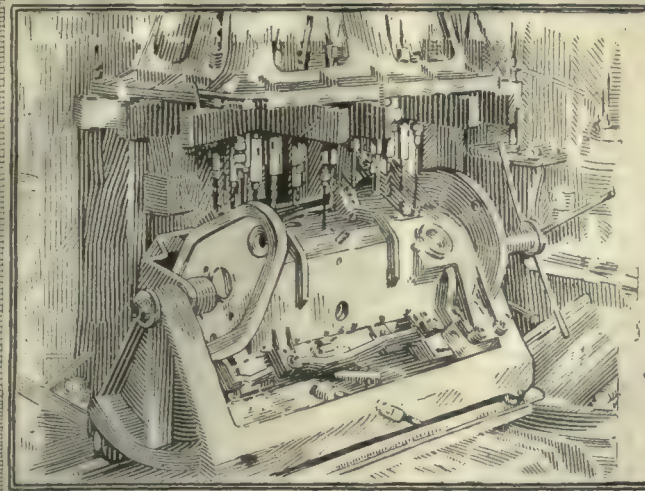
Various other parts can be economically surface ground upon the same machine. Slide valves can be ground to clean parallel on this machine at the rate of five per hour, the width of the casting being 12½ in. Piston rings 10 in. in diameter are ground on the face on the rotary table at the rate of 30 per hour. The ring is held to $\frac{3}{8}$ in. or 0.003 inch.

A Blanchard surface grinding machine is shown in Fig. 10, grinding the faces of washers for driving wheel crankpins. This view shows in the foreground a number of piston rings ready for surface grinding of the sides to thickness. The work on the table is held by the magnetic chuck and revolves with the table under the wheel. The wheel spindle and table are electrically driven.

In cutting off the rings in the vertical boring mill, the tools are so spaced in their holding blocks as to leave the ring $\frac{1}{64}$ in. over thickness and this amount is removed in the surface grinding machine.

Siam Can Use Steel Plows

There is an excellent opportunity for the introduction of modern steel plows into Siam for use in preparing rice lands, according to a report from James P. Davis, consul at Bangkok. Rice growing is the greatest industry of the country, furnishing the food staple for the entire population and 1,000,000 tons or more annually for export. The primitive wooden plow is still being used in most places for preparing the soil for this immense crop.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
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Boring Tools for Turret Lathe Use—Working Conditions—Principles of Boring—Position and Shape of Cutting Tools—Fastening of Tools in Holders

TRUE boring is a generating operation in which a single-point tool revolves about a center in alignment with the hole to be bored. In turret lathe work the tool does not revolve but the work does, which produces a similar effect. If it were possible to support both tool and work so that each were absolutely rigid and without spring, the hole produced would be perfectly true and of exact size as determined by the distance from the center to the cutting point of the boring tool. There is more or less spring to the tool and possibly a small amount in the work itself, so that bored sizes in production work are likely to vary a trifle, making it necessary to depend on a reamer for sizing the hole.

A point of importance in boring is the fact that a generated hole is true and concentric with the center of rotation of the work. A bored hole generated by a single-point tool is the first step in the accurate sizing of a concentric hole. A boring tool is often preceded by a twist drill, core drill, or cutter head, these being used to remove stock preparatory to the boring operation.

The method used in boring is determined to a great extent by the shape of the hole in its rough state. A number of conditions are encountered, and each may require a slightly different method in order to produce a hole which will be true and concentric. Fig. 299 illustrates a number of these conditions found in castings and forgings. The example *A* illustrates a short, straight cored hole of small diameter; *B* is a long straight cored hole. The holes *A* and *B* both extend entirely through the casting, but in the example *C* is a "blind" hole, which does not run entirely through.

The treatment in boring these three castings would be considerably different. In the first case *A* a short and rigid boring tool could be used and good results obtained. In the case *B*, a much longer tool would be required, and several cuts would undoubtedly be necessary in order to produce an accurate hole. If the holes *A* and *B* are approximately 1 in. in diameter when finished, the cored hole would probably be about $\frac{13}{16}$ to $\frac{7}{8}$ in. in diameter. Therefore, it would be possible to use a boring bar with a pilot which would give sufficient support to obviate excessive spring in the tool. If the hole is much smaller than the size mentioned, it would be difficult to use a piloted tool, hence the operation of boring would be slower and less accurate. In the case *C* the hole is "blind," so that no pilot can be used and the work must necessarily be produced by an unsupported tool.

In the example *D* the hole is cored and cylindrical, and there is a pocket at *E* on one side of the casting. This condition is frequently found where the boring operation is an interrupted cut. This intermittent pressure on the tool is severe, and both bar and tool should be made heavy enough to withstand the sudden strains.

In the example *F* there are two holes to be bored at *G* and *H*, and the difference in the finished diameters is only $\frac{1}{32}$ in. If this is a cored hole arranged to be bored with a boring bar having two cutters, the first cutter will have to bore the entire distance through the piece, as the difference in diameters is so slight. The second tool, which bores the diameter *H* will really be a finishing tool, as it will not be required to encounter the scale on the inside of the cored hole. The first tool, therefore, will naturally wear much faster than the second, and as its service is much more severe it should be proportioned accordingly.

In the example *K*, three diameters are to be bored at *L*, *M* and *N*, and the portion *O* must be finished to a large radius. A bar having multiple cutters would be needed for this work, but the mistake should not be made of using a "round-nose" tool for the roughing cut at *O*. Round-nose tools for boring cuts require considerably more power, as they come in contact with more surface and remove a wider chip.

The example shown at *P* is a large diameter which must be bored concentric with the hole *Q* and the recess *R*. Surfaces of this kind are usually handled by a boring bar in combination with a cutter head. The example *S* is a piece of work of large diameter having four shallow concentric holes, *T*, *U*, *V* and *W*. Holes of this variety can also be most conveniently handled by means of a combination of a bar and cutter head.

The example *X* is a combination of a straight and a taper hole. There are two ways of machining work

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of this kind: The straight hole can be bored with a piloted bar, and the tapered portion roughed and finished by means of taper stepped reamers; or, both straight and taper holes can be bored with single-point tools, the taper being generated by a special taper-boring tool. The example *Y* is a plain tapered hole, while that at *Z* is a tapered hole relieved by a cored portion as indicated. Tapered holes require special treatment, which will be taken up later.

Cored holes which are to be bored and reamed are seldom machined properly. A cored hole will not usually run true if the work is held by the outside diameter, unless it is indicated and trued up. When there is only one casting to be machined this method can be used, but in quantity production it is neither practical nor desirable.

In Fig. 300 is shown in diagrammatic from both correct and incorrect methods of generating a hole by

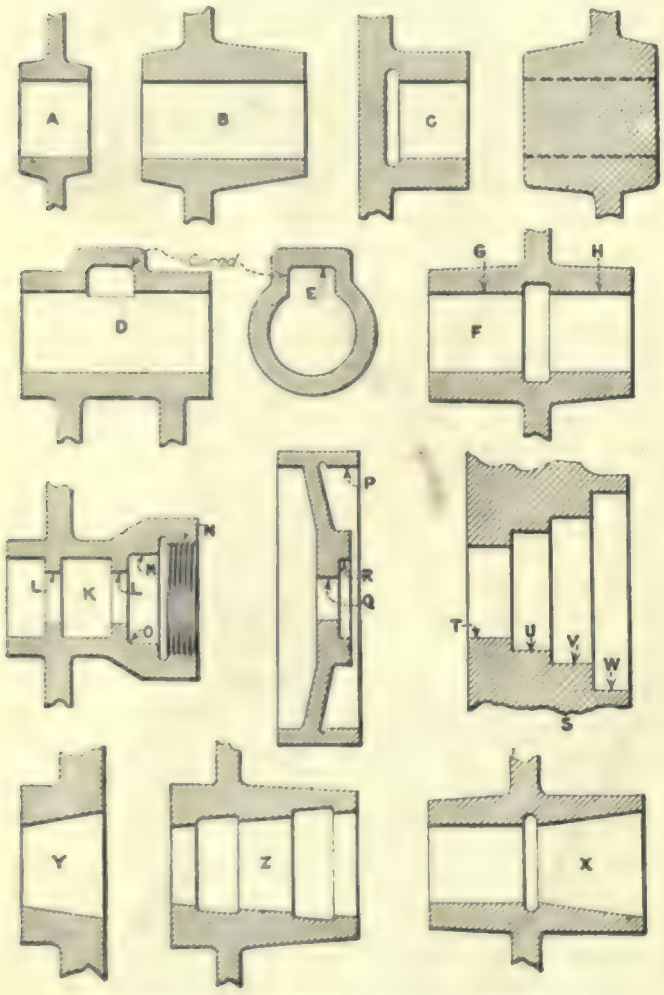


FIG. 299. EXAMPLES OF WORK REQUIRING BORING OPERATIONS

means of boring. In the example, the hole *A* is cored, and will therefore doubtless run out of true slightly when the work is set up on the machine. The core drill *B*, if used first, will naturally follow the cored hole and produce a finished hole which is eccentric to the center of rotation to some extent at least. If the next tool used is a boring tool *C*, it will naturally follow the previous hole, but will cut more on one side than on the other, thus tending to true up the hole. The result here will be a round hole slightly eccentric. In finishing the work by the use of a reamer, this tool will undoubtedly follow the bored hole, so that the completed work will be untrue and slightly eccentric. The amount of eccentricity will depend to a great extent upon how nearly the original cored hole runs true with the outside of the work. Many shops use this method and are, therefore, obliged to true up work after the operation.

Work done in this way is started incorrectly, and as a consequence the final hole is inaccurate. It is just as easy to do it right as it is to do it wrong, and a correct principle will lead to gratifying results. The correct method of sizing a hole of this sort is shown

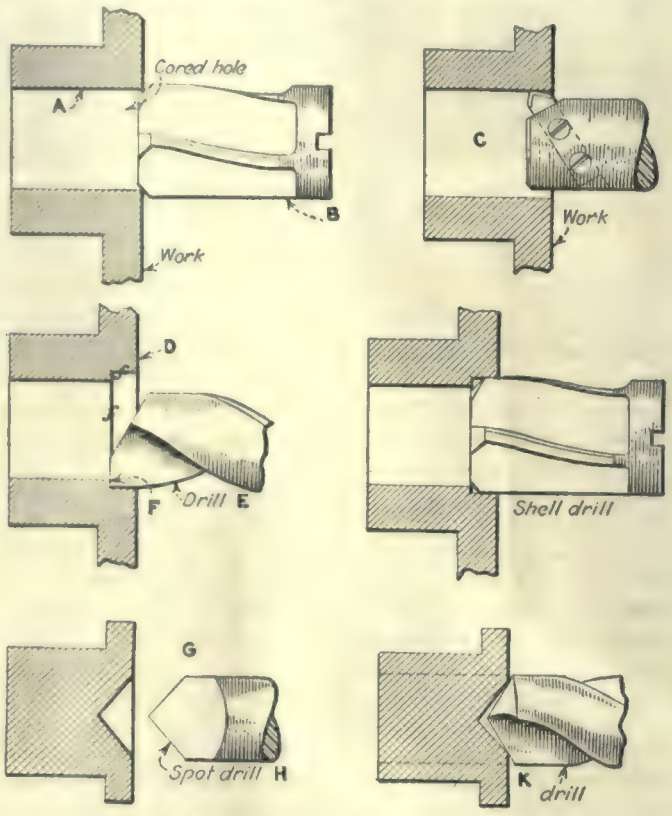


FIG. 300. METHODS OF BORING A HOLE

at *D*. The first tool *E* may be a short twist drill ground away for clearance and made square on one lip. The size of this drill should be a few thousands of an inch smaller than the core drill which is to be used. If the hole is generated a short distance so that it appears as shown at *F*, this portion will undoubtedly be true with the center of rotation of the work. The core drill, or shell drill, can then be used, and as it is started accurately, it will not be likely to run out of true to a great extent while passing through the work, and is not influenced greatly by the eccentricity of the core. By following this tool with a boring tool, the hole is trued up by a generating action, so that the final floating reamer will produce a true and concentric hole.

In the example *G* the work is a solid forging which is to be drilled, bored and reamed to size. Work of this kind should be spotted with a short, rigid spotting tool similar to that shown at *H*. This tool produces a true center in the work, so that it can be followed by a standard twist drill like that shown at *K*. The angle of the spotting drill should be slightly greater than that of the twist drill, so that the lips of the latter will start to cut first in the hole as shown in the example *L*. The drill will then start true, and the cutting will be much better. After the hole is drilled, it may

be followed by a boring tool and reamer, as in the preceding example.

The shape and position of the boring tools are both important factors in the generation of a true hole. Fig. 301 shows a cored hole *A*, which is to be bored by the tool *B*. The hole is blind so that no pilot can be used, and the bar will therefore be more or less flexible, depending upon the size and depth of the hole. If the tool is made so that the nose or cutting point is shaped as shown at *C*, the flexibility of the bar and the angle of the tool will tend to make it deflect and to take a position as shown exaggerated at *D*. This action is caused by the tool not getting under the "scale," but riding upon it, as indicated. The tool will be dulled very rapidly by the abrasive action of the scale, and the results will be very unsatisfactory.

In designing a boring tool for a hole of this kind, the cutting point of the tool should be shaped as shown

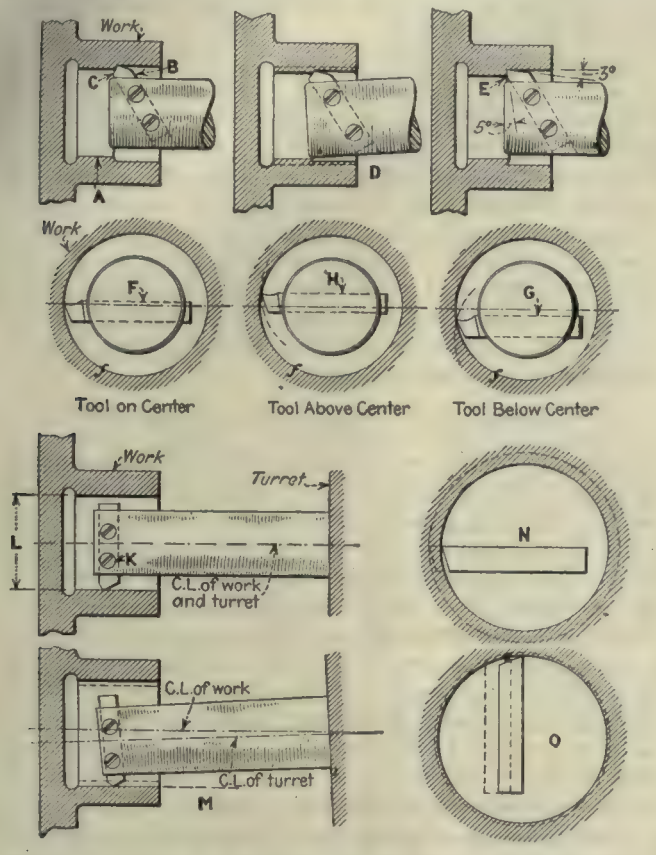


FIG. 301. TOOL POSITIONS IN BORING OPERATIONS

at *E*. When made in this way there is no tendency for the tool to ride on the scale; and it will therefore keep the position indicated, will not dull up rapidly nor deflect, and consequently will produce a much better hole. When piloted bars are used, it is not necessary to take as much care to avoid a condition of this kind, because the bar is supported and cannot deflect. The point of the boring tool should be as blunt as possible, and still retain a sufficient cutting edge. The metal should be allowed to remain behind the cutting point and should not be ground away any more than is necessary for clearance. Generous sizes of tools with plenty of metal at the cutting point carry away heat more rapidly and stand up better for production work.

A point of importance is the position of the tool with respect to the center of the work. If placed directly on center, as shown at *F*, any slight deflection of the tool causes it to dig into the work. If placed a trifle below center, as shown at *G*, this action is still more apparent. If placed slightly above center as shown at *H*, any deflection caused by the pressure of the cut does not tend to throw the tool into the work. Hence, there is no chance for chatter from this cause. Boring tools are usually placed directly on center; but it is better to position them a very small amount above it, say, from $\frac{1}{32}$ to $\frac{1}{16}$ in., depending somewhat on the diameter of the work being bored. This practice is not universally followed, but it will be found an advantage.

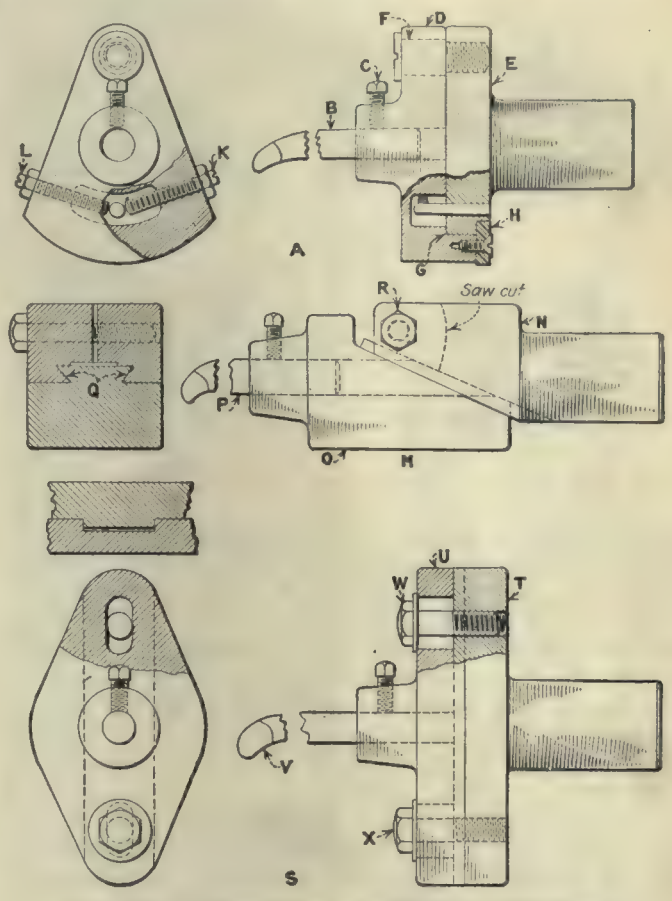


FIG. 302. ADJUSTABLE BORING TOOLHOLDERS

Another point of importance is the position of the tool in a horizontal or vertical plane. The turret does not always index exactly the same, and any variation in the index position is mulitiplied at the end of a long bar. If the tool is placed in a horizontal plane, as shown at *K*, the diameter of the hole *L* will theoretically be produced to a size corresponding with the amount of fluctuation in the position of the bar. Errors in indexing when the tool is placed in this position will frequently cause a variation in the work of from 0.005 to 0.010 in. This point is clearly brought out by the diagram at *M*.

The end view at *N* indicates the variations in diameter which would be caused if the tool were set in a horizontal plane and if the turret did not index correctly. The dotted lines show the size of hole which would be produced under these conditions. It is much better to place the tools in a vertical position as shown at *O*. When they are so placed the cutter variation caused by errors in the indexing may be considerable, and yet the diameter will be changed only a small amount, as indicated by the dotted lines.

It is often desirable to use an adjustable holder for

a boring tool which is required on small work. The principal use of holders of this kind is for automatic screw machine work, or for any other kind of work

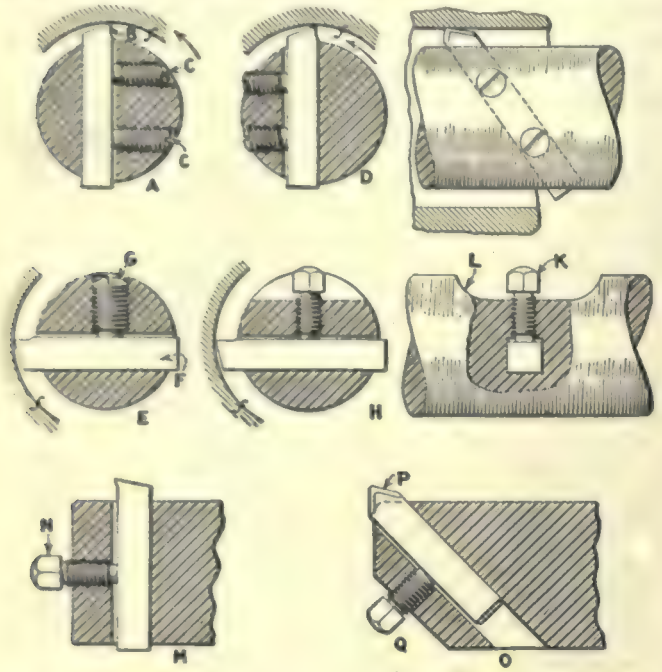


FIG. 303. HOLDING ROUND OR SQUARE BORING TOOLS

in which a forged boring tool not adjustable in itself is used. Several examples of holders for this purpose are shown in Fig. 302. The example at *A* shows a forged tool *B* held by means of a setscrew *C* in a movable member *D*. This member is fastened to a holder *E* which fits the turret of the machine. The member *D* is pivoted on a shouldered screw *F*, so that it can be adjusted to either side of the center line of the turret. It is fitted at *G* and gibbed at *H*, so that there is no lost motion.

In adjusting the tool *B*, the setscrews at *K* and *L* are operated to throw the tool to one side or the other of the center, as many be required. The tool itself

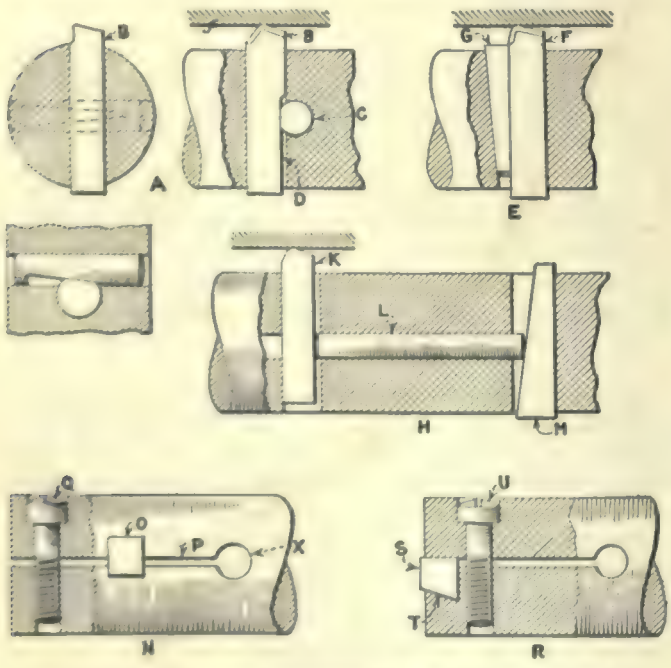


FIG. 304. OTHER METHODS OF HOLDING TOOLS

may be held in a vertical or horizontal position, and it is easily possible to adjust it for varying diameters within its capacity. This design is manufactured in more or less modified form by several machine tool builders specializing in turret lathe work. It would be easily possible to use this holder on the cross-slide of an engine lathe or even in the tailstock by providing a suitable bracket or a taper shank.

Another type of adjustable holder is shown at *M*. It is somewhat out of the ordinary in general design. The shank *N* is designed to fit the turret of the machine and is dovetailed, as shown in the sectional view. The holder *O* contains the tool *P*, which is held by the setscrew as indicated. The dovetailed portion *Q* fits the dovetail in the holder, and adjustments are made by sliding it backward or forward along the taper. When the desired position has been reached the screw *R* is tightened, thus holding the tool firmly. The end of the shank is slotted as indicated, in order to provide for the binding action.

Another type of adjustable boring toolholder is shown at *S*. This device consists of a holder *T* on which is mounted a member *U*, fitted to slide vertically on the holder. The tool *V* is held in the usual manner by a setscrew, and adjustments are made by sliding the movable member up and down, and then tightening the screws at *W* and *X* when the desired position has been reached. In general it is not necessary to provide holders of this sort with very much adjustment when they are to be used for screw machine work. From $\frac{1}{16}$ to $\frac{1}{8}$ in. is usually sufficient, although more can be provided to suit special cases.

Fastening Tools in Holders

Tools for boring bars may be either round or square. If made from round stock they ordinarily fit the hole easily; while if square, bright, drawn stock is used, they do not generally fit closely, but are more or less loose. For a factory using a comparatively small number of boring bars in its production work, the round shape is to be preferred, because it is easier to make a round hole in a bar than it is to make one which is rectangular or square. Square tools have some advantages over those of a round section, but if they are to be adopted as a standard a set of broaches of various sizes must be made up, so that the holes can be put in the bars cleanly and without trouble.

Tools are held in boring bars in various ways, depending upon the type of cutter, its size and general shape. The essential points in holding are rigidity and convenience of adjustment. The thrust of the cut is to be taken against the solid portion of the bar; but in actual practice convenience often requires the setscrews be placed in such a way that the thrust comes against the screws themselves.

In Fig. 303 is shown a sectional view of a boring bar at *A*. The tool *B* is so placed in the bar that the cutting edge is in line with the center of the bar. The tool is held in place by two setscrews, shown at *C*. The thrust of the cut is in the direction indicated by the arrows, but if this bar were to be used on turret lathe work, the screws placed as shown would be at the rear of the machine, and the operator would not find it convenient to adjust them without going around behind the machine. In the example *D* the setscrews take the thrust of the cut, but if they are substantially made there will be no difficulty in this respect and the oper-

ator will find it much more convenient to make adjustments.

Incidentally, it may be stated that small setscrews with slotted heads should not be used for holding the cutter, because it is difficult to set them up tight enough to hold it, and also because the slots are apt to be broken or mutilated by long use. A hollow-head setscrew will be found an advantage in holding cutters and boring bars. If there is plenty of room, it is not objectionable to use a square-head setscrew. In the example shown at *E*, the tool *F* is held by a single screw *G*, but this method should be avoided and two screws used whenever possible. In the example *H* a square-head setscrew *K* is used. The bar is cut away at *L*, so that the setscrew will not project beyond the outside diameter of the bar.

A cutter which is placed close to the end of a boring bar may often be held as shown at *M*, when the bar is not piloted. The setscrew *N* is placed in the end of the bar as indicated. If the size will permit, it is better to use two screws. Many cases are found when the cutter must project beyond the end of the bar itself. An example of this kind is shown at *O*, in which the tool *P* projects slightly. The method of holding in this case is by means of a setscrew *Q*, although here also two screws would undoubtedly be an advantage.

In holding tools in small bars or when space is limited, other means must be provided. Several examples of this kind are shown in Fig. 304. One of the best known of these methods is shown at *A*, in which the tool *B* is held in place by a straight pin *C*, one side of which has been milled to a taper. The tool is flatted at *D*, and the pin driven firmly into place against this flat. This method is used to a great extent in holding many kinds of cutters. The principal objection to its use is the difficulty of adjustment.

The method shown at *E* is very objectionable. Here the tool *F* is held in place by means of a wedge *G*. It is practically impossible to set a tool of this kind to a given diameter and hold it firmly, because the wedge *G* when set up always carries the cutter with it slightly, thus changing the setting. Another method employing the wedge principle is shown at *H*. In this case the tool *K* is clamped by means of the steel rod *L*, which is acted upon by the wedge *M*. There are certain cases where some arrangement of this sort may be found necessary.

Another method of holding a rectangular tool is shown at *N*. The tool *O* is close to the end of the bar and is of rectangular shape, as shown. The bar is slotted at *P*, and the screw *Q* is used as a pinch binder to draw the sides of the bar together, thus holding the tool securely. This arrangement may also be found very convenient at times. It is advisable to make the hole *X* of fairly large size in order to help the spring action.

In the example *R* the tool *S* is held so that it projects a trifle beyond the end of the bar. The tool is shaped so that it has a slight angle at *T* which fits a corresponding slot across the bar. As in the preceding case, the bar is slotted to allow for a pinch-binder screw at *U*. The advantage of this type is that the tool can be securely held either straight or at an angle, and also so that the cutting edge is at the end of the bar.

Specifications for Brass and Bronze Gears

The American Gear Manufacturers Association recommends the following specifications for brass and bronze gears:

For spur and bevel gears, hard cast bronze, S. A. E. No. 62 of the well known 88-10-2 mixture to the following limits:

Copper	86 to 89 per cent
Tin	9 to 11 per cent
Zinc	1 to 3 per cent
Lead, max.	0.20 per cent
Iron, max.	0.06 per cent

Good castings made from this bronze should give the following minimum physical characteristics:

Ultimate strength	30,000 lb. per square inch
Yield point	15,000 lb. per square inch
Elongation in 2 in.	14 per cent

For bronze worm gears, two alternative analyses of phosphor bronze, both S. A. E. specifications, Nos. 65 and 63, are recommended.

S. A. E. No. 65, Called Phosphor Gear Bronze

Copper	88 to 90 per cent
Tin	10 to 12 per cent
Phos.	1 to 3 per cent
Lead, zinc and other impurities, max.	5 per cent

Good castings made of this alloy should give the following minimum characteristics:

Ultimate strength	35,000 lb. per square inch
Yield point	20,000 lb. per square inch
Elongation in 2 in.	10 per cent

S. A. E. No. 63, Called Leaded Gun Metal

Copper	86 to 89 per cent
Tin	9 to 11 per cent
Lead	1 to 2.5 per cent
Phos., max.	0.25 per cent
Zinc and impurities, max.	0.50 per cent

The following minimum physical characteristics may be expected from good castings:

Ultimate strength	30,000 lb. per square inch
Yield point	12,000 lb. per square inch
Elongation in 2 in.	10 per cent

For bronze bushings the recommended practice is S. A. E. No. 64, a strong phosphor bronze with excellent anti-friction qualities, and capable of sustaining heavy loads and severe usage. The composition is as follows:

Copper	78.5 to 81.5 per cent
Tin	9.0 to 11.0 per cent
Lead	9.0 to 11.0 per cent
Phos.	0.05 to 0.25 per cent
Zinc, max.	0.75 per cent
Other impurities, max.	0.25 per cent

Good castings of this alloy should give the following minimum physical characteristics:

Ultimate strength	25,000 lb. per square inch
Yield point	12,000 lb. per square inch
Elongation in 2 in.	8 per cent



Making a Casehardened Crankshaft

Some Details of a Method of Heat-Treating Both Main and Crankpin Bearings To Give Them an Extremely Long Life

SPECIAL CORRESPONDENCE

THE Franklin Motor Car Co. has, after long tests, made a departure in crankshaft practice being, so far as the writer knows, the only builder of passenger cars to caseharden or carburize the crankshaft. The object, of course, is to secure a harder and better wearing surface for the main and crankpin bearings. Tests show the wear to be reduced from one-third to one-sixth the amount found in the usual crankshaft. This means putting off the taking up of bearings, with its attendant expense, for a much longer period.

The shafts are rough and finish turned, leaving material for two grinding operations. The parts to be left soft, which means all but the bearings themselves, are copper plated before the crankshaft is packed for carburizing. The bearings are wound with tape to prevent being plated.

The crankshafts are very carefully packed in carburizing material in the boxes shown in Fig. 1 and the covers "luted" or sealed in place with fireclay, Fig. 2, to exclude gases and keep them airtight. The boxes are then handled by the truck shown in Fig. 3, which places them in the furnace where they remain for 24 hours at a temperature of from 1,600 to 1,700 deg. F. The pots last about 450 hours.

After removal, the crankshaft is allowed to cool in the box and is then reheated to 1,450 deg. F., and when removed from the furnace it is placed in the die or "straight jacket" shown in Fig. 4. This keeps the shaft rigidly in line during the quenching process and prevents the springing and distortion which is so apt to occur in a piece of this shape.

Then come two grinding operations to finish the shaft to size (with a straightening process in between), after which it is balanced, both on static and dynamic machines and with the fan and parts attached.

The casehardened shaft presents new problems and means, above all things, extreme care in all the processes.





FIG. 1. PACKING FOR CARBURIZING. FIG. 2. SEALING THE LID

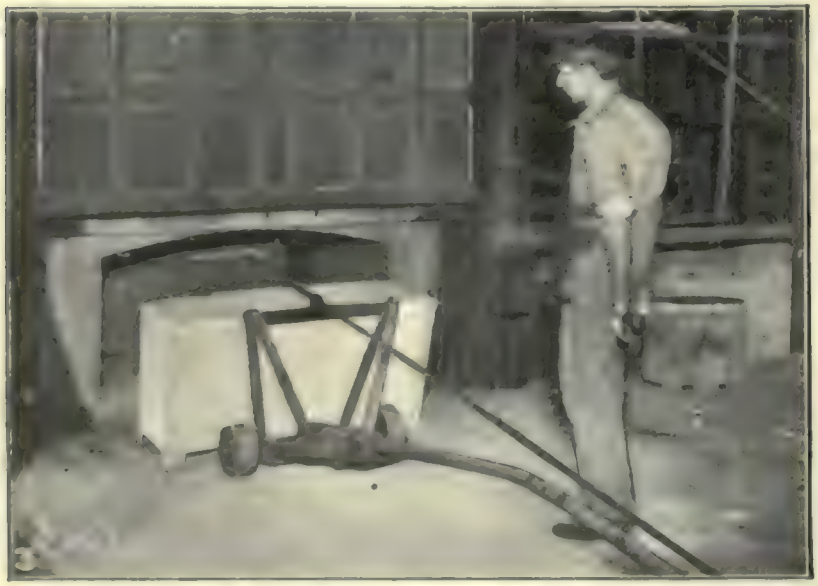




FIG. 3. TRUCKING INTO FURNACE. FIG. 4. PREVENTING WARPING IN QUENCHING

Machine Tool Industry May Utilize Its Idle Equipment

Wartime Expansion Makes Industry Seem Overbuilt, but Readjustment Will Bring Demand for More and Better Machine Tools to Lower Production Costs

BY FRANK A. SCOTT
Vice-president the Warner & Swasey Co., Cleveland, Ohio

DURING the year 1921 the American machine tool industry, in common with other metal-working industries, has experienced a constantly diminishing volume of business, with curtailment of production, decreases in the number of employees, reduction of wages, limitation of advertising and sales expense, and all the phenomena that accompany a period of depression. It is probable that the industry as a whole operated throughout the year at less than 20 per cent of its productive capacity. It is equally probable that the reductions in wages and salaries in machine-tool organizations averaged 30 per cent. The close of the year finds machine-tool manufacturers with large stocks of finished machines; a somewhat improved market, as compared with the middle of the year, but with a demand for their product still too small to justify continued operation even on a greatly reduced basis.

Most of the American machine-tool companies will show a loss for the year 1921. The financial condition of these companies has been unfavorably affected by the small volume of business and by the necessity for paying during 1921 income tax and excess profits tax on the business of 1920. Therefore, there has been a heavy increase in bank indebtedness throughout the industry during the year. Some concerns have already met the situation by additional financing in the form of bond issues or preferred stock isues, thereby relieving bank indebtedness and acquiring additional working capital to meet the cost of carrying organizations and stocks.

PRICES DROP 25 PER CENT

The price trend has been steadily downward, and, although definite data are not yet available, the average reduction will doubtless be shown to have been around 25 per cent. This reduction is based on the probabilities of lessening costs, rather than on any cost represented in present stocks. It is probable that the price recession is now about complete, with only readjustments between different kinds of machines to bring the industry into balance. It is anticipated by manufacturers that reduced costs of materials, together with wage reductions which have already taken place and organization readjustments will offset the lowering in price.

It is probable that the industry has now experienced most of the grief which will fall to its share during the period of readjustment and recession. The majority of the people in the industry are undoubtedly looking forward to improved conditions during the year 1922. In all likelihood the improvement during 1922 will result partly from substantial economies, which have now been enforced, and from temporary utilization of excess plant capacity to produce articles not manufactured by machine-tool builders under ordinary economic conditions. There is already considerable evidence of this tendency.

The American machine-tool industry, prior to the war, led the world in every department; that is to say in design, workmanship, efficiency, and volume of production. The World War was a great stimulus to the industry in at least four of the countries affected; namely, the United States, Great Britain, France, and Germany. Whether this period brought such pressure in England and Germany, as to produce new and better designs than those developed in the United States, still remains problematical. The chances are, that whatever advantage may have been secured by any foreign nation during the war will be regained by the United States during the present depression, for normally it is in such periods of quiet that the industry does its best work in producing new designs of high efficiency.

It was natural that the period of the war should witness unprecedented extension of facilities by machine-tool manufacturers already in existence, and an equally unprecedented development of new concerns, attracted to the field by the prospect of business easily attainable and enticingly profitable. All of the machine-tool manufacturers in the world, in the middle of the year 1918, were unable to meet the demand for the production of weapons and facilities of war.

Immediately following the armistice there was little recession in this demand; but, on the contrary, the needs of the metal-working industries, endeavoring to resume their respective places as producers of "peace time" instead of "war time" products, continued the unprecedented demand upon the machine-tool manufacturer. By May, 1920, it was evident that this demand had been satisfied, and by September, 1920, the machine-tool industry was entering upon such a period of depression as had never theretofore been experienced. From the pinnacle of its greatest success and prosperity it descended during 1921 to the lowest level, contrasting its present productive power with the existing demand, that has been known since the making of machine tools grew large enough in volume to be called an industry.

The older and better established concerns realize that they have nothing to fear from the present discouraging period and are even now confidently predicting the outcome. The products of these manufacturers are known to metal workers in every land and enjoy world-wide distribution. Their designs represent the intelligent development of years of experience, and their plants, for the most part, have been developed from year to year from the earnings of the business. Their organizations are seasoned by years of training in every department through designing, workmanship, production, sales, and administration. On the other hand, the newcomers in the field, with trade names unknown to the general buyer, with products designed during the

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war pressure and unseasoned by years of experience and correction, with profits, wherever made during the war, largely withdrawn from the business to meet war time taxes, face a discouraging future; and that many of them must go the way of other short-lived war time industries can be assumed.

The tendency, however, to reason in the machine-tool industry, that 1913-1914 represents a normal period, and that the present depression is merely "return to the normal," is as baseless as it is in every other field of thought and industry. There is no more possibility of this industry returning to a "before the war condition" than there is of the nations in general returning to such condition. The relationships, the needs, and the demands of mankind have been so changed that we face in every industry, and especially in the machine-tool industry, a future to which past experience is not the key. The future of the machine-tool industry must be based upon the tremendous development in metal production and metal working in every country which has industrial facilities. For example, the new blast furnaces now being erected in India will give a pig-iron production which will double the pre-war production. Similar developments in Japan and China, the increased tonnage which will come from Belgium, the increased tonnage in the United States, England, and France, in pig-iron and other metals, all indicate the need of a much greater machine-tool volume than the world possessed prior to the war. We are in the midst of a metal age, and all the metals known to man might be mined and smelted, but they could not be worked and made available for the uses of civilized man except by the intervention of the machine tool. Even beyond this, the one great lesson which metal industries learned during the war was the efficiency and profitableness of quantity production and, if possible, automatic processes. This knowledge will create a world-wide demand for efficient machine tools such as even the dreamer in the industry dare not now put into words.

The United States is the greatest machine tool market in the world, and the automotive industry of the United States has been the greatest machine-tool customer the industry has ever had. Roughly speaking, it would have been possible prior to the war to approximate the machine-tool demand in any country by observing the pig-iron production of that country. A chart of the pig-iron production has for many years been a fairly accurate gage of machine-tool production. The value of this gage of the industry has temporarily been destroyed by the maladjustments caused by radical and sudden changes in the quantity, uses, and forms of metal products needed to supply the demands of war.

The American machine-tool manufacturers, thus enjoying the greatest market right at their own doors, were naturally the first to develop quantity production of machine tools; and in all machine-tool producing countries except England the tools manufactured were mostly copies of American designs and wherever the volume was sufficient to justify quantity production were manufactured under American methods.

In addition to supplying its own market, the American industry had developed a gratifying volume of foreign trade, as is shown by the following figures:

EXPORTS IMMEDIATELY PRECEDING THE WAR

1909	$3,600,000
1910	9,600,000
1913	16,000,000

(Note: Classified in foreign and domestic commerce reports as "lathes," "other machine tools," "sharpening and grinding machines," and "other metal working machines.")

COMPARISON WITH LARGEST COMPETING NATIONS

	Great Britain		
1909	$3,700,000	1913	$4,900,000
	Germany		
1910	$12,328,000	1913	$19,500,000
	United States		
1909	$3,600,000	1913	$16,000,000

The ascendancy which this shows for American machine-tool exports over the nearest competitors is accounted for by the superior American design fostered by our intensive mass production methods, by quantity production of the tools themselves, and by superior American workmanship. These same factors, by which we were able to defeat our machine-tool export competitors, are not only still in operation but have advanced many fold during the war period. They will therefore continue to operate to our advantage in the future, but in a lessening degree.

GROWTH OF MACHINE TOOL EXPORTS IN THE YEARS 1914 TO 1920

1914	$14,000,000
1915	28,000,000
1916	61,000,000
1917	85,000,000
1918	58,000,000
1919	58,000,000
1920	44,000,000

During the year 1921 the export of machine tools showed a recession greater than the domestic business. This was in part due to the flood of second-hand tools in foreign markets released from war production, to credit maladjustments, to exchange conditions, and to German competition which was especially evident in Scandinavia, Belgium, and the north of France. Also, it must be remembered that Russia, which at one time was one of the best customers for machine tools of both Germany and Great Britain, has been entirely out of the market since the war. German competition throughout Europe will be especially effective until German economic conditions are settled and she is brought into real competition in the cost of her raw materials and production with the rest of the world.

Credit Conditions

The year 1921 was unusually hazardous in all lines of industry. In the machine-tool industry this condition was reflected in a high percentage of undesirable accounts. A fair proportion of sales consisted of regular business with excellent credit risks, but the necessity for securing all available orders in the face of the second-hand machinery market and unrestricted competition forced acceptance of the most hazardous credits of the last ten years.

Further, a substantial portion of the machine-tool sales of 1921 was made to new firms for the manufacture of new products, and, of course, general conditions have made this class of business exceptionally risky.

In spite of these factors the losses in the machine-tool industry during 1921 have been less than in allied lines. The explanation of this may be, first, that the purchase of new equipment is usually carefully considered, with a resulting provision for payment; second, the nature of the product makes it possible to sell hazardous risks under some form of retained title contract, so that the seller is secure until full payment is made. The product, of course, is one which depreciates slowly, and therefore with the proper technical safeguards to title there is little danger of loss even from sales to accounts that are known to be hazardous.

It is obvious that machine-tool manufacture takes its place among fundamental industries essential to modern civilization. Equally obvious are the great and continu-

ing contributions made by the machine-tool designers and manufacturers to American industrial prosperity and advancement. Better machine tools have made possible quantity production and less cost in American metal industries, and low cost has meant a wider market for the product; therefore, we have in the United States such striking examples as our automotive industry, our electrical industry, our plumbing supply and house-equipment industries, our textile industry, our shoe-manufacturing industry, and our great transportation systems, with many others which serve the public cheaply and almost universally because of the efficiency of the machine tools placed at their command. Their service to the people has been increased and their charges for the service decreased in proportion to the improved facilities supplied to them by the machine-tool industry.

Outlook for the Future

In the new industrial era before us competition will again be the ruling force. The industries best served by the machine-tool designers and manufacturers will enjoy the advantage. Machine tools of even five years ago cannot compare with the machines and the expert application of their possible service worked out by the engineering science of today. What of the manufacturers who are going to try to compete with machine tools ten, fifteen, or even twenty years old? They must re-equip, and the sole gage will be the best machine at any price, so long as the cost per piece of the product can thereby be reduced. In the end this will mean greater production, a cheaper product, a better product, and therefore a wider distribution and greater markets.

This, then, is the answer to the charge that there has been overexpansion on the part of the experienced and efficient manufacturers due to the war. The expansion so made will eventually be balanced by the increased world needs also due to the war. These expanded facilities, in our country and in every other machine-tool manufacturing country, which now constitute a considerable embarrassment, are a temporary embarrassment only, and, with readjusted world conditions, will prove but a further vehicle for serving metal-working industries and through them all mankind.

Kinks for the Machine Shop

By R. McHenry

The drawers of a new tool case are apt to stick, and work stiffly. An application of soft grease along the sides and bearing surfaces of the drawers will give that desired velvet smoothness of movement at once.

It is often necessary to round or point the ends of small machine screws, rivets, or headed pins. The usual method of procedure is to start at the grinding wheel and end by searching the floor for the lost piece. A more satisfactory way is to hold the work in a pin-vise with the head back of the jaws, and grasp the handle of the pin-vise in the chuck or collet of the speed lathe. The pointing can then be done neatly with a file and the work will be there after it is done.

After planing, milling, or otherwise machining a bar of cold-rolled steel on one side, the bar will spring to a considerable extent upon being released from the holding vise because of the relieving of the rolling strains. This may be counteracted to a great degree by first heating the bar to a dull red and allowing it to cool in air.

Oftentimes it is desirable to unwind small coil springs and the usual method of using pliers and a hammer for that purpose is unsatisfactory. By gripping one of the free ends of the wire in a vise, inserting a rod of suitable size through the coil and pulling away from the vise by holding the protruding ends of the rod in both hands the wire will unwind smoothly and, though it will not be straight, it will be in a condition to re-wind to a different size.

When it is not advisable to use a dog on a small piece of finished work to drive it upon centers in a lathe, a piece of belt lacing may be passed two or three times around the work, knotted, and the free ends run through opposite slots in the faceplate and tied together. This takes up less room than a dog and does not mar the work. It will also drive much more strongly than would be supposed.

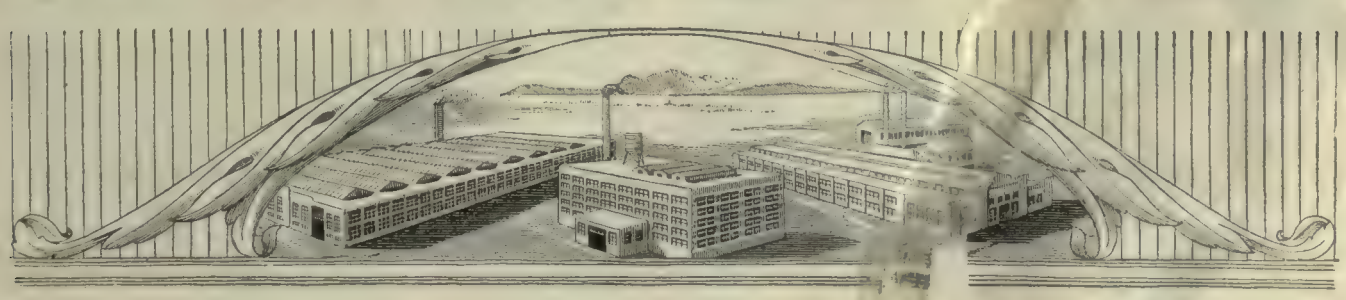
When clamping or strapping work on the planer table or elsewhere and it is necessary to rest the ends of the clamps or straps on a sloping surface, there is a tendency to slip and the work will be held insecurely. If a broken bit of old file be placed under the strap-end it will hold much more securely.

Cutting Oil Grooves

A quick way of cutting smooth and straight oil grooves in the bores of pulleys, bushings, etc., is to turn a round-pointed toolbit flatwise in the boring tool-holder and plane the groove by running the lathe carriage back and forth by hand; meanwhile feeding the tool to the cut by means of the cross-slide.

Small pulleys made from hardwood prove very efficient for emergency or experimental work. They should be bored, reamed and turned with as much care as an iron pulley but, owing to the nature of the material, they can be made in a fraction of the time that would be required to make an iron one of the same dimensions. With a suitable keyway cut in the bore they will transmit a surprising amount of power and will last a long time.

It is sometimes desirable to make a "witness" mark on pieces of hardened steel when disassembling a machine to assist in relocating them. An application of copper sulphate solution will leave a neatly coppered surface upon which a temporary mark may be made with a scriber.



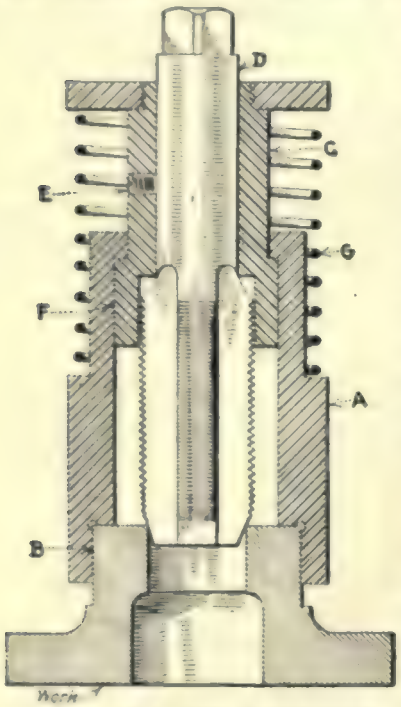
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Simple Fixture for Hand Tapping

By Gene Phelps

The hand tapping fixture shown here was used to tap a hole in a piece of work at a right-angle to the base and also concentric with the hub diameter. As extreme accuracy was required, it was necessary to design a simple fixture which would do away with possible errors often resulting in hand tapping. The sleeve *A* fits over the hub of the work at *B* as shown. The housing *C* is assembled on the tap shank *D* and is held securely by means of a setscrew *E*. The diameter of the bushing acts as a bearing at *F*, thus keeping the tap from starting at an angle. The tap is started into the hole and as it enters the work the compression spring *G* exerts pressure on the sleeve, holding it in proper position on the work. The general construction is very simple.



A HAND TAPPING FIXTURE

Holding a Boring Bar in a Radial Drilling Machine

By F. R. Hammond

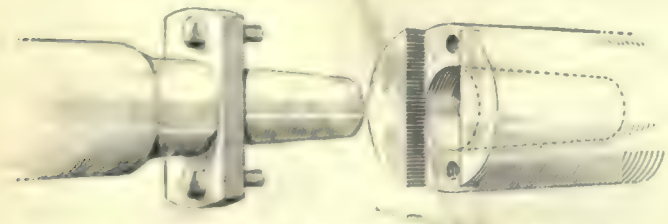
Being employed in a jobbing shop where there is no boring mill, I have to do occasional boring mill jobs on the radial drilling machine and I have often experienced trouble in keeping the bar in the spindle, as the driving power of the taper shank is not sufficient to drive the cutter on large diameter holes. The bar will wring loose or the ta. e will be twisted off.

The accompanying sketch will serve to show the manner in which I overcame this difficulty and am now able to bore large holes, giving no thought to the connection between bar and spindle.

I first cut out a rectangular slot across the end of the spindle, the width of the slot being equal to the large diameter of the taper hole and its depth being ⅜ in. At the bottom of the slot two small holes were drilled and tapped into the spindle, one on each side of the taper hole and parallel with the center line.

Now when I turn up a new bar I leave a flange, or shoulder, ⅜-in. thick at the proper place on the shank and then flat it off on two sides in the shaper to a width equal to the width of the slot in the spindle. Holes in this flange for small hexagon head capscrews complete the job.

When the bar is set in place in the spindle the flange enters and fills the slot but does not quite bottom, the shank stopping on the taper. The two capscrews draw the taper to a firm seat and prevent it from working loose while the flange, bearing against the sides of the slot, does the driving.

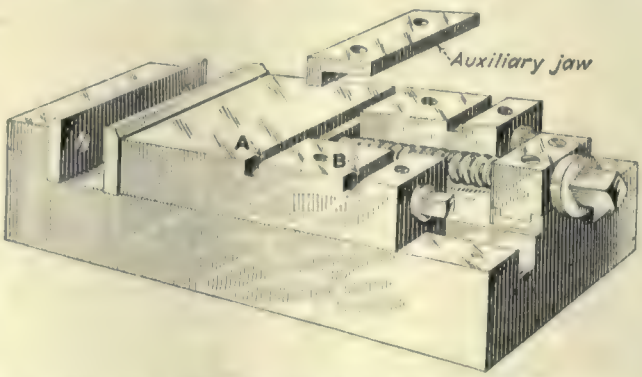


HOLDING A BORING BAR IN TH[illegible]LE OF A RADIAL DRILLING M[illegible]

Increasing the Capacity of a Milling Machine Vise

By Harry R. Holbrook

Having occasion frequently to hold dies and other work larger than 2¾ in. wide in a Brown & Sharpe milling machine vise, I milled cross-slots in the top of the slide, as shown in the illustration, and fitted an auxiliary jaw with a tongue to match the slot.



AUXILIARY JAW FOR BROWN & SHARPE MILLING MACHINE VISE

The steel jaw faces upon this vise project ¼ in. above the surface of the slide, and therefore when the face is removed from the slide the fixed jaw face presents the necessary surface opposed to the auxiliary jaw and makes a vise ¼ in. deep, capable of holding work up to 6½ in. upon the top of the slide.

The first slot should be so spaced that the vise will hold work down to the original capacity, while the other slot should be at the farthest limit.

A Safety Screwdriver for Use Around the Screw Machine

By H. Moore

Many of the toolholders and shanks commonly used in connection with the screw machine are fitted with headless setscrews for the purpose of securing the tool. In using a screwdriver upon these screws, it is liable to slip because of the oil that is always present, and, if the shank is held in the hand at the time, injury to the operator is likely to result. I have made a safety screwdriver as shown in the accompanying sketch that reduces this danger to a minimum. The blade is made from round stock drawn down to the required shape at the end, and a larger round piece is fitted to slide upon it. In one end of this larger piece, or collar, is a deep V-groove that spans the round holder in which is the screw to be loosened. A small spring plunger, fitted as shown in the sketch, provides sufficient pressure to keep the collar from falling off yet allows it to be moved along the round part of the screwdriver blade readily.



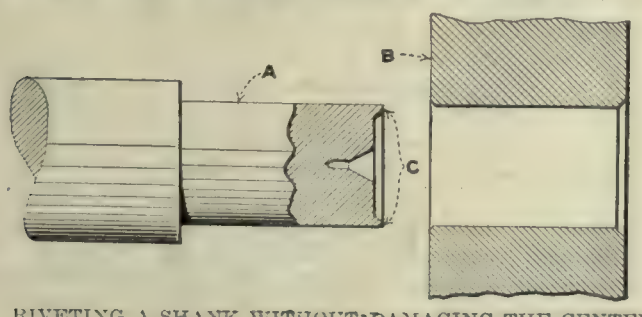
SAFETY SCREWDRIVER

To use the device, the toolholder is held in the hollow of the left hand, the thumb and fingers pressing the V-groove against the holder. This centers the screwdriver and when the slot is once found there is no opportunity for the blade to slip out.

How to Rivet Properly

By Fred C. Bryant

Few machinists know the quickest way to rivet a shaft neatly into a solid body, or a punch into it's holder, without causing injury to the center hole, so I have prepared this sketch and description for their benefit. *A* represents a shaft to be riveted into the solid body *B*. The shaft should be turned about $\frac{1}{64}$ in. longer than the thickness of the piece into which it is to be riveted and should be slightly undercut from the center hole to within about $\frac{1}{32}$ in. of the outer edge, depending on the size of the stock. *B* is then placed over *A* and the resultant edge *C* peened over.



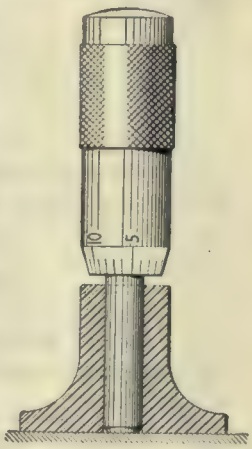
RIVETING A SHANK WITHOUT DAMAGING THE CENTER

Quick Method of Refinishing the Measuring Surfaces of Micrometers

By Charles Reimschissel

A quick way to true the measuring surfaces of micrometer anvils and spindles is shown in the accompanying sketch.

A bushing of cast iron is bored to a neat fit on the spindle, and faced accurately square with it. Three round laps about $\frac{3}{4}$ in. in diameter are made of cast iron or very soft steel. The first of these laps may be of any convenient thickness, with the others varying by increments of 0.008 in. These laps should be charged, *on one side only*, with diamond dust.



REFINISHING MEASURING SURFACES OF MICROMETERS

With the spindle removed from the instrument and inserted in the bushing, the combined surfaces may be lapped on any convenient lapping plate. Returning the spindle to place and again putting the bushing upon it, the anvil may be lapped by means of the small circular laps, the necessary lapping pressure being applied by the micrometer screw.

The uncharged sides of the laps are in this operation turned towards the bushing, and the comparatively large surface of the latter insures that the anvil will be lapped parallel to the already corrected surface of the spindle.

By using the three laps successively, the anvil is lapped in three positions of the spindle approximately 120 deg. apart.

Center Drill Used for Spotting

By Gus Haessler

On page 565, Vol. 55, of *American Machinist*, G. G. Little describes the use of a combined center drill and countersink as an end mill.

A combined center drill and countersink can also be used to advantage in spotting work. If an ordinary twist drill is used for spotting, an irregular outline is often produced on the surface of the work, rendering a scribed guide circle useless. By using a combined center drill and countersink, the countersink will make a round spot and the concentric relation between the spot and the guide circle can easily be seen. If the spot should be eccentric with the guide circle the work can be pressed to one side as the drill is fed down, so as to have the countersink cut more on one side or the other and by careful manipulation the spot can be brought concentric with the guide circle.

In laying out guide circles we found that with one point of the dividers located at the intersection of the

layout lines, the work can be sufficiently indented to form a center for scribing a circle by pressing down on the dividers. The dividers should, of course, have sharp points.

A Shop Man's Method of Figuring Change Gears

By J. Crommell

There are many ways to figure the change gears required to cut a given thread on a lathe. Some are absurdly technical and confusing, necessitating the use of both sides of a slate on which to make the calculations, while others are simple and easy.

One of the best ways that I know—one that is most commonly used by practical men and is the basis of all of them—is to express the required lead as a fraction and multiply the numerator or divide the denominator by the number that represents the lead of the leadscrew.

The first problem that I will cite is a simple one, the gears for which will be found on any index plate, and the plate may be referred to as proof that the method is correct.

Problem 1. We wish to cut sixty threads in 4 in. The fraction expressing this lead is 4/60 (which is the lead of one thread, or the distance a nut would advance upon it in one turn) and the lead of the lathe is 5. Multiplying 4 by 5 gives us 20/60, the correct gears to use. Dividing 60 by 5 would give us 4/12, which is the proportion of the gears. We could reduce this still further to 1/3, indicating that we may use any pair of gears one of which is three times larger than the other.

Problem 2. Required twenty-seven threads in 5 in. The fraction in this case is 5/27 which multiplied by 5 is 25/27, the proportion of the gears.

Problem 3. Required, ten threads in 7 in. As this is heavier work we will assume that the lead of the lathe is 2. The lead of the thread to be cut is 7/10, which multipled by 2 is 14/10. We will not have gears with so few teeth so we multiply *both* terms by the same number, thereby keeping the same proportion, until we find a pair that is available; thus 14/10 x 2 is 28/20; x 3 is 42/30; x 4 is 56/40.

If we reduce the fraction of the above problem to 7/5, its lowest terms, we will have another range of numbers from which to select gears, thus 7/5 x 5 is 35/25; x 7 is 49/35.

Problem 4. Let us reverse our requirements as above and cut a thread of seven turns in 10 in. The lead is now 10/7, which multiplied by 2 is 20/7, the proportion of the gears. The actual gears in this case will be 60/21 or 80/28. The larger gear always goes on the stud when the lead to be cut is greater than the lead of the screw.

Problem 5. Four turns of a thread are required in 4½ in. The fraction expressing this lead is 4½/4 or 17/16. Multiplying by 2 (the lead of the lathe), we get 34/16 as the proportion. The actual gears will be 68/32, or reducing the fraction to 17/8 and multiplying by 3, 51/24.

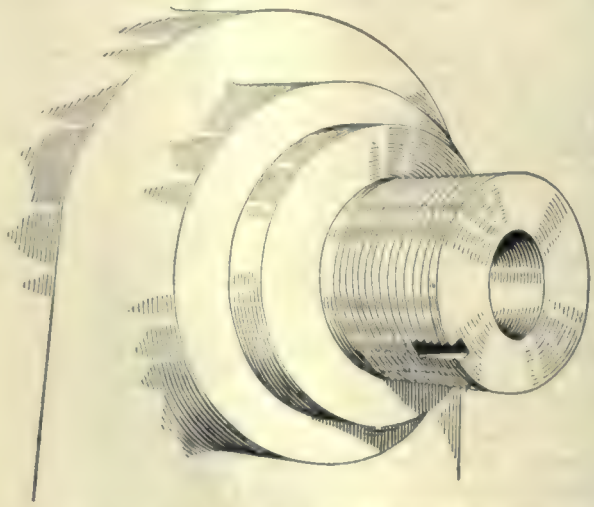
All of the above problems are based upon the assumption that the spindle and stud of the lathe are evenly geared. If such is not the case we must disregard the actual lead of the screw and substitute in its stead the number representing the thread that the lathe would cut in one inch with even gears on stud and screw.

Kink That Saves Trouble in Putting on Lathe Chuck

By Henry Knabe

Most of us have experienced trouble in putting a heavy chuck on a lathe spindle by reason of small particles of dirt or chips lodging in the internal thread, making it necessary to return the chuck to the bench and poke around for several precious minutes with a wire or thread cleaner.

To abate this nuisance as far as possible I have filed



A LITTLE KINK THAT SAVES MUCH TROUBLE

a shallow groove, as shown in the sketch, in the threads of the spindle nose; leaving the advancing side of the groove square and sharp, like the threads of a tap.

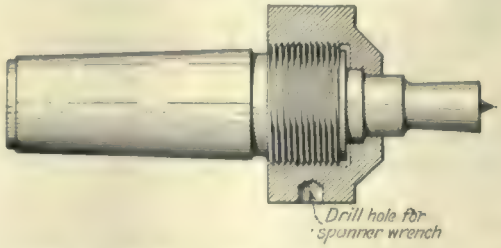
Upon screwing the chuck on the spindle these sharp edges scrape out any particles that may be in the internal thread and the groove provides a place for them to get out of the way.

Chuck for Refinishing Standard Piercing Punches

By Fred S. Harger

The illustration shows a chuck which the writer has made for the purpose of repairing or salvaging the standard sheet-metal piercing punches so commonly used.

The device is quite simple to make, consisting only



CHUCK FOR HOLDING PIERCING PUNCHES

of a shank, tapered to fit the lathe spindle and threaded on the outer end to take a knurled sleeve.

It is desirable to make a rather fine pitch thread in order to increase the gripping power; or, rather to diminish the manual effort necessary to exert that power. If the facilities are available it is advisable to harden the sleeve and grind the internal parts to a

finish, because this will increase the durability of the tool. A hardened steel button in the outer end of the shank, if ground true in place, will also help to increase the life of the tool and insure continued accuracy in holding the punches.

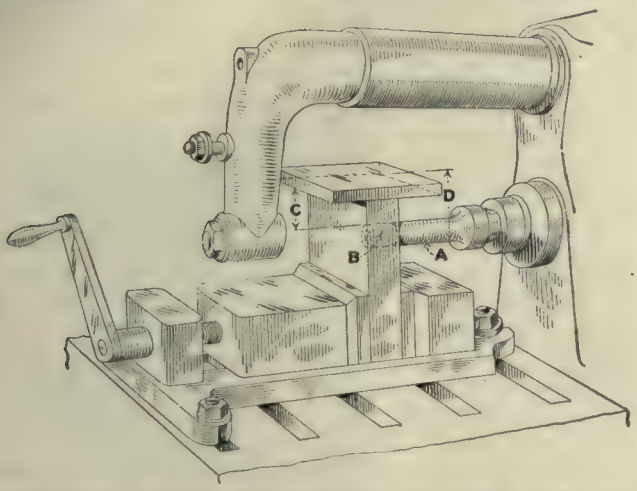
Handy Locating Device for the Milling Machine

By Frank M. Johnson

The locating device described here has been found by the writer to be very convenient and accurate. It consists of a short arbor *A* to fit the milling machine spindle, having a toolmakers' button attached to the outer end.

In use, the device is placed in the milling machine spindle and the button *B* trued up with an indicator. The work is then brought into position so that a size block of the proper dimension will just fit between the button and a parallel resting upon the top of the work, as indicated by the dimension *C*. If more convenient, a micrometer can be used on dimension *D*.

The writer recently used this device to locate thirty-



LOCATING DEVICE FOR USE ON MILLING MACHINE

seven holes in a piece approximately 1 x 5 x 14 in., the tolerance being plus or minus 0.001 in. in both directions. All the holes came well within this limit.

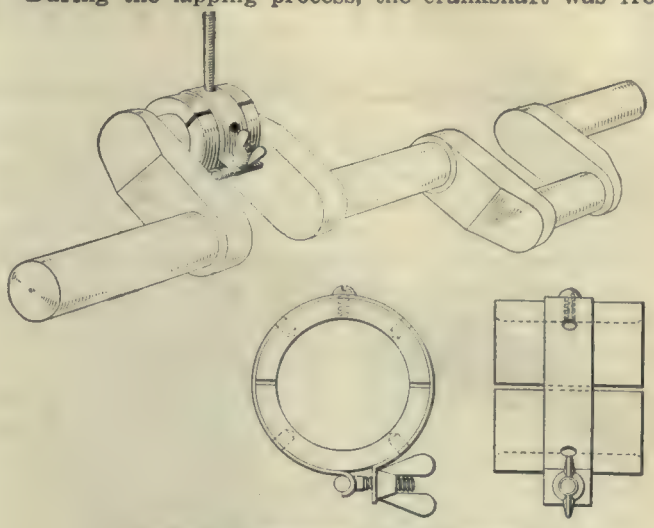
Lapping a Pitted Journal to Make It True

By Fred. A. Clock

On a marine gasoline engine repair job, it was found that salt water had gotten into the base and that journals on the crankshaft throws were rusted and pitted badly. As it was not practical to have the shaft reground, we decided to lap it and a lap was made as shown in the illustration.

A cast-iron bushing was bored out to the exact diameter of the shaft, and was turned on the outside so as to leave a wall ⅜ in. thick. It was cut off about 1 in. shorter than the journal and the inside corners rounded to fit the fillets on the shaft. Next it was sawed lengthwise so as to leave two half bushings, the halves being prick-punched so as to insure their always going together in the same relative position. A hose clamp was then fitted over the two halves and fastened to one of them by means of a round headed screw. Four equally spaced holes were drilled through the clamp and the lap, those in the clamp afterwards being reamed out with a slightly larger drill. These holes were for the purpose of inserting a handle, made of ¼-in. stock, for operating the lap.

During the lapping process, the crankshaft was fre-



TRUING A JOURNAL BY LAPPING

quently turned part of a revolution so as to bring the journal into different angular positions. As the four holes in the lap were also consecutively used in this way, all danger of uneven lapping was eliminated.

The lapping material used was ordinary valve grinding paste. After lapping for a few hours, the journals were brought to a smooth bearing surface.

The engine has now been in operation for seven months and the bearings have given no trouble whatever.

Jig for Drilling Crossholes in Round Stock

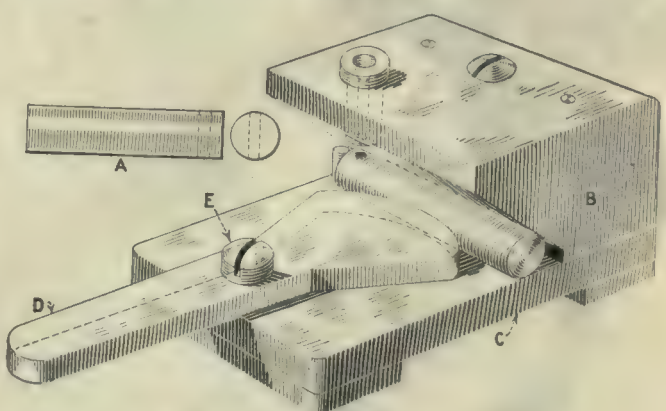
By Gus Haessler

On several occasions contributors have described work similar to that shown at *A*. The jig outlined herewith differs, as far as known to me, from any heretofore published and therefore may be new to others.

The principal members *B*, *C* and *D* are made of cold rolled steel, and are pack hardened. Part *B* is fastened to *C* in the usual way, while the clamping lever *D* fulcrums on the screw *E*.

A slow rise cam is formed on the end of the short arm of the lever, the proper action of which is determined by trial in assembling.

In operating the jig, the work is simply dropped into the cage and is checked by the stop pin, the lever then being pressed to the right. To eject the work, the lever is reversed and the work drops out.



A SIMPLE DRILL JIG FOR ROUND STOCK

EDITORIALS

The American Valuation Plan

IN THE midst of the confusing welter of assertion and denial from those whose interests are affected by the proposed American Valuation Plan, many are turning to the professional economists for counsel. This group takes a remarkably united and unequivocal stand in opposition to the measure. The grounds upon which they take their stand are roughly these:

In the first place, they believe that the proposed plan really means a higher tariff. They recognize that the precise rates to be imposed on the American values are the determining factor here, but they are convinced that those urging the plan intend to see to it that the rates shall be sufficiently high to cover any uncertainty incident to the establishment of the new valuation basis. They suspect that at bottom the proposal resolves itself into a demand for a hidden and undetermined amount of increased protection.

The arguments, aside from this, do not impress the economists. The three which contain some modicum of force are that the plan will meet the problem of the fluctuating exchanges, that it will prevent "dumping" and that it will put up a more effective bar against the country with exceptionally low production costs. The economists point out, however, that prices rise in countries whose exchanges fall and that any disparity in the two movements is largely offset by the internal disorganization of the productive forces in the country whose exchanges are violently deranged. "Dumping," they believe, can best be prevented by administrative measures applied when the facts of a particular situation demand them. The argument that the present method of valuation puts a lower duty, for example, on cheaply produced Japanese goods than on more expensively produced European goods of the same character is admitted, but it is pointed out in rebuttal that specific rates would meet this situation as well as the American valuation plan.

On the other hand, the economists are considerably influenced by the contention that the adoption of the proposed plan would introduce so much uncertainty into the process of importing goods as to greatly embarrass the process. A retailer, buying foreign merchandise, cannot estimate his costs with any degree of precision under the proposed plan. Uncertainty of this character is a very patent anaesthetic to business enterprise. The economist suspects that the adherents realize this and view it with complacence because it means fewer imports and less foreign competition.

The administrative difficulties of securing fair cost figures from American manufacturers interested in excluding their rivals' goods, of determining American costs in the case of goods which America does not make, and of securing uniform valuations at various points of entry, are perfectly self-evident. Furthermore, it is contrary to all past practice and procedure in this country. It constitutes, in the words of Professor Taussig, the foremost student of the tariff in this country, "a veritable leap into the dark."

But, after all, the opposition of the economist rests back upon his conviction that the proposal is equivalent to a demand for increased rates at a time when the true economic interests of the country would not be served by the establishment of a high tariff wall. The changed conditions resulting from the war have convinced many, who previously were in favor of high protection, that we cannot hope for a real business recovery until we reach an economic adjustment which the high tariff will tend to prevent or postpone. The question of American valuations should not be settled without a full consideration of all of these elements.

A National Engineering Research Laboratory?

AT THE recent meeting of the American Society of Mechanical Engineers the suggestion was made during the course of the research session, that it would be desirable to have a national engineering research laboratory. The proposer advocated such a laboratory "to do for engineering what the Bureau of Standards is doing so well for pure science."

The wisdom of this suggestion seems to us to be open to question. In the first place the Bureau of Standards has not confined its work to pure scientific research by any means. Many essentially engineering problems have been solved at the bureau, with the co-operation of research engineers from various industrial corporations, and facilities exist for solving many more if the men who are anxious for a solution based on engineering research will present them and co-operate with the bureau officials and staff. It is rather a case of insufficient advertising of the bureau's resources.

By the very nature of the organization of a government institution certain difficulties present themselves. Insufficient funds, departmental red tape, an inadequate number of research men are all factors that hamper the successful prosecution of engineering research at the bureau to speedy conclusions. But the relief from these drawbacks does not lie in establishing another institution but rather in helping the existing one to attain a position where it can handle the job.

Another serious obstacle in the way of organizing another research laboratory lies in the small number of research men available in this country. While there are enough for one big laboratory there would be great difficulty in obtaining a really high grade staff for a second one. Research men are scarce and cannot be trained in a year—or five for that matter. It might well be said of the research man as of the genius, that he must have an infinite capacity for taking pains. Unfortunately such a characteristic is not common among Americans. Another factor which must be considered is that the research man must either have some independent means or else a devotion to science sufficient to make him sacrifice a comfortable living, for present salaries are inadequate, especially when compared with those attainable by the same men in private business.

By all means let us have facilities for engineering research but let us not adopt the wasteful plan of unnecessary duplication of effort and equipment.

Shop Equipment News

Stewart Furnaces and Forges

The Chicago Flexible Shaft Co., 5600 Roosevelt Road, Chicago, Ill., has recently placed on the market the Stewart line of furnaces and forges for general shop use. In Fig. 1 is shown a high-pressure burner intended for operation with air at a pressure of 10 lb. per square inch or over, or for dry steam at a pressure of 25 lb. per square inch. The burner produces an intimate mixture of the fuel and air, is rugged in construction and adapted to severe service. In Fig. 2 is shown the combination high- and low-pressure burner for operation with compressed aid at a pressure of 10 lb. per square inch or over, or with dry steam of 25 lb. per square inch, and with blast air at from 4 to 6 oz. pressure. Only sufficient compressed air to atomize the oil is used, while the remaining air for combustion is supplied by a fan at low pressure. This burner is said to be capable of producing high heat, and to permit of exact control of conditions inside the furnace. The intermediate pressure burner shown in Fig. 3 is for operation with air at pressures of from 1½ to 2 lb. per square inch, and supplied from a positive-pressure blower. Atomization of the oil is said to be complete, insuring efficient utilization of all the fuel.

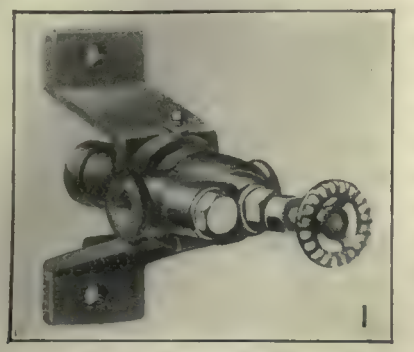


FIG. 1. STEWART HIGH-PRESSURE BURNER



FIG. 2. COMBINATION BURNER

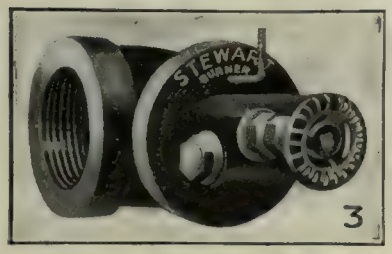


FIG. 3. INTERMEDIATE PRESSURE BURNER

The No. 6 portable rivet forge shown in Fig. 4 is for use in connection with either machine or hand work. The forge burns oil, and employs compressed air for atomization. It is stated that the furnace is capable of heating five hundred ¾-in. rivets per hour. The capacity is 30 gallons, the oil being forced to the burner and atomized by the compressed air from the shop line, reduced to 20 lb. per square inch pressure by a regulating valve. An asbestos flame shield and blast pipe are provided to protect the operator. If desired, the forge may be mounted on a truck. The chamber of the furnace is 12 in. wide and 12 in. deep, the opening being 3 in. high and 7 in. wide. The height from the floor to the top of the sill is 40 inches.

In Fig. 5, is shown an oil-fired furnace intended especially for the tempering of dies, tools, punches and knives. The oil bath is heated slowly to a temperature of not more than 700 deg. F., and then is allowed to cool down rapidly to permit the addition of a new charge. The furnaces are made in five sizes, and adapted to the use of either gas or oil as fuel. The weight varies from 355 to 1,550 pounds.

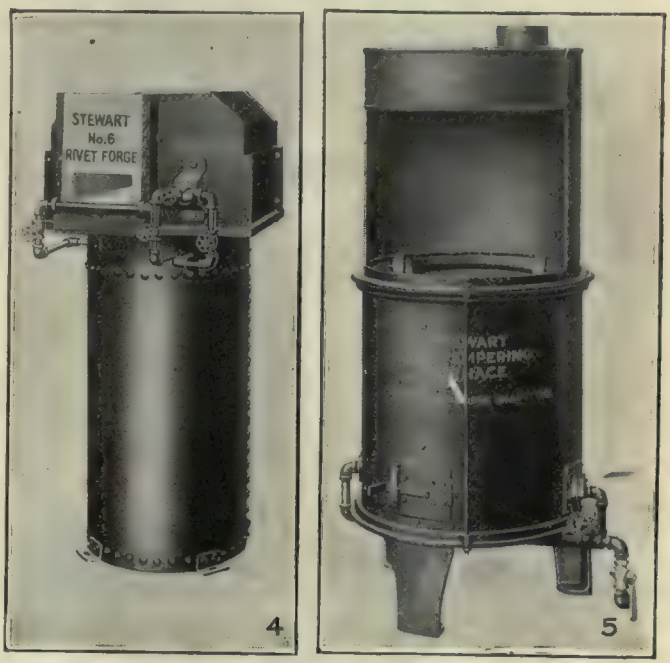


FIG. 4. STEWART PORTABLE RIVET FORGE. FIG. 5. OIL TEMPERING FURNACE

The Stewart No. 200 crucible furnace, shown in Fig.



FIG. 6. NO. 200 CRUCIBLE FURNACE

6, is intended for use in lead or cyanide hardening, soft-metal melting, tinning baths and galvanizing. It is stated that the flame is given a rotary motion by virtue of the position of the burner, and that there is a

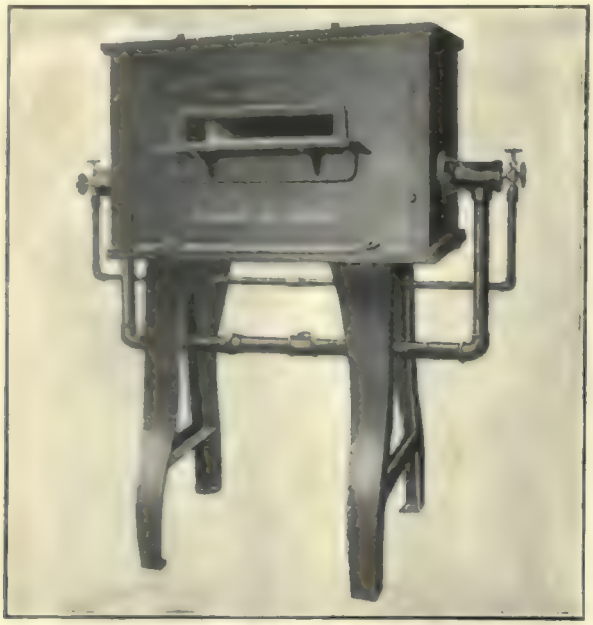


FIG. 7. STEWART NO. 1 FORGE

uniform distribution of heat around the pot, thus lengthening the life of the crucible and permitting of accuracy in the work. The pressed-steel pot is 14 in. in diameter and 14 in deep. A No. 5 blower is required, and either gas or oil may be used as fuel. The floor space is 36 x 36 in., and the shipping weight 1,300 pounds.

The No. 1 forge, shown in Fig. 7, is for use in welding and in miscellaneous forging work, as well as for heating rods and bolts prior to upsetting. Combustion occurs both beneath and at the sides of the opening, the flame striking the work directly. It is said that high heats are obtainable with great economy of fuel, either gas or oil being employed. The opening is 12 x 2 in. in size, with an inside depth of 8 in. The floor space is 32 x 24 in., and the shipping weight 800 pounds. The double-deck furnace shown in Fig. 8 is for heating high-speed steel with rapidity and with accuracy in temperature. The upper chamber is used for preheating, and is heated by the waste gases from the lower chamber. Economy of fuel is claimed for the arrangements. The lower chamber is fitted with carbofrax slabs to withstand the high temperature. Combustion takes place under the floor, and a uniform heat is said to be obtained because of the placement of the burner and the high heat conductivity of the walls. In order to conserve the heat, 4½-in. linings having a special insulation 1 in. thick are employed. The furnace is made in five sizes, having openings varying from 5 x 9 in. to 6 x 12 in. Gas is used as fuel. The smallest size has a floor space of 28 x 30 in., and the largest of 36 x 40 inches. The furnace enables the quick heating of tools, with close control of the temperature and of the character of the treatment, a reducing flame being easily obtainable.



FIG. 8. DOUBLE-DECK HIGH-SPEED-STEEL FURNACE

A furnace for handling large forging work is shown in Fig. 9. It is equipped with large enough burners to give high welding heat, and with provision for running off the slag at the rear. Doors may be provided at each end, if desired. Either oil or gas may be burned. The furnace is made in a range of sizes, the smaller sizes

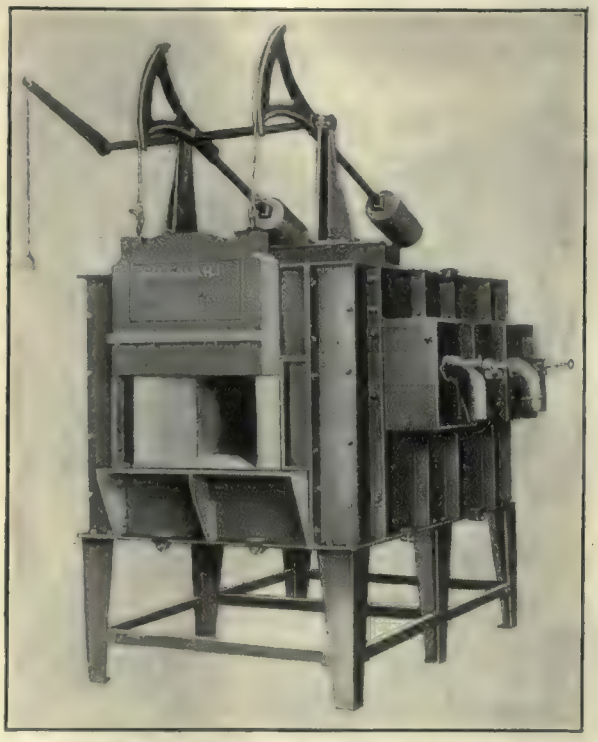


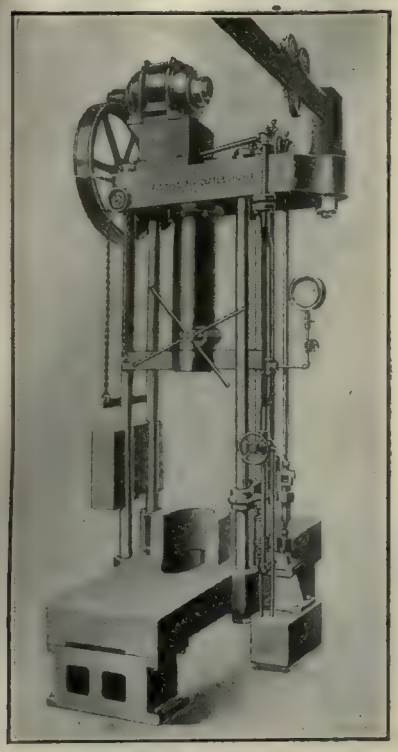
FIG. 9. STEWART HAMMER FORGE

being mounted on legs, as shown. The same type of construction, that is, the iron-plate and fire-brick type, is employed in the large sizes, which are built up on brick foundations. In the smallest size of furnace, the chamber is 27 in. wide and 36 in. deep. In the largest size, which is of the double-door type, the chamber is 99 in. wide and 63 in. deep. The sill height is 27 in. for all models.

In the sizes having chamber dimensions up to 36 in. in width by 63 in. in depth and entrances 22½ in. wide by 20½ in. high, the furnace may be mounted on legs. In this form, it is particularly adaptable to the heating of forging and welding work for steam hammers. However, the construction of the furnace makes it suitable for practically all purposes. In the larger sizes, having chambers from 36 in. in width to 49 in. in depth and mounted on brick foundations, the furnace is adaptable particularly to heavy or medium forging work.

Watson-Stillman Forcing Press

The Watson-Stillman Co., 50 Church St., New York, N. Y., has recently placed on the market the hydraulic press herewith illustrated, the machine being intended especially for the operations of forcing, pressing and bending that are found in railroad and in other large machine shops. It provides a means of rapidly pressing in and out locomotive driving-box brasses, or pressing on and off gears or disks. The press is of the reversed - cylinder type, having the ram movement from the top downward. The pump is required only to actually apply the pressure, the handwheel being used to bring the ram quickly to and from the work, thus obviating the necessity for waiting while the pump moves the ram through the idle part of the stroke. The bottom platen is strong enough to permit of bending operations up to the full capacity of the press with the bending blocks placed at each end of the platen. A U-shaped piece is hinged to one of the columns, so that it may be easily swung under the ram or out of the way. A jib is furnished with a trolley, so that a chain hoist may be attached for easily handling the work on and off the platen. A hole in the bottom platen permits of receiving shafts and pressing on gears. The drive may be either by belt through tight and loose pulleys, or by direct-connected constant-speed motor, as shown.



WATSON-STILLMAN PRESS

The gage indicates the pressure on the ram in pounds per square inch, and also the total pressure in tons. The pump used is of the two-plunger type, and the entire control of the press is through a single screw stem valve. The bottom platen, top platen, cylinder and crane brackets are open-hearth steel castings, the ram and rods are machine steel, and the cylinder copper lined. The press illustrated is built in a capacity of 75 tons with a ram movement of 21 in. The bottom platen is 72 in. long.

Oliver No. 65 Self-Feed Rip Saw

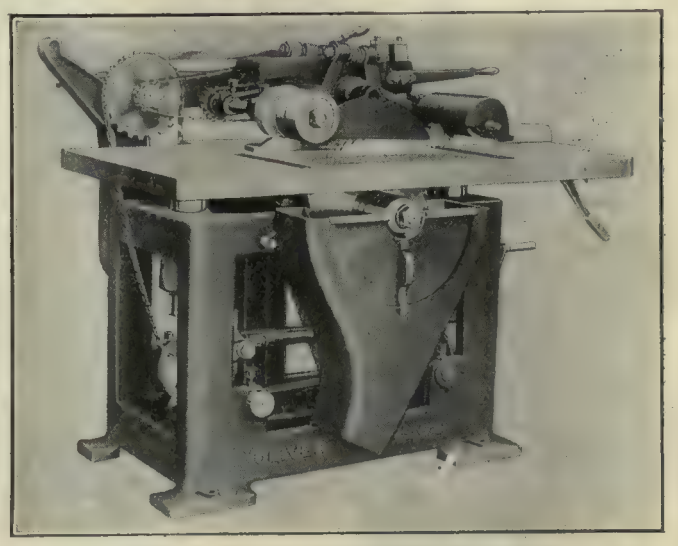
The accompanying illustration shows the No. 65 self-feeding rip saw recently placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine incorporates improvements over the Oliver machines of the type already on the market, chiefly with regard to the safety features and the dust chute. The machine is intended for ripping all kinds of lumber, being adaptable to the handling of either rough or finished stock.

The saw arbor is mounted on a frame provided with a vertically adjustable table. The in-feed spur roller is made either corrugated or smooth, according to the requirements of the work, and it carries the stock across the top of the table and through the saw. The machine will carry saws up to 18 in. in diameter, will cut lumber up to 5 in. thick, and rip up to 24 in. wide. A gang of six saws with 1-in. spacing collars may be used at one time.

There are three rates of feed, 80, 110 and 140 ft. per minute. Quick adjustments are provided for the feed rollers and the ripping fence, which can be easily locked in position. A mechanism is provided for absorbing shock on the feed rolls, so as to overcome jerks upon starting stock through the machine. A difference in thickness of $\frac{3}{4}$ in. is permissible in the stock without readjusting feed roll.

The lower portion of the saw is thoroughly guarded by means of the dust chute, which can be connected directly to the exhaust system. The upper portion of the saw runs in a guard carried by the feed mechanism. The star feed and the in-feed roll are covered by a metal guard, so as to prevent accidents to the workman while feeding the machine.

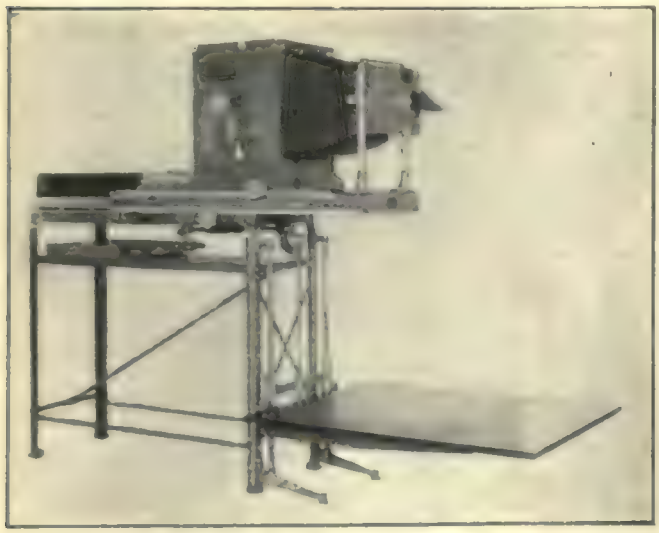
The table is 33½ x 56 in. in size, being adjusted vertically by means of a lever locking cam. The saw arbor has self-lubricating chambers. If desired, the machine may be arranged for motor drive. The regular equipment of the machine includes one 16-in. saw, a saw guard, feed spur and guard, splitter, one plain and one corrugated sectional out-feed roll, filling collars and sawdust chute.



OLIVER NO. 65 SELF-FEED RIP SAW

Improvements in the "Photostat"

The Photostat Corporation, 299 State St., Rochester, N. Y., has recently made some improvements in its "photostat," or photographic copying machine. The chief feature of the machine is its all-metal construction, making it durable and light in weight. The machine is made in the same sizes as heretofore furnished. Roller bearings are used for the magazine and bellows, so that these parts may be easily moved backward and forward. The mechanism for elevating and lowering the engineering copyboard or bookholder has been changed, it being stated that the weight of a man on the copy-



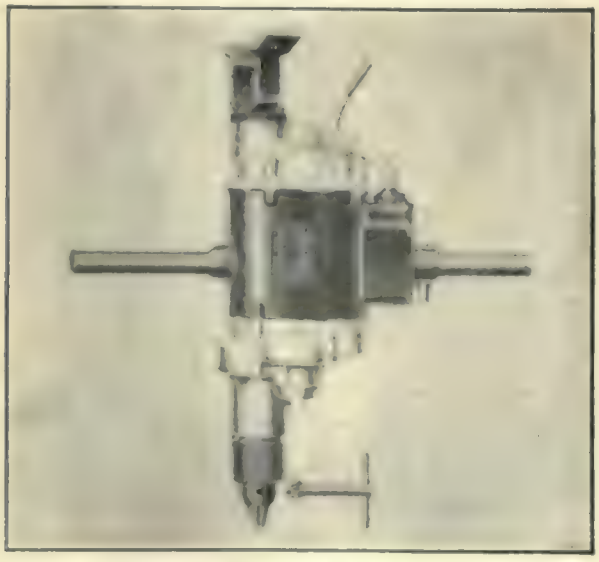
ALL STEEL "PHOTOSTAT"

board may be very easily lifted by turning the elevating handle.

The design of the developing tray makes it practically a separate developing tank carried on the side of the machine. Protection is given for all the other parts of the photostat from the possible splashing of chemicals, or erosion from the escaping fumes of the chemicals. The knife mechanism used for cutting off prints has been strengthened. An adjustable curtain on the magazine operates on special gear wheels and rollers. The function of the curtain is to make the magazine positively light proof and to protect the sensitized paper when the magazine is open. The height of the curtain can be adjusted by turning a knob, so as to give the proper length of sensitized paper for the exposure.

Hisey "Super" Universal Portable Electric Drill

In the accompanying illustration is shown the Hisey "super" universal portable electric drill recently placed on the market by the Hisey-Wolf Machine Co., Cincinnati, Ohio. The drill is intended for operation on either direct-current or single-phase alternating current of any frequency from 25 to 60 cycles. The principal feature to which the maker calls attention is the fact that the machine is equipped with ball bearings throughout. It is stated that in the mounting of the bearings, spring tension is provided, thus permitting expansion and contraction of the shaft without distortion, and insuring uniform stress on the different parts of the bearings.



HISEY "SUPER" PORTABLE ELECTRIC DRILL

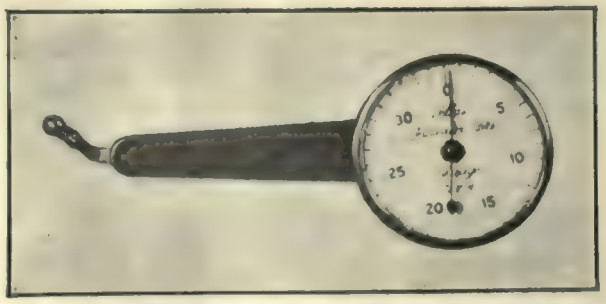
A quick-operating external cable connector permits of mounting or removing the cable without disturbing or dismantling the parts of the machine. The switch is mounted externally, but is protected by the removable switch handle cover. The brush holder is made of bakelite, and is not affected by oil, moisture or atmospheric conditions. The complete yoke is adjustable in position, so that the brushes can be shifted from the outside without dismantling the machine. Forced ventilation is provided. The cool incoming air passes over the commutator and the brushes before being drawn through the motor and expelled.

The drill is made in three sizes, having capacities in steel of $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. It is ordinarily supplied for operation on voltages of 110 or 220, although it can be furnished for special voltages up to 250. Each machine is ordinarily supplied with 15 ft. of electric cable fitted with a suitable attaching plug, and with a Jacobs drill chuck for holding straight-shank drills. If desired a Morse No. 1 taper socket can be furnished. The drill may be fitted with a screw-feed, breast-plate, grinding-wheel, flexible shaft for drilling or grinding, and with a stand for converting it into a bench drill. The machines weigh respectively, 18, 22 and 24 pounds.

Atlas "Junior" Dial Indicator

A small dial indicator, designated as the "Junior," has recently been placed on the market by the Atlas Indicator Works, 160 North Wells St., Chicago, Ill. The device, shown full size in the accompanying illustration, weighs but $\frac{3}{4}$ oz. It is said to be very sensitive and durable.

The housing is made of machine steel and case-hardened, while the important working parts are made of tool steel and hardened. A swiveling clamp is mounted on the back of the housing, so that it is possible to turn the dial to the most convenient position for reading, and to mount the instrument in the position required for the work. The indicator is graduated to read to 0.001 in., and has a range of 0.055 in. The position of the contact point can be changed, so as to facilitate different sorts of inspecting operations. After adjusting the contact point on the work, the dial may be revolved so as to bring the zero mark in line with the indicator hand.



ATLAS "JUNIOR" DIAL INDICATOR



NEWS SECTION

Pennsylvania Orders 80,000 Tons of Rails

Pennsylvania Railroad has concluded contracts involving 80,000 tons of steel rails, for delivery in the current year. In December, 1920, the company placed orders for 200,000 tons for delivery in 1921. The steel trade a while ago estimated that the Pennsylvania would contract for about 150,000 tons, but later the figure was reduced to 100,000 tons.

The Pennsylvania last year laid in the neighborhood of 160,000 tons of new rails, the largest amount since 1916, and carried over to 1922 about 50,000 tons.

This carryover, together with the 80,000 tons just contracted for, will give the road 130,000 tons of rails for 1922.

The order was alloted as follows: Forty thousand tons to the Carnegie Steel Co., 18,000 tons to the Bethlehem Steel Co., 18,000 tons to the Cambria Steel and 4,000 tons to the Lackawanna. The contract calls for 130,-pound open-hearth rails, the price of which was reduced $7 a ton last October.

Committee Appointed to Standardize R.R. Ties

The American Railway Engineering Association and the U. S. Forest Service have been designated by the American Engineering Standards Committee as joint sponsors for the unification of specifications for wood crossties and switchties for all classes of use including mining ties. The work is to include the grouping of ties with regard to preservative treatment, but not methods of treatment, and also inspection rules. This action is in accordance with the recommendations of a conference on railroad ties, at which the following organizations were represented: American Electric Railway Association; American Railway Engineering Association; American Society of Civil Engineers; American Society for Testing Materials; National Association of Railroad Tie Producers; National Hardwood Lumber Association; National Lumber Manufacturers Association; U. S. Department of Commerce; U. S. Forest Service.

For carrying out the work there will be organized by the sponsors a sectional committee having accredited representatives of the above organizations and of the American Mining Congress, and the American Wood Preservers Association.

American Machinery Wins in Spain

Pessimists who have been flooding the country with statements concerning the inability of American exporters to compete in the world's markets because of ruinous European price quotations, will find food for thought in a Department of Commerce announcement of another American trade victory in Spain.

Reports reaching the Department of Commerce from Spain indicate that the Spanish government has just awarded a contract to an American company for printing presses for the national mint. The American bid was 40,000 pesetas higher than the Spanish bid, and 25,000 pesetas above the German bid. The other bids submitted were too far out of the way to be considered in the awarding of the contract.

Technically Perfect

In commenting on the award the *Gaceta de Madrid*, a Spanish newspaper says: "Notwithstanding the fact that the German machine has an established reputation in Spain and these machines were offered at a price which was thousands of pesetas lower for each machine than of the American, the latter is considered the most technically perfect of its kind." The American machine, aside from producing the greater output, is the most economical and reliable of these machines, according to the government experts deciding the question. The American machines won on their merits.

Officials in the Department of Commerce feel that this news should prove helpful to those American exporters who have long believed that lower prices are not always the most important or the ruling factor in successful merchandising abroad. Service, delivery and credit arrangements carry great weight with importers in foreign countries and in these respects the American business man is usually on an equal footing at least with his price cutting competitors. Information had reached the Department that some of the German merchants had fallen down on their Latin-American contracts—they were finding it impossible to make delivery at the prices and terms originally offered. While low prices would for a time retard certain American exports, other distinctive American products will always be in wide demand abroad, irrespective of prices, because of the reputation which such products have established.

Treasury Reports Reduction in Public Debt

A reduction in the public debt of more than $180,000,000 during December was announced on Jan. 4 by the Treasury. The total debt on Dec. 31 was $23,438,984,351, as compared with $23,619,085,725 on Nov. 30.

The reduction reported makes a total of more than $543,000,000, as compared with December of 1920, when the total debt was $23,982,224,168, and a reduction of more than $485,000,000, as compared with the total at the end of the previous quarter on Sept. 30, 1921, when the debt was $23,924,108,125.

Industrial Engineers Elect J. W. Roe

The Society of Industrial Engineers, a member society of the Federated American Engineering Societies, has elected Joseph W. Roe, head of the industrial engineering department of New York University, as its president. W. G. Sheehan, of Detroit, has been chosen secretary, and F. C. Schwedtman, vice-president of the National City Bank, New York City, treasurer.

Four vice-presidents in charge of four phases of the society's work have also been chosen. Dwight T. Farnham, of C. E. Knoeppel & Co., New York City, was elected vice-president in charge of education; E. E. Arison, of Chicago, vice-president in charge of finance; Edward J. Kunze, head of the department of industrial engineering, Pennsylvania State College, vice-president in charge of research; and William S. Ford, of Milwaukee, vice-president in charge of promotion.

The society has now completed plans for the annual spring meeting which will be held at the Hotel Statler, in Detroit, April 26, 27 and 28.

A Market in Latvia

Farm machinery is very much needed in Latvia, according to recent reports from trade commissioner H. Lawrence Groves to the Department of Commerce. The Central Agricultural Cooperative Society of Latvia has issued a statement outlining these requirements, and states that this machinery should be furnished within the next two years. At present the intention is to replace only the machinery destroyed or removed as a result of the war. This does not cover the needs arising from the large number of farm units established in the last few months.

Col. Peck Assails Metric System as Favoring Minority—Advocates to Get More Time

An opportunity will be given before the end of January for those favoring the Ladd metric system bill to offer testimony and briefs to rebut the arguments made by the anti-metric witnesses. This will close the hearing. Senator McNary and the other members of the sub-committee then will make their report to the full committee on manufactures. As it is believed that an adverse report will be submitted by the sub-committee, the chances are that no metric legislation will be reported out at this time.

It is known that Ordnance officials are very much concerned lest by some chance legislation of this type be passed. Their feeling is that it is difficult to induce the average busy legislator to study deeply enough into such a question to arrive at conclusions of his own, and not be influenced by apparent advantages which disappear when knowledge of the question goes beyond the superficial.

An Ordnance estimate covering a change in the gradation of the sight slide of the small arms rifle from American units to metric units—yards to meters—shows that the change on all the small arms in the possession of the Government would cost $2,678,000. If the cost would be so great for a small change of that character it gives an indication as to the expense that would be involved were general changes made necessary, it is argued.

A brief resume of the arguments laid before the Senate committee by E. C. Peck, of the Cleveland Twist Drill Co., is as follows:

"The bill will cause endless confusion in the industries for an extended period. It seems to indicate in section two that immediately upon its passage the metric standards now at the Bureau of Standards become the primary standards from which all others are derived, but that punishment for failing to adopt them begins ten years from that date. The result will be the immediate adoption of this new standard for some industries, whereas others will not adopt it until the last minute. The whole manufacturing public will be without a consistent standard for ten years.

"The bill gives a cabinet officer, the Secretary of Commerce who changes every four years, too much power by authorizing him to make and promulgate the rules and regulations for the enforcement of the act. Courts finally would pass upon these matters, but the power to make preliminary definitions puts into one man's hands the power to work disastrous hardships. With a Secretary of Commerce favorable to the metric system, a ruling likely would result that farm products, land, etc., would have to be sold in metric terms. Such a ruling soon would set up an enormous number of agencies all over the country to translate the land records into metric units. Law suits would follow, due to mistakes. At least it would result in a fee being charged to every seller or purchaser of land for the making of a legal translation of the present land measures. From this it would be only a step to a licensed body of mathematicians charging fat fees for translating values for farmers and laymen.

"The statement often is made condemning our present system on account of the variety of bushels used. I cannot endorse that kind of evidence because practically everything we buy and sell now is handled in hundred-pound lots. The hundred-pound unit has come to be very nearly a standard in farm use.

"It is not clear what would become of stocks of tools the sizes of which are not in either the inch system or the metric. The alphabetical sizes and the numerical sizes are demanded in large quantities both in the United States and abroad.

"The passage of this bill would endanger all American standards because the adoption of the metric system will require a translation of all dimensions into metric units. It is impossible to think that other countries are going to adopt our sizes of machine parts, structural steel and other equipment, with dimensions in unheard-of fractions of the millimeter. There will be a constant endeavor to lop off the fractions or add to them, to make a nominal standard. Then all our tools and equipment become special. We must standardize all over again to meet this nominal or round number size. Take gearing for an example. It is highly standardized in the United States. Gears bought in one city will fit and function properly with gears bought in another. These gears are largely used. There are millions of them. They will not fit any of the gears now proposed by the metric countries. There is not a single pitch in the metric system that will fit the United States system now used so universally. Take the well-known twelve-pitch gear used by the thousands in this country and carried in stock commonly by large machinery dealers. The nearest pitch to this in the metric system is Module 2, but they will not run together because the U. S. gear tooth would be 0.007 in. too thick for the space in the metric.

"To get the metric countries to use our twelve-pitch standard translated into a metric module would be to ask them to change from a 2 module to 1.889 module. They would stand out against this awkward fraction and ask us to change our standard to Module 2, which would mean that the millions of gears on hand no longer would be interchangeable with the new product. Millions of dollars worth of gear-cutters, together with the necessary gages for checking this product, would become obsolete.

"The United States makes more than one-half of the screw-thread products of the world. It is the most interchangeable of any in the world. The metric system does not have a single diameter of bolt or pitch that will fit those now being made so extensively in the United States. There is no comparison between the methods used in metric countries and those of the United State for originating the correct size of a screw or a thread gage. This was evidenced plainly by the failure of the French mechanics during the war to make thread gages which were interchangeable or true to the dimensions prescribed for them. The threads on three out of the five French 75-mm. artillery pieces sent over to the United States did not interchange nor did they conform to their drawing dimensions for these threads. The thread gages they sent over to the United States to check the interchangeability of American made guns, did not fit the guns they sent nor did they check with the dimensions to which they were supposed to be made.

"One of the most valuable assets of our industry is a conception in the mind of the average American mechanic of the physical meaning of the dimension 'one thousandth inch.' All clearances, fits and tolerances are known in shop language as so many 'thousands.' These dimensions are the mechanic's alphabet.

"The compulsory use of the metric system would penalize too large a majority for the advantage gained by a small minority. The line is drawn between those who perform their work nearly entirely with paper and pencil and the great mass of producers, and people who deal with the actual physical representations of the standards. This proportion is more than a hundred to one. A hardship is worked on the hundred to help the one who is best fitted by education and training to take the harship, if any exists. The small proportion of the public benefited by the metric system is the better situated to use the present current units, even if it does not admit of rapid calculation decimally.

"As the product of locomotive and crane builders and makers of large special machinery is not standardized, as they carry no stocks and as their parts have little or no interchangeability, it is a matter of indifference to them whether or not their system of measurement is changed between one lot of manufacture and another."

Connecticut Manufacturers See Foreign Competition

The Manufacturers' Association of Connecticut, held its eleventh annual meeting at the Taft Hotel, New Haven, Conn., Dec. 29, and the following officers were elected for the ensuing year: E. Kent Hubbard, manufacturer, of Middletown, re-elected president; John H. Gross, of the Scoville Manufacturing Co., Waterbury, vice-president; Robert C. Buell, of the Hart & Hegeman Manufacturing Co., Hartford, treasurer. Directors were elected as follows: Don H. Curtin, Willimantic; Frederick J. Kingsbury, of the Bridgeport Brass Co., Bridgeport; Oliver L. Johnson, of the Aspinook Company, Jewett City; E. A. Moore, New Britain; William Parks, of the Riverside Woolen Mills, Stafford Springs; Charles E. Treadway, of the New Departure Manufacturing Co., Bristol; Isaac M. Ullman, New Haven; and W. W. Wilcox, of Middletown. The meeting resolved itself into a realization of the serious nature of foreign competition in the manufacturing market, especially German, to which the Connecticut industries are subjected. Among the speakers were Walter Camp, president of the New Haven Clock Co., New Haven, who spoke on "American Valuation." He advocated the plan of assessing duty on imports (on value) estimated at the port of arrival, in American money in the country of production. Mr. Carl W. Ackerman, a war correspondent, spoke on "Germany's Economic Offensive"; Col. John Q. Tilson, spoke on Connecticut's industry in general.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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As the business men of America take up the routine that was somewhat interrupted by the holidays, a tendency toward a more inclusive view of the world's affairs is apparent. The many leaders of industry, finance and commerce who expressed themselves in the newspapers at New Years were almost unanimous in predicting better times in the United States during 1922, but this prediction was in most cases conditioned upon the financial reconstruction of Europe and a recovery of her purchasing power.

As a result public attention in this country is being diverted from Washington and the Disarmament Congress to Cannes, where the Supreme Council of the League of Nations met last Friday. Although the United States is not a formal participant in this conference, our Ambassador to Great Britain, George Harvey, is present as an unofficial observer and American interest in the proceedings is very keen.

Numerous schemes for providing Europe with a stable currency and the credit that business requires will be discussed. Among them is the Ter Meulen plan, which seems to be highly regarded, but nearly all of them contemplate the creation of an international bank or something akin to it, whose capital shall consist of gold or other assets readily convertible. It seems to be assumed that a large portion of this capital can be obtained in the United States. As this is unlikely it is to be feared that none of the proposals put forward will prove to be workable.

But a partial solution of the problem presented is meantime being effected by the increasing use of the dollar as money is continental Europe. Returning travelers report that in Poland, Czecho Slovakia and parts of Germany the farmers are refusing to sell their produce unless they are paid in dollars and that in Paris the shopkeepers prefer dollars to francs for their goods. Coming nearer home, Cuba has no paper money and no bank notes except our own, and has not resorted to the printing press and to inflation to ease her economic distress.

To make the dollar a legal tender for debts already incurred in Europe is of course impracticable, but if new contracts expressed in dollars were legalized they would no doubt soon come into general usage and American money would speedily supplant the discredited paper whose fluctuations make foreign trade so difficult and hazardous.

The suggestion is not by any means fanciful for competent authorities estimate that many millions of our reserve notes are already held abroad and that in the form of dollar deposits the New York banks have custody of a very substantial portion of Europe's liquid capital.

Any great increase in the use of American currency in Europe would, of course, presuppose enlargement of its issue here, but our reserve ratio is so high that there is abundant room for expansion without inconvenience; and if the thousands of American tourists who will go abroad this summer or are already on their way to the Mediterranean resorts, understood that their dollars would buy as much as the equivalent in francs, lire or marks Europe would be automatically supplied with a large share of the good money it requires.

First place is given to a discussion of European conditions this week because they are likely to have a profound effect upon business in this country, both psychologically and physically. We are in good shape here but we produce more than we consume and unless we can sell our surplus production abroad at fair prices our farmers will suffer and their inability to buy will be felt all along the line. The news that a general moratorium is now being considered by the Italian government has therefore created some little apprehension in this country. The fear is that the distrust may spread and that other European countries may be affected. For this reason the Cannes conference is very opportune and it is to be hoped that it will act promptly and aggressively.

India and Ireland are two other sore spots in the overseas situation. De Valera is still blocking the ratification of the treaty offered by Great Britain, and Gandhi and his followers seem to be creating a great deal of trouble for the English in India. The resulting unsettlement need not, however, affect us directly except as all uncertainties make capital hesitate in undertaking new ventures.

The dullness of the stock market reflects the doubts that are felt with regard to the economic future of Europe, for certainly there is nothing in our domestic outlook to cause concern. The weekly statement of the Federal Reserve Banks shows a reserve ratio unchanged at 71.1 per cent and a gain of nearly $6,000,000 in the gold held.

Last Wednesday the new bond issues offered in New York totalled $76,447,000. They included $40,000,000 gold bonds of the Dutch East Indies put out on a 6.45 per cent basis, and $20,000,000 soldiers' bonus sold by the State of Ohio at prices which yield from 4 to 4.40 per cent. It is estimated that new bond issues amounting to more than $1,000,000,000 were brought out during the year and while much of this money was required to pay old debts or maturing obligations a large portion of it will be used for new construction which will give employment to millions of people.

Speculation is nevertheless dormant and the commodity markets show few changes. Cotton continues firm as the probability of another small crop becomes more generally appreciated. Woolen and cotton textiles are steady. The demand seems about equal to the supply. Sugar is attracting more attention at almost the lowest prices on record. It is a few points higher. Cuban advices say that a big crop next year is financially impossible as the planters cannot get the money required.

Reports from the steel industry are distinctly favorable and an increased production of pig iron is believed to presage a larger production of steel in the near future. The action of the General Motors Co. in passing the dividend on its common stock is variously construed. Some think it indicates that automobiles are still hard to sell while others claim that it reflects conditions that are peculiar rather than general. The truth seems to be that there is a good demand for low priced cars while those that are more expensive are slow of sale. Pennsylvania crude oil is down from ten to fifty cents a barrel and a proportionate decline in the mid-continent field is expected.

Railroad net earnings for November are nearly complete. They are much better than had been anticipated but the gain is chiefly due to the reduced cost of operation. December earnings are expected to be poor as those who could deferred making shipments until January when the repeal of the transportation tax and the reduction of about 25 per cent in the freight rates on food products in the trans-Mississippi territory became effective. We shall not know the facts until February, but many railroad managers expect a handsome increase in the traffic this month.

At the direction of the President, the Secretary of Agriculture has called an agricultural conference to consider the plight of the farmers. It will convene in Washington, probably on Jan. 23. Just what can be done at such a conference is not yet apparent, but it will at least quicken sympathy with the class who have suffered the most by the precipitate deflation and decline in prices.

These are the annals of a comparatively quiet week. In so far as they may be prophetically interpreted they indicate stability without excitement and increased activity when the long deferred hope of European recovery commences to be realized.

Steel Plant Coming Down

The enormous plant of the Chickasaw Shipbuilding and Car Co., near Mobile, Ala., constructed at a cost of several million dollars during the early part of the war by the United States Steel Corporation, is being dismantled. Of the plant proper only the acetylene gas plant and the million dollar electric power plant will remain when the present work has been completed. Officials are being transferred to other plants of the steel corporation.

Business Conditions in England

Outlook for 1922 Better In British Industry—Government Planning Financial Economy —Disarmament Having Its Effect—Machine Tools Quiet

BY OUR LONDON CORRESPONDENT

While there is not much that is material to justify it, the atmosphere appears once again to be clearing, this being due in a large part to the armament limitation congress at Washington, to the happier turn of affairs in Ireland, and to the fairly general feeling that questions of reparations, war debts and so on will at last have to be re-settled on a more workmanlike basis by international agreement. The steady rise in the New York exchange is ascribed not only to the Washington proceedings but also to Americans being more ready to use their money in Europe instead of importing gold, thus directly improving conditions on this side of the Atlantic and eventually in their own country. But the feeling grows that the load of debt weighing on all the lately-combatant countries of Europe will have to be re-adjusted, and for materialistic and other reasons Great Britain is quite ready to make sacrifices in order to get trade flowing again. The statement has often been made, in fact so often as almost to suggest a remote doubt about it, that this country, come what may, will pay her debts. Almost as frequently we are reminded that while we borrowed sums of the order of about 876 million pounds from America, we advanced to our Allies just a little more; and our Allies show very slight ability, or even disposition, to repay.

Production Increasing

The overseas trading of Great Britain, according to the latest return, does indicate some improvement, imports having increased in value during November as compared with the previous month by more than 4½ million pounds, while exports of British produce rose by more than half a million pounds; on the other hand re-exports fell by nearly the same amount. Of course, as compared with the same month in 1920 very marked declines in total values are shown in every direction, and this again is true when the eleven months of 1921 are compared with the same period of 1920, the imports having fallen, in value that is, by 44 per cent and exports of British produce by 48 per cent.

But for the time being the movement is in the right direction, and since the settlement of the coal strike last summer the output of British goods per working day has regularly improved month by month. Of course, there is a long way to go and imports out-value exports by about one million pounds per working day. Our imports may be regarded as steady. Exports are not of course the sole measure of productivity, and no real estimate can be made of the home trade. All the same, as far as they go the figures of export support what a number of employers have been stating of late, namely that the British workman is slowly but steadily putting his back into his business.

German reparations are causing as much trouble here as—probably more than—our debts elsewhere, and in response to the suggestion of Sir Peter Rylands that Germans should be allowed to build super-power stations in Great Britain, the Institution of Electrical Engineers has made a public protest. First of all on the general principle of reparations in kind the government is reminded of the extensive unemployment here, with the suggestion that any such reparations should be of a character not to compete with productions in Great Britain "involving employment on a great scale of labor, both skilled and unskilled." As to the special suggestion of large power stations, this, it is asserted, would lead to an additional amount of unemployment in the electrical trades, besides giving a world-wide advertisement to German goods, and, further "would fatally diminish the present prestige of British electrical goods, with most serious effects on our export markets."

British Economy

Besides the handicap to trade due to international debts, it is felt that few countries are making sufficient efforts to live within their means. Of European countries engaged, only Great Britain made any attempt by taxation to pay for the war while it was running. The two chief continental antagonists proceeded by way of loans, in the belief that the conquered enemy would have to pay for everything. After much talk a special committee has been sitting in Great Britain for the purpose of cutting-down expenditure. An interim report has just been made, but not published (a cut of £195,000,000 a year is suggested), and the final report will not be ready until the new year is fairly well advanced. In view of the reductions to be proposed in expenditure, it is anticipated with confidence that the income tax will be lowered next year, and newspapers have not been lax in asserting positively that the new corporation tax will disappear after a one-year run. As to the income tax, during the past six years this has raised something like £1,568,900,000, comparing with just under 271 million pounds for the six previous years. Heavy taxation is undoubtedly affecting enterprise adversely and now that profits are declining the disadvantage of assessment on the average profit of three years working is becoming obvious; though why this fact could not have been foreseen by so many people responsible for business affairs is rather surprising. The assertion has been made that payment of the tax now in many cases implies inroads into capital; thus in some instances at least a capital levy is already in operation.

Some firms have difficulty in meeting demands for excess profits duty and in response to pressure the Chancellor of the Exchequer has agreed to arrange definitely in his next budget for spreading the payment of outstanding arrears over a period of five years, payment to be made by quarterly installments, with interest at the rate of 5 per cent per annum without allowance for income tax. Special application will have to be made for this concession and the Chancellor is anticipating matters by instructing the officials concerned to give effect to the arrangement in advance. Here he may perhaps be on safer ground than was Lloyd George, when, as Minister of Munitions, he promised the machine tool makers special concessions in taxation, only to forget that the Chancellor of the Exchequer is responsible for the budget. But the concessions do not satisfy everyone. Some firms who have paid the duty complain that the new arrangement is not fair to them. Some add that the Chancellor was forced to make the concession by the fact that, if he did not, the firms concerned would go bankrupt and he might lose the whole of the money. It is perhaps an exaggerated view; in such cases the tax-collector has a very early claim on assets.

Another point is that before a real trade revival is possible railway rates must be lowered and prices generally, and especially of coal, must be still further reduced. The average drop in the price of coal during the current year is estimated at 13s 6d a ton. It is mainly in steam, gas and bunker varieties, household coal showing little change. The retailer has come in for much criticism, not without effect, and as the cost of living is reduced—according to the latest available official estimate it is 99 per cent above prewar cost—many wage reductions occur automatically and others can be pressed for on the ground of equality. Indeed the council of the trade union congress has just issued a manifesto which asserts that wage reductions effected last year reached £286,000,000. But this figure, if correct, relates to wage rates, not wages.

Production Costs Increasing

On the other hand, against it has to be set the fact that, according to Lord Weir's estimate, increased costs of production in Great Britain in 1920 due to the lessening of hours of working, etc., exceeded £200,000,000. Workers, or at least many of them, hold the view that employers have entered into a conspiracy to reduce wages and to lengthen drastically the working week. The council issuing the manifesto asserts this, "from the evidence submitted to us." But any such general combination of employers for that particular purpose is extremely unlikely. Reductions in wages are being forced solely by circumstances. The fact that for some time past Great Britain has had an army of unemployed drawing on public funds to numbers approaching two million, with more than a quarter of a million on a reduced working week, should be almost sufficient evidence.

The executive council of the Amalgamated Engineering Unions evidently

appreciate the gravity of the situation. Indeed they admit it, in view of the fact that more than 92,000 members are out of work. They therefore urge the members to ratify the provisional agreement reached with the employers on freedom of management and overtime matters; in fact the council suggest that failure of the workpeople to agree will probably mean a national stoppage of the industry on the part of the employers. The membership of the union is 430,000, or 30,000 less than at the beginning of 1921, and more than 25 per cent are unemployed.

The problem of the out-of-work has been especially acute in the midland areas, and rest rooms for unemployed men have been instituted in Birmingham, while lately one for women and girls has also been opened. The men's rooms are available all day and are controlled chiefly by committees of the unemployed themselves. More women's centers will be established in this year, the ordinary proceedings including evening concerts, games, etc., and the supply of cheap refreshments.

Effects of Disarmament

The negotiations at Washington had effect on the market prices of shares of the armament firms and indeed caused some little depression in other quarters. For although the production of armaments is certainly not to the advantage of the nation, some interests must be affected adversely. Firms outside regular armament circles who were to have supplied material, etc., for new capital ships had already named their particular vessel "Godsend," and it was partly because of the suspension of Admiralty orders that W. Beardmore & Co., Ltd., Glasgow, decided to pay no dividends recently. The accounts for the five years ending with 1920 show an aggregate profit of £2,411,021, separate accounts for each year not being available. After payment to preference shareholders, placing a million pounds to the general reserve, etc., the ordinary shareholders receive nothing; in fact they have been without a dividend since 1918, the directors last year carrying forward £711,909.

Vickers, Ltd., Sheffield, holds half of the ordinary capital in the Glasgow concern and provides two directors. It happens that Vickers, Ltd., has just issued a report for the year 1920; here again no dividend is to be paid on the ordinary shares. The profit for the year was £541,300, and after payment of preference dividend, etc., a balance of about £145,300 is to be added to the balance brought in, the carry forward being £991,639. The share capital issued of this company is £20,678,400, with £2,770,200 in debentures and notes. The value of material and work in progress shows a slight reduction and is put at £3,481,600. This is in the company's own works and does not take in the work of the subsidiary companies, in which Vickers, Ltd., is interested to the extent of £18,076,600. It may be added for comparison purposes that against the sum for 1920 of £541,300, the profits amounted to a total of £4,493,700 for the four previous years.

The Sheffield concern of Brown, Bayley's Steel Works, after including the balance brought forward and interim dividends paid, shows a balance on revenue account of £29,457. This firm is preparing stainless iron or mild steel, some half a dozen brands of which are now on the market. Dorman, Long & Co., Middlesbrough, iron and steel producers, etc., paid 5 per cent free tax on their ordinary shares, or half the dividend distributed last time. The accounts show profits for 1920 of £413,799. The ordinary shares amount to some six million pounds, out of a total issued capital of 7½ million pounds.

Machine Tools Very Quiet

The motor car and cycle industry may have received somewhat of a fillip from the Olympia shows, but this has not led to any great expansion in the call for machine tools, and the machine tool industry is as depressed as ever. A deputation from the Machine Tool Traders' Association recently drew attention to the large stocks of tools still held by the government, valued at £2,000,000 and upwards; the proceedings were private and apparently no conclusion was reached. Recent voting in the association in connection with the proposal to bring machine tools within the second part (prevention of dumping) of the Safeguarding of Industries Act and thus make them liable to duty resulted in less than 100 being in favor, a quarter the number against, a handful neutral, while the remainder did not vote.

A statement of affairs of the Universal Machinery Corporation, Ltd., London, E. C., now in liquidation, shows on the one side unsecured creditors at £120,892, while the chief item on the assets side is stock of machinery, some of which is understood to be in France, valued at £50,000. The net result is a deficiency of £73,675 to meet claims of unsecured creditors, subject to costs of liquidation. The share capital, authorized, issued and fully paid up is £20,000.

Some Firms Prospered

Among motor car firms Humber, Ltd., Coventry, seems to have done very well, the turnover in 1920, in face, constituting a record, with profits amounting to nearly £104,000, or almost the same as for the previous year. D. Napier & Son, Acton, W., also made a good return, showing a net profit of £79,099 against a loss the previous year of £59,541; no dividend is being paid on the ordinary shares and the directors are being reminded that good will is valued at £300,000. W. H. Dorman & Co., Stafford, associated with the motor car industry as manufacturer of motors, shows in the report for the year ending with July, 1920, a trading loss of £309,363, compared with a profit of £72,980 the previous year. After allowing for payment of preference dividends, etc., the debit balance is £186,000. The directors state that at the end of last year the company had booked orders worth approximately £700,000, mainly for the Dorman engine, but the major portion of these orders had to be suspended or cancelled as customers could not take delivery or pay. Rudge, Whitworth, Ltd., Coventry and Birmingham, again paid 10 per cent free of tax on the ordinary shares, but presents no statement of accounts; no balance sheet, in fact, has been available since 1915. It is reported that the Triumph Cycle Co., has bought up one of the Coventry motor concerns and will manufacture a four-seater car.

Trend of Business Improvement—Plants Resuming

The Imperial Wheel Co., Flint, Mich., manufacturer of automobile wheels, has resumed full production at its plant. The company is said to have orders on hand for more than 75,000 sets of wheels.

The Bourne-Fuller Co., Cleveland, Ohio, has resumed production at its Upson nut works, giving employment to about 800 operatives. A wage reduction of 15 per cent has been made at the plant.

The Ingersoll-Rand Co., New York, is maintaining the full-time operating schedule at its West Easton, Pa., plant.

The Missouri-Pacific Railroad Co., St. Louis Mo., has re-opened its repair shops at Sedalia, Mo., giving employment to about 1,400 operatives.

The Chief Motors, Inc., Port Huron, Mich., recently merged into the Whitney Tractor Co., with kindred interests, is arranging for increased operations at its plant to develop an output of 100 tractors daily. Additional equipment will be installed at once.

The Bessemer Gas Engine Co., Grove City, Pa., is increasing operations at its plant and will soon inaugurate a full production schedule.

The Missouri, Kansas & Texas Railroad Co., St. Louis, Mo., has resumed operations at its shops in the vicinity of Sedalia, Mo.

The Jewett Phonograph Co., Allegan, Mich., manufacturer of talking machines, has increased its working force to over 100 men, with working schedule advanced from 10 to 13 hours a day.

The Jenkins Brothers Co., Bridgeport, Conn., manufacturer of valves, is maintaining active production at its local plant and distributed a bonus of 5 per cent to employees on Jan. 1.

The Carbon Iron and Steel Co., Parryville, Pa., is arranging for the resumption of operations at its plant, following a shut-down for the past six months. Repairs and improvements were made to equipment.

The Rochester Can Co., Rochester, N. Y., distributed a bonus totaling $26,000 to its employees during the holiday season. Active production is being maintained at the plant.

The Delaware, Lackawanna & Western Railroad Co., is operating its shops at East Buffalo, N. Y., on full time, with a normal working force of about 1,000 men.

The Lockwood Manufacturing Co., Norwalk, Conn., manufacturer of hardware products, has recently resumed operations on a full time schedule, giving employment to about 700 operatives.

The Westinghouse Electric and Manufacturing Co. has placed two additional plant units in operation at its East Pittsburgh, Pa., works.

The Baldwin Locomotive Works, Philadelphia, Pa., is maintaining an active working schedule, giving employment to about 7,500 men, and expects to maintain this basis of production throughout the winter.

The A. B. Stove Co., Battle Creek, Mich., manufacturer of gas ranges, is operating at full production, with the largest output ever maintained at the plant.

The American Car and Foundry Co., New York, has received a contract for twenty-five all-steel passenger cars

from the Manhattan Railroad Co., New York. The work will be handled at the Berwick, Pa., plant of the company.

The American Locomotive Co., New York, has taken contracts for twenty-five heavy-type Mikado locomotives from the Central Railroad of New Jersey.

The Algoma Steel Corporation, 120 Broadway, New York, operating in the Lake Superior district, has taken an order for 15,000 tons of steel rails from the Canadian National Railways Company.

It is reported that the General Electric Company's plant in Pittsfield, Mass., has received another large order from Japan, for power transformers and lightning arresters. Transformers are to be of a capacity to generate 150,000 volts and transmit current 150 miles. This, together with substantial orders from the Alabama Power Co. and the Southern Power Co., of South Carolina, assures an expansion of the plant's operations by February.

The Smith & Wesson Co., Springfield, Mass., is installing new machinery, and the prospect is that the plant, closed since last summer, will resume operations soon.

Chamber of Commerce to Aid Study of Depreciation

Practical studies by the various industries for the purpose of ascertaining within each industry a normal rate of depreciation on buildings, machinery, etc., which may be used as a basis for reckoning depreciation in individual plants, are urged by the Fabricated Production Department of the Chamber of Commerce of the United States. Such studies have the approval of the United States Treasury Department.

It is not the purpose to create within any industry an inflexible standard rate of depreciation for the buildings, machinery, etc., of each unit within the industry, but it is proposed to set up something that may be used as a guide to fit usual conditions, as explained in a bulletin in which the Fabricated Production Department puts forward its recommendation.

There are certain conditions affecting the wear and tear upon buildings and machinery that are similar in most of the plants within any industry, it is declared. If these uniform conditions are taken into account in arriving at depreciation rates which are to be charged, it is much easier, it is held, for members of the industry and treasury officials to agree on rates than when no basis at all is set up.

The Fabricated Production Department of the national chamber has been working on this particular problem for some time. The announcement which it makes in its bulletin that the Treasury Department approves investigation and study along the lines suggested will be of unusual interest to business men, particularly manufacturers, who have wrestled with this question of proper rates to charge for depreciation. Manufacturers have recognized that different conditions obtain in the different industries and that depreciation is much greater in certain lines. It is clear for instance that depreciation on buildings used in the manufacture of steel products, foundries, etc., is greater than on buildings used for the manufacture of fine textile goods.

Government Officials and Manufacturers Urge Extension of Work of Screw Thread Commission

In all probability Congress will extend the term of the National Screw Thread Commission for a period of five years, from March 21, 1922. The matter is now being considered by the Committee on Coinage, Weights and Measures of the House of Representatives. No opposition to the proposal has been voiced and it is believed that the resolution, to the foregoing effect, which was introduced by Representative Tilson of Connecticut, will be passed.

Since the issuance of its report on screw threads, the commission has been urged to extend the work with the idea of standardizing heads of bolts and nuts, heads of screws, and the wire sizes. Col. E. C. Peck, of Cleveland, Ohio, who is a member of the Screw Thread Commission, testifying before the House Committee, stated that there are seven distinct systems in use in the United States for measuring wire sizes. He declared it would be a great benefit to the entire manufacturing industry if the commission can establish a system of wire gage numbers that will suit all purposes and be standardized in the same way screw threads have been standardized. Col. Peck told the committee that there had been no complaint from manufacturers as a result of the effort to standardize screw threads and pointed out that the Association of Screw and Nut Manufacturers, which includes fifty-seven manufacturing concerns, adopted the commission's report unanimously. He said that the demand for the extension of the work of the commission comes more insistently from manufacturers than from the consumers of their products.

In emphasizing the importance of exact fits in screw threads, Col. Peck cited the consequences which followed the breaking of a bolt when England and the United States were competing in an effort to cross the Atlantic Ocean in an airplane. England would have won that honor had our standard of screw threads been in use in that country, as the failure was caused by too great an initial strain on the bolt

The value of the screw thread report, Col. Peck pointed out, may be judged from the fact that the whole principle has been adopted in Germany.

Commerce Secretary Hoover appeared before the committee and urged that the benefits which had followed the simplification and standardization of screw threads be extended. He pointed out that "it has become more necessary than ever before, with the disparity between distribution and production costs, to resort to simplification of matters of this type. The most pregnant field I know in which something can be done toward restoring the relativity of production and distribution, is that we do not produce such a tremendous variety of goods. Then we are not compelled to carry such quantities of materials in stock. We do not have so much waste through misfits and other losses of that type. This commission has demonstrated that it is possible to get co-operation between manufacturers and engineers. With our very strongly individualistic manufacturer, the tendency is to establish little qualities about his own dimension that will hold his particular trade. But generally the manufacturing industry has taken a wider view and is prepared to co-operate in such matters."

Major J. O. Johnson, of the Ordnance Department of the Army, referred to the commission's report as "the universal language on screw threads." In the manufacture of 75-mm. shells during the war, it was necessary to deal with various tolerances, he said, until there were twenty-eight different sizes applying to the fuses which were screwed into the shell. This now has been worked down to six sizes and by working through this class of fits he expects to get it down to less than that. The fact that manufacturers now have to have only six sets of taps and six sets of gages instead of twenty-eight, means a tremendous saving, he pointed out. He cited, as an instance of the difficulties which arose prior to screw thread standardization, the experience of ships in American harbors. Due to the variety of threads on hydrants, it would be necessary for the ship's machine shop to make a coupling at nearly every port before it could hook onto a hydrant to get water.

When the Washington fire department was sent to Baltimore to help fight the great fire in that city, Washington hose and other apparatus could not be coupled up in Baltimore due to the difference in thread. This instance was referred to by Major Johnson as one of the most striking instances of lack of standardization of screw threads. By following the present standardized system, there is no confusion. A tap can be bought in San Francisco and the die in New York. He explained that the commission wishes to extend its work to the standardization of taps and tools and the acme thread remains to be standardized.

Machine Tool Exhibit in Japan

The manufacture of machine tools in Japan has undergone gradual development during the past twenty years. The period of the war saw the greatest expansion, due mostly to the high price of imported tools and the difficulty of transporting them. This gave Japanese manufacturers the opportunity to perfect their designs and expand.

Since the armistice the general depression has had its effect upon the machine tool trade. Manufacturers took this as an opportune time to arrange an exhibit and it was held at Osaka from Oct. 22 to Nov. 30, last year. The show was a great success, practically all the large builders of tools in Japan taking part. Prominent exhibitors were the Ikegail Iron Works, Karatsu Iron Works, Niigata Iron Works, Locomotive Works at Osaka and the Gas and Electric Works at Tokio.

Russia Introduces the Metric System

According to a decree of the Peoples Commissars, published in official soviet papers, the metric system of measures was introduced in all soviet institutions beginning Jan. 1, 1922, and from 1924 the metric system of weights and measures must be finally and universally adopted throughout Soviet Russia.

Special Meeting of Manufacturers To Discuss Tariff

To crystalize and give expression to the manufacturing opinion of the country respecting the vital principle of tariff administration and the need for early action upon tariff legislation in the public interest, it has been determined to call a convention of American manufacturers under the auspices of the National Association of Manufacturers to meet at the New Willard Hotel, Washington, D. C., on Monday and Tuesday, Jan. 30 and 31.

A referendum vote of the association has just been taken to determine whether or not the membership approves the proposal to insert the principle of "American Valuation" in any tariff bill which may be enacted. The membership vote disclosed 77.7 per cent favorable to American valuation, 20.7 per cent unfavorable, and 1.6 per cent of the ballots cast were defective. This meeting has been called as a means of forming intelligent public opinion upon the vital subject at issue, acquainting Congress with the viewpoint of industrial business and securing the earliest practical action toward a stable public policy. Further information of the meeting can be obtained from the secretary, George S. Boudinot, 50 Church St., New York City.

Farm Machinery Finds Favor in Chile

American farm machinery formed an important part of the exhibits at the agricultural show held during the last week of October in Santiago, Chile, by the National Society of Agriculture. This indicates a tendency toward the employment of modern equipment, obtained chiefly from the United States, according to a report from Charles A. McQueen to the Department of Commerce. American plows, cultivators, drills, mowers, binders and binder-thrashers, together with traction engines, both American and British, and thrashers, chiefly American, formed the bulk of the machinery on view.

In the more highly specialized products American manufacturers had little competition. The American reaper-thrasher was the object of much interest and this machine is particularly adaptable to conditions in the south of Chile, the principal wheat-growing district, because the copious rainfall requires rapid action on the part of the farmer so that the grain may be harvested and thrashed between the frequent showers, when conditions are favorable.

The market for modern agricultural machinery in Chile is limited by two factors—the cheapness of labor and the lack of a steady export demand for the agricultural products of the country. This exhibit has shown an increasing interest on the part of the Chileans in modern farm equipment. A return to normal conditions will undoubtedly witness an increased demand for American agricultural machinery.

Among the lighter tools and implements exhibited were articles manufactured locally. Dairy machinery and light flour mills of American manufacture were rather scarce, these products coming most from Sweden, where the exchange rates permit of lower prices than we can compete with.

Major Hoke Addresses New Britain Section, A. S. M. E.

Major W. E. Hoke, formerly of the Bureau of Standards at Washington, addressed a gathering of about 200 members and friends of the New Britain Section, A. S. M. E., assembled at the plant of the New Britain Machine Co., on the evening of Tuesday, Jan. 3, 1922. His subject was "The Millionth of an Inch."

Major Hoke's wide experience in the development and manufacture of precision gages renders him peculiarly adapted to bring home to his hearers the possibilities in the way of accurate measurements by the use of such gages. Lantern slides of the gages, the machinery used in their manufacture, and some of the many ways in which they may be applied to modern production methods were shown on the screen.

The speaker exhibited gages, squares, surface plates and similar tools that were claimed to be accurate to within a few millionths, and demonstrated in an interesting manner how surfaces of the utmost precision were produced upon machines far less accurate than themselves by the application of the principle of the "symmetrical distribution of errors."

The theory of the interference of light waves was explained and the manner in which the color bands of the interferometer were applied to the checking of accurate measurements.

New England Foundrymen Dine and Frolic

The twenty-sixth annual meeting of the New England Foundrymen's Association was held in the Exchange Club, in Boston, on the evening of Jan. 11. A large crowd of members and friends attended the festivities, which were garnished with a program of entertainment seldom provided at such affairs. The Foundrymen's own orchestra supplied the music for the occasion. A vaudeville show with a variety of performers made the evening a most enjoyable one.

The election of officers for the ensuing year resulted in the selection of E. H. Ballard, of the General Electric Co., Lynn, Mass., as president. Other officers chosen were: George A. Ray, Taylor-Fenn Co., Hartford, vice-president; H. H. Gibby, Gibby Foundry Co., Boston, treasurer; and Fred F. Stockwell, Barbour-Stockwell Co., Cambridge, secretary.

Charles A. Reed, chairman of the executive committee, arranged the details of the meeting.

November Exports of Motor Vehicles

With the exception of motorcycles, exports of motor vehicles during November show a decrease from the exports of the previous month, says the Department of Commerce. Passenger car shipments were one-tenth smaller in number, while motor trucks showed a decrease of more than one-fourth. Motorcycle exports increased 13 per cent in number. A slight increase in the unit value of passenger cars is evident and a considerable decrease in the unit value of motor trucks exported—12 per cent as regards complete trucks, and 43 per cent as regards chassis of trucks.

Gov. Harding on Exchange and Tariff

Foreign exchange and the export situation were referred to in a recent public address by W. P. G. Harding, governor of the Federal Reserve Board.

He said that judging from our own history after the Civil War, many years will doubtless elapse before some European countries can restore the normal value of their currencies, but if the violent fluctuations in exchange which have marked the past two years can be prevented in future and a stabilization on some basis accomplished, it will be possible to engage in commercial and financial transactions with Europe on a much larger scale than at present. If we wish to sell our surplus products abroad, it is evident that we must continue to exchange commodities with foreign countries, for where we sell we must buy. A curtailment of production to meet merely American requirements would involve wide-spread unemployment and would invite disaster. On the other hand, because of the great depreciation in the currencies of many foreign countries their labor costs are much less than ours and partly because of this fact and partly because of the high premium on dollar exchange, they are able to undersell us in our own markets.

One of the great problems of our national legislators today is to frame a tariff which will prevent the dumping upon our markets of foreign goods, without at the same time erecting a tariff wall so high that our exports will be greatly reduced because of the inability of foreign nations to trade with us.

Japan Shows Slight Improvement in Trade

There has been little change in the general economic conditions of Japan since Nov. 15, according to acting commercial attaché H. A. Butts, of Tokio, to the Department of Commerce. Except some increased activity in the cotton yarn, raw silk, silk textile and rice markets, trade and industry in other lines remain depressed. Heavier railroad traffic during November, a more active demand for shipping space, the chartering of more small vessels, however, are hopeful signs of increasing business. Postal and savings deposits have decreased, bank rates increased and money is somewhat tighter but that is quite natural in view of the general custom to settle all outstanding debts before the beginning of the new year. The government reports expenditures in excess of revenues for the period from Jan. 1 to Oct. 1.

Although there will probably be some improvement in the export trade in December, through increased exportations of silk, cotton yarns and textiles, it does not seem probable that the increase will be sufficient to equal the probable imports for that month and the year will undoubtedly close with an excess of imports over exports of about 360,000,000 yen, compared with a similar unfavorable trade balance last year of 388,000,000 yen. While the balance is less this year than last, the ratio of the balance to their exports is considerably greater. However, the outlook for 1922 presages a larger export and import return.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Lathe, Engine, 9- and 11-In., "Junior"

Monarch Machine Tool Co., Sidney, Ohio.

"American Machinist," August 25, 1921.



The lathe is made in both 9- and 11-in. swing, in bed lengths from 2½ to 5 ft., and in either bench or floor models. The headstock is of the bowl type, and is equipped with a three-step cone pulley and single back gears. The bed is made of semi-steel. Longitudinal and cross feeds are provided. The machine can be furnished with either full or semi-quick-change gear box, 54 feeds and threads being obtainable with the former and 3 quick changes with the latter. Taper, turret and draw-in attachments, chasing dial and stop, oil pump and individual motor drive can be furnished.

Car, Shop, Electric

Automatic Transportation Co., 2933 Main St., Buffalo, N. Y.

"American Machinist," August 25, 1921.



The machine is intended to provide quick and convenient inter-shop transportation. The wheelbase of the car is 65 in., and the tread is 35 in., so that the machine can pass through most shop doors and aisles. The car has a cruising radius of fifty miles on one charge at a speed of 15 miles per hour, and a load capacity of 500 pounds. It is said that the cost of recharging the batteries is but a few cents per day. Charging apparatus can be furnished.

Gages, Plug, Thread, Reversible

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," August 25, 1921.



These reversible thread plug gages are made in all sizes above ¾ in. "No go" and "go" ends are interchangeable with the cylindrical plugs, and either long or short lengths can be used. Rigidity between the gage and the handle is said to be assured by the use of the tripod support. At *A* and *B* in the illustration are shown the standard type of reversible end gages. At *C* is a "protected master," so called from the fact that it is impossible to screw it into a hole. *D* is a plug for setting thread gage templets. *E* and *F* show the non-reversible type of thread plug gage.

Die-Head, 2½ in., "Coventry"

Alfred Herbert, Ltd., Coventry, England, and 50 Church St., New York, N. Y.

"American Machinist," August 25, 1921.



The die head is intended for cutting fine threads, being lighter than the standard one of the same nominal size. The action is the same as in the head described in the *American Machinist* on April 15, 1920. It will cut threads on rods from 1½ to 2½ in. in nominal size. The maximum length threaded using the standard shank is 2½ in. The shank is removable, permitting the use of an adapter and allowing the work to pass through it, so that any length can be cut. Weight, 23 pounds.

Connecting-Rod Machine; Babbitting, Boring and Straightening; Weber

Sawyer-Weber Tool Manufacturing Co., Los Angeles, Cal.

"American Machinist," August 25, 1921.

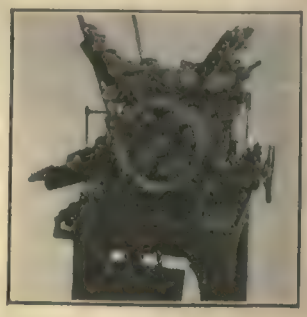


The bed of the machine consists of a face-plate on which may be located the clamps, V-blocks, boring tool and other equipment. It is said that with this machine an operator can babbitt a connecting-rod bearing, straighten the rod and bore the bearing to size. The rod is held both by a wristpin through the small end, and in a support which has two setscrews in the top for clamping the rod. One formed cutter is used for the entire operation of boring, facing and filleting. A piston can be clamped to the side of the plate and held there for reaming the crosshole. It is possible to test the connecting-rod and piston assemblies for straightness, by rearranging the equipment.

Drilling and Tapping Machine, Automatic, Spoke-Nipple

Langelier Mfg. Co., Providence, R. I.

"American Machinist," August 25, 1921.

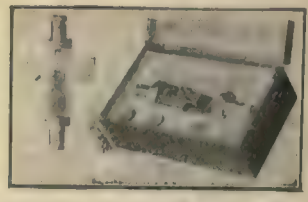


This is a special machine for the rapid drilling and tapping of the spoke-nipples used in automobile wheels. The nipples are held in lots of five in five different positions on the surface of the drum in the center of the machine. Corresponding to these five positions are five heads carrying the tools for the different operations. With each movement of the drum, five completed nipples are ejected from the machine, the production being stated as 120 nipples per minute. The machine is almost entirely gear driven. It is equipped with automatic stops which suspend its operation if tools are broken or work misplaced.

Arbor, Grinding and Relieving

Kelly Reamer Co., 3705 W. 73rd St., Cleveland, O.

"American Machinist," August 25, 1921.

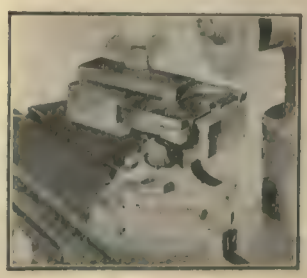


This arbor is for use in grinding the cutters of "Kelly" reamers. The center bar of the reamer is placed in the arbor, as shown at the left, and is located centrally by a lug entering a slot on the bar. The arbor is furnished with hardened end plugs. It is used in a cylindrical grinding machine between centers, where it is oscillated by hand while the grinding wheel is passed across the face of the cutter. Plugs with offset or eccentric center holes are used, the result being that the cutter is not only sharpened but relieved as well.

Fixture, Grinding, Angle, Universal

Kelly Reamer Co., 3705 West 73rd St., Cleveland, O.

"American Machinist," August 25, 1921.



The fixture is intended for grinding the nose angles on cutters for reamers, and also for grinding lips on the cutters to give them top rake. The illustration shows the latter operation, using a formed wheel. For grinding nose angles, the fixture is turned approximately 90 deg. in a horizontal plane and a cup wheel used. The fixture can be completely revolved in a horizontal plane, and also set to all necessary vertical angles. Provision is made for centrally locating the cutter bar in the fixture.

Colorado Commission to Develop Water Power

President Harding has appointed Secretary Hoover as federal chairman of the Colorado River Commission recently created jointly by Congress and the seven states traversed by the river. The appointment has been made with the approval of the Governors of the states concerned. The creation of this commission is the first step in what promises to become one of the greatest of our national improvements, involving over a term of years an expenditure of several hundred millions of either public or private funds. Each of the States of California, Arizona, Nevada, Utah, Colorado, Wyoming, and Montana, is interested in the irrigation and power to be derived from the river and considerable conflict has already developed. Unless the river problems are considered as a whole there is likely to be a great waste both in water and power, through private or public grabbing or ill-considered plans, with much conflict both between the states and with private interests.

The land under irrigation in 1920 from the river and its tributaries amounted to about 2,464,000 acres in the United States and 190,000 acres in Mexico. If the river were equipped with proper storage dams the amount of irrigated land could be increased to about 6,123,000 acres in the United States and 800,000 acres in Mexico.

There is practically no power developed on the river at the present time, but it has possibilities of developing six million horsepower as an incident to development of irrigation storage. Some of this horsepower is urgently needed at the present time in Southern California and Arizona.

Foundrymen to Prepare Technical Papers

Technical subjects to be covered by members of the research committee of the Southern Metal Trades Association, a committee established by the organization some weeks ago to set a certain high standard for the manufactured products of Southern foundries and machine shops that are included in the membership, have been announced as follows:

By W. W. Stone, of the Wilmington Iron Works, Wilmington, N. C.; (1) The Physical Specifications of Gray Iron Castings; (2) Coke.

By John S. Schofield, of the Schofield Iron Works, Macon Ga.; (1) Chemical Specifications of Gray Iron Castings; (2) Finish of Castings.

By T. H. Siddall, of the Sumter Machine Co., Sumter, S. C.; (1) Mixing of Iron by Analysis; (2) Molding Sand; (3) Core Sand and Venting.

By J. R. Hedges, of the Casey-Hedges Co., Chattanooga, Tenn.; (1) Cupola; (2) Blast Pressure.

As soon as these subjects have been prepared they will be issued by the association in mimeographed form and distributed to all members, and it is later the plan to publish the entire series in book form. Each subject is covered by a man particularly fitted for it and recognized as one of the leaders in the metal trades industries of the Southern field. William E. Dunn, Jr., of Atlanta, secretary of the association is in charge of the distribution of the papers.

Metal Trades of South See Bright Future

The year 1921 came to a close with the metal trades industries unusually active in the Southeast, especially in the Alabama district. Production is far in excess of its total four or five months ago when it had reached about the lowest ebb of the year. Conditions began to gradually pick up about the time cotton went up in the early part of October, and during November and December the improvement was more rapid. The outlook for 1922 is unusually bright. In Georgia, South Carolina and Tennessee foundry and machine shop conditions have improved somewhat during the past three months, but do not compare with the outlook portending more rapid improvement early this year. In Alabama conditions are rapidly approaching normal, while there has also been material improvement in Louisiana and Mississippi.

Excessive freight rates at this time appear to be one of the main factors retarding industry's more rapid advancement, but it is generally believed in the Southeast that lower rates will probably be in effect by next April.

Business Items

The Standard Machinery Co., 453 Chapel St., New Haven, Conn., new and used machinery dealer, has recently changed the name of the company to Machinery Dealers, Inc. The personnel of the firm remains the same.

The Watrous Engineering Co., Inc., 211 State St., Bridgeport, Conn., was incorporated in December in the State of Connecticut to deal in machinery, tools, etc. The capital stock is $25,000. The incorporators are J. A. Watrous, M. Watrous and H. M. Hanks.

Beginning Jan. 1 the process engineering department of the Bridgeport Brass Co., manufacturers of brass goods, Bridgeport, Conn., will be absorbed by the research engineering department. Both will be under the supervision of William R. Webster, vice-president of the company.

The Nanbestos Products Co., of New Haven, Conn., was recently organized and incorporated under the laws of the State of Connecticut, to engage in the manufacture of hardware and asbestos products. The capital stock is $20,000. The incorporators are William Nanfelt, 156 Atwater St., New Haven; Ernest F. Nanfelt, and T. F. Reilley, also of New Haven.

The Danbury Mill Supply Co., Inc., of Danbury, Conn., was incorporated in December filing a certificate with the Secretary of the State of Connecticut, to engage and deal in machinery, etc. The capital stock is $25,000. The incorporators are; Winfield S. Holman, 35 Liberty St., Danbury; G. A. Seagraves, Providence, R. I., and H. Holman, of Danbury.

The Kraut, Brenton & Salvucci Co., Inc., toolpost manufacturer, Bridgeport, Conn., recently incorporated, has changed the name of the company to the Universal Tool Post Co., Inc.

The Industrial Supply Co., Inc., 464 Chapel St., New Haven, Conn., has recently been incorporated to deal in mill supplies, machinery, etc. J. F. Toole, 144 Townsend Ave., New Haven, is president and secretary; James F. Toole, New Haven, is the vice-president and treasurer.

The English & Mersick Co., Winchester Ave., New Haven, Conn., manufacturers of hardware, etc., has recently filed a certificate with the Secretary of State of Connecticut, increasing the capital stock from $300,000 to $500,000.

The Segal Metal Products Co., manufacturer of locks and hardware specialties, recently purchased the foundry of C. A. Lund, at Springdale, a suburb of Stamford, Conn.

The Fitzgerald Forging and Heat Treating Co., Springfield, Mass., has just been organized and will operate a plant at 576 St. James Ave., in that city. M. V. Fitzgerald and Thomas J. Fitzgerald are the partners.

The tool and machines shops of the New England Tank and Tower Co., Main St., Everett, Mass., were recently burned in a fire which occurred the latter part of December.

The Nickel Engineering Works, of Saginaw, Mich., manufactures of agitator equipment for chemical tanks, has leased a portion of the Schemm Brewing Co. plant, 920 North Hamilton St., for machine shop purposes.

The H. O. F. Motor Manufacturing Co. has been established at Cleveland, Ohio, with a capital stock of $100,000. Directors are W. T. Holliday, A. B. Oakes, M. F. Hanning, W. A. McAfee and C. M. Buss.

The Wainwright Engineering Corporation of Connersville, Ind., has combined with the McQuay-Norris Manufacturing Co., of St. Louis, Mo. The new organization will do business under the latter name. Harry A. Wainwright is manager of the company.

The Southern Berkshire Power and Electric Co. has completed its 700-ft. dam at Rockdale, Mass. A powerhouse has been built and a penstock and waterwheel installed for the development of 600 horsepower. The plant will be ready for operation in February.

The Gem City Machine Co., Dayton, Ohio, has increased its capital stock to $225,000. The company manufactures airplane motors and special machinery.

The plant of the Lowell Aircraft Co. was destroyed by fire. The loss is estimated at $250,000.

The Combustion Engineering Corporation, of New York, has opened a branch office at 806 First National Bank Bldg., Pittsburgh, Pa. This office will be in charge of W. C. Stripe.

W. B. Stratton, of New York, and H. W. Champion, of Philadelphia, have been appointed receivers for the White Roller Bearing Co., of Philadelphia.

The Paragon Tool Co., of Seattle, Wash., has been appointed as distributor, in the Northwest, of Deluxe lightweight gray-iron pistons, which are manufactured by the Clark-Turner Piston Co., of Los Angeles, Cal.

The Reading Machine and Tool Co. is the new name of the Reading Machinery Exchange of 437 Washington St., Reading, Pa. The change took place on Jan. 1. There will be no change in ownership or management.

The Seifreat-Woodruff Co., Dayton, Ohio, has closed a most successful exhibit of machine tools in operation. The show was held from Dec. 12 to 31

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Sanding Machine, Belt, No. 126

Oliver Machinery Co., Grand Rapids, Mich.

"American Machinist," September 1, 1921.



The machine is intended for the rapid sanding and polishing of all kinds of metal parts. As shown, the machine is set up so that there is no overhead belt. The slack in the sanding belt is automatically taken up, the idler being adjustable vertically. The table is 32 in. wide and 96 in. long, and equipped with an adjustable bar to hold the work. The equipment consists of one sanding shoe, wrenches and edging attachments. The table travels 36 in. and has a vertical adjustment of 14 in. Sanding belts up to 10 in. wide may be used. Weight, 1,400 lb.

Milling Machine, Die

Johnson Tool Co., 201 Eddy St., Providence, R. I.

"American Machinist," September 1, 1921.

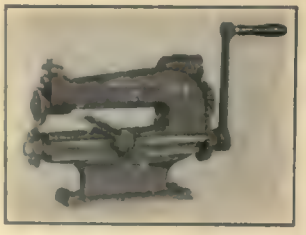


This die-milling and cutter-plate machine is intended especially for use in the manufacture of punching dies and hubs. The machine is provided with a tilting table, which has a capacity of 9 in. when not fitted with jaws. The machine has two spindles, one carried under the vise table and the other above. The head in which the upper spindle is carried can be swung out of position when not in use. The crossfeed is 4 in. and the lateral feed 6 in. The height from the floor to the top of the table is 40 in. Weight 600 lb.

Gage, Slitting, Rotary Sheet-Metal Shear

Niagara Machine & Tool Works, Buffalo, N. Y.

"American Machinist," September 1, 1921.

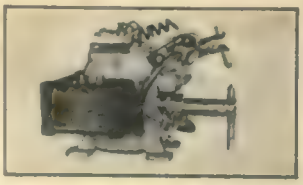


The gage is shown applied to the No. 2 rotary sheet-metal slitting shear, its purpose being to provide a simple means of guiding work through the shearing machine. The gage is easily adjusted, being held in alignment by the guideway. When the nut is tightened on the lock-bolt, the gage is locked firmly in position. The No. 2 slitting shear shown has been re-designed, and is now a miniature of the heavy slitting shear made by the concern.

Welding Machine, Spot, Bench-Type, S-4-B

Taylor Welder Co., 12 Atlantic St., Warren, Ohio.

"American Machinist," September 1, 1921.

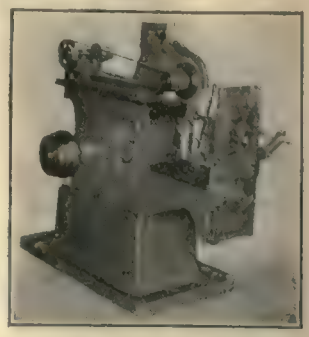


This welding machine is known as the S-4-B bench type. It has a cast copper frame, which acts as the secondary. The horns are of cold-drawn copper, 1⅛ in. in diameter, and are cooled by the circulation of water in them. The distance between the horns is 3 in. when closed in the upper position, and 5 in. in the lower position. Current is applied through an automatic single-pole switch, stepped down through a 3-kw. transformer, which has a four-step regulator for adjusting the current. The machine is designed for light work such as welding, brazing and soldering. Weight, 150 lb.

Grinding Machine, Gear, Automatic

Garrison Gear Grinder Co., Dayton, Ohio.

"American Machinist," September 1, 1921.



This machine is for grinding gear teeth, by means of a wheel having a section like that of a rack tooth and generating the bearing surfaces on the gear teeth. The gear to be ground is held on the arbor below the wheel. A master gear and rack are employed for each different size and type of work. While the wheel slide reciprocates horizontally, the work is indexed entirely around. The work is then moved horizontally and rolled slightly, and the indexing repeated. Thus, after a series of steps, each tooth is completely ground on the contacting surface. The movements are provided with automatic stops. A wheel-truing device is mounted directly beneath the wheel. The machine can handle gears having pitch diameters from 2 to 9 in. and face widths up to 2 in.

Milling Machine, Thread, Automatic

Waltham Machine Works, Waltham, Mass.

"American Machinist," September 1, 1921.



The automatic features of the machine are intended to make it possible for a number of machines to be handled by one operator. After the work has been placed in position, the movements are wholly automatic. The length of the thread is the same as the amount of rise of the cam that controls the workslide. The extreme travel of the workslide is 2 in. An angular adjustment of 45 deg. on each side of the horizontal is provided for the cutter head. The drive for the workhead is made by means of a geared connection and a universal joint.

Shaper, 9-Inch

Milwaukee Shaper Co., 1023 Cold Spring Ave., Milwaukee, Wis.

"American Machinist," September 1, 1921.



The machine is intended chiefly for toolroom work. All iron castings used in the construction of the machine are said to contain 40 per cent of steel. The ram has wide V-shaped bearings, scraped to fit with the ram gibs. The apron is provided with a taper gib to take up wear in the crossrail. The toolhead is graduated and swivels through an arc of 60 deg. The table is 8¾ in. long and 8 in. wide, and can be tilted to either side. The swivel vise has a graduated base, steel jaws, and an extra set of jaws for taper work.

Molding Material, for Thermit Welding

Metal & Thermit Corporation, New York, N. Y.

"American Machinist," September 1, 1921.

This molding material for thermit welding is said to prevent blowholes and assure sound welds. The action of the material is based on the theory that good silica sand will stand the heat of the thermit reaction very well, and that the weakness in all molding materials is the clay binder. The material is composed of three parts of sharp silica sand mixed with one part of Welsh mountain plastic clay. The ingredients are first thoroughly mixed in the muller with one-fortieth part glutrin by volume, and sufficient water to bring them to the proper consistency.

Clip, paste on 3 x 5-in. cards and file as desired

in specially prepared showrooms in Dayton. A variety of drilling and milling machines, lathes, presses and screw machines were shown in operation. The exhibit was in charge of Chris Seifreat.

Campagnie d'Applications Mecaniques, manufacturer of RBF ball and roller bearings, has published an interesting booklet entitled "Le Roulement a Travers les Ages." It is an historical and instructive treatise on the development of the bearing art. The book can be seen at the New York Public Library.

The Harley Company, brass manufacturer, of Springfield, Mass., has been purchased by A. W. Morris, representing New York and Philadelphia capitalists.

The Bostwick-Lyon Bronze Co., Waynesboro, Pa., has purchased the plant of the Maryland Smelting and Refining Co., Hagerstown, Md., and will merge it with the Hagerstown Bearing Metal Works.

Personals

A. P. MORROW has resigned as president of the Willys-Morrow Co., and retires from active management of the Elmira plant of the company. He will retain a financial interest in the company and will also act in an advising capacity to the directors.

RALPH E. NORTHWAY has resigned as vice-president of the Northway Motors Corporation, of Boston, Mass. He was the designer of the automobile which bears his name.

COL. GEORGE W. MIXTER has resigned as president of the Pierce-Arrow Motor Car Co. He will be succeeded by Vice-president H. E. Forbes.

A. H. D'ARCAMBAL, metallurgist of the Pratt & Whitney Co., manufacturer of tools and machinery, Hartford, Conn., will speak on "High-Speed Steel" at the February meeting of the Hartford chapter of the American Society for Steel Treating.

GEORGE W. GALBRAITH, manager of the Cincinnati (Ohio) office of the Worthington Pump and Machinery Co., was elected vice-president of the Cincinnati Engineers' Club at a meeting of the newly elected board of directors.

W. P. CHRYSLER has been elected to the presidency of the Willys-Morrow Co., to succeed A. P. Morrow who recently resigned. Mr. Chrysler was formerly president of the Buick Motor Co., and vice-president of the Willys-Overland Co.

ALBERT W. MORRIS has been elected president, and Elisha H. Brewster, treasurer, of the reorganized Harley Co. in Springfield, Mass. Plant and machinery are being put in shape for early resumption of operations.

ARTHUR BREWER, chief engineer of the Bridgeport Brass Co., Bridgeport, Conn., manufacturer of brass goods, etc., has been made works manager of the mills product division of the company.

ARTHUR JACKSON, engineering representative in Japan, of the Potter & Johnston Machine Co., has been elected a regular member of the Japan Society of Mechanical Engineers. During the war Mr. Jackson was demonstrating Gridley automatics in Great Britain.

T. W. ROGERS has been appointed representative in Toronto and Western Ontario, of Canada Foundries and Forgings, Ltd., of Brockville, Ontario.

L. A. SCHLOSSSTEIN, formerly supervisor of tools for the Robbins & Meyers Co., Springfield, Ohio, is now employed in a similar capacity with General Motors at the Plant of the Oakland Motor Co., Pontiac, Mich.

E. R. FREICHT has been appointed head of the plant engineering and maintenance departments and supervisor of maintenance of the Bridgeport Brass Co., brass goods manufacturer, Bridgeport, Conn.

JOSEPH WEISENBACH, of Chicago, has purchased the properties of the Quenelda Graphite Co., at Lineville, Ala., for $150,000, at an auction held by the receivers. The company, which operated the largest graphite plant in the South, went into bankruptcy last July. Immediate reorganization is planned and resumption of activity at the plant.

JOHN T. BELL, general sales manager of the Gurney Ball Bearing Co., Jamestown, N. Y., has resigned that position and will engage in the manufacture of a new type of anti-friction bearing. A plant has been secured at Syracuse and Mr. Bell, with several associates, will organize a company, the name of which will be announced later.

WALTER B. CLARK, works manager of the mills products division of the Bridgeport Brass Co., Bridgeport, Conn., has just been appointed general works manager of the entire plant.

Obituary

THOMAS MURRAY, assistant secretary and assistant treasurer of the United States Steel Corporation, died on Dec. 27 at his home in Sparkhill, N. Y. He was fifty-four years old.

JOHN J. CUNNINGHAM, president of the Western Foundry Co., Wingham, Ont., Canada, died on Dec. 31. He was fifty-seven years old.

HORACE THURSTON, founder of the Thurston Manufacturing Co., Providence, R. I., died at his home at Kingston on Dec. 22. He was seventy years old. Mr. Thurston was a pioneer in the manufacture of saws and cutters.

Pamphlets Received

Industrial Opportunities in New Jersey: Board of Conservation and Development, State House, Trenton, N. J. The purpose of this booklet is to exhibit, by word and picture, the advantages of New Jersey outside of the recognized industrial and suburban centers, showing a variety of locations that combine factory and home-making opportunities. The pages are replete with maps, photographs and tables of facts and figures. The board will send the booklet to anyone interested.

Steam Condensing Plant: Ingersoll Rand Co., 11 Broadway, New York City. Paper by Paul Bancel read before the American Society of Mechanical Engineers, May 16, 1921. It covers the installation and use of surface condensers. An improvement in design which eliminates to a great extent, the necessity for renewing of boiler tubes on account of leaks and corrosion. The paper discusses various phases of boiler and condenser construction and gives some practical information on vaporizing, steam distribution and temperatures.

Twist Drills: Cleveland Twist Drill Co., Cleveland, Ohio. A thirty-six page booklet presenting a brief but comprehensive collection of ideas on obtaining increased capacity, durability and general satisfactory performance in the use of twist drills. These ideas are based on the practice and observations of the Cleveland company.

Trade Catalogs

Hobbing Worms. Gould & Eberhardt, Newark, N. J. Bulletin No. 90, describing a new system of automatically hobbing worms. The machine is illustrated, as is also the more important parts connected with the operation.

Automatic Attachment. The V. & O. Press Co., Glendale, Long Island, N. Y. Bulletin No. 6-B describing a line of attachments for automatic feeds on power presses. Each type is illustrated and specifications are furnished.

Tool Service. Mehl Machine Tool and Die Co., Roselle, N. Y. Catalog describing a line of jigs and fixtures, dies, gages, patterns, special machines and methods of designing. It also contains a prospective of the Mehl tool service plan. A short history of the company, showing scenes in its present day factory, is also given.

"GF" Barrel Sand-Blast. The Pangborn Corporation, Hagerstown, Md. Bulletin describing a new machine for quantity cleaning, with small labor cost and economic operation.

Gray Planers. The G. A. Gray Co., Cincinnati, Ohio. Catalog No. 37, thirty-two neatly bound pages, describing and illustrating three types of planers—"standard," "Maximum Service" and "Switch and Frog" planers. Each type is fully illustrated and specified.

Gilfillan Products, Gilfillan Bros., Inc., Los Angeles, Cal. A supplement to catalog No. 7, describing a variety of parts for electric apparatus, including ignition, starter and generator brushes, etc.

Triplex Tool. Triplex Tool Machine Corporation, 18 East 41st St., New York City. Catalog No. 1 describing the Triplex No. 1 three-in-one machine tool. The machine is built to do milling, drilling and turning operations and it is here illustrated in the three positions.

"Brute" Trailer. Sharon Pressed Steel Co., Sharon, Pa. Circular describing a new type of truck trailer, made entirely of pressed steel.

Diamonds Used in Tools. The Arthur A. Crafts Co., 125 Summer St., Boston, Mass. A 32-page catlog, 4 x 9 in., describing the many ways in which diamond tools may be used in the industrial arts, and giving illustrations of the various settings in common use, together with examples of practical application. A brief outline of the mining and recovery of the diamond crystals is included, as is also a description of the kinds and sizes of "bortz" suitable for tools. The booklet contains valuable hints on the care and preservation of diamond tools

ERRATUM

In our issue of Dec. 22, page 1022g, appeared catalog notices for three products of the Collis Company, of Clinton, Iowa. We regret very much that the name of the company was misspelled, appearing as "Callis," and that the address was given as Clinton, Ohio, instead of Clinton, Iowa.

Forthcoming Meetings

American Society of Civil Engineers: Annual meeting Jan. 18 and 19, Engineering Societies Building, New York City. Charles W. Hunt, secretary.

United Engineering Societies: Annual meeting Jan. 26, Engineering Societies Building, New York City. A. D. Flinn, secretary.

National Association of Manufacturers: Special convention on tariff legislation, Jan. 30 and 31, New Willard Hotel, Washington, D. C. G. S. Boudinot, 50 Church St., New York City, is secretary.

American Boiler Manufacturers Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

Condensed-Clipping Index of Equipment

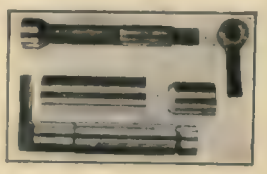
Patented Aug. 20, 1918

Drill, Portable, Electric, Bench-Type, "Dumore," 2-BD
Wisconsin Electric Co., Racine, Wis.
"American Machinist," Sept. 1, 1921.



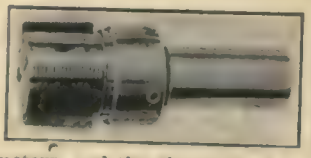
This is the model 2-BD bench-type portable electric drill. The motor is of the Dumore universal type, operating on either d.c. or a.c., 25 to 60 cycles. The spindle runs in self-aligning annular ball bearings. The capacity in steel is ¼ in., and in wood ½ in. The motor and gearing are encased in an aluminum housing. The feed is through rack and pinion. A Jacobs chuck, 10 ft. of cord, plug and switch are supplied. Net weight, 21 lb.

Mandrel, Expanding
John Bath, Inc., Worcester, Mass.
"American Machinist," Sept. 1, 1921.



This expanding mandrel is for use on cylindrical grinding machines where accurate workmanship is necessary. The body of the mandrel has a conical shoulder under the head, which matches a similarly shaped cavity in the end of the split sleeve, while a loose bushing is fitted in the same way to the other end of the sleeve. The driving dog serves the double purpose of driving the work and of expanding the sleeve in the bore of the piece to be ground, by forcing the two cones together. The sleeve has six slots cut alternately from either end. The mandrel is made in all sizes, from 1 to 5 in., one body and bushing accommodating several sizes of sleeve.

Tap, Adjustable
Geometric Tool Co., New Haven, Conn.
"American Machinist," Sept. 8, 1921.



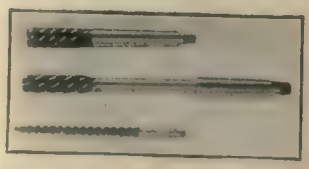
This threading tool or adjustable tap is intended for use where a machine has no means of closing a collapsible tap, or for some other reason does not permit the use of a collapsible tap. The tap is not equipped with a collapsing device. It is adjustable so that correct size can always be maintained. Each size of tap accommodates chasers for a range of diameters, and the chasers can be readily removed for re-grinding or re-placing.

Protractor, Bevel, Universal
Union Tool Co., Orange, Mass.
"American Machinist," Sept. 1, 1921.



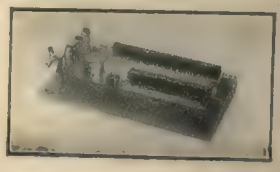
The dial is graduated to a full circle of 360 deg. and the blades may be set at any angle. The latter are securely held in whatever position they may be set, by means of knurled thumbscrews. When tightened by means of the central clamping screw, the disks are drawn to a firm bearing on their respective seats. The blades and the clamping devices conform in design to the related parts of the combination square made by the same company. The blades and all working parts are of tool steel, hardened and ground.

Reamers and End Mill, Helical-Fluted
Gammons-Holman Co., Manchester, Conn.
"American Machinist," Sept. 1, 1921.



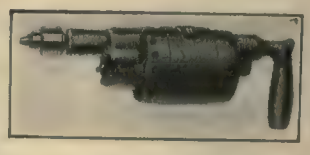
In this helical-fluted end mill and chucking reamer the twist is carried to a greater extreme than is the usual practice. The angle of helix is reversed from the direction of rotation. It is claimed for this construction that heavy cuts may be taken without chatter, and that the tendency to "draw in" is entirely counteracted. Both the chucking reamer and the end mill are made in all commercial sizes up to 2 in. in diameter, and larger sizes to order. The taper-pin reamer, shown at the bottom of the illustration, is now made in fifteen sizes, ranging from 0.101 in. at the small end of the smallest reamer to 1,050 in. at the large end of the largest.

Plate, Bench, Plain
Kelly Reamer Co., 3705 West 73rd St., Cleveland, Ohio
"American Machinist," Sept. 1, 1921.



This bench plate is one of the adjuncts furnished by the concern for taking care of "Kelly" reamers, and is intended to be used when adjustments are to be made for grinding the cutters.

Drill, Portable, Electric, "Dumore," Model 1-BD
Wisconsin Electric Co., Racine, Wis.
"American Machinist," Sept. 1, 1921.



This drill is intended for use in drilling small holes, where speed and adaptability are necessary. The motor used is the Dumore universal type, operating on either direct or alternating current, 25 to 60 cycles. The power is delivered to the spindle through heat-treated steel gears of the helical type. The motor and gears are encased in an aluminum housing, the length over-all being 12½ in. Jacobs chucks are furnished as standard equipment. The capacity of the drill is ¼ in. for steel and ⅜ in. for wood. Net weight, 5 lb.

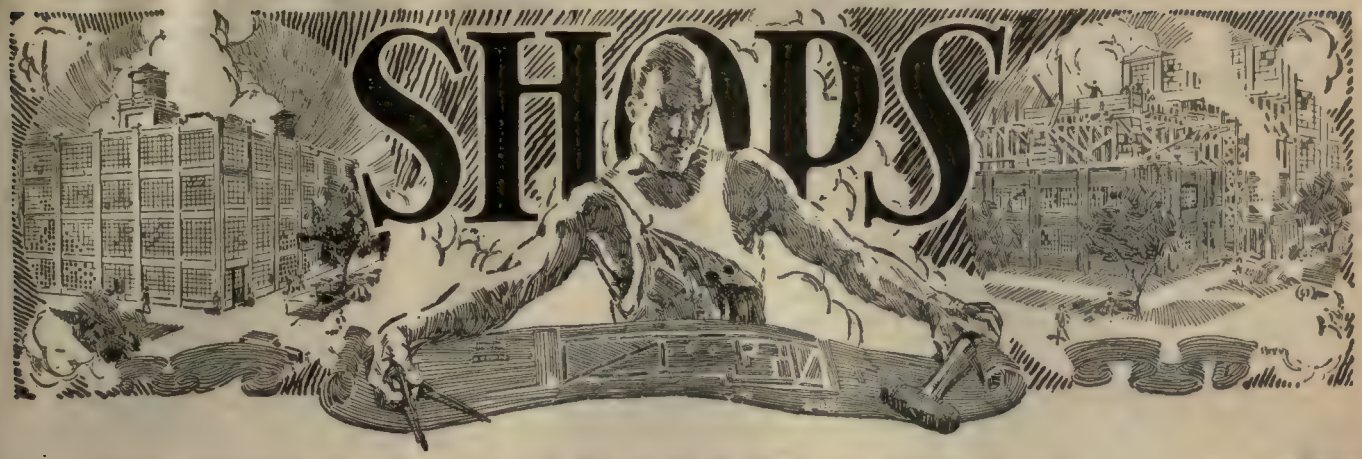
Clamp, Banding, Box
M. B. Hill, Worcester, Mass.
"American Machinist," Sept. 1, 1921.



The device is for stretching metal bands tightly upon packing cases. To operate it, the band is placed around the case in the desired position and the ends passed under the cam levers of the device. The movable jaw is then advanced along the frame by means of the screw until the requisite tension is put upon the band; and the band is nailed to the case as close to the device as may be convenient. The screw is then loosened, the ends of the bands are released from the cam levers, the device is removed, and the free ends of the band are tacked down.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., Ansonia—The Ridgewood Garage, 278 Wakelee Ave.—one small lathe for auto repair use.

Conn., Bridgeport — A. L. Adams, 307 Center St., manufacturers of cutting machinery and cloth cutters,—one 12 in. Hendey lathe, (used).

Conn., Bridgeport—The Amer. Chain Co., Inc., C. G. William, Purch. Agt.—one 80 lb. Bradly Helve hammer.

Conn., Bridgeport — The Brennan Stone Co., 202 Housatonic Ave., F. J. Brennan, Purch. Agt.—one 5 or 6 ton electric hoist for a.c. current.

Conn., Bridgeport—R. H. Gorham, R. F. D. No. 3, Box 22—one 12 in. x 5 ft. Davis lathe (used if in good condition).

Conn., Hartford—The city, P. A. Mason, Supt. of Public Bldgs.—equipment for garage and repair station on Wells and Hudson Sts.

Conn., Stratford — C. W. Beeman, 3rd Ave., Lordship Manor—small plain milling machine for automobile shop (used if in good condition).

Conn., Waterbury—M. J. Byrne, P. O. Box 884—one universal milling machine, one footpress and one positive presser blower (used if in good condition).

Ga., Rome—The Rome Stove & Range Co.—emery wheel, direct motor driven, and rattlers.

Ill., Chicago—The Force Pump Co., 1821 Berteau Ave.—one 6 in. turret lathe.

Ill., Chicago — Hollingshead & Blei, 10 South La Salle St.—one wood planer.

Ill., Chicago—The Montgomery Ward Co., 618 Chicago Ave., W. G. Baumhaggler, Purch. Agt. for Stove Div.—one surface grinder, disc 30 in.

Ill., Kankakee — The Kankakee High School Dist., c/o E. Hoennicke, 1057 Washington Ave.—manual training and domestic science equipment for proposed high school.

Ill., Urbana—The Leavitt Mfg. Co., 208-10 Griggs St., manufacturers of dehorners and dehorning appliances—one 14 in. tool room lathe 4 to 6 ft. bed with complete set of collets, etc.; one 18 in. engine lathe with 8 to 10 ft. bed equipped with 1-4 jaw chuck; one 4 ft. radial drill; one back geared punch and shear, 12 to 14 in. throat, ½ in. stroke; one 30 in. sensitive drill; one power drop hammer for handling stock up to 2 in. square.

India, Bengal, Belghorria—MacCoby Snuff Mills—one brake horse power snuff grinding machine (smallest type, latest improved).

Ky., Garth—The Elkfield Coal Co., J. C. Bowman, Pres.—electric mining machinery and equipment, mining tools, rails, switches, steel ties, cars, fans, steel plates, irons, etc., for tipple, also other mining equipment.

Ky., Louisville—The Henry Vogt Machine Co., 10th and Ormsby Sts.—machine for bending angles into complete circle.

Md., Baltimore — The Standard Electric Mchy. Co., 9 East Hill St.—two Lincoln electric welding outfits, complete (state serial numbers, etc.).

Mich., Bay City — The Garber Machine Co., Inc., 3004 North Water St.—several air compressors (garage size), also one about 5 x 5 single cylinder, belt driven; tanks with compressors; one belt driven 100 lb. Bradley hammer; one Fellows gear shaper, 36 in.; one Universal grinder 12 in. wheel by 36 in. between centers; three 14 in. x 6 ft. quick change lathes (used).

Mich., Detroit—T. J. Doyle, 4462 Woodward Ave.—service station equipment for Dodge cars.

Mich., Holland—C. Thiel, Holland Engine Bldg., 12 West 4th St.—one 8 or 9 in. accurate engine lathe, Dalton or equivalent, motor driven, 220 volt, 2 phase, 60 cycle; one Federal bench planer (used if in good condition); small motor grinder with exhaust 220 volt, 2 phase, 60 cycle, bench or floor type; catalogs of motor driven drill presses, capacity 0-½ in.

Minn., Fairmont — The Fairmont Elevator Co.—grain grinding and handling machinery, power operated.

N. J., Chrome—The United States Metal Refining Co.—circular and slitting shear to take plates up to ½ in. thick.

N. Y., Buffalo—H. Wile & Co., Ellicott and Carroll Sts.—bench lathes for screw cutting and turning.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway.—one 10 ft. power brake for use in plate shop with capacity for bending up ½ in. steel plate.

N. C., Taylorsville—C. L. Frazier—labor saving machinery for plant manufacturing wooden boxes and picker sticks.

O., Canton—The Bd. Educ.—equipment for vocational department of new McKinley High School.

O., Cincinnati — Norton-Broadway Mchy. Co., 238 Bway.—contractors' equipment, including hoisting engines, shovels, etc., also one 700 to 1,000 ft. belt driven air compressor, 100 lb. pressure and 100 to 125 hp. motor, 3 phase, 60 cycle, 220 volt, induction type with starter to operate compressor.

Okla., El Reno—The Calhoun Mchy. Exch., J. C. Calhoun, Purch. Agt. — one 250 lb. anvil; one 150 lb. vise, box type; one 50 lb. Little Giant trip hammer; one emery wheel, stand and arbor with emery wheel on one end and buffing wheel on the other end; one Little Giant punch and shear (above is for Texas delivery).

One pipe threading machine, 1½ in. to 6 in. capacity (used); one pipe threading machine, 2½ in. to 8 in. capacity (used); one plate bending roll with drop and housing for 1½ in. plates; one 12 in. shear for No. 16 gage metal (above is for New York delivery).

One 3-ton ice freezing tank, space available 24 ft. x 24 ft.; one complete 5-ton raw water ice plant, belt driven compressor; one complete 10-ton raw water ice plant, belt driven compressor (above is for Oklahoma delivery).

O., Fremont—The Herbrand Co.—milling machines.

Ont., Dundalk—J. R. McIntyre—machinery and equipment for printing plant to replace that which was destroyed by fire. Estimated loss, $20,000.

Ont., Dundalk—W. A. Stafford—equipment for garage and auto repair work.

Ont., Essex—S. Mossop, complete equipment for modern garage and auto repair shop at Cottam.

Ont., Fort Dover — The Woodhouse Crushed Stone Co., B. W. Ball, Pres.—modern equipment for quarry, near here.

Ont., London — The Goderich Elevator Co., 85 Horton St., J. I. Hunt, Pres.—grain handling and unloading machinery also two steel unloading towers for grain elevator at Goderich.

Ont., London—The Vulcan Co., 84 Fullarton St., manufacturers of iron castings and heating equipment (and is going into new lines)—metal working machinery, lathes, planers, shapers, welding equipment, rivetters and belting.

Ont., Sarnia—The Sarnia Paper Box Co., Ltd., capital is being increased to $300,000 and will move its business to London—machinery and equipment for the manufacture of fibre and corrugated shipping containers.

Ont, Tavistock—C. Erb—machinery for planing mill and making sashes and doors.

Pa., Carbondale—The Amer. Welding Co.—one set of 10 ft. Bement boiler plate rolls.

Pa., East Pittsburgh—The Bd. Educ.—lathes and shop equipment for vocational department of high school on Howard St.

Pa., McKeesport—The Bd. Educ.—equipment for the vocatonal department of new school.

Pa., New Kensington—The Whistle Bottling Co., 4th Ave., C. Adams, Genl. Mgr.—bottling machines.

Pa., Pittsburgh — The Stonecrete Corp., 6023 Penn Ave., manufacturer of structural blocks and forms, A. Caler, Purch. Agt.—used machinery for equiping complete machine shop at new plant at Cheswick

Pa., Pittsburgh—The Union Railroad Co., Carnegie Bldg., subsidiary of the Carnegie Steel Co., one heavy shaper and one heavy shear for cutting channels.

Pa., Scranton—The Spring Service Co., 328 DuPont Court, manufacturers of auto springs, etc.—one taper roll for rolling end of spring leaves.

Pa, Sharpsville—The Coolrite Mfg. Co.—Ethyl Chloride refrigerating machines, one ton capacity.

Tenn., Chattanooga—The Amer. Mfg. Co., Cnut and Water Sts., manufacturers of harness and builders' hardware specialties—one multiple slitting shear for No. 12 gage.

Tenn., Knoxville—The Nickerson Mfg. Co., 8th Ave., manufacturers of porch and interior columns, woodwork, etc., M. F. Nickerson, Vice. Pres.—woodworking machinery for the manufacture of clothespins.

Tenn., Nashville—The Nashville Box Co., 5th and Crutcher Sts.—Morgan lock corner machine for boxes up to 18 x 18 in. in size; setting up machine for lock corner boxes; screw driving machine; trimming saw and multiple borer.

Tex., Houston—R. D. Frazier, P. O. Box 913—machinery capable of cutting and polishing perfect spheres from hard materials, such as glass, cornelian, quartz, etc.

Va., Richmond—M. & L. Repair Shop, 2104 West Broad St., V. Loxterman, Mgr.—equipment including drill press, lathes, emery grinder, etc.

W. Va., Linn—The Bd. Educ. of Glenville Dist., Linn, J. A. Radcliffe, Pres.—equipment for vocational department of new 2 story high school, at Sand Fork.

The Weekly Price Guide

This Week's Market

Pig iron quotations show reductions ranging from 50c. to $1 per gross ton. Drop of 15c. on shapes, plates, bands, bars and hoop steel; 25c. on floor plates at New York warehouses. Chicago quotes decreases of 15c. on cold finished shafting, flats, squares, hexagons and coppered bessemer rods; 25c. per 100 lb. on floor plates. No change in mill quotations.

Tin is quoted at 33c. as against 33½c. in New York. Cleveland quotes an advance of ½c. on zinc sheets (casks) and a drop of 1½c. per lb. in babbitt metal (best grade).

Discounts on rivets, bolts, nuts and other shop supplies increased from 10 to 20 points; rubber and duck belting, second grade, quoted at a discount of 60-10 per cent as against 60-5 per cent, in the New York warehouses.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	22.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	27.50
BIRMINGHAM	
No. 2 Foundry	17.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	22.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	20.21
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	3.78
Spring steel (light) (base)	6.00	6.00	....
Coppered Bessemer rods (base)	7.00	8.00	5.88
Hoop steel	3.38	3.11	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.60	....	4.98
Cold finished shafting or screw	3.55	3.50	3.40
Cold finished flats, squares	4.05	4.00	3.90
Structural shapes (base)	2.63	2.61	2.88
Soft steel bars (base)	2.53	2.51	2.78
Soft steel bar shapes (base)	2.68	2.51	2.78
Soft steel bands (base)	3.13	....	3.48
Tank plates (base)	2.63	2.61	2.88
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			33.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 5.10; New York			5.50
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	21.00	23.50	19.25
Babbitt metal (best grade)	24.62½	42.50	36.00
Babbitt metal (commercial)	9.87½	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper-nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.50	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	7.00	6.50	8.50
Brass, light	5.00	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13½x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.76	.74
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$2.75
Coke, prompt foundry, Connellsville	per net ton		3.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	—60%	60-10-10%
1¼ and 1¼x3 in. up to 12 in.	50%	-60-10-10%	-60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	-65-5%
Lag screws, coach screws	65%	.....	—60%
Carriage bolts, up to 1 in. x 30 in.	-50-10%	-50-10-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	—55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	—75%	—80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$5.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.75	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	-65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	40-10%	50-10%
Copper burs	40%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	List $9.00 less 20-10-5%	50–10–5%	–20-10%
Emery paper	List 11.00 less 20%	$11.00 net	–20%
Emery cloth	List 32.75 less 10%	32.75 net	–10%
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net			list+10%
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	List $1.65 less 20%	.....	–10%
Cloth	List $3.55 less 10%	.....	–10%

Wis., Appleton—The County Bd. of Outagamie County, A. G. Brusewitz, Comr.—appropriated $20,000 for small tools and equipment for the county garage and machine shed.

Wis., Cudahy—P. & J. Motor Co., 1106 Packard Ave., E. F. Palmer, Pres.—drill presses, one drilling machine, several boring mills, one planer, two lathes, one turret lathe and power machinery.

Wis., Eagle River—Radcliffe & Co., manufacturers of woodworking products—woodworking and special machinery for new lath mill.

Wis., Hartford—Gehl Bros. (monuments)—light crane and marble cutting equipment.

Wis., Hortonville — W. L. Schroeder—special canning machinery.

Wis., Milwaukee — The Badger State Realty Co., 504 11th Ave.—one belt sander.

Wis., Milwaukee—The Dort Motor Car Co., 242 4th St., L. F. Mitchell, Purch. Agt.—small drill press.

Wis., Milwaukee—E. J. Findlin, 38 34th St.—small engine lathe.

Wis., Milwaukee—H. Grimes, 1165 35th St.—one 30 in. band saw and planer.

Wis., Milwaukee—J. Guschl, 831 45th St.—(carpenter)—woodworking machinery.

Wis., Milwaukee — F. Luenzmann Co., 31st St. and Auer Ave.—cross cut saw, rip saw and surfacer.

Wis., Milwaukee—T. H. Merrill, 383 5th St.—arbor press.

Wis., Milwaukee — The Milwaukee Radiator Mfg. Co., c/o R. I. Kenney, 120 Wisconsin St.—sheet metal machinery to manufacture auto radiators.

Wis., Milwaukee—The Modern Candy Co., c/o F. Heinl, 1059 4th St.—candy machinery, operated by electric motors.

Wis., South Milwaukee—J. Nirschl, Jr., 1220 Manitoba Ave. — Universal woodworker, 6 or 8 in. sticker, motor driven.

Wis., Milwaukee — The Raymond Mfg. Co., c/o W. H. Schmahl, 77 Cawker Bldg., manufacturers of auto accessories — one electric welder and one circle saw or power hack saw.

Wis., Milwaukee—The Richards Machine Co., 3417 Vliet St.—machine tools including lathe, shaper, grinder and drill press (used preferred).

Wis., Milwaukee—The Rosenberg Elevator Co., 174 Reed St., E. Rosenberg, Purch. Agt.—power hack saws.

Wis., Milwaukee—Starck Bros., 1212 National Ave., carpenters and mill workers—one 4 to 6 in. sticker.

Wis., Neillsville — The Neillsville Milk Products Co., E. Scheele, Purch. Agt.—belt driven separators, churns, coolers and refrigeration machinery.

Wis., Neillsville—E Scheel, manufacturer of dairy products—refrigerating machinery, power machinery and other dairy equipment.

Wis., Wausau—C. Lotz, 1016 Grand Ave, woodworking machinery and equipment for lath mill.

Wis., Wauwatosa—R. Mueller, P. O. Box 515—one 10 or 12 in. joiner.

Wis., Wauwatosa—R. Van Nostrand, 381 5th Ave.—one 30 to 32 in. band saw.

Wis., West Bend—The Goldbaum Laundry—complete equipment for small laundry, electric power preferred.

Wis., Wisconsin Rapids — The Consolidated Water Power & Paper Co., G. W. Mead, Purch. Agt.—one monorail crane.

Metal Working Shops

Cal., San Francisco—R. W. Kern has awarded the contract for the construction of a 1 story garage on Jones St., north of O'Farrell St. Estimated cost, $39,400.

Conn., Bridgeport—The Union Specialty Co., 138 Hurd Ave., has awarded the contract for the construction of a 2 story, 50 x 125 ft. factory on Oak St., for the manufacture of metal specialties. Estimated cost, $40,000. Noted Dec 20.

Conn., East Hartford (Hartford P. O.)—H. E. Bidwell, 209 State St., Hartford, is receiving bids for the construction of a 1 story, 50 x 122 ft and 24 x 122 ft. garage and auto sales and service station on Connecticut Blvd. Estimated cost, $40,000. Associated Architectural & Eng. Co., 145 State St., Springfield, Mass., archts. Noted Dec. 23

Conn., Hartford—F. C. Walz, Archt., 407 Trumbull St., is receiving bids for the construction of a 2 story, 85 x 190 ft. garage and repair shop on Main and South Prospect Sts., for Herchman & Levine, 223 Main St. Estimated cost, $125,000.

Conn., Stamford—A. Spelke, 292 Main St., has awarded the contract for the construction of a 1 story, 60 x 160 ft. garage and service station on Gay St.

Ind. Ft. Wayne—The Bd. Educ. is having plans prepared for the construction of a 2 story, 80 x 150 ft. gymnasium and shop building. Estimated cost, $200,000. C. Weatherhogg, Citizens Trust Bldg., Archt.

Ind., Richmond — The Peille Co. has awarded the contract for the construction of a 2 story, 260 x 500 ft. factory for the manufacture of fire doors. Estimated cost, $200,000.

Ind., Richmond—The Reliance Fdry. Co. is having plans prepared for the construction of a 1 story, 85 x 110 ft. foundry. Estimated cost, $25,000. J. Mueller & Co., Palladium Bldg., Archts.

Mich., Detroit—T. J. Doyle, 4462 Woodward Ave., has had plans prepared for the construction of a 1 story, 60 x 451 ft. garage and service station on Jefferson Ave. and Chene St. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts.

O., Cleveland—J. L. Free, 1004 Prospect Ave., has awarded the contract for the construction of a 1 and 2 story, 38 x 80 ft. and 50 x 113 ft. office building and garage, at 1530 and 1618 Brownell Ct. Estimated cost, $60,000.

O., Cleveland—The Hess-Schenk Machine Tool Co., 801 St. Clair Ave., has awarded the contract for altering its 3 story, 48 x 76 ft. factory. Estimated cost, $40,000.

O., Cleveland—Moody & Thomas Milling Co., 6312 Kinsman Rd., has awarded the contract for the construction of a 1 story, 50 x 150 ft. warehouse and garage on Park Ave. near East 66th St. Estimated cost, $50,000. Noted Dec. 8.

Ont., Cottam—S. Mossop, Essex, plans to build a garage and auto repair shop here. Estimated cost, $42,000.

Ont., Dundalk—W. A. Stafford plans to rebuild his garage which was destroyed by fire. Estimated loss, $45,000.

Ore., Portland—The Imperial Investment Co., Concord Bldg., will soon award the contract for the construction of a 5 story, 100 x 100 ft. garage on 4th and Pine Sts. Estimated cost, $150,000. Sutton & Whitney, Lewis Bldg., Archts.

Pa., Dubois—The Triumph Motor Truck Co. of Medina, N. Y., has purchased a site here and plans to build a plant for the manufacture of motor trucks.

General Manufacturing

Cal., Napa—The Union Ice Co., 354 Pine St., San Francisco, is having plans prepared for the construction of a cold storage warehouse and ice plant (20 tons daily capacity), here. Estimated cost, $50,000. W. H. Toepke, 942 Market St., San Francisco, Archt.

Conn., Boardman—The New England Lime Co., 226 Main St., Danbury, plans to rebuild its lime plant, here, which was recently destroyed by fire. Estimated cost, $100,000. Private plans.

Conn., New Haven—The Seamless Rubber Co., Inc., Hallock St., is having plans prepared for the construction of a 1 story, 140 x 160 ft. addition to its plant. Estimated cost, $100,000. R. W. Foote, 185 Church St., Archt.

Ill., Chicago — The Atwell Printing & Binding Co., Sherman and Polk Sts., plans to build a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St. Estimated cost, $700,000. Architect not selected.

Ill., East St. Louis—The Obear Nestor Glass Co., Bway. and Belt St., plans to build a 1 story addition to its glass factory. Private plans.

Ind., Ft. Wayne—The Superior Baking Co., 1702 South Calhoun St., is having plans prepared for the construction of a 1 story, 50 x 90 ft. bakery on South Calhoun St. Estimated cost, $25,000. A. Mahurin, Lincoln Life Bldg., Archt

Ind., Indianapolis—The Brannum-Keene Lumber Co., East Washington St., plans to build a lumber plant on East Washington St. Estimated cost, $150,000. Architect not selected.

Ind., Indianapolis—Piel Bros. Starch Co., 831 State Life Bldg., will receive bids until Jan. 18 for the construction of a 1 story, 85 x 150 ft. starch factory on Drover St. Estimated cost, $20,000. R. F. Daggett, 962 Lemcke Annex, Archt. Noted Dec. 15.

Ind., Linton — The Chero-Cola Bottling Co. is having plans prepared for the construction of a 1 story, 44 x 80 ft. factory. Estimated cost, $25,000. J. Fritz, Linton, Archt.

Ky., Louisville — The Standard Printing Co., 220 South 1st St., has awarded the contract for the construction of a 4 story, 70 x 100 ft. printing plant at 220-28 South 1st St., and for altering adjoining plant at 220 South 1st St. Estimated cost, $150,000.

Ky., Louisville — The Standard Sanitary Mfg. Co., 6th and A Sts., has awarded the contract for the construction of a 1 story, 53 x 404 ft. enameling plant. Estimated cost, $80,000. Noted Nov. 17.

Mass., South Hadley—The Larose Dairy Co., Inc., has awarded the contract for the construction of a 2 story, 40 x 60 ft. dairy and refrigerating plant on Falls Rd. Estimated cost, $30,000.

Mich., Ypsilanti — The Owen Sanitarium Co. is having plans prepared for the construction of a sanitarium and industrial plant for bottling mineral water, making soap and tooth paste. Estimated cost, $800,000. Menefee & Streeter, 706 Marquette Bldg., Detroit, Archts.

Minn., Minneapolis — The Bd. of Park Comrs., City Hall, plans to construct a 2 or 3 story storehouse and laundry on Lyndale Farmstead. Total cost, $175,000. Bond issue and sale of $75,000 has been authorized to construct portion of buiding. J. A. Ridgway, Secy.

Mo., Kansas City—The Superior Ice & Storage Co., Lee Bldg., will build a 3 story ice plant on 2nd and Main Sts. Estimated cost, $150,000. Noted Oct. 6.

N. J., Linden—The Warner Quinlan Co., 79 Wall St., New York, has awarded the contract for the construction of a refinery and asphalt plant, here. Estimated cost, $2,000,000.

N. Y., Brooklyn — Werbelovsky Bros., Flushing Ave., manufacturers of glass, will soon receive bids for the construction of a 3 story factory on Flushing Ave. Estimated cost, $175,000. M. Klein, 37 Graham Ave., Archt. and Engr.

N. Y., New York—Fordham University, Fordham Rd., is having sketches made for a printing plant on Fordham Rd. and Bathgate Ave. Estimated cost, $250,000. R. J. Reilly, 477 5th Ave., Archt. and Engr.

N. Y., New York—The New York Times, Times Sq., is having plans prepared for the construction of an 11 story, 100 x 143 ft. printing plant and office building at 217 West 43rd St. Ludlow & Peabody, 101 Park Ave., Archts. and Engrs.

O., Cleveland—The Cuyahoga Mill Work Co., 2615 East 29th St., plans to build a 1 story warehouse and mill on Grand Ave., along the tracks of the New York, Chicago & St. Louis R.R. Estimated cost, $40,000. Private plans.

O., Columbus — H. C. Godman Co., 31 North 4th St., plans to build a 4 or 5 story, 147 x 230 ft. shoe factory on Starling St. Estimated cost, $300,000. Architect not selected.

O., Dayton—P. Kuntz Lumber Co., Norwood Ave., has awarded the contract for the construction of a 1 story, 60 x 110 ft. woodworking plant on Mound and Norwood Sts. Estimated cost, $25,000.

O., Norwood—The Federal Garage Co., Cincinnati, has awarded the contract for the construction of a 4 story garage here. Estimated cost, $140,000.

Ont., Fort Dover — The Woodhouse Crushed Stone Co. plans to develop a quarry near here. Estimated cost, $50,000. B. W. Ball, Pres.

Ont., Ottawa—The Hamilton Tar & Ammonia Co., Lees Ave., plans to construct a factory for the manufacture of tar and ammonia. Estimated cost, $50,000. W. M. Currie, Pres.

Pa., Altoona—The Caums Ice Cream Factory Co., 5th Ave. and 9th St., plans to build a 2 story, 25 x 120 ft. addition to its factory. Estimated cost, $45,000. E. A. Caum, Mgr.

Pa., Erie—The Times Publishing Co., 11 West 9th St., is having plans prepared for the construction of a 2 story, 90 x 165 ft. publishing plant on 10th St. Cody, Hicks & Davidson, Ariel Bldg., Archts.

R. I., Pawtucket—J. and P. Coats, Inc., 366 Pine St., have awarded the contrac for the construction of a 1 story, 110 x 320 ft. thread bleachery. Estimated cost, $150,000.

American Machinist

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The Training of Workers in Manufacture

I. Present Scope of Apprenticeship in the United States — Number of Apprentices in Various Industries—Importance of Apprentices in the Metal-Working Field

By J. V. L. MORRIS

A ROUGH estimate, based on a study of the apprentice departments of about thirty manufacturing plants and the repair shops of several railroads, places the number of apprentices in such departments, where well organized, at approximately 10,000. It should be noted that this does not include the building trades, where, particularly in plumbing and bricklaying, there still remain some vestiges of apprenticeship.

From the figures given in Table II on the plants visited, some approximations may be made of the enrollment in the various trades. It will be seen

TABLE I. DATA FROM 1910 CENSUS

Apprentices in Iron and Steel Industries:	
Car and railroad shops	395
Ship and boat building	576
Iron foundries	2,619
Agricultural and implement factories	95
Automobile factories	1,096
Blast furnaces and steel rolling mills	1,313
Wagon and carriage factories	627
Other iron and steel factories	12,494
Total	19,215
Apprentices in printing and publishing establishments	11,376
Total apprentices	30,591
Total Number of Workmen at Above Trades:	
Blacksmiths	232,957
Machinists	460,784
Boilermakers	44,761
Other iron and steel workers	900,443
Toolmakers, die setters and die sinkers	9,243
Pattern and model makers	23,006
Compositors, linotypers and typesetters	113,538
Total	1,784,732

that about 60 per cent are to be found in the machinists' and toolmakers' trades. While adequate data is not available, there should here, however, be made a differentiation between the toolmakers and the all-round machinists, as it is usually recognized that only a small portion of the apprentice-trained machinists should be considered toolmakers. The relatively small number of a hundred odd patternmakers' apprentices should be noted. There are, of course, a considerably larger number than this under apprenticeship throughout the country as most shops recruit by that means.

What constitutes an electrician is not well defined. It may mean an inside wire-man, a general service mechanic on motor repairs and installation, an armature winder, an assistant at testing, or plant operator; so that little significance should be given to that column. Owing also to the large amount of technical information which should be acquired by those who have the capacity and who desire to rise, it is a field recommending a large utilization of either day or evening technical schools. The same remark holds in a general way as regards draftsmen.

As the 1920 census was not yet available at the time of writing, the figures in Table II should be compared with the data in Table I, available from the 1910 census.

In considering this data, the following factors should be kept in mind: In the census no distinction is made between the apprentice under an organized scheme for providing variety of experience and instruction, on the one hand, and the helper and inexperienced machine hand and operative without systematic training, on the other. Probably, for example, most of those in training as molders and blacksmiths should be classed as helpers. A very large number in iron and steel factories should probably also be considered as merely inexperienced machine hands. Also, it should be noted that there has been a very considerable reorganization of apprenticeship in the past ten years. In the railroad shops and in the boat-building industry, for example, there has been a decided increase in the number of apprentices.

The comparatively small number of toolmakers and patternmakers, 9,000 of the former and 23,000 of the latter, should also be contrasted with the half million classed as machinists, as the two former trades are outstanding examples where apprenticeship has survived because no adequate substitute has been found.

Approaching the matter from another standpoint, we can divide those employed in the metal-working trades under consideration into four categories:

(1) Initial production and toolmaking.
(2) Piece production, or single operations.
(3) Assembling.
(4) Repair or maintenance work.

(1) If no new designs were got out there would, of course, be no work for the patternmaker; but, as a matter of fact, all larger plants are constantly remodelling their products in the keen competition to produce the best article for the purpose. This requires the work of the patternmaker, diemaker, diesinker, etc. The toolmaker is also constantly in demand to provide the requisite tools. All these trades are of the skilled nature which we have come to associate with apprentice training.

(2) In actual quantity production, specialization is found to be so much more efficient in obtaining both output and quality that all-round training for stock production has practically disappeared. There are two types of workers in this field, however, who do need the general training. These are the supervisory force, such as the superintendent, foreman, sub-foreman, and inspector, and the substitute man, the one who can fill in at any machine. Naturally, if the latter has the

capacity to lead he may be expected to be promoted to the supervisory force when vacancies occur.

This category of "piece production" is by far the most numerous of all, and aside from the very limited number of foremen and substitute men just mentioned, is ordinarily recruited from the unskilled group by being taught one machine or process, after which the worker is recognized as belonging to the semi-skilled class.

Assembly and Maintenance

(3) Formerly assembling was considered a type of skilled work. Recent developments in the way of standardized products are making it possible to permit this work to be performed by unskilled workers who are taught to do just one or two operations, when the partially completed production passes on to another who, in turn, adds his one or two parts to the whole. Of course, if the product is intricate, the inspector may profit by the all-around training predicated by apprenticeship; but as a matter of fact his knowledge needs to be chiefly of the product inspected, which may often be quickly learned. Of course, there is much assembling of the old-fashioned type by building up the complete product where all-round capacity may seem

TABLE II. ENROLLMENT OF APPRENTICES

Type of Plant	Approx. No. Employees	Total No. Apprentices	Machinists and Toolmakers	Patternmakers	Electricians	Molders	Draftsmen	Miscellaneous
No. 1 electrical manufacturing	20,000	228	142	27	39	..	20	...
No. 2 electrical manufacturing	20,000	403	186	15	75	12	115	...
No. 3 electrical manufacturing	12,000	327	249	21	35	..	22	...
No. 4 electrical manufacturing	40,000	190	...	..	..	..	...	...
Rubber manufacturing	34,000	105	54	..	14	..	11	26
No. 1 automobile manufacturing	55,000	1,000	1,000	..	..	..	...	...
No. 2 automobile manufacturing	12,000	122	109	7	6	..	...	...
Abrasive machinery	3,000	7	7	..	..	..	...	...
Ordnance manufacturing	1,000	76	76	..	..	..	...	...
Rifles and specialties	12,000	116	116	..	..	..	...	...
No. 1 printing press manufacturing	4,000	55	55	..	..	..	...	...
No. 2 printing press manufacturing	5,000	168	160	5	1	2	...	5
Steel production	12,000	70	38	..	..	..	...	32
Recording machines	8,000	60	51	1	2	..	6	...
No. 1 machine tool manufacturing	5,000	50	48	2	..	..	...	...
No. 2 machine tool manufacturing	8,000	200	150	5	..	12	23	10
No. 3 machine tool manufacturing	1,400	89	89	..	..	..	...	...
Air brake manufacturing	4,500	30	26	2	..	2	...	...
Electrical instruments	900	15	15	..	..	..	...	...
Machinery manufacturing	1,200	40	37	3	..	..	...	...
Roller bearing manufacturing	4,500	38	38	..	..	..	...	...
No. 1 shipyard	12,000	243	88	14	12	..	16	113
No. 2 shipyard	16,000	400	...	..	..	..	...	...
Locomotive manufacturing	5,500	83	17	12	1	15	38	...
No. 1 railroad shops	.....	1,300	795	..	12	..	...	...
Boilermakers	.....	..	...	..	..	..	...	175
Sheet metal-workers	.....	...	...	..	..	..	...	79
Carpenters	.....	...	...	..	..	..	...	234
Blacksmiths	.....	...	...	..	..	..	...	22
Painters	.....	...	...	..	..	..	...	13
No. 2 railroad shops	.....	730	365	..	..	..	...	365
No. 3 railroad shops	.....	900	...	..	..	..	...	...
Printing plant	3,500	150	...	..	..	..	...	...
Estimated totals	500,000	7,225	4,500	114	200	43	251	1,074

desirable, and hence apprenticeship be urged. The facts are that the inexperienced men starting at this type of work are usually adults who, perhaps, slowly and clumsily work at it until they learn the knack of putting together completed parts, and of making the slight adjustments always necessary at the end of every fabricating process.

(4) Finally, there is the maintenance work, which in a large number of cases seems to recommend the all-round mechanic for whose training apprenticeship is usually urged.

As a whole, then, accepting the estimate that there are approximately ten thousand apprentices in the fields investigated, the question naturally arises whether this is ample. Most manufacturers would answer in the negative. Usually the shortage of toolmakers is lamented, of the all-round mechanics for repair work and of suitable material for foremen. It should also be recognized that these plants studied are the outstanding examples of corporations which have introduced well-organized apprentice training. Many of their competitors make a practice of "stealing" the skilled mechanics they require. For example, the two automobile companies cited are among the few automobile concerns who have paid serious attentiton to apprentice training; and yet owing to their large amount of development work, of intricate assembling, and increased demands for foremen to supervise their expanding factories, most automobile manufacturers could use a far larger number of apprentice-trained mechanics.

Use Diamond Tools Carefully

By E. Ferber

How to properly use diamond tools seems to me to be so little understood that I think the following extract from the catalog of the Arthur A. Crafts Co., Boston, Mass., is worth passing along.

The most common evidences of careless use of diamond tools that are returned to the factory for resetting are: The overheating of the diamond; the nicking or grinding away of the setting by careless application to the wheel, thus exposing too much of the crystal; and the continued use of the diamond after the crystal has been worn to a broad, flat surface.

From an inspection of hundreds of diamonds so returned in every mode of setting we can safely say that the principal cause of trouble is overheating. This may be due to taking too heavy a cut, using a feed that is too fast, or may result from an inadequate supply of water, or no water at all, upon the tool. After the diamond has become worn down as above described the broad surface rubs rather than cuts and overheating is inevitable.

Like all other materials the diamond expands slightly when heated. Most grinding machine operators have seen the diamond rise to a red heat when truing a wheel, even under a liberal stream of water. The heat would not of itself injure the diamond but the expansion causes to be set up an enormous pressure against the rigid walls of the metal setting, which, because of the presence of the cooling liquid does not expand in conformity with the diamond, and thus a serious strain is induced in the structure of the crystal, tending to crack it.

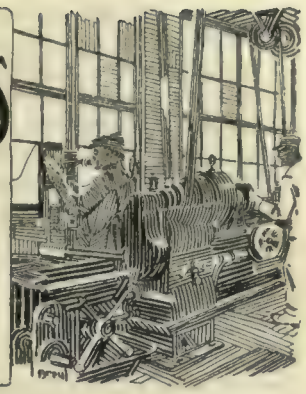
If on the other hand the metal setting expands to some extent with the diamond, the continued expansion and contraction soon loosens the crystal in its setting, allowing it to vibrate under the action of the wheel, which vibration will sooner or later cause it to crack very easily.

Our advice to operators is, therefore, to take light cuts, exercising due patience and using plenty of water so that the diamond will never be overheated. When a diamond has become dull it should promptly be reset so that it may present new and sharp points to the work.



MODERN PRODUCTION METHODS

By
W P. Basset
of
Miller, Franklin, Basset & Co



XXVI. Time Study on Automatic Machines

Quality of Labor Employed—Importance of Standardization in This Work—Rules of Procedure and an Example of Rate Setting

AUTOMATIC machines present some special problems in time study and rate-setting. Commonly, not much study has been given along these lines, for the thought has been that the automatic feature reduces the human element to a minimum. This is actually an added reason for making careful studies.

The quality of labor employed on this kind of work need not be high; in fact, most automatic machine operators know only how to operate one certain kind of machine, and frequently only one size. This means that the operations must be standardized as much as possible, accurate standard instructions developed and a careful scheme of supervision and inspection installed.

Standardization is the keynote for all automatic machine time study work. Possibly due to the fact that we are dealing with an automatic machine it is possible to establish standard speeds, feeds and methods which are applicable to practically all types of work. On an automatic machine, the human element is comparatively unimportant. Supposing the machine to be in good condition, the tools will always feed evenly, or at least the same on each piece, and the movements of the machine will take place with the same amount of shock each time. This is very different from hand operated machines where everything depends on a human operator. While there are exceptions, this is generally true.

Having established sufficient standards, it is a comparatively easy matter to establish rates and, consequently, costs on any part on which an estimate may have to be made, laying out what each tool is to do, so that the tool designer will only have to design tools which will fit in with the layout already made. Instruction sheets, set-up cards and tool lists may all be made up at the same time long before the job is ready to work.

I shall not try to cover each automatic machine on the market, but shall outline the methods which were installed in a large automatic department in which there were several different makes of machines with a multitude of different sizes. The same general procedure was followed in setting standards on each class of machines.

It is also beyond the scope of this article to attempt to outline the various types of work which each machine is particularly fitted to do. Some are admittedly designed for low speeds, heavy feeds and wide limits of accuracy, giving merely a roughing cut; others give practically any degree of accuracy desired, using high speeds and light feeds. This type will give a very fine finish to the work if desired.

One reason why automatic machines have not been generally the subject of time study work, is that their operation being automatic, the machine will, with proper attention, get out the desired number of pieces daily without an incentive.

Also the large amount of time needed to keep automatics in condition has been given as a reason for not subjecting them to time study. This loss of time, due to failure of machine or tools should be, however, a real reason for the establishment of a wage incentive, as will be fully explained later. Although the machines should, as a result of their automatic feature, get out a certain definite number of pieces per hour, they never seem to do it when there is no extra incentive. If the operator has not this incentive, it is very easy to allow a machine to "cut wind" for a few minutes before putting in a new bar of stock. Or, if he is working on one machine and another needs a slight adjustment, he will frequently shut down the second machine and continue working on the first, when just a few moments' attention would enable the second to go on producing good work.

With a proper incentive, the operator is inclined to keep his machines in better working condition by repairs or seeing that they are made before the breaks occur. The machines are watched more attentively, and slight breaks are prevented from developing into bad ones by immediately stopping the machine when the trouble starts. This reduces the machine repair cost and also the resulting delay.

When the study of the operations is made and the operators are trained to make their task, they are shown the fallacy of attempting to adjust their machines when the dimensions of the part being made vary a bit but are still well within the desired limits. Operators generally seem to feel that it is necessary to make adjustments when they are not really necessary. This frequently results in damaging tools or spoiling several pieces of the work before the machine is brought back to a working condition as good as that existing when the adjustment was started. As long as the work turned out is within the desired limits, the operators are to merely make frequent inspection trips to all of the machines, gaging a few pieces at each.

A special set-up and repair man should be employed if the department is so large that the foreman has not

time to do the setting up himself. Except in extreme cases, the operators should not be required to do this work. When not making set-ups, the set-up man may well be required to instruct the operators under him, inspect the machines, make repairs, etc. He is to make all repairs possible, although help will frequently have to be given him when machines have to be overhauled.

When starting in to do time study work in an automatic department, the first thing to do is to clean up the department and provide means for it to be kept clean. Workmen cannot be expected to maintain their machines in good working order if the machine and all of its surroundings are covered with oil that has caked and has not been removed. If the floor and other surroundings are kept clean, the operators will generally take pride enough in their own machines to see that they are kept clean also. Unless the operators are watched carefully, they are liable to feel that the oil guards are a hindrance and consequently leave them off. This is one of the principal reasons why some departments become so thoroughly besmeared with cutting oil and compound. These guards must be kept in position when the machines are running, and where there is one missing a new one should be provided.

It is next necessary to see that all machines are in first-class working condition. Although the foreman may think that all of the machines in his department are in good condition, if an attempt is made on any machine to operate at the maximum speed consistent with good work, it will usually be found that there are some attachments missing, the compound pump does not work just as it should, or any one of many other minor evils will appear that must be attended to. To see that all machines are in good condition, it is well to start a time study, each man taking studies on a group of about ten machines. He should record all time lost for any reason whatever. This will quickly call his attention to those faults which should be rectified.

While the machines are being put into condition, the time study man should make out a tool data sheet, Fig. 116, for the work that is on the machines. A great deal may be learned from a study of the data on these sheets. Having the information on the jobs as they are being run, it is now necessary to build up a new tool data sheet for each of the jobs, filling in the speeds and feeds desired in place of those in actual use.

Where the same job is running on two or more machines, it will frequently be found that widely different feeds and speeds are in use for the same tools on the same cuts. On one job I recall, a small pinion was being made on three machines, two Clevelands and a large Acme. One of the Clevelands was using a very high feed and speed on the form tool operation which controlled the remainder. The other Cleveland, of the same size and general condition was running at a low speed and a medium feed, while the Acme was a fair average between the two.

In building up the theoretical tool data sheets, it is well in starting to use tables of feeds and speeds as furnished by most of the high speed steel makers. Later, this data can be supplemented by the results obtained in practice. In many cases, however, on special alloy steels, it will be necessary to determine what speeds are to be used without this help. The tool data sheets for the jobs, as running, will serve as a basis. It is well to use the highest feed and speed that is thought to be practicable. When the tool data sheets are made up, the jobs on the machines should be brought to the desired condition and started working on that basis. At this point, considerable patience must be exercised by the time study man and all connected with the work, as generally when he has set up the

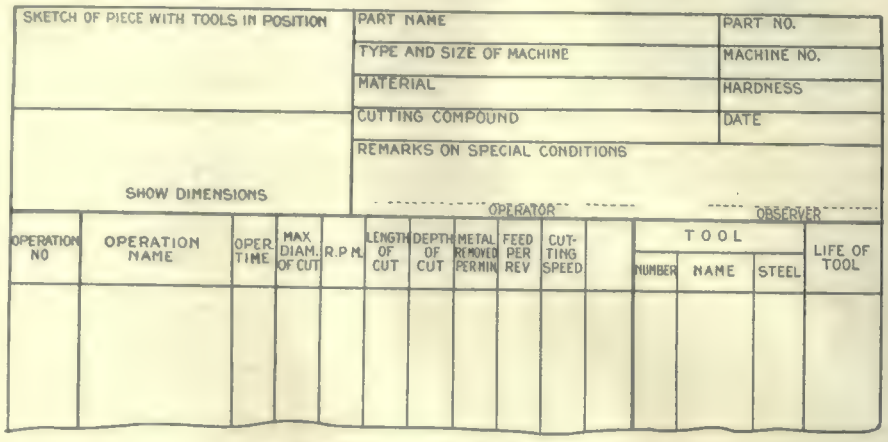


FIG. 116. TOOL DATA SHEET

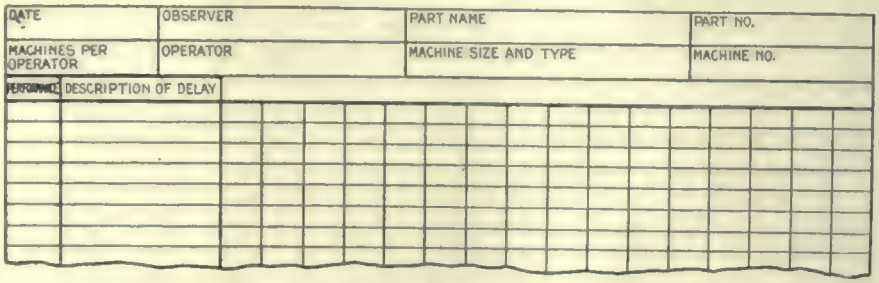


FIG. 117. TIME STUDY SHEET

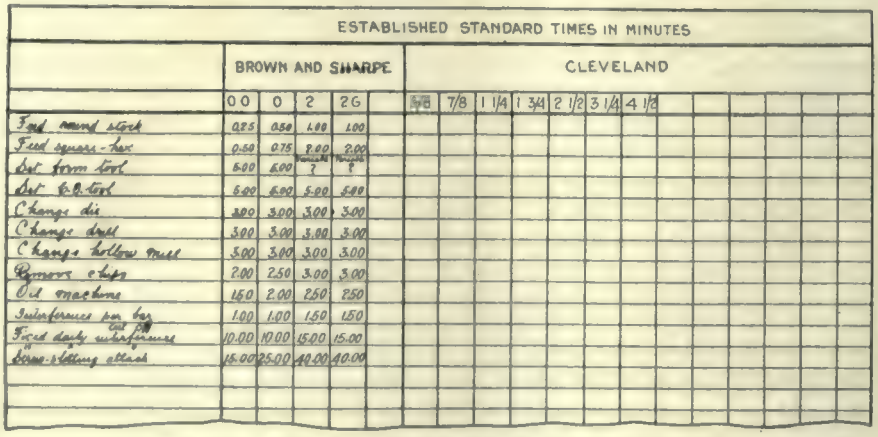


FIG. 118. FORM FOR TABULATING STANDARDS

machines to run as desired, he will find that some of the tools do not stand up well enough to warrant the speed or feed used. Before conceding that the standard is too high, he must be very sure that the machines and tooling are in the proper condition. There are any number of reasons why tools do not stand up properly, and only too frequently the experimenter blames his trouble on the speed as the condition most easily remedied.

At this point also, one must remember that the feed per revolution has very little effect on the heating of the tool, this trouble being almost entirely dependent on the surface speed of the cut. The feed per revolution used is most generally dependent on two conditions, that is, on the capacity of the machine and on the finish desired. While this is well understood, I mention them so that they may not be forgotten even for a moment.

Before condemning the surface speed the machine and tools should be very carefully studied. The trouble may be due to loose or worn bearings, loose or worn toolholders, toolholders too lightly constructed, tools improperly set, tools improperly ground, tools improperly hardened, turrets too loose, cams too loose, lack of proper coolant and lubricant, slipping belt, and many other lesser evils.

One of the principal troubles as a rule, is the hardness of the tools used. Only too infrequently are sufficient precautions taken in hardening tools. Very careful attention may be paid to the production parts; they are inspected, tested for hardness, polished, etc., but in the same departments the tools are merely given to a man to be heated and quenched according to his best judgment, after which they are sent directly to the tool stock or to the tool grinding department without further inspection. Unless the tools are of the proper hardness, they will not hold their edges and will, as a result, burn up very quickly. The present tendency to use several kinds of high-speed steel aggravates the trouble experienced with tools, because it tends to give just so many more chances for the wrong hardening process, as most of the various steels require a slightly different quenching temperature or handling. The use of only one or two kinds of high-speed steel is consequently very strongly advised. Determine on one or two brands and then stick to them.

The cams used should be studied very carefully to make sure that the feeds obtained from them are uniform. Sudden jumps in the feed of a tool such as might be caused by a nick or flat on a cam are very hard on the tools and work as they are liable to break the tool, loosen the holder or start a "chatter" on the work. It will frequently be found desirable to lay out and prepare new cams for many parts unless the department under consideration is exceptional. There is a strong tendency to use any cam that gives approximately the desired conditions, rather than go to the trouble and expense of preparing new ones. This is frequently false economy if the job is expected to run for more than a week, because the new cam will frequently effect a very material saving in time.

Having speeded up the machines to the figures as set down on the theoretical tool data sheet, some of the tools may stand up well enough to warrant a still greater increase. This is advisable wherever possible, not only for the added production but for the determination of new standards to be used later. It is advisable to run tests on as many different jobs as possible to determine just what the maximum practicable feeds and speeds are for the various qualities of finish desired.

In order to determine the number of machines that are to be controlled by one operator, it is first necessary to segregate certain classes of work and machines into groups. That is, plain cut-off machines should be in one class, the machines to handle the simpler drill and ream jobs should be in another and then the more complicated jobs with special taper tools, dies, etc. This forms a classification for the operator also. Cut-off work, for instance, calls for very little skill, while the best operators must be on the jobs which require the taper tools, cross drilling attachments, etc. An operator should be given enough machines so that his time will be occupied approximately 75 to 80 per cent in the changing of tools, stocking machines, adjusting tools, inspecting work, oiling machines and the other routine operations which he must perform. As a basis for making studies, it is well to give an operator from four to seven machines, determining the time he will be occupied from an estimate.

Having the machines running properly and the proper number of machines assigned to each operator, the final studies are to be made for the setting of standard time for rodding or stocking the machines, changing various types of form tools, changing drills, changing cut-off tools, removing chips, gaging work, oiling machines and interference.

These standards will vary on different types and sizes of machines and also with the shapes and styles of tools. However it will be found as a rule that on a certain type of machine, all sizes of bar stock used on that machine require practically the same amount of time for stocking. Some tools will require the same time for changing on all machines. Time is allowed for removing chips largely for its psychological value, for although the time allowed is generally small its presence on the final rate analysis sheet has a good effect on the operator. By interference is meant the time that one machine is not producing, caused by the operator's inability to give it the necessary attention, being busy with another. It is generally very nearly a function of the number of bars of stock that have to be put into the machine.

The studies will be made on the time study sheet, Fig. 117. Studies extending over a period of about two weeks on any one type of machine should be sufficient for setting the standard if a variety of jobs are being worked on. Of course, if a single job is being run during the entire time the standards may not be applicable to other jobs which come later. While taking these times, however, the time study man should instruct the operator, reducing the delays as much as possible and removing the unnecessary ones. Due to the fact that after the study the operator will have to operate more machines at one time than he has previously, considerable training of the men is usually necessary before they are capable of handling the machines properly.

The rates are to be set on the assumption that the operator has sufficient tools, properly ground, supplied to him. Too often it is the practice to allow the operator to grind his own tools and most of them by hand. This is uneconomical. In the first place, in grinding tools by hand, it is practically impossible to have them ground with the proper rake. Frequently they are considerably out of true. Then too, if the operator is to grind the tool, he must leave his machines, which is also bad practice. The tool grinders should be located cen-

trally, and some one person be made responsible for the grinding; if necessary, the operator can take the dull tools to the tool grinder and leave them, returning for them later and using one of his extra tools in the meantime. In a large department it is well worth while to have a boy make regular trips to all of the machines picking up dull tools and delivering the reground ones.

Having taken sufficient studies for the setting of the standards, the times required for various types of delay are summarized by size and type of machine and from these summaries the standards are set. All times which have been noted on the studies as unusual or not allowable should first be eliminated before trying to determine the standard.

The standard chosen should as a general rule be less than the average of all the times and should be the time which occurs most frequently in case there is any one time or times that stand out. This is done on the basis that this time is what should ordinarily be required. However, this rule cannot be used at all times and all conditions must really be judged after due consideration of all factors.

It should be remembered in setting the standards that the delays on automatic machine work are as a rule a small percentage of the actual operating time, and as a result, a 50 per cent error in a standard might affect by only one or two per cent the possibility of making the task. Consequently it is always well to be generous when establishing the standards, and the operator should be given the benefit of the doubt.

Having established the standards they should be tabulated for later use in setting the rates, as in Fig. 118. This table is best constructed with all of the standard allowable delays listed down the side and the various sizes and types of machines across the top.

In order to set a rate, it is now only necessary to establish the time per piece, the number of pieces from bar of stock and the tool data sheet, as follows, using B & S No. 2-G standards:

Piece 2½ in. long, bar stock 12 ft. long; approximately 55 pieces per bar; time per piece 1.00 min.; life of form tool 200 pieces; life of cut-off tool 300 pieces; life of drill 300 pieces; life of spot drill 2,000 pieces; per 10 hour day.

Feed 10 bars per day	@ 1.00 ea.	=	10 00
Interference 10 bars per day	@ 1.50 ea.	=	15 00
Change form tools 3 times	@ 7.00 ea.	=	21.00
Change cut-off 2 times	@ 5.00 ea.	=	10.00
Change drill 2 times	@ 3.00 ea.	=	6.00
Oil machine 2 times	@ 2.50 ea.	=	5.00
Miscellaneous interference		=	40.00
Remove chips 2 times	@ 3.00 ea.	=	6.00
Allowable delay			113.00 min.
Possible minutes per day			600.00
Delay			113.00
Productive time			487.00 min.

$$\frac{\text{Production time } 487\ 00}{\text{Time per piece } 1\ 00} = 487 \text{ pieces per day.}$$

or 48 7 task per hour.

$$\text{Time allowance per piece } \frac{60}{48\ 7} = 1.231 \text{ min.}$$

Wage incentives on automatic screw machines can best be based on the task and bonus plan, on which basis, if the task of 48.7 pieces per hour is made, a bonus of 20 to 25 per cent is given to the operator with all pieces over the task carrying a rate similar to straight piece work. The object of the task and bonus plan is to require a certain minimum production before any incentive is paid.

The rate having been set, a tool list of the tools required on the job and an instruction sheet showing the set-up with dimensions for placing all of the tools are prepared for future guidance.

Time study of automatic machines is thus seen to present but few difficulties compared to studies on other machine tools. It is largely a question of seeing that the machine and tools are in good condition and then to make proper allowances. It is the varying human factors in machine operation that cause most of the difficulties in time study work.

The Apprentice's Problem

By R. H. Kasper

A question which frequently troubles the machinist's apprentice in the small shop is whether it would be advisable to remain in his present position or to seek employment in a large shop. It is a problem which is encountered by almost every apprentice, and about which he receives so much advice both pro and con, that his problem appears unsolvable.

The average machinist's apprentice has not chosen the trade because of any previous signs of talent, or desire for the work, but because he needed a "job," and necessarily took the first thing which presented itself. Having accepted, he is satisfied for a time, until, perhaps, a dissatisfied worker (who, by the way, is usually dissatisfied because he is not making good) makes the remark that "this is a one-horse shop." Then numerous questions spring up in the mind of the apprentice. "Would I learn more in a large shop?" "Am I working in a shop which does not employ modern methods?" "Would I advance more rapidly in a large shop?"—these are a few of the questions which resolve themselves into the one large question, "Shall I stay or leave?"

The problem frequently assumes gigantic proportions —and not without reason. Starting out in his life's work, the apprentice is anxious to succeed, but is hampered by the fear of starting on the wrong track, the fear that years may be wasted in vain efforts, the fear that the same years spent in another shop may spell the difference between success and failure. Some of us have never experienced these fears, but most of us have—and they have been quite disconcerting at times.

The apprentice pictures himself, years later, after having spent the best years of his life in a small shop, as a "half-baked" mechanic, unable to hold a position in a modern shop for any length of time. He sees himself wandering from place to place until finally he strikes another "one-horse" shop, where he must spend the remainder of his days in unpleasant surroundings at low wages and with no opportunity for advancement. Of course, the condition is greatly exaggerated in the mind of the apprentice, but most of us have come in contact with men, who, in spite of years of experience at the work, never succeed in producing a creditable piece of work. Although this is usually the fault of the man himself, he is frequently held up as a horrible example of the folly of sticking to the small shop. It is true that one cannot learn everything in the machine business in a small shop, but it is equally true that one's life may be spent in a large shop and still leave much unlearned.

In order to arrive at a satisfactory decision, the apprentice must view the question from all angles, and carefully compare the advantages and disadvantages of

the one shop with the advantages and disadvantages of the other.

In the large shop, where scores, or perhaps hundreds, of men are doing the same work, the absence of one for a day amounts to but a drop in a bucket. Among a large number of workers there are a certain number of absentees daily, and the daily or weekly output is usually computed with the proper allowances for the absentees. But in the small shop each man assumes a greater responsibility. His absence for a day becomes immediately noticeable, as certain work to which he would have been assigned has been left undone. He is a noticeable part of the organization, and he feels the responsibility. Should the output fall below normal, he feels it his duty to put his shoulder to the wheel in an effort to make it up. Thus by working in a small shop, the apprentice develops the habit of loyalty to his employer, which is a virtue frequently lacking in the large-shop worker.

In the small shop there is usually a greater variety of work than in the large shop. Some men are content to do the same work day after day, but most of us desire variety. Lack of variety becomes like a bread and water diet. Variety is the interest sustaining factor in all classes of work. Continued repetition becomes deadening to the senses. there is no interest; the worker becomes a machine, doing his work, perhaps, but with his mind elsewhere. When a piece of work or an operation can be done perfectly, it is natural for the worker to desire something different in order to increase his skill or knowledge, unless the pay is high enough to suppress such a desire.

An interested worker is a satisfied worker, and perhaps nothing goes further in sustaining the interest of the apprentice than the variety of work usually encountered in the average small shop. The worker is not bored with the realization that each day is to be a twin brother to the previous day, but begins his day's work knowing that each day means more knowledge to be acquired or new experiences to be encountered.

In the large shop each man may perform only one operation out of the many required to complete the work. Perhaps his work may not be noticeable on the finished product. In the small shop one man may perform several operations on the finished product, or he may complete the entire work. Working from the raw material to the finished product, he feels a certain pride in having produced something by the skill of his hands or brains. He feels responsible for the appearance and efficiency of the finished product, and the joy of having created something frequently overcomes the discouragements to which the apprentice is subject.

It is true that many small shops accept work for which they lack the necessary facilities. This is frequently necessary, as the refusal of one contract may mean the loss of others which could be handled efficiently. Thus it is necessary to adopt makeshift methods of doing the work, which proves the greatest bone of contention for the apprentice. He realizes that he could do much better work with the proper facilities, though he is sometimes surprised at the good quality of the work produced by the methods pursued. He does not realize that by employing such methods he is storing up knowledge which may some day prove of immense value. He employs methods which would not be dreamed of by the machinist who had always worked in a shop having a complete equipment. Most of us have heard the saying, "Anyone can work with tools, but it takes a good mechanic to work without them." There is a great deal of logic in the statement.

The worker in the small shop is usually given a piece of work and is permitted to work out his own salvation. The foreman is usually a worker himself and cannot spare the time to elaborately explain the method of procedure. The apprentice is thus thrown on his own resources to a great extent, thereby developing the ability to plan and reason for himself. Should he by a miscalculation find himself against a stone wall, so to speak, he must plan to get over it. Having safely passed the danger zone, he realizes that the same procedure may mean disaster the next time, and he firmly resolves that there shall be no next time. He profits by his error.

In the shop where everything is highly systematized the man in charge has carefully studied the work with the object of deciding on the quickest and best method of procedure. The machines to be used and the sequence of operations are decided on before the worker receives any orders. Under such conditions it is sometimes impossible for the worker to make a mistake and the worker who never makes an error begins to think that there is no such thing. Then, perhaps, his position may change, and having made an error, he is lost—he has not learned how to avoid mistakes as far as possible, nor how to rectify them when they occur. "The best scholar is not he who never makes a mistake, but he who never makes the same mistake twice."

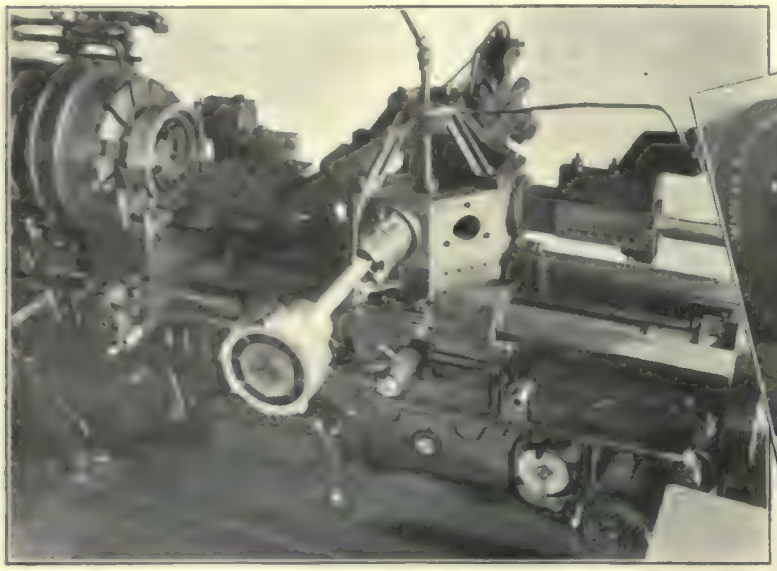
Another point frequently noticed is the difference of attitude between the workers themselves. In the small shop there is a sort of family spirit. Should one man find himself in a tight place the others are always ready with suggestions. In many of the larger shops, especially if there is a piece-work or bonus system, the prevailing attitude is "each man for himself and the devil take the hindmost." Nothing hurts the apprentice more than to find that his fellow workers have deserted him at a time when a few words of suggestion may mean so much.

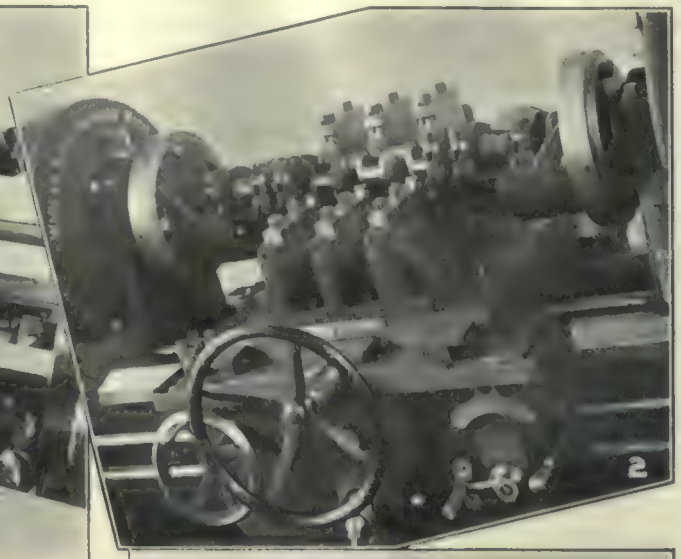
Of course, the worker in the small shop does not come in contact with the efficient methods pursued in the large shop, but such methods are described in detail in the technical magazines, while the methods of the small shop may not become known outside of the shop in which they originate.

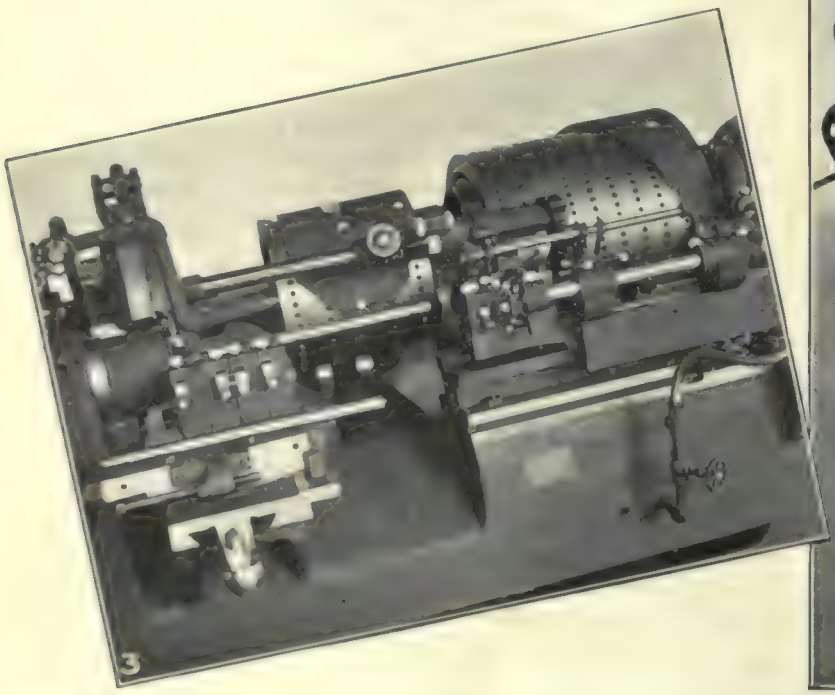
The apprentice frequently reasons that the opportunities for advancement are greater in the large shop than in the small shop. This is true in a sense, as there are positions in the large shop which are unheard of in the small shop. But it must also be remembered that each position is open to greater competition. Should there be an opening in a shop employing four men, each man's chance of being the selected one is four to one. But in the shop of one hundred men this ratio becomes one hunded to one. If mechanical ability is to be used as a basis for promotion, the man of exceptional ability is more easily selected from among the four than from among the hundred. Then, again, among the hundred there may be several of the same mechanical ability, and in such cases friendliness with a superior is often the cause of the selection.

The happy medium seems to be to acquire experience in both the large and small shop. Which should come first may be a matter of personal opinion, but it is a noticeable fact that the small shop worker experiences less difficulty in the large shop than the large shop worker in the small shop.

PRODUCTION







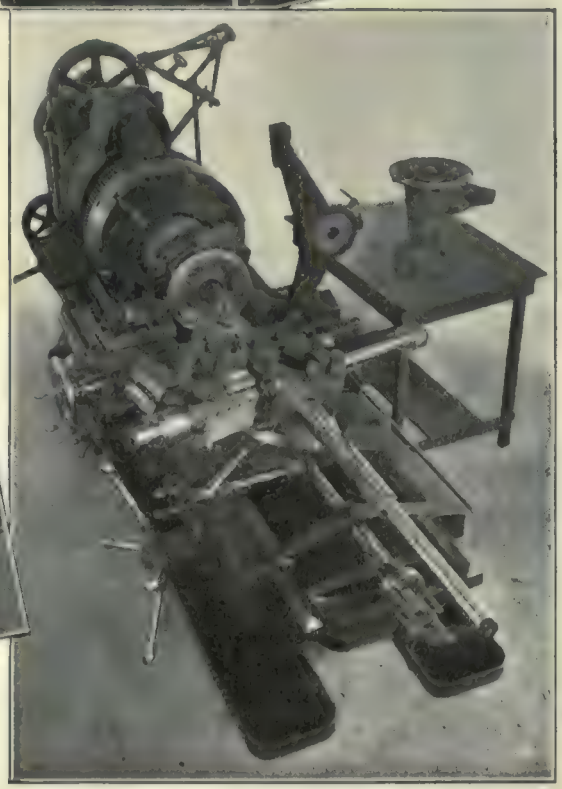


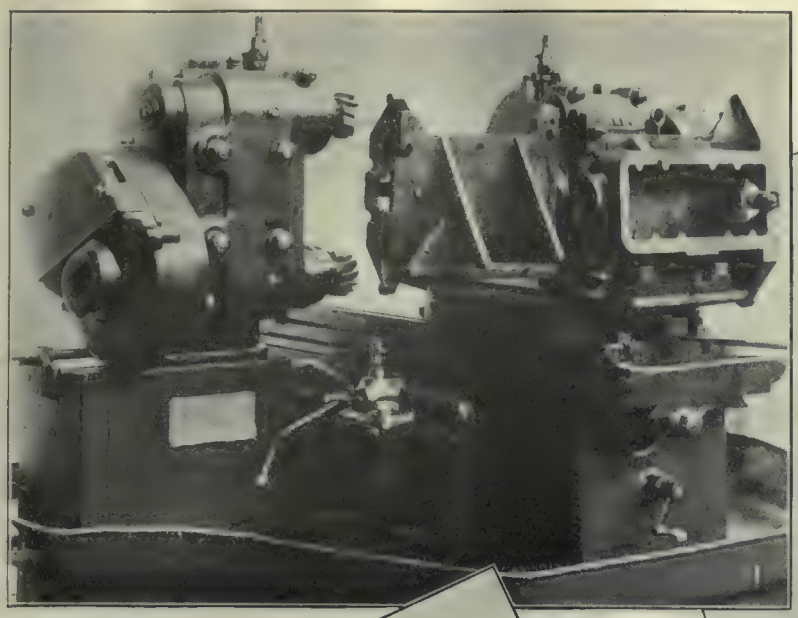
Fig. 1. The automatic turret lathe is a comparatively recent development. The 20-in. Gisholt automatic lathe shown herewith is machining ring-gear blanks of chrome-nickel steel. The work is finished all over, including an interior central web, and requires four operations and three chuckings. The blanks are 13 in. in diameter and 2⅞-in. face and are completed in 28 minutes.

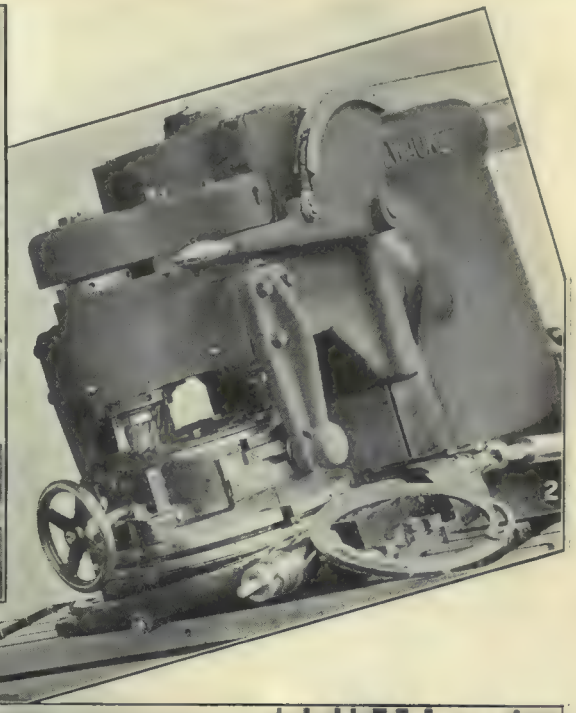
Fig. 2. The Wickes duplex crankshaft lathe shown in this illustration rough-turns two crankpins at one time. The time per pin is 3.07 min. Thus the pins on a six-throw crankshaft are roughed out in 18.42 min. As several machines were formerly required and the time taken was 81.6 per min. per shaft, the saving is 77.4 per cent.

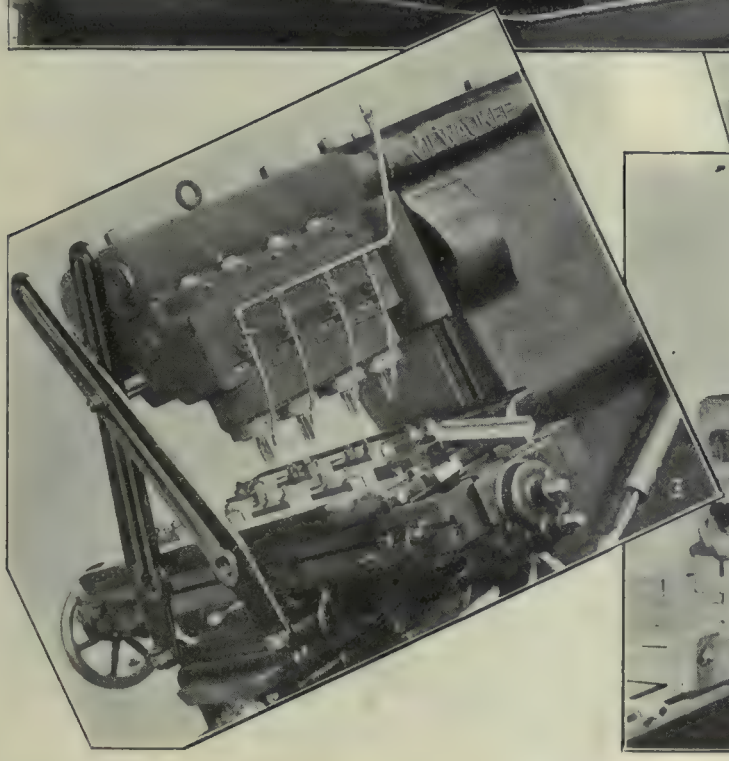
Fig. 3. An automatic machine for turning shouldered-shafts has been devised by the Cleveland Automatic Machine Co. and is here shown together with a 1 x 17-in. shaft having nine shoulders which it turns out at the rate of four shafts per hour. The performance of this machine would make the old time lathe hand "Sit up and take notice."

Fig. 4. Here is a 24-in. Gisholt turret lathe machining an axle housing for a tractor. The tool set-up can be clearly seen in this rather unusual view. While two operations and two chuckings are required, the work is completed in 14 minutes.

IN PICTURES







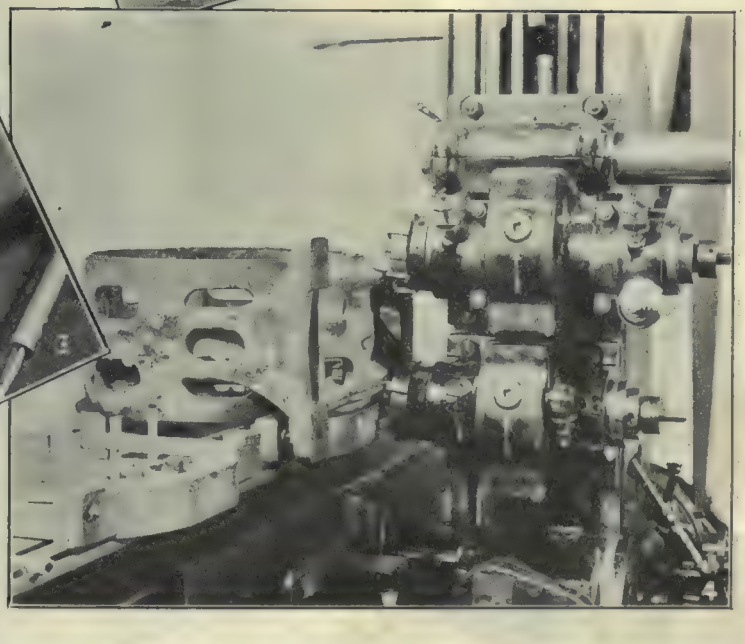


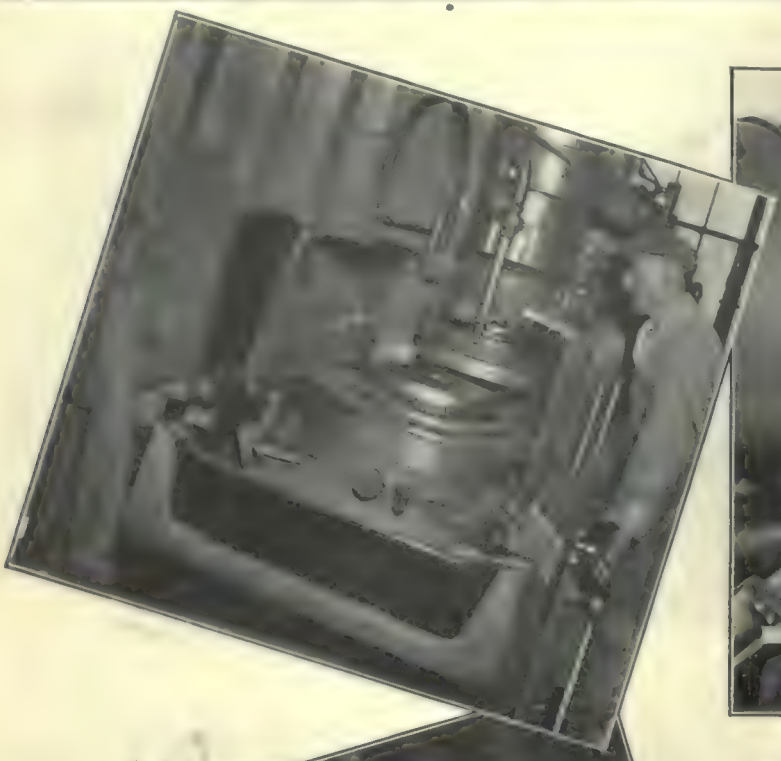
Fig. 1. In this view is shown a 48-in. Cincinnati duplex automatic milling the end pads on crankcases. The head at the left is especially arranged for the work and carries two spindles. The two station fixture permits loading and unloading without interrupting the work. With a feed of 3½ in. per minute the production is forty pieces per hour.

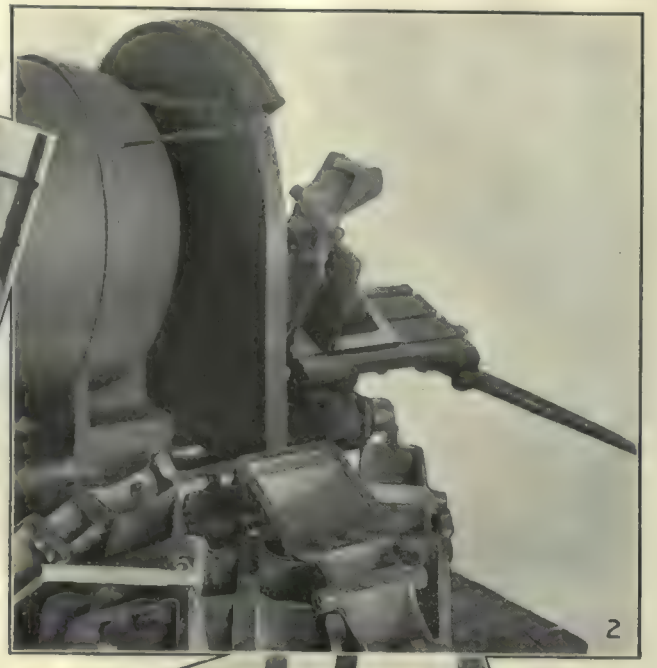
Fig. 2. Here is a Milwaukee milling machine with a special head carrying three vertical spindles. Three pads on a circular piece are being milled in steps. As the fixture revolves it is raised from step to step by cams and the work is completed in 1 min. 16 sec. The number of operations and set-ups that would be required on a single-spindle machine is apparent.

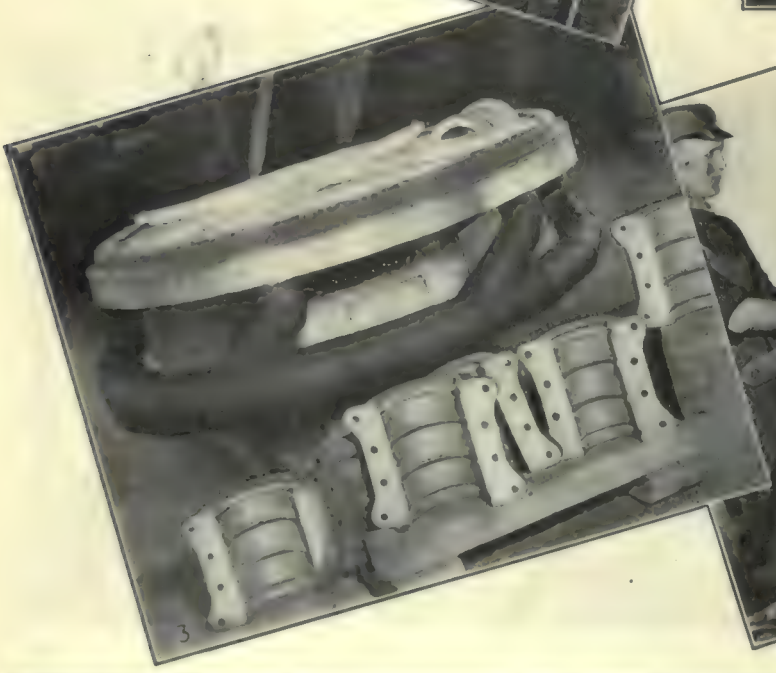
Fig. 3. This illustration shows a No. 3B plain Milwaukee milling machine, milling channels in steel toolholders. The special head carries four spindles and the work is ganged in the fixture shown. It does not require a mathematician to tell how much this arrangement beats doing the work with a single cutter.

Fig. 4. A No. 33 Kempsmith two-spindle production milling machine is shown in this illustration milling the bottom faces of field rings. Two fixtures are used permitting loading and unloading without stopping operations. An automatic quick-traverse prevents cutting wind between surfaces and the production is 9.6 pieces per hour.

PRODUCTION







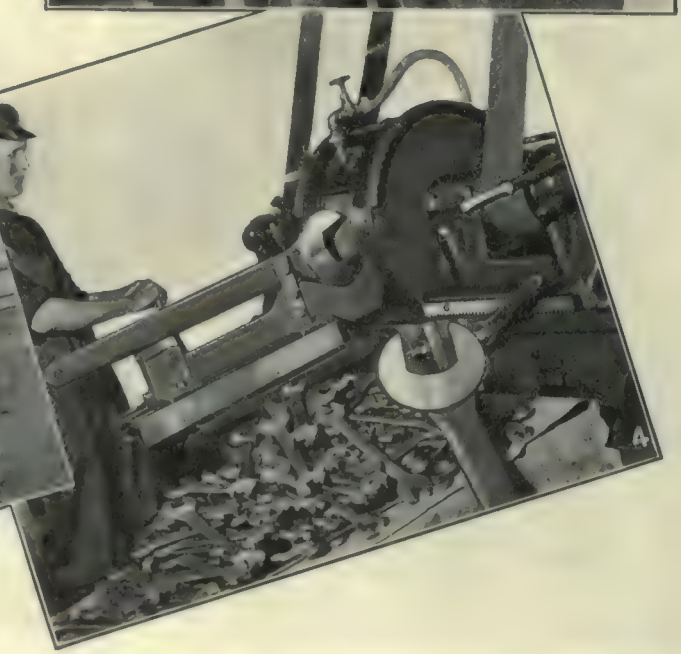


Fig. 1. Here is a No. 16 Blanchard vertical spindle rotary grinding machine at work on hardened-steel transmission gears. The work is ground on one side only. From 0.015 to 0.020 in. of stock is removed and the limits are ±0.005 in. Production, twenty-five pieces per hour.

Fig. 2. The Gardner No. 6 disk grinding machine shown in this illustration is grinding automobile transmission covers. The work rests on the table and is supported against the abrasive disk by a single point in the angle plate. As this point is in the center of the area to be ground it allows the work to float. Production is at the rate of 150 pieces per hour.

Fig. 3. Finishing large pieces on a vertical spindle disk grinding machine is an economical proposition. A Gardner No. 24 machine of this type is here shown grinding split pipe-sleeves of cast iron. The work with an added weight of about 100 lb. furnishes the grinding pressure. The area ground is 72 sq.in. and the amount of stock removed is 1/16 in. Production is fifteen to twenty pieces per hour.

Fig. 4. This Besly wet ring-wheel grinding machine was shown on page 707, Vol. 55, but errors were made in the production figures. Production on the large wrenches weighing 9 lb. each, should have been 100 per hour instead of 200; and on the small double-end wrenches 800 per hour instead of 600.

IN PICTURES



Fig. 1. When cold saws are fitted with proper clamping arrangement, more than one piece of work can be operated on at once. Here is a Lea-Simplex cold saw trimming the ends of two 7-in. channels. As may be seen from the location of the saw in the cut, this arrangement is a time saver. The saw has cut well into the second channel before passing entirely through the first one.

Fig. 2. The cold saw has of late years been recognized as a machine tool. The Lea-Simplex saw illustrated herewith is mounted on a turntable and can be revolved so as to receive bars from any direction. This feature is especially valuable when very long bars are to be handled or the space about the machine is small.

Fig. 3. One advantage of the hack-sawing machine is that the saws are comparatively cheap. The Peerless hack-sawing machine illustrated herewith is cutting a piece from a 9-in. bar of steel. Before the advent of such machines as are shown on this page, round bars were cut off in a cutting-off machine or a lathe, while bars of irregular shape were nicked by a cold chisel and then broken.

Fig. 4. The Nutter-Barnes cold saw shown in the accompanying illustration is cutting pieces from a 4-in. I-Beam. The cutting time is 5 min. but as one operator can attend to several machines, the cutting-off cost may be reduced to a minimum.

Diverting Burden Factors to Direct Production

Finding and Watching Non-Productive Costs—Direct Labor Usually the Smallest Item—Predetermination of Costs a Necessity

By P. B. HUSTON
Chief Factory Accountant, Cleveland Automatic Machine Co.

GREAT stress has been laid in the past on the productive labor cost in manufacturing product. Systems have been developed costing thousands of dollars, to determine how and where the productive labor cost is being used. And managers in most cases have lost track of the fact that productive labor, if properly handled, is not the largest part of the cost of the product.

To the productive labor cost is added burden, administration and selling expenses. In the past five years these added expenses in most cases have been the "dumping grounds" for much inefficiency and extravagance.

J. P. Brophy, vice-president and manager of the Cleveland Automatic Machine Co., by whom the writer has been employed, has always been insistent on cost reports of his product, but never required extreme accuracy to the exact penny on each class of product. His orders are not to "split hairs" in arriving at the cost of any unit. This has saved thousands of dollars by not having an excessive number of non-producers to figure details that would have proved of little value.

Very little money has been lost through not figuring these small details and a great amount might have been spent to find out what small details were costing.

At a convention of the Machine Tool Builders' Association in Cleveland last spring, a manager of a large eastern concern in an address on cost accounting, made the remark that he thought if the majority of corporations would set aside a fund each year to endow an asylum for "cost specialists" and then send all such "specialists" to this asylum, that they would be money ahead. This however, was rather a broad statement and one that would need to be taken with a "grain of salt."

Cost accounting is a necessity and has to be recognized as such, but the so-called "specialist" has sometimes run this phase of accounting to the extreme. He has frequently worked himself out of a job through his lack of knowledge of conditions and the value of the results of his statistics.

Predetermining Costs

In any well-regulated manufacturing plant it is necessary to predetermine costs. This is easily done if common sense is used. After these costs are set, all that is necessary is to have the production department see that the materials and productive labor operations do not cost any more than this predetermined figure. The manager can then control the other medium of costs, such as factory burden, selling and administration expense, by seeing that he receives reports at certain periods detailing these costs. A very small amount of clerical help can compile these periodical statements. The manager then has a chance to control the necessary burdens that have to be added to costs.

The method used in this control is practically the same as any other factor of costs. In predetermining costs it is necessary to set a standard on all the elements entering into costs; therefore this burden standard should be determined at this time.

In the manufacture of machine tools, the relations of the cost factors to the total cost are approximately: 35 per cent materials; 20 per cent productive labor; 45 per cent manufacturing burden, selling and administration expense.

The deduction follows that the heaviest factor in the costs is the non-productive feature or burden. Judging from the past it would look as though more of this indirect or non-productive expense could have been used on direct production had more attention been given this factor of costs.

Determining Standard Burden

In determining the standard burden, conditions of all sorts in your plant must be taken into consideration. These include floor space and the maximum number of productive man- or machine-hours your plant capacity will allow in any period. Compare this data with the average number of productive man- or machine-hours you have been getting from your factory in the past.

Over the same period compile your actual expenses and figure a man- or machine-hour rate for these expenses from your finding. Most concerns will be greatly surprised to find this rate per hour, if on the productive man-hour basis, is from 50 to 125 per cent greater than their productive man-hour rate.

After arriving at the actual rate, set a rate that will be on the basis of extreme economy—a safe standard for this factor of costs. From this standard rate determine a monthly total by multiplying by the average number of productive man- or machine-hours. The total arrived at must then be distributed to the various classes of expense. This can be done by taking the actual relation of each class to the total actual expense and then distributing the standard total on the same basis as the actual.

After this standard is distributed, monthly comparative statements can easily be compiled showing the management exactly where he is gaining or losing on his standard expense. The relation of the productive man- or machine-hours to the expense must always be considered in this report.

Power, light and heat, maintenance of plant machinery, buildings, small tools, patterns, jigs, etc., supervision, factory accounting and other manufacturing expenses should be carefully analyzed and cut where possible.

Cost of Welfare Work

One main expense that has not been mentioned above, upon which vast sums have been expended by many concerns is so-called welfare. Buildings have been erected, gymnasiums, reading rooms, dining halls and assembly rooms have been equipped and special directors of this work hired at large salaries. The benefit to be derived from such a source has been greatly over-estimated and

instead of increasing efficiency and production has added to the cost of production.

Do you know in your plant whether it pays or not? A certain amount of it does, but in the writer's opinion 75 per cent of it could be done away with and this money be devoted to other channels more profitably.

The average employee's natural inclination on being relieved of his labors is to seek recreation away from his place of employment. He does not appreciate this vast expenditure. A conservative amount spent on this branch of industrial expense is necessary. A clean, light, well-ventilated place to work, sanitary toilets with lockers and shower baths, a clean place for employees to eat their lunch and a well-equipped first aid hospital are all essential.

Any more elaborate plans promoted by employees themselves should be entirely under their control and personal expense, with a possible small donation by the firm to encourage anything beneficial to the employees' health or education.

Laying Out a Factory for Production Work

By FRANK W. CURTIS
Chief Engineer, Dowd Engineering Co., New York City

(Continued from last week's issue)

CERTAIN classes of work can be handled in more than one way and the method used may affect the factory layout to a considerable extent. Fig. 5 shows a piece of work of this nature. This work is

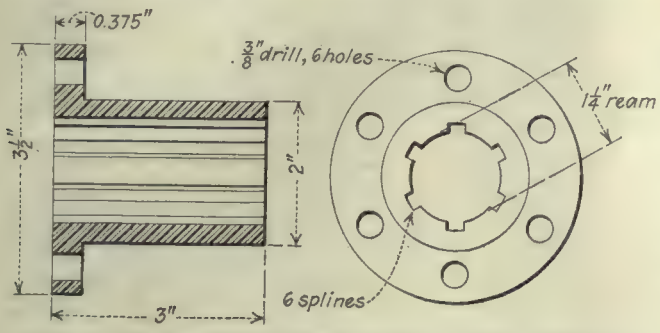


FIG. 5. EXAMPLE OF PART TO BE MANUFACTURED FROM A FORGING

a combination flange and hub and the operations were laid out in two different ways in order to determine which would be more profitable.

First Method:

Op. 1. Drill, bore and ream hole; rough and finish turn O. D.; face end and back of flange.

Op. 2. Broach spline cuts in hole.

Op. 3. Face flange end and turn O. D. of flange.

Op. 4. Drill six holes in flange.

Total time required for this method, 11 minutes.

Second Method:

Op. 1. Rough drill large hole and spot-face end of hub.

Op. 2. Broach round hole in hub.

Op. 3. Broach spline cuts in hub.

Op. 4. Face both sides of flange and turn O. D.

Op. 5. Rough and finish turn hub. (Two machines.)

Op. 6. Drill six holes in flange.

Total time for this operation, 9½ minutes.

It will be seen that the second method is somewhat faster than the first method and in addition to this the tools required and the machines used are less expensive. In the first method, the first operation is performed on a turret lathe and it requires some special tooling. Reaming of the hole requires an adjustable reamer in order to keep the work up to the proper size. Some of the other tools also are of a special nature. In the second method the first operation is a very simple one and the upkeep of tools is extremely easy, a jig only being used. The broaching of the round hole in the second operation is in accord with modern practice, and the upkeep of the broach is excellent. The fourth and fifth operations in the second method require only the use of an engine lathe with simple tooling.

It can therefore be considered that the second method is more profitable both from the viewpoint of higher production and also on account of the upkeep of tools.

A number of points of importance must be taken into consideration when making a factory layout. Some of these points are noted herewith:

(1) What machine tools are on hand that can be used in the production? Are these machines new or old, and if the latter, what condition are they in? Do they need overhauling before they can be used, or have they been recently inspected?

(2) What is the nature of the product and how great a production will be required?

(3) Is it the intention to manufacture the product complete in this factory or will some parts be manufactured outside? (4) Is there a likelihood that production will later be increased? If so, provision should be made for inspection and the setting up of additional machines, which should be done as far as possible without disturbing the routing of the work.

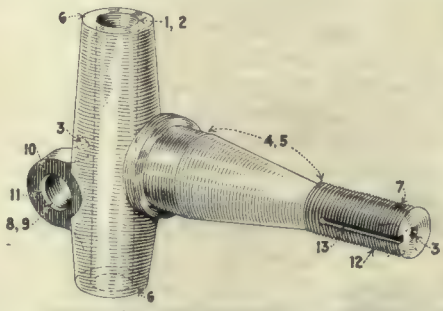


FIG. 6. EXAMPLE OF WORK SHOWING MANUFACTURING OPERATIONS REQUIRED

(5) Is money available for the purchase of new machine tools if required? If not, what provision can be made with the equipment available to handle some of the difficult work which would ordinarily require a different type of machine?

(6) What is the tool equipment available? Are the tools which have been designed efficient or must new designs be made? If new designs are to be made is it possible to obtain the services of a strictly first-class tool engineer who understands the value of high production tools.

(7) If the layout of operations has been made and time studies computed, is it capable of being improved; that is to say, have the feeds and speeds been set and

are they practical and productive of the greatest possible output?

(8) What provision is made for handling material? Suitable aisle space must be provided with plenty of room for trucks to pass each other. If conveyors are to be used are they to be power operated or by gravity? The nature of the work naturally determines some of these points, yet they should all be considered before making the factory layout in order that proper provision may be made for rapid handling of the product.

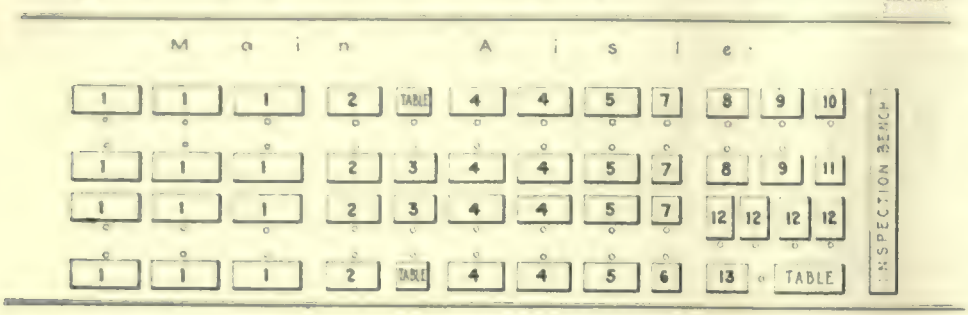


FIG. 7

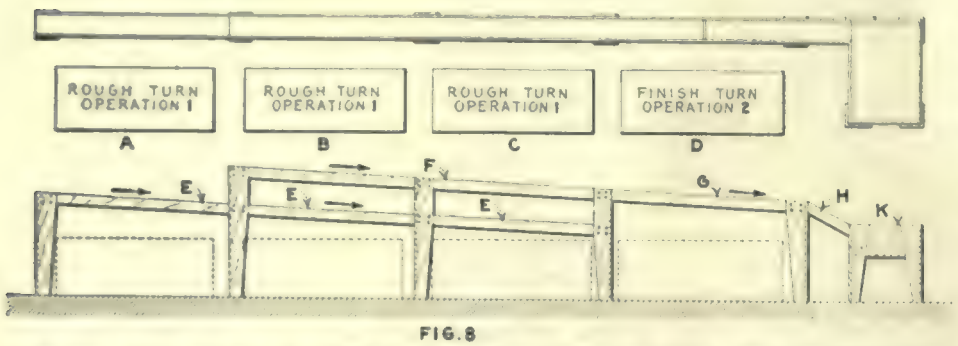


FIG. 8

FIG. 7. LAYOUT OF MACHINES FOR PART SHOWN IN FIG. 6, FOR PRODUCTION OF 4,000 PIECES PER EIGHT HOURS. FIG. 8. ARRANGEMENT OF CHUTES FOR HANDLING WORK BETWEEN OPERATIONS

(9) How will the departments be divided? This is an important point because if one unit is to be handled in a department devoted to that unit exclusively, a different arrangement of machines will be required than if the factory is to be arranged with separate machines departments.

(10) Is the inspection to be handled by departments or separately? This is a matter for the factory management to decide upon and it naturally affects the factory layout to some extent as provision must be made for inspection according to the method used.

(11) Assembling department: This must be proportioned according to the production required and provision must be made so that there will be ample room to assemble and test the mechanisms before they are shipped.

(12) What shipping facilities are there? In considering this matter the nature of the product also is an important factor. If the units are small, they may be boxed in small boxes, while if they are large, they may require heavy crating.

All of the points mentioned have a bearing on the factory layout and they should therefore be considered with care in the early stages of the development.

We have previously given an example of a factory layout for general manufacturing. In this layout the departments were separated as they should be for a factory of this kind. In very high production work, however, it is often found more economical to devote an entire department to a single part and arrange the machine tools in such a way that all of the work on one part will be done in this department. The steering knuckle shown in Fig. 6 is an excellent example of a high production part which is manufactured in a department set aside for this purpose alone. In referring to this piece it will be seen that it is a forging on which there are a number of operations. In order to make the matter clear an operation sheet is given showing the method of handling as well as the time of production and the machine tools used on each part. Reference numbers for the various operations will be found on the part drawing, so that the various machining operations can be readily followed.

The production required on this part is 4,000 per day of eight hours and the machine arrangements are such as to make sure that this number of parts will be obtained under all conditions. The production of this piece will be taken up in detail in order to show the method of arranging machines for economical production. Fig. 7 shows the layout of machines with numbers applied to each machine to correspond to the operation on which they are used. By referring to the operation layout it will be easy to understand just what are the functions and purposes of the various machines. A brief mention will be made on each operation to show how the required production is obtained.

The first operation of drilling a $\frac{3}{8}$-in. hole is done on a four-spindle gang drill, the production obtained being 363 pieces per eight hours for one machine. Twelve machines are required to give the necessary production and allow for the possibility of break-downs in production.

OPERATION SHEET FOR PART SHOWN IN FIG. 6

Oper.	Operation	Machine	Production —8 Hrs.
1	Drill $\frac{3}{8}$-in. hole	4-spindle drill press	363
2	Ream 0.685-in. hole	Special	1,480
3	Center both ends	Centering machine	2,350
4	Rough turn	Lathe	520
5	Finish turn	Lathe	1,296
6	Face to length	Drill press	4,320
7	Drill 5/32-in. hole	Drill press	1,700
8	Drill 47/64-in. hole	4-spindle drill press	2,100
9	Ream 0.749-in. hole	Drill press	4,320
10	Spotface	Drill press	4,320
11	Countersink	Drill press	6,480
12	Chase $\frac{7}{8}$-in. thread	Threading machine	1,296
13	Mill keyway	Hand miller	4,320

The second operation, which consists of reaming the 0.685-in. hole, is done on a special machine giving a production of 1,480 per eight hours. Four machines are required to take care of this operation.

The third operation of centering the ends is done on a center drill on which a production of 2,350 per eight hours is obtained. Two machines are necessary for this operation.

The fourth and fifth operations consist respectively of rough- and finish-turning. The portions specified by number are done on an engine lathe with special tool-

blocks. The fourth operation gives a production of 520 per eight-hour day which requires eight machines. The fifth operation gives a production of 1,295 per eight-hour day, requiring four machines.

The sixth operation consists of facing the work to length. This operation is done on a drill press producing 4,320 pieces per eight hours. One machine is sufficient to take care of the production on this piece.

The seventh operation is the drilling of the $\frac{5}{32}$-in. cotter-pin hole which is done on a sensitive drill giving a production of 1,700 per eight hours. This operation requires three machines to give the necessary production.

The eighth operation, which is the drilling of the $\frac{21}{64}$-in. hole, is done on a four-spindle drill press giving a production of 2,100 per eight-hour day. Two machines are sufficient to take care of this operation.

The ninth operation consists in reaming the 0.749-in. hole, the work being done on a drill press. This operation is very rapid and one machine would be considered sufficient under normal conditions. An extra machine is provided, however, in order to make sure that there will be no break-down in production.

The tenth operation, facing both ends of the hub, is done on a drill press, using a simple fixture. A production of 4,320 pieces is obtained in eight hours and one machine is considered sufficient for the work.

The eleventh operation consists of countersinking the hole in the lug on a drill press. This operation also is very rapid and 6,480 pieces are produced in eight hours. One machine is sufficient.

The twelfth operation is the cutting of the $\frac{3}{4}$ x 16-in. thread on a special machine using a die head. A production of 1,296 parts is obtained in eight hours. Four machines are required.

The thirteenth and last operation is the milling of the keyway on a hand milling machine; 4,320 pieces are obtained in eight hours and one machine is sufficient for the operation.

All of the operations mentioned are very rapid and the number of machines is so proportioned that there is little likelihood of break-downs which will tend to hold up the production. In addition to this, allowances are made in each operation for lost time and production is figured on a basis of 90 per cent of maximum.

In order to assist in the handling of work between operations, a system of chutes can be standardized so that it can be adapted to a number of conditions in the factory. When operators are handling work rapidly it is tiresome to stoop and pick up work and walk to the end of the machine to lay it down and then come back again and pick up a new piece and put it in position on the machine. By an arrangement of chutes such as that shown in Fig. 8, a great deal of this labor can be obviated. There are three lathes at *A*, *B* and *C*, all of which are being used to rough-turn a certain piece of work. Finish-turning is done by a lathe at *D*. The arrangement shown allows the workmen at *A*, *B* and *C* to take work out of the lower chute *E* as they require it, and when they have finished their operation the work is thrown into the upper chute *F* in the direction of the operator at *D*. A stop is placed at *G* so that the rough work does not pass beyond this point. When operator *D* completes his work he throws it over into the chute beyond the point *G*, from which position it travels down the slide *H* on to a table *K*. The chutes mentioned are made of sheet metal and they may be arranged in various ways according to the product that is to be handled. On certain classes of work it may be necessary to provide fiber guides on which the work can rest, so that it will not be marred in transit. The angle at which the chutes are set is naturally dependent upon the work that is to be handled. It will be found that devices of this sort are great labor savers and a little ingenuity in their construction will permit a considerable amount of standardization so that they can be applied in numerous cases throughout the factory. If work being handled is flat or irregular so that it will not slide easily, a roller conveyor can be used in place of the chute. Conveyors of this kind can be purchased or made up according to the requirements of the work. All of the devices mentioned facilitate handling and increase production in the factory. A conveyor system of this type was used in the layout shown in Fig. 7.

Big Shops vs. Little Shops

BY THE LATE W. D. FORBES

A most interesting report has been made by a British board of investigation into the relative costs of production in large manufacturing concerns and small makers of furniture. The board is known as "The Standing Committee on the Investigation of Prices, Costs, and Profits."

The report shows that the individual maker of furniture can compete with the large concern and make a satisfactory profit. This to my mind is a very encouraging report and one which will, to a large extent, affect the manufacturing world. The investigations show that the large manufacturer has to have a huge overhead, is allowed to work only eight hours, and is constantly encountering strikes and other labor interruptions, so that the selling cost runs very high.

On the other hand, the small and individual furniture maker can work ten hours, and there seem to be men willing to work that length of time. Often the shop is in the man's house or yard. Then, being able to sell direct to the buyers, he is able to collect more promptly, and turns over his money more quickly. The report goes on to say that the small furniture maker does as good work, and in many cases better work, than the large manufacturer, who seems to have only the advantage of lower cost of material, as by buying in large lots a better price is obtained in lumber and other materials.

The board is soon to report on other industries, and I feel sure that the same conditions will be found. There is no doubt in my mind, nor has there been for a long time, that the huge manufacturing concerns building certain machinery in this country have gone too far, and have passed the line which marks the economical point.

Time and time again the question has been discussed as to the disadvantage of shops being so large that the personality of the men is unknown to the employer. I have met men within the last three years who have asserted that their shops have increased in size but not in output; that it was far more difficult to keep up a high standard of work than when the shops were smaller, and, they added in several cases, that never again would they enlarge their works save for storeroom, and if more work was wanted they would build smaller shops in different localities. It has been said, and believed, that the small shop could not compete with the large one. In certain industries this is no doubt

true, but in building machine tools I am not at all inclined to admit it.

This is how, according to my exeperience, the large and small shops seem to back up the findings of the British board. I wanted a small job done only a short time ago and I wrote to four firms for a fixed price, or their rates per hour. This is what I sent to each firm.

The article required is as follows:

Material, tool steel; outside diameter of piece, 1¼ in.; thickness, ½ in. A center hole is to be ⅛ in. in diameter; at 1⅛-in. pitch circle, ten ⅛-in. holes are to be drilled evenly spaced; neither the outside diameter nor thickness is of moment, as either may vary ⅛ in. above or below sizes given. The central hole must be concentric with the pitch circle and small holes, but the size of the central hole may vary several thousandths above or below.

The piece is not to be hardened.

One firm, a very large concern, wrote at once to say that it no longer did small job work. Another quite large one did not answer at all. A third gave me the price of $40, and stated that it would not be responsible for the hardening of the piece, and, as far as I could make out, would not be responsible for the work at all. The fourth concern, a very small one as compared with the others, gave a price of just one-eighth of the third concern. The work was done by the last party and was perfectly satisfactory.

The concern which gave the $40 price made me feel uncomfortable, as it showed me that one of the following conditions must have governed the bid: First, the work was not wanted. If this was so, was it not poor business not to so state? Second, the concern did not know what the piece would cost them, so put the price very high. As the party has been in business for years, this does not seem possible. Or lastly, the spirit of absurd profits had taken possession of the bidder; and it was thought proper to ask an exorbitant price, as he believed that he could get it, and did not even consider asking a fair price.

Now, it is possible that the $40 concern was very slack in work, and, as it was a large concern, the overhead was so great that even the $40 price would not cover the cost. The small concern that did the job could find work enough to keep it going full time, so that the overhead was kept down at all times. I know that during the war, and since, it has had about all it could do, but it has been wise enough not to take more orders than it could handle, and it has not increased its capacity greatly.

The small jobs are not looked upon with favor by jobbing shops, I know, and many small shops undertake them and believe that they make a profit while, as a matter of fact, they do not. But, on the piece such as I have described, the work is so simple that any experienced man could easily tell how long it would take to get the piece out.

Here is how I figure the job, doing the work in any well-equipped shop, and in the way, I think, that most machinists would turn it out. Take off the faceplate of a small lathe, say 12-in. swing, and put on a chuck. Get a piece of 1⅝-in. tool steel about 3 or 4 in. long from the storeroom, and chuck it up. With a side tool face off the end. Replace the side tool with a diamond or a half-diamond point, and bring the stock down to 1½ in. in diameter, calipers being used for this size. Remove the diamond point and set a properly ground parting or cut-off tool and part the piece, getting the thickness with a scale. If this last-used tool is properly ground, it will make a good smooth cut. The chuck can be quite fairly left on the lathe and what remains of the steel must, of course, be returned to the storeroom. All this work may be charged to the lathe, and the time taken should not be more than one hour, at most.

The high-speed attachment will have to be put on a small milling machine, and the cross-platen and the dividing head mounted on it, also. A ⅛-in. drill will have to be obtained from the toolroom for the ten holes, and also a drill for the center hole. But these drills are more than likely to be found in the toolchest of the milling-machine hand.

The index must be set for spacing the ten holes. If I were doing the job, I would get a piece of steel or brass tubing, say, with a ⅛-in. wall and a 1⅝-in. diameter, and cut a piece from it just long enough to act as a stop for the tool steel disk when held in the dividing head chuck, thus backing up the piece while drilling. Others would use, perhaps, three small parallels. Then the dividing head would have to be brought central and the center hole drilled, the drill removed, the small drill put in place, the dividing head offset ¼ in. to meet the ½-in. pitch circle, and the small holes spaced and drilled. This drilling must not be hurried, but done with care. When the drilling is done, the dividing head and cross-platen will have to be taken off and put away, as well as the high-speed attachment.

This would complete the actual work on the piece, and all the milling work should not take more than two hours, at the very most. Thus, all the time that can be charged against the job is three hours. The cost of the steel would not be 20 cents. To ask $40 for three hours' work looks like rank absurdity. It would be interesting to hear the opinions of some machinists as to what better procedure could be used in regard to getting out the work, or in reducing the time.

The small shop seems to show up in this country at an advantage, as it does in the English furniture makers' report; and it is an open question if small jobs can be made to pay in a large shop, even at wild prices. The further reports of the committee in England should make interesting reading.

An Apprentice with Resource As Well As an Automobile

Way back in March 1907 the *American Machinist* published a very humorous poem by Frank A. Stanley on the "Millionnaire Apprentice." Automobiles were far less common than at present but one stanza is particularly appropriate in view of a recent occurrence in a large machine plant. It ran:

"In his runabout trim to work he would skim
With Hawkins, his man, at his side;
They'd pass in a blur with a honk and a whirr—
Great Scott! how those fellows would ride!
Poor Hawkins held hard but got cruelly jarred
From the top of his head to his heels,
While Jim stayed aboard by the grace of the Lord
As he handled the levers and wheels."

The other day one of the apprentices of the large shop referred to above, in driving to work in his Cadillac had a puncture near the shop. Time was short, so he found a telephone, told his chauffeur to come fix the tire, while he landed in the shop just in time to punch the clock.

By all signs and tokens that boy ought to make good, in spite of the evident handicap of having all he needs anyhow.

Manufacturing Parts of Northway Trucks

Work on Pistons and Connecting Rods—Turning and Inspecting Camshafts—Crankshaft Balancing—Fixture for Assembling the Chassis—Pressing on the Rubber Tires

BY ROBERT MAWSON

IN this article are shown some of the methods and special tools, jigs and fixtures employed in making commercial trucks. The Northway Motors Corporation, Natick, Mass., manufactures two sizes of commercial trucks, 2 and 3½ tons capacity respectively and the tools used to machine the various units employed in the making of these vehicles show that much thought has been taken so that high-grade results can be obtained.

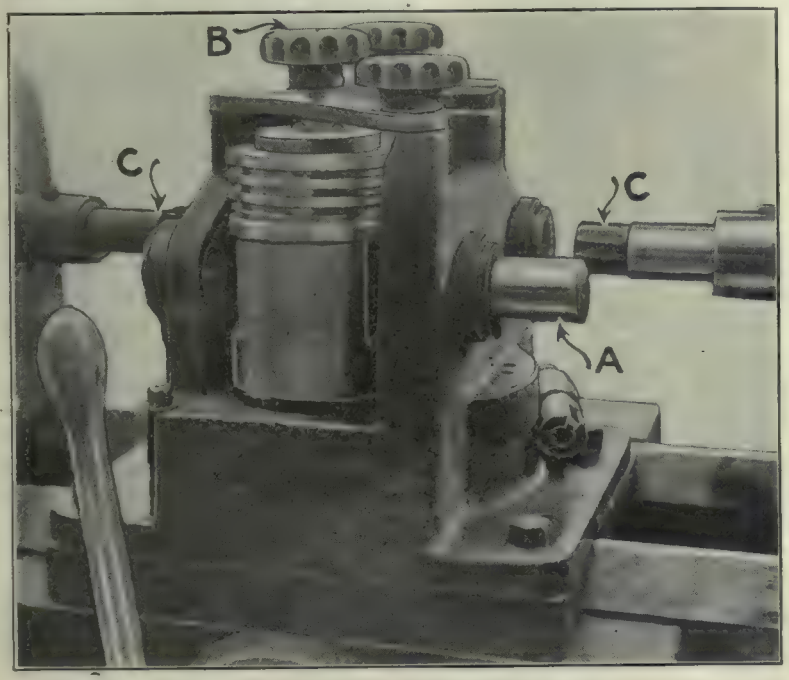


FIG. 1. REAMING WRISTPIN HOLES

The pistons are made of an aluminum alloy and are machined on the outside, the ring grooves cut and the ends faced, using standard automobile practice for these operations. The wristpin holes are then drilled in a jig, leaving material for the finish reaming, which is done in the fixture shown in Fig. 1. This fixture holds two pistons. The pin *A* is made with a tapered end, so that it will enter and locate the piston by means of the wristpin hole. The clamps on top of the pistons are tightened by the hand nuts *B*. The two reaming tools *C* are guided through long bushings so that the holes will be in line. During the reaming of one piston, another one is placed in position so that little time is wasted, the operation being almost continuous. The manipulation of the fixture is very simple, as the operator has only to loosen the hand nut when the clamp may be swung clear and the piston lifted out.

In machining the wristpin and crankshaft holes in the connecting rods, three operations are performed—drilling, rough reaming and finish reaming. The machine set up for these operations is shown in Fig. 2. The forgings are held in similar fixtures, each holding two pieces. At *A* the wristpin hole is being drilled and the large hole rough-bored. The second set-up *B* shows rough-boring or reaming of the small hole and second boring of the large hole. It will be noticed that at this stage both tools are guided both above and below the forgings, bushings being provided in the fixture for this purpose. At *C* the two holes are finish reamed. The jigs are then turned end for end and the operations performed on the other ends of the rods; it will be observed that the jigs hold the forgings with the large end of one next to the small end of the other.

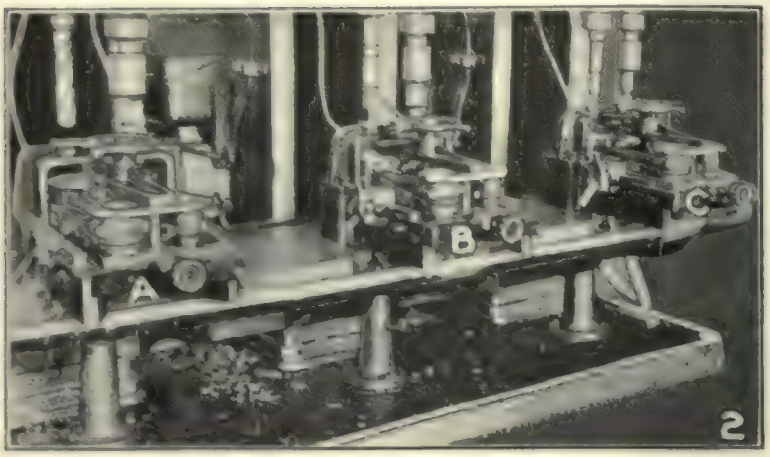
One of the jigs with the forgings removed is illustrated in Fig. 3. The connecting rods rest on the circular pads *A*. The large handwheel *B* is then operated and its action is to draw the wedges *C* toward the center and push out the V-blocks *D* which center and locate the rods. Rollers are provided at *E* so that the sliding member can be operated with the smallest amount of friction. The locating stop may be seen at *F*, the swinging strap at *G* and the notch into which it fits at *H*. It may be added that a number of sliding members are kept on hand so that as one set of rods is being machined other forgings can be placed in them, making the operation practically continuous.

After the caps have been parted and reassembled the rods are line reamed, using the fixture shown in Fig. 4. The plug *A* is placed in the wristpin hole and held in position by the screw *B*. The reamer *C* is guided in bushings on both sides of the forgings while the rod is held by a clamp operated by the screw *D*. It will be seen that the end *E* of this fixture can oscillate on a pin so that the rod can adjust itself for length between holes to suit the position of the reamers, a perfect hole for the crankshaft end of the rods rather than an absolute center distance between the holes being desired.

MACHINING THE CAMSHAFT

As the proper functioning of a motor depends in a large measure on the correctness of the camshaft great care is taken in its manufacture. A rear view of the lathe used when turning the camshaft is shown in Fig. 5. The shaft is carried on centers in the usual manner and supported by the two steadyrests *A*, while the arrangement of the tools, nineteen in number, may be plainly seen. The tools are spaced so that the sides of each cam lobe may be machined also the sides of the center bearings and the thrust collars at each end of the shaft.

A front view of the machine is illustrated in Fig. 6. The steadyrests are at *A* and it will be noticed that they are provided with rollers in order to reduce the friction to a minimum. The various turning tools are adjusted with the screws located in front of the toolposts. Lubricant is supplied through the four flexible pipes shown. The shaft is machined on the straight portions, the work being done in an ordinary lathe and the



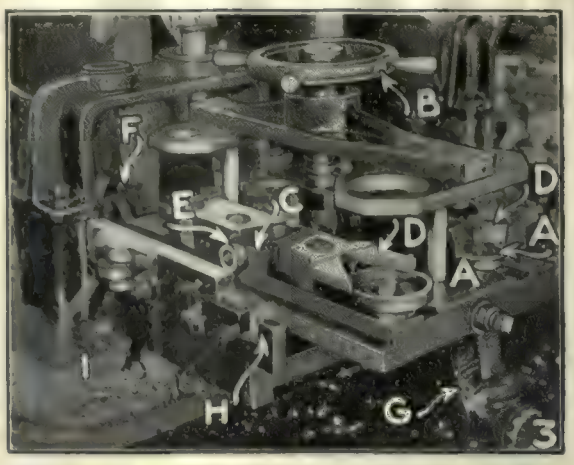


FIG. 2. DRILLING AND REAMING CONNECTING RODS. FIG. 3. ONE OF THE DRILLING AND REAMING FIXTURES

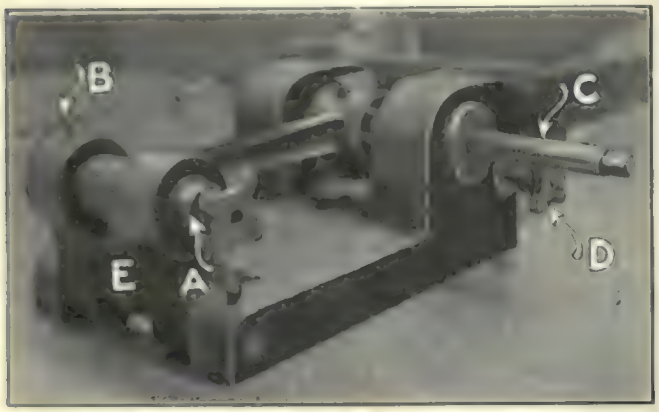


FIG. 4. LINE REAMING A CONNECTING ROD

are placed on the special stands shown which are made of piping suitably braced with trusses and are at a convenient height for placing the various units in position.

The stands are provided with castors so that they can be moved into any position desired on the trucks shown. As it is necessary to turn over the chassis during the assembling work, the revolving fixtures *A* have been provided one at each end of the frame.

After the crankshafts have been machined they are put into static and dynamic balance by testing in the Carwen machine shown in Fig. 9. The shaft is supported in the steadyrests *A* by the three main or line bearings, and revolved by means of the faceplate chuck *B* which is fastened to the outer bearing. The shaft





FIGS. 5 AND 6. TURNING THE CRANKSHAFT

various cams are next ground, using formers to control the grinding wheel.

Each camshaft is then given a rigid inspection in the machine shown in Fig. 7, the shaft being placed on centers so that it may be revolved by the inspector. The disk *A* is graduated in degrees so that by placing the dial indicator *B* over one of the cams and revolving the shaft the inspector can analyze each cam by the amount of its motion and its angular position. A chart is furnished the inspector showing the correct opening and closing locations for each cam also the proper lift or movement.

The chassis assembling department is at one end of the factory and is illustrated in Fig. 8. The frames

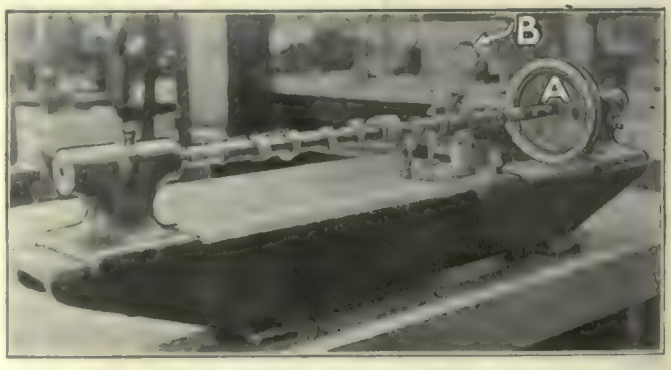


FIG. 7. INSPECTING A CAMSHAFT



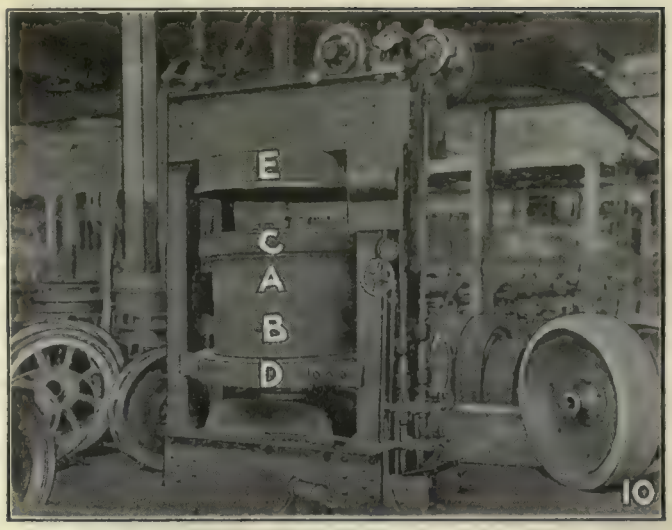


FIG. 9. BALANCING THE CRANKSHAFT. FIG. 10. PUTTING ON THE TIRES

is first put into static balance by drilling holes in the cheeks of the cranks when necessary until this condition is obtained.

The shaft is then put into dynamic or running balance by revolving it in the machine, the motor and rheostat for controlling the speed of the apparatus being shown at the right of the illustration. The amount of fluctuation or whip of the shaft during its revolutions is recorded on the indicator *C* and further drilling is resorted to when necessary until smooth running with absence of eccentric movement is obtained.

The hydraulic press used to force the tires onto the wheels is shown in Fig. 10. The steel wheel *A* rests on the base *B* and is located by means of a register on the inside. The solid rubber tire *C* is placed on top of the wheel as shown. The pump at the right is then operated raising the ram *D*, together with the wheel and tire until they come against the rigid flange *E*. As the



FIG. 8. ASSEMBLING THE CHASSIS

machine continues to force the parts upward, the tire is pressed onto the rim, the edge of the rim passing into the opening of the flange until the first tire is in position. The ram is then lowered and the second tire forced onto the rim in a similar manner, the wheels being of the dual tire type. The pressure required for the operation is approximately 150 tons. Some of the various types of wheels and tires used are shown in the illustration.

Figures on Production of Machinery During 1919 as Compiled by the Bureau of the Census

The Bureau of the Census is now compiling and publishing statistics of manufactures for the year 1919, which were collected during 1920. Tabulation of the statistics concerning production of machinery has been completed but it will be several months before the Census Bureau can issue its special bulletin for the industry.

An act of Congress which authorizes the taking of the 1920 census of manufactures provides for the collection of the manufacturers' statistics biennially hereafter covering the years 1921, 1923, etc. The canvass for the year 1921 will begin early in 1922. The success of the enterprise will depend entirely upon the rapidity and accuracy with which the manufacturers make their reports. Simplified forms have been prepared upon which statistics are to be reported.

The statistics of production of machine tools during 1919 specify a value of $222,504,654 for machine tools and certain accessories produced by 496 establishments. Of these plants 403 produce machine tools only.

The report shows the number of machines produced and their value by principal cities. Classes of machines are lathes (sub-divided into engine, turret, and bench and other lathes), milling machines (sub-divided into plain, universal, vertical, automatic, and other), gear cutting machines, grinding machines (sub-divided into plain, universal and other), drilling machines (sub-divided into radial, multiple spindle, sensitive and upright), screw machines (sub-divided into automatic and hand), boring machines (sub-divided into horizontal and vertical), planers, presses (sub-divided into punching and others), hammers, shapers, pipe machines, shears, broaching machines, bending machines, portable tools and all other machine tools.

Machinery other than machine tools is divided into the following classes and the value of machines produced by principal states is given: Adding and calculating, air compressors, bakers' blowers and fans, bottling, brick, pottery, cash registers, concrete mixers, condensers, confectioners, cranes, dairy, elevators, excavating, flour and grist mill, gas, glass making, laundry, leather working, metal working, meters, mining, oil well, oil mill, paper and pulp mill, printing, pumping, refrigerating, road making, rubber making, sand blasting, sewing, shoe, slot vending, steam shovels, stokers, sugar mill, typewriter, washing, wind mill, wire drawing, wood working.

The Bureau of the Census is under the direction of the Department of Commerce. W. M. Stewart is Director.

Design of Bevel, Helical and Worm Involute Gears

Application of Data of Author's Previous Articles — Determination of Helix and Tooth Angles—Relation Between Interference, Number of Teeth and Sliding Action

By A. B. COX

THE data and curves for interference, number of teeth in contact, and slip of teeth, worked out in preceding articles by the author in the *American Machinist* for involute spur gears, can be applied to involute bevel gears, helical and worm

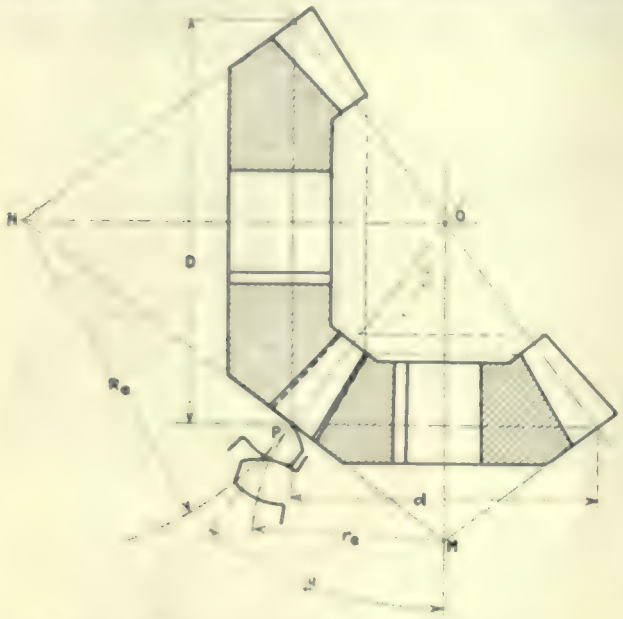


FIG. 1. ACTION OF BEVEL GEAR AND PINION

gears, and spiral bevel gears. The method of application for each of these types of gears is given herewith.

Bevel Gears

Referring to Fig. 1, a bevel gear of pitch diameter D having N teeth is shown meshing with a pinion of pitch diameter d and n teeth. The speed ratio of the gears is, of course, governed by the actual number of teeth. The ratio is $K = \frac{N}{n}$. In so far as the tooth action is concerned, the gears operate as though they were spur gears of radii r_e and R_e with shaft centers at M and N. r_e and R_e have been called the "effective" radii.

$$\tan\beta = \frac{d\,2}{D\,2} = \frac{d}{D} = \frac{n}{N}. \qquad \cot\beta = \frac{N}{n}.$$

$$r_e = \frac{d}{2}\sec\beta. \quad \text{Effective diameter } d_e = d\sec\beta.$$

$$R_e = \frac{D}{2}\csc\beta. \quad \text{Effective diameter } D_e = D\csc\beta.$$

The effective number of teeth $n_e = Pd_e$

$$= Pd\sec\beta = n\sec\beta. \qquad (1)$$

Similarly $N_e = PD_e = PD\csc\beta = N\csc\beta. \qquad (2)$

The effective ratio $K_e = \frac{N_e}{n_e} = \frac{N\csc\beta}{n\sec\beta} =$

$$\frac{N}{n}\cot\beta = \frac{N^2}{n^2} = K^2: \qquad (3)$$

By using n_e, N_e and K_e instead of n, N and K, the values read from the curves for straight-face spur gears will be correct for bevel gears of ratio K having n and N teeth. The actual number of pinion teeth n for actual gear ratio K has been transposed from the spur gear interference curve on Fig. 2 by this method and plotted as a separate curve on the same sheet for bevel gears. The minimum number of actual pinion teeth necessary with any ratio of bevel gears to prevent interference can be read direct from the curve.

Helical and Worm Gears with Shafts at Right-Angles

The effective number of teeth of helical and worm gears is found as follows: In the plan view of Fig. 3 are shown two mating helical gears of pitch diameters D and d whose teeth mesh together on their center lines in the direction a-b. If the face widths of the gears be extended to w' and W' and a section A-B be taken perpendicular to the teeth at the point of contact between the two gears, the sections will appear as two ellipses of major axes $d\csc\alpha$ and $D\sec\alpha$ and minor axes d and D, where α is the tooth helix angle of the gear having the larger number of teeth. The radii of curvature at the point of contact O of the two ellipses are found by calculus to be

$$r_c = \frac{d^2\csc^2\alpha}{4 \times d/2} = \frac{d\csc^2\alpha}{2}$$

$$\text{and } R_e = \frac{D^2\sec^2\alpha}{4 \times D/2} = \frac{D\sec^2\alpha}{2}.$$

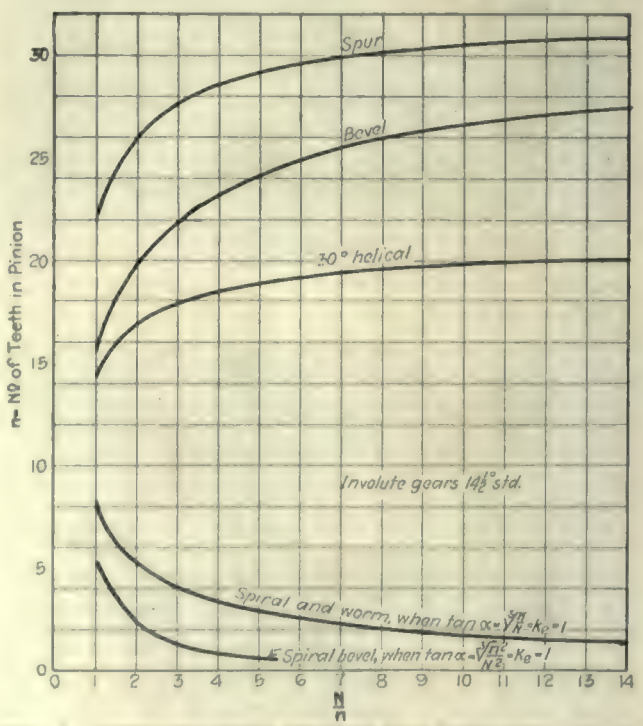


FIG. 2. INTERFERENCE CURVES FOR INVOLUTE GEARS

The effective diameters are, therefore,

$$2r_e = d_e = d\csc^2\alpha, \text{ and } D_e = D\sec^2\alpha,$$

and the effective numbers of teeth are

$$n_e = P_n d_e = P_n d \csc^2\alpha$$

and $N_e = P_n D_e = P_n D \sec^2\alpha$, where P_n = the normal diametral pitch.

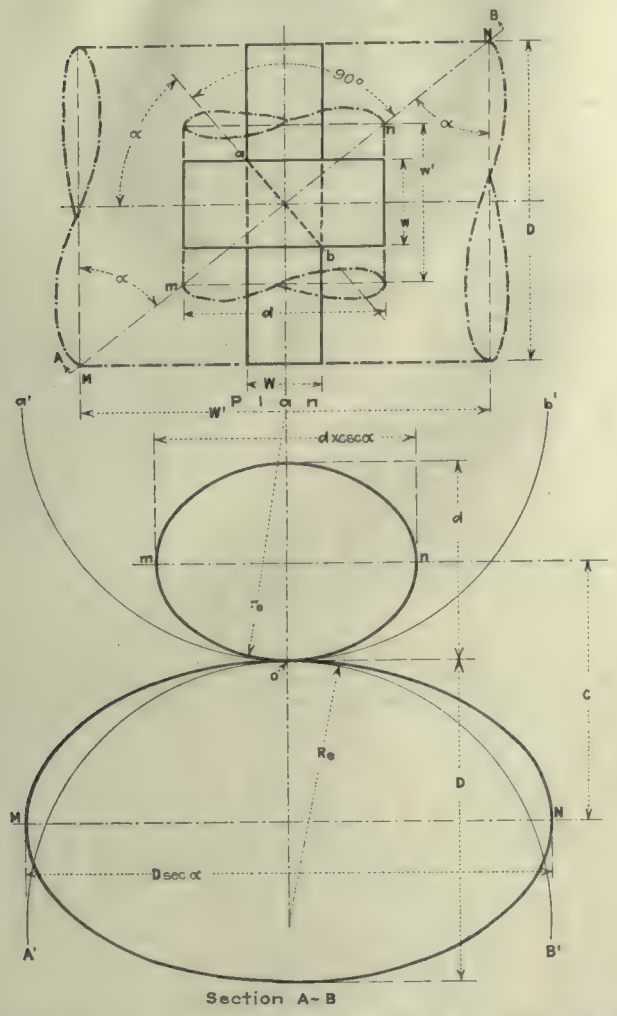


FIG. 3. DIAGRAM FOR CALCULATION OF FORMULAS FOR HELICAL GEARS WITH SHAFTS AT RIGHT-ANGLES

But $d = \dfrac{n}{P_n \sin\alpha}$ and $D = \dfrac{N}{P_n \cos\alpha}$ (from Machinery's Handbook).

Therefore, $n_e = n\csc^2\alpha$, (4)

and $N_e = N\sec^2\alpha$ (5)

and the effective ratio

$$K_e = \frac{N_e}{n_e} = \frac{N\sec^2\alpha}{n\csc^2\alpha} = \frac{N}{n}\tan^2\alpha = K\tan^2\alpha \quad (6)$$

Fig. 4 shows how any effective ratio can be obtained. It should be noted that the effective ratio can be made the exact reverse of the actual ratio. When $K_e = 1$, $n_e = N_e$, and $K\tan^2\alpha = 1$.

$$\tan\alpha = \sqrt[4]{1/K} = \sqrt[4]{n/N} \quad (7)$$

This gives the effect of two equi-diameter gears of equal numbers of teeth meshing together. Formula (7) can also be obtained by differentiating the formula for center distance,

$$C = \frac{n}{2P_n \sin\alpha} + \frac{N}{2P_n \cos\alpha}, \text{ equating } \frac{dC}{d\alpha} \text{ to zero and}$$

reducing, for minimum center distance.

In Fig. 5 an actual case has been plotted, using a center distance C against helix angle α. A center distance of 11½ in. and helix angle of 33 deg. 16 min. was used in cutting these gears, though it is apparent from the curve that a 11½ in. center distance and helix angle of 43 deg. 38 min. could have been used. Formula (7) gives 38 deg. 15 min. for the helix angle, and the center distance is then calculated to be 11.36 in. This is the least value of center distance that can be used with the given values of n, N, and P_n; and there is, of course, only one solution for the problem with this center distance.

Helical Gears with Parallel Shafts

The mathematics for helical gears with parallel shafts is similar to that for those with the shafts at right-angles:

$$d_e = d\sec^3\alpha; \quad D_e = D\sec^3\alpha$$

$$n_e = n\sec^3\alpha \quad (8)$$

$$N_e = N\sec^3\alpha \quad (9)$$

and $K_e = \dfrac{N_e}{n_e} = \dfrac{N\sec^3\alpha}{n\sec^3\alpha} = \dfrac{N}{n} = K,$

α being the tooth angle, as in the preceding case.

It may sometimes be more convenient to consider these gears in a different way. If the teeth are cut with a cutter of ϕ deg. at a tooth helix angle of α deg., the angle of the involute ϕ when projected on a plane at right-angles to the shafts of the gears becomes something different, ϕ'. Referring to Fig. 6, the value of ϕ' is found as follows: A rack with a face width w has involute teeth of ϕ deg. cut at an angle of α deg. across its face.

$$\tan\phi = \frac{a}{b}. \qquad a = b\tan\phi.$$

$$\cos\alpha = \frac{a}{a'}. \qquad a' = a\sec\alpha.$$

$$\tan\phi' = \frac{a'}{b'} = \frac{a'}{b}. \qquad a' = b\tan\phi'.$$

Equating values of a',

$$b\tan\phi' = a\sec\alpha.$$

$$b\tan\phi' = b\tan\phi\sec\alpha.$$

$$\tan\phi' = \tan\phi\sec\alpha. \quad (10)$$

$\phi' = 16°\ 38'$ for $\phi = 14\frac{1}{2}°$ and $\alpha = 30°$.

The circular pitch P_x in a plane perpendicular to the gear shaft is

$$P_x = P_c\sec\alpha. \quad (11)$$

The addendum is, of course, the same length in both planes, or 0.3183 P_c for standard 14½-deg. gears. Expressed in terms of P_x, the length of addendum becomes 0.2757 P_c for $\alpha = 30$ deg.

From (10) and (11) it is seen that parallel-shaft helical gears cut with 14½-deg. cutters at a tooth angle of 30 deg. are the equivalent of stub-tooth gears with a 16 deg. 38 min. involute when considered in the plane of rotation.

Spiral Bevel Gears

For spiral bevel gears the formulas for bevel and helical gears are combined, as follows:

From (1) and (4), $n_e = n\sec\beta\csc^2\alpha$ (12)

from (2) and (5), $N_e = N\csc\beta\sec^2\alpha$ (13)

and from (3) and (6), $K_e = K^2\tan^2\alpha$. (14)

When $K_e = 1$, (7) becomes

$$\cot\alpha = \sqrt[3]{\frac{N^2}{n^2}} = \sqrt[3]{K^2}. \quad (15)$$

The characteristic movement of the teeth of a helical driver gear over those of the driven gear as the latter is revolved by the former, has been given the name of "sliding" to distinguish it from the "slip" discussed in the previous article, and which is common to all types of involute gears. In this discussion the gear having the smaller actual number of teeth is called the pinion regardless of whether it is the driver or the driven gear. Upon taking up a pair of helical gears and revolving them by hand, it is seen that when the pinion makes one revolution, all of its teeth in contact M_t with those of the gear, slide the equivalent of their full helical length against the teeth of the gear. The gear teeth slide in the opposite direction of the pinion sliding, and of course the same total number M_t of gear teeth slide the pinion teeth, but for only $\frac{n}{N}$ of their helical length, since the gear makes only that fraction of a complete revolution. The total sliding S_{Ts} during one revolution of the pinion is, therefore,

$$S_{Ts} = \left[M_T h + M_T \frac{n}{N} H \right] \text{in.},$$

where h and H are the lengths of the pinion and gear helices respectively, supposing the face widths of the gears to be wide enough to give the total theoretical number M_T of teeth in contact.

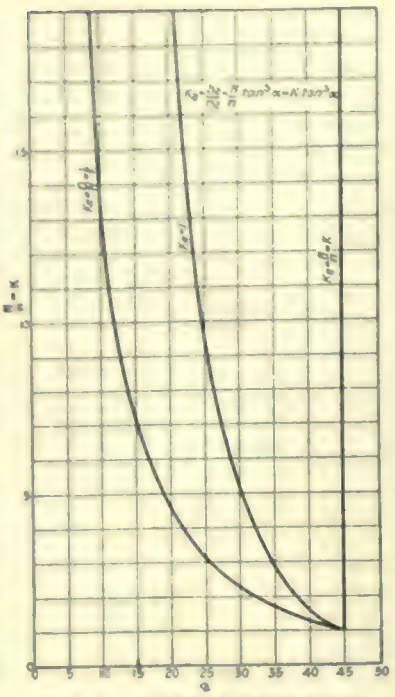


FIG. 4. GRAPHIC REPRESENTATION OF EFFECTIVE RATIO FOR HELICAL GEARS

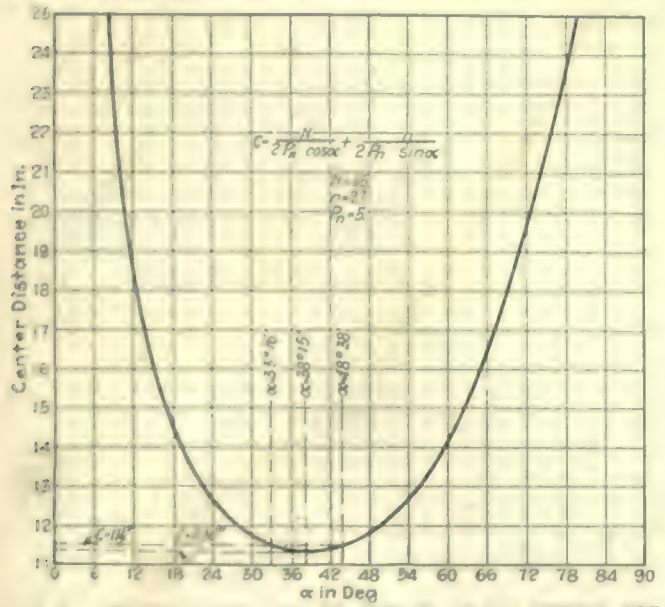


FIG. 5. CENTER-DISTANCE VS. HELIX-ANGLE CURVE FOR TURBINE GOVERNOR GEARS

Substituting these values,

$$h = \pi d \sec \alpha \text{ and } H = \pi D \csc \alpha.$$

$$S_{Ts} = \pi M_T \left(d \sec \alpha + \frac{n}{N} D \csc \alpha \right).$$

$$d = \frac{n}{P_n \sin \alpha}; \quad D = \frac{N}{P_n \cos \alpha}$$

$$n = dP_n \sin \alpha; \; N = DP_n \cos \alpha$$

$$\frac{n}{N} = \frac{d P_n \sin \alpha}{DP_n \cos \alpha} = \frac{d}{D} \times \frac{\sin \alpha}{\cos \alpha}.$$

Substituting this value of $\frac{n}{N}$,

$$S_{Ts} = \pi M_T \left(d \sec \alpha + D \csc \alpha \times \frac{d \sin \alpha}{D \cos \alpha} \right)$$

$$= \pi M_T (d \sec \alpha + d \sec \alpha)$$

$$= 2\pi M_T d \sec \alpha \text{ in. per pinion revolution} \quad (16)$$

Substituting the value of d,

$$S_{Ts} = \frac{2\pi}{12} M_T \sec \alpha \times \frac{n}{P_n \sin \alpha} = \frac{\pi n M_T}{6 P_n \sin \alpha \cos \alpha} \text{ ft per pinion revolution.} \quad (17)$$

$$S_{Ts} = \frac{\pi n M_T}{3 P_n} \csc 2\alpha \text{ ft. per pinion revolution.} \quad (18)$$

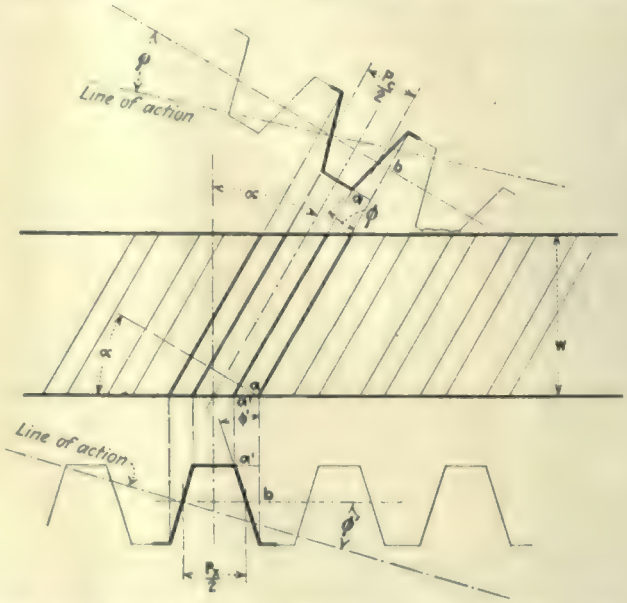


FIG. 6. DIAGRAM FOR DETERMINING ϕ' FOR HELICAL GEARS

The sliding per tooth in contact

$$S_S = \frac{\pi n}{3 P_n} \csc 2\alpha. \quad (19)$$

$$P_n = \frac{\pi}{P_c}. \quad S_S = \frac{\pi n \csc 2\alpha}{3\pi / P_c} = \frac{n P_c \csc 2\alpha}{3}. \quad (20)$$

In order to make the sliding a minimum, the smallest possible pitch consistent with strength should be used, also the smallest number of pinion teeth n possible to have, and still avoid interference. Csc 2α is a minimum when $\alpha = 45$ deg., and the smallest practical value of n is, of course, $n = 1$. But, since $n = 1$ cannot always be used with $\alpha = 45$ deg. on account of interference—n and α being mutually inter-dependent in the interference formula—the investigation must be carried still further.

In Fig. 7 formula (19) has been plotted for various values of n and α. The value of S_S when $n = 1$ becomes equal to the least value of S_S when $n = 2$, at $\alpha = 15$ deg. and 75 deg., and is less than S_S for $n = 2$ for all values of α between 15 and 75 deg. There-

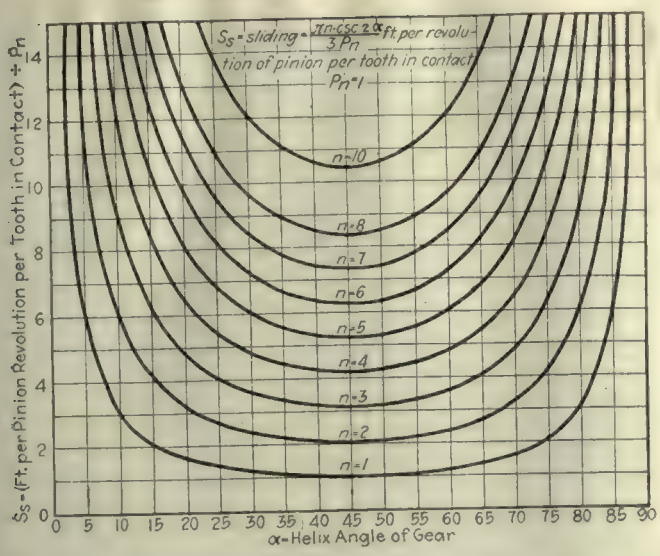


FIG. 7. GRAPHICAL REPRESENTATION OF THE SLIDING OF HELICAL GEAR TEETH

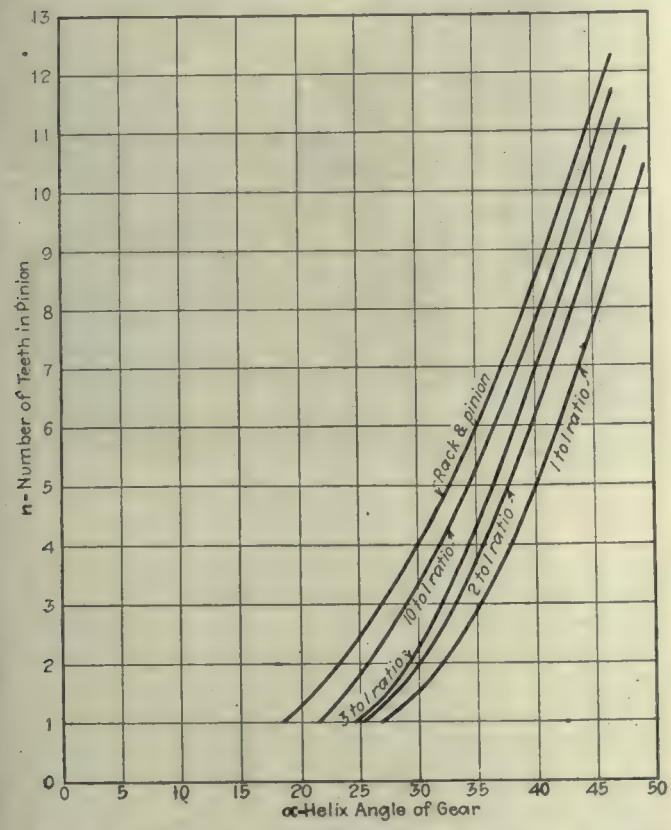


FIG. 8. CURVES TO DETERMINE THE MAXIMUM HELIX ANGLE WITHOUT INTERFERENCE

fore, if $n = 1$ can be used for all gear ratios without causing interference and still keep within the limits of 15 to 75 deg. for α, a theoretical solution has been found for our minimum sliding problem. For highest efficiency and least wear, this theoretical solution should be modified no more than necessary by practical factors in getting a practical design. The sliding can, of course, be greatly reduced by increasing the angle of the involute; or preferably by reducing the length of addendum, or by both methods simultaneously.

The general formula for spur-gear interference is:

$$\frac{N}{n} = K = \frac{n^2\sin^2\phi - 4\pi^2q^2}{4\pi nq - 2n^2\sin^2\phi} \qquad (21)$$

where q = ratio of length of addendum to circular pitch. For standard gears

$$K = \frac{n^2\sin^2\phi - 4}{4n - 2n^2\sin^2\phi}.$$

For spiral gears, K_e and n_e must be substituted for K and n, see formulas (4) and (6).

$$K_e = \frac{n_e \sin^2\phi - 4}{4n_e - 2n_e \sin^2 2\phi}$$

$$K\tan^3\alpha = \frac{n^2\csc^6\alpha \sin^2\phi - 4}{4n\csc^3\alpha - 2n^3\csc^6\alpha \sin^2\phi}$$

$$K = \left[\frac{n\csc^6\alpha \sin^2\phi - 4}{4n\csc^3\alpha - 2n\csc^6\alpha \sin^2\phi}\right]\cot^3\alpha. \qquad (22)$$

For rack and pinion, $K = \infty$, and therefore

$$(4n\csc^3\alpha - 2n^3\csc^6\alpha \sin^2\phi) = 0.$$

$$(2 - n\csc^3\alpha \sin^2\phi) = 0.$$

$$\csc\alpha = \sqrt{\frac{2}{n\sin^2\phi}}. \qquad (23)$$

The curves of Fig. 8 have been plotted from (22) and (23). They show the maximum value of α that may be used with a given ratio and value of n without interference.

By substituting n_e and K_e, see formulas (12) and (14), for spiral bevel gears in formula (21), similar minimum sliding curves can be worked out for this type of gearing.

Alaska Code Extended to China

Hon. Charles Sumner Lobingier, judge of the United States Court for China, recently visited the division of commercial laws in Washington and supplied interesting data on incorporating in China under the extension to Americans in China of the Alaska Code. He also contributed valuable information on exterritorial jurisdiction which will be used, in conjunction with other sources of information, in a series of articles on this subject now being prepared for *Commerce Reports* by the chief of the division of commercial laws.

The division has also received a copy of a letter written by Consul General Edwin S. Cunningham, of Shanghai, discussing in detail the character and taxation regulations for incorporating in China under the Alaska Code, as well as a translation of the Chinese companies ordinances for registering companies under Chinese law from Trade Commissioner Lynn W. Meekins. This information will appear as special bulletin CL—8, which may be had by application to the Bureau of Foreign and Domestic Commerce or to its district and co-operative offices.



Hydraulic and Hand Forcing Presses in a Locomotive Shop

A Horizontal Press for Forcing Brasses in Boxes—Method of Using Air Pumps for Boosting Pressures—Self-Contained Portable Press

By J. V. HUNTER

GOOD forcing presses can be of great service in connection with locomotive shop work and some of the different types that prove serviceable are well exemplified in the Beech Grove shops of the Big Four Railroad. The presses here shown were all built in the shop to fill particular needs for which in the unfortunate railroad routine it is frequently impossible to obtain an appropriation for purchase.

The largest press, Fig. 1, is giving satisfaction as a tool for pressing bearing brasses in locomotive driving boxes. This operation is standard practice on this system. The press has two heavy cast-iron heads tied together by four 1½-in. bolts which are covered with pipe sleeves to act as spacers. The heads and cylinder are mounted on a light but suitable base that serves to hold the parts in alignment. The cylinder plunger passes through the upper head *A* and shows at *B*. The cylinder is safely secured to the head to sustain the heavy thrust developed when the plunger is under load.

The booster pump for the hydraulic fluid, mounted on a frame at the left, was made from a standard air pump unit and obtains its power by using compressed air in the steam cylinder. What was formerly the air cylinder handles the hydraulic fluid and in order to obtain a high fluid pressure the cylinder has been bushed down to an inside diameter of 2½ in. and fitted with a piston head to correspond. With full shop air pressure for operating the unit, it is possible to obtain pressures of several hundred pounds per square inch in the fluid chamber.

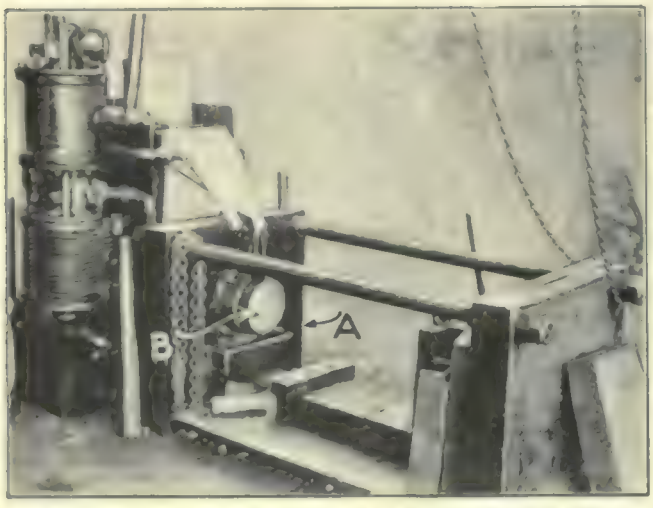


FIG. 1. HORIZONTAL HYDRAULIC PRESS FOR FORCING IN DRIVING BOX BRASSES

The rear view of the press, Fig. 2, shows the pressure cylinder *A*, which has an inside diameter of about 15 in. A counterweight, contained in the case *B*, is provided for drawing the plunger back at the completion of each stroke. The pull of the counterweight acts through the cable *C* running over pulleys to a connection on the front of the plunger head. When the weight draws back the plunger, the fluid is forced back into its reservoir. The illustration shows a locomotive driver-box *D* in position for having a bearing brass forced into place. The shelf *E* fitted over the cylinder is a convenience for holding the can of white lead and other accessories.

The press shown in Fig. 3 is used for forcing bushings and pins from brake levers and other similar pressing operations. It has a heavy cast-iron base on which four pedestals support the upper head with the cylinder. The pedestals are heavy tension rods encased in sections of pipe that support the upper head when there is no load under the plunger. The pressure cylinder has an inside diameter of 6 in. Its upper head is held down by eight ¾-in. bolts, which also pass through the upper head of the press. A coil spring in the cylinder and around the plunger serves to lift the latter and return the liquid to its reservoir after the completion of each stroke.

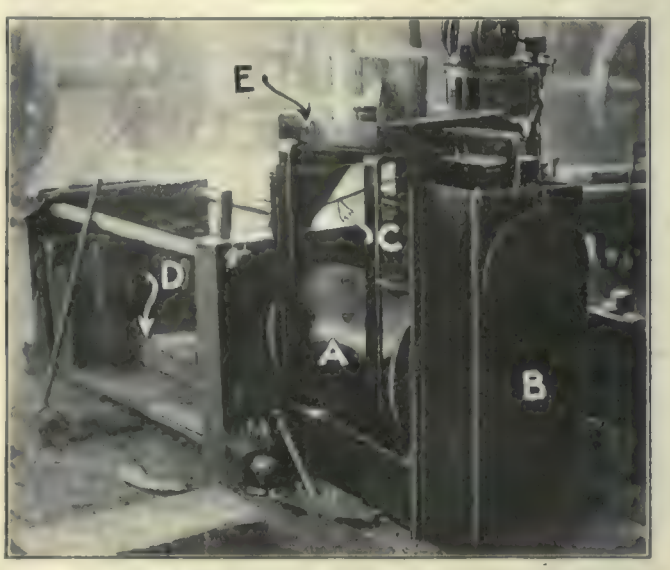


FIG. 2. REAR VIEW OF PRESS SHOWING CYLINDER AND RAM COUNTERWEIGHT CASE

Pipe Fittings Made of Mild Steel

The pressure line *A* extends from the press cylinder to the pressure booster set mounted on a nearby floor column. Unusual fitting are used on this pipe line; they are made of square blocks of mild steel, drilled and tapped to produce fittings capable of withstanding the high hydraulic pressures created in this line. The tank *B* serves as a reservoir for the hydraulic fluid. The suction line from the lower pump cylinder may be seen extending into this tank. Like the booster set previously described, this one was built over from a locomotive air pump, and uses compressed air from the shop line for its motive power. The air cylinder is

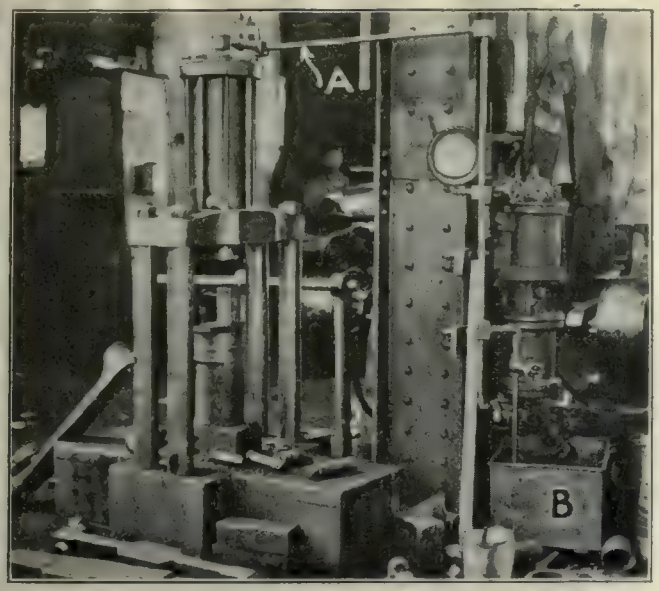


FIG. 3. PRESS USED FOR FORCING BRAKE-LEVER BUSHINGS AND PINS

bushed down to about 2 in. inside diameter so that the booster builds up relatively high fluid pressures.

The press shown in Fig. 4 is somewhat similar in construction to the one previously described, but differs in having its fluid-pressure booster pump mounted on a portion of the frame. Therefore it is practically a self-contained unit and can be transported, as required, to different parts of the shop. Only two pedestals are provided to carry the weight of the upper head, and they again are tension rods inclosed in sleeves. A cast-iron plate is bolted to the base and the upper head and serves as a frame for mounting the pump unit. The pressure cylinder is of the type already described and the high pressure fittings on the fluid line are similar to those used on the press shown in Fig. 3. The pump cylinder is partially submerged in its fluid reservoir, thus insuring greater ease in picking up its suction.

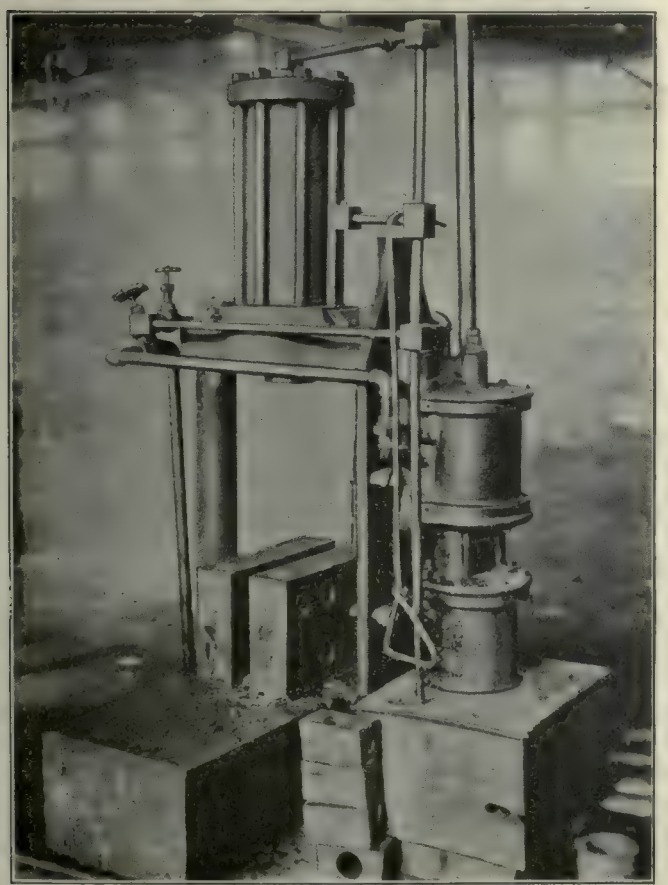


FIG. 4. SELF-CONTAINED PRESS CAPABLE OF BEING TRANSPORTED

Hand-Operated Forcing Press

The press shown in Fig. 5 is used for forcing out pins and for similar operations requiring the exertion of considerable power. The press has a double gear reduction that greatly multiplies the pressure exerted on the hand lever. The press has cast-iron plates for its base and upper head, held in position by tension

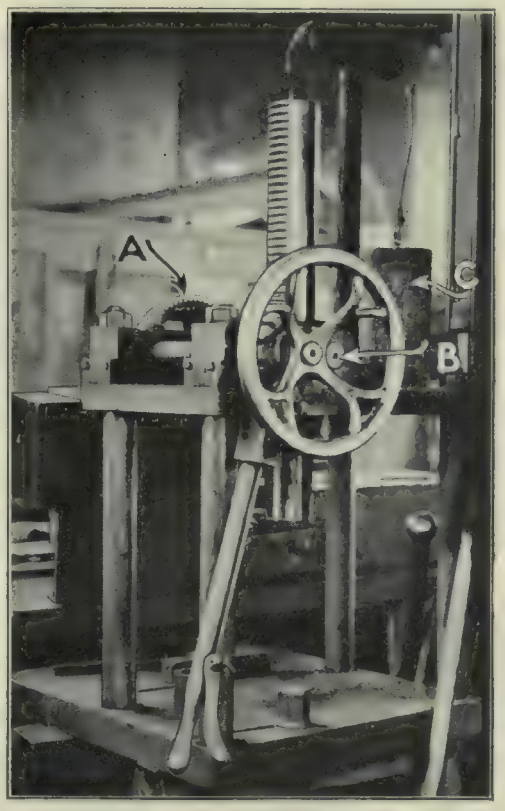


FIG. 5. POWERFUL HAND-OPERATED FORCING PRESS

bolts and spacing sleeves of pipe. The operating lever acts through a ratchet to drive the shaft of the first gear reduction. The gear reduction is located at *A* and the power comes back through the shaft *B* that has bearing supports at both ends and carries the pinion for driving the rack cut on the press ram. The ram is counterbalanced by the weight *C* which draws the ram up after each stroke by means of the cable shown.

This outfit is very convenient for general shop use—so much so that it is almost constantly in service. Work of all kinds is brought to it and the consequence is that it is many times subjected to much heavier work than it is intended for when originally built.

As might have been expected, the results of constant overloading have on several occasions been the breaking of teeth from the rack pinion used in operating the ram. The original pinion and some of the replacements were made of cast iron.

Profiting by the breakages referred to, a pinion is now being made of steel, heat treated, and which it is expected will stand up under any punishment it is likely to receive.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Converting a Milling Machine Into a Slotter

By R. Grant

We had more slotter work to do than our slotter would take care of, so it was decided to convert a Becker vertical milling machine into a slotter. The result is shown in Fig. 1.

Briefly it involved removing the vertical spindle and its slide, making patterns and castings for the slide

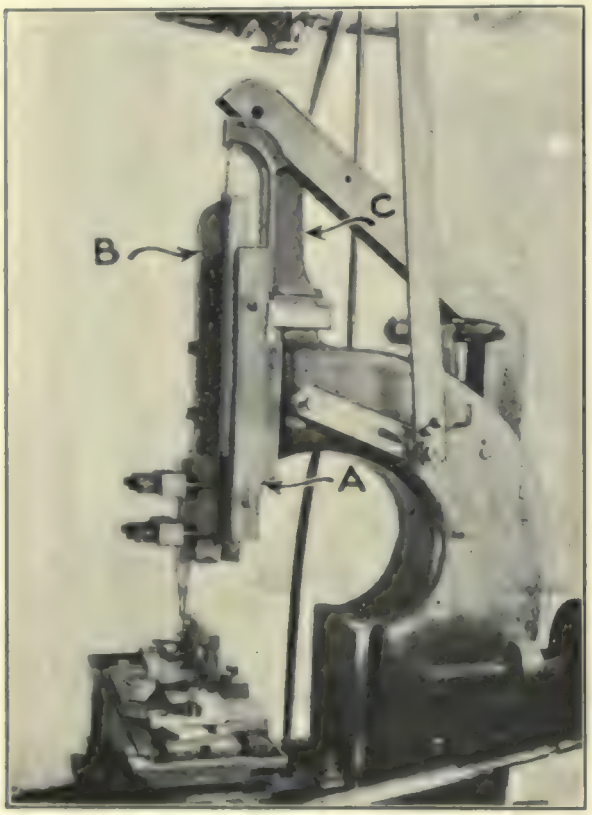


FIG. 1. SLOTTER MADE FROM A VERTICAL MILLING MACHINE

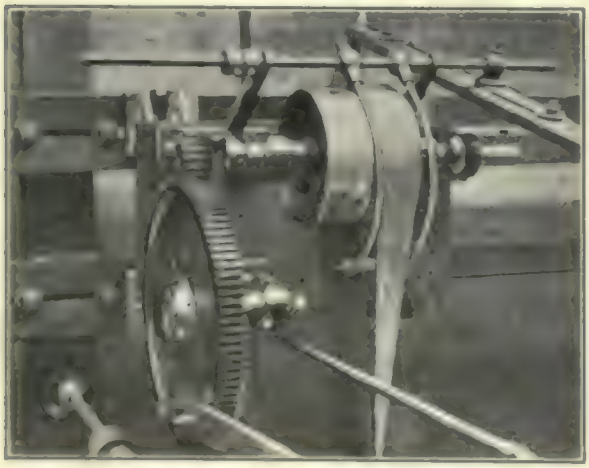


FIG. 2. THE OVER-HEAD DRIVE

A and ram *B*, making a new rack and pinion and several levers. Included in the work, was making the over-head drive shown in Fig. 2 the parts for which were taken from the scrap pile and assembled on a cast-iron plate.

The casting *C* for supporting the counterweight chain also came from scrap and required but little work to adapt it. The cost for labor was about $200.

Depreciation of Machinery and Its Inventory Values

By Martin H. Ball

Believing that the two most common methods of establishing inventory values by charging off a certain per cent of the original cost of a machine tool each year, or charging off a certain per cent of its value on the previous year's inventory date, are the two extremes, has led to the working out of the accompanying table to show a more nearly accurate value of machinery during the various stages of its life for establishing inventory values. To use the table, the useful life of the machine must be determined and its value at the expiration of this period established.

Take for an example a machine that cost $950 delivered at the factory, plus a cost of $50 for installation, making a total cost of $1,000. This machine is considered as being a profitable one for an average of ten years use. At the expiration of that time it not being suitable for further use as a machine tool, it has only scrap value which is estimated at $125 minus the cost of dismantling and carting which would amount to $25, leaving a net value of $100 to be deducted from the original cost of $1,000 and leaving a difference of $900 to be spread over ten years of serviceable time.

The value of the machine at the end of its ten years service of $100 divided by its original cost of $1,000 gives 10 per cent, which will be its percentage value of the original cost at its time of removal estimated as ten years after installation. The method of using the table is as follows:

On the ten-year horizontal line find the percent figures that are the nearest to 10 per cent—in this case it is 10.7 per cent—this determines which column to use for all subsequent percentages.

Now if we wish to ascertain the value of the machine at the expiration of the first year, multiply the original cost of $1,000 by 85 per cent = $850, the percentage figure is found in the column on the line of the first year; or its value after five years, $1,000 × 38.9 per cent = $389, etc.; and at the expiration of ten years $1,000 × 10.7 per cent = $107, which approximates the desired amount.

It would seem that machine tools should be inventoried at their market value with removal charges deducted, and it is obvious that the first year's use of a machine tool reduces its value more than the last year's service. If a percentage of discount figured on the previous

THE EFFECTS AT DIFFERENT RATES OF DEPRECIATION FOR TERMS OF YEARS CALCULATED IN ARITHMETICAL PROGRESSION, ADDING 0.1 PER CENT EACH YEAR FOR THE FIRST COLUMN, 0.2 PER CENT FOR THE SECOND, 0.3 PER CENT FOR THE THIRD, ETC.

Year	Percentages of Value															
1	95.0	94.0	93.0	92.0	91.0	90.0	89.0	88.0	87.0	86.0	85.0	84.0	83.0	82.0	81.0	80.0
2	90.2	88.2	86.2	84.3	82.4	80.5	78.6	76.7	74.9	73.1	71.3	69.6	67.8	66.1	64.4	62.7
3	85.5	82.5	79.7	76.9	74.1	71.4	68.8	66.3	63.8	61.4	59.0	56.8	54.5	52.3	50.2	48.2
4	80.9	77.1	73.4	69.8	66.3	63.0	59.8	56.8	53.8	51.0	48.2	45.6	43.1	40.7	38.4	36.2
5	76.6	71.8	67.3	63.1	59.0	55.2	51.6	48.1	44.9	41.8	38.9	36.1	33.6	31.1	28.8	26.7
6	72.4	66.8	61.5	56.8	52.0	48.0	44.1	40.4	37.0	33.9	30.9	28.2	25.7	23.3	21.2	19.2
7	68.3	62.0	56.1	50.9	46.0	41.5	37.4	33.6	30.2	27.1	24.2	21.6	19.3	17.2	15.2	13.5
8	64.4	57.4	51.0	45.4	40.2	35.6	31.4	27.7	24.4	21.4	18.7	16.4	14.3	12.4	10.8	9.3
9	60.7	53.1	46.2	40.3	35.0	30.3	26.2	22.6	19.5	16.7	14.3	12.2	10.4	8.8	7.4	6.2
10	57.1	48.9	41.7	35.6	30.3	25.7	21.7	18.3	15.3	12.8	10.7	8.9	7.4	6.1	5.0	4.1
11	53.7	45.0	37.6	31.3	26.0	21.6	17.8	14.6	12.0	9.8	7.9	6.4	5.2	4.1	3.3	2.6
12	50.4	41.3	33.7	27.5	22.3	18.0	14.5	11.6	9.2	7.3	5.8	4.5	3.5	2.8	2.1	1.6
13	47.3	37.8	30.1	23.9	18.9	14.9	11.7	9.1	7.0	5.4	4.2	3.2	2.4	1.8	1.3	1.0
14	44.3	34.6	26.8	20.8	16.0	12.2	9.3	7.0	5.3	4.0	2.9	2.2	1.6	1.1	0.8	....
15	41.5	31.5	23.8	18.0	13.4	10.0	7.4	5.4	3.9	2.8	2.0	1.5	1.0	0.7	....	....
16	38.8	28.7	21.1	15.4	11.2	8.1	5.8	4.1	2.9	2.0	1.4	1.0	0.7	....	....	....
17	36.2	26.1	18.6	13.2	9.3	6.5	4.5	3.1	2.1	1.4	0.9	....	....	....	....	....
18	33.8	23.6	16.3	11.3	7.7	5.2	3.5	2.3	1.5	1.0	....	....	....	....	....	....
19	31.5	21.3	14.3	9.6	6.3	4.1	2.7	1.7	1.1	....	....	....	....	....	....	....
20	29.3	19.3	12.5	8.1	5.1	3.2	2.0	1.2	0.7	....	....	....	....	....	....	....

year's value of the tool was used it would require a 37 per cent annual discount to effect the desired reduction in ten years, and the first year's use would lower the tool's value $370 and the last or tenth years' service would only lower its value $5.79. The other method of charging off 10 per cent of its first cost each year gives $100 reduction in value each year throughout its useful life; whereas the method of using the accompanying table reduces this tool's value $150 the first year and $36 the last year, which to the writer's mind shows values that meet average conditions very much closer than either of the other methods mentioned and answers the purpose very well for all except very unusual cases.

This method of figuring is simplified and shortened by reference to the table which has range enough for general use.

Milling a Multi-Threaded Nut

By Richard D. Fo :

A fixture for machining a multi-threaded nut was built recently by the Rogers Una-Drive Motor Truck Corporation, of Sunnyvale, Cal. The nut (Fig. 1) is used in a self-locking differential and has cut on its inner surface five-threads of five-eighths pitch. The threads had formerly been cut on an engine lathe but the slowness of the operation made the cost prohibitive. Due to the small inside diameter and the length of the thread, it was inadvisable, if not impossible, to cut the threads with an ordinary milling machine attachment, and the layout shown in Fig. 2, in which a milling fixture is used in conjunction with a small lathe, was built for the job. The fixture which was bolted to the tool-block of the lathe, carried an end mill driven through a pair of bevel gears from a pulley at the end.



FIG. 1. THE MULTIPLE-THREADED NUT

The whole of the moving parts, with the exception of the cutter and the driving pulley were enclosed in the fixture body. The bevel gears and the cutter arbor (which was mounted in taper bearings to insure rigidity) ran in a bath of oil.

A close-up in Fig. 3 shows the method of supporting the work, one end being held by an index plate and the other end in a special steadyrest. This view also shows the milling cutter projecting from the fixture body.

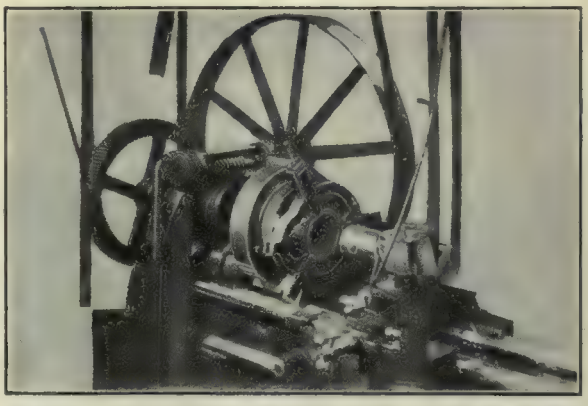


FIG. 2. THE FIXTURE MOUNTED ON THE LATHE

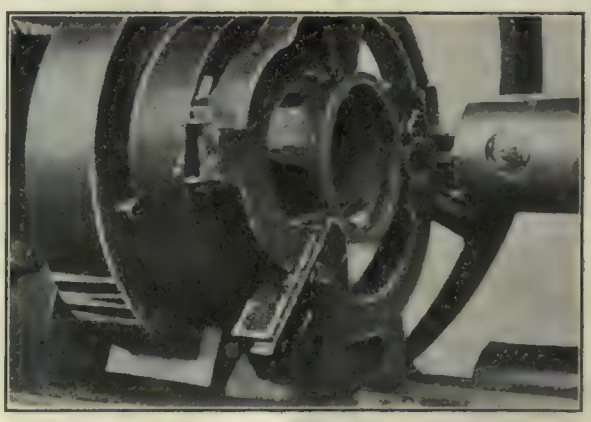


FIG. 3. HOW THE WORK WAS HELD

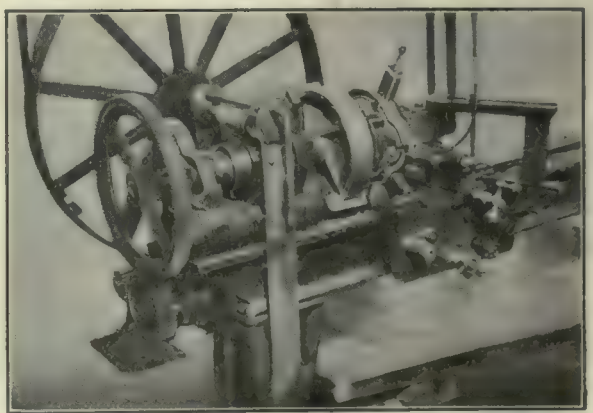


FIG. 4. ARRANGEMENT FOR DRIVE AND FEED

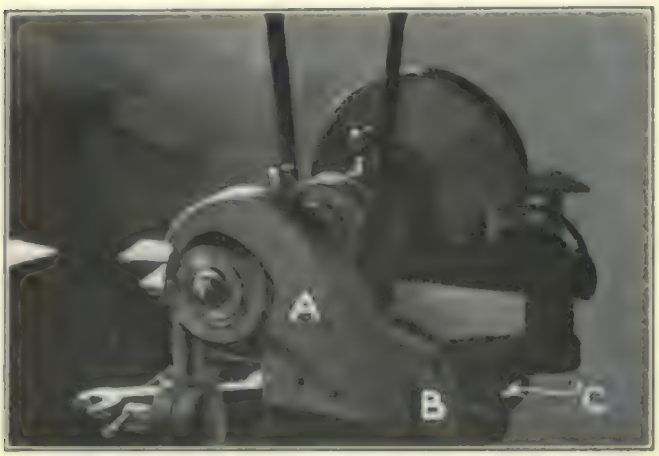
Fig. 4 shows the drive. A worm gear was pressed on one of the steps of the cone pulley, the worm being driven from a line shaft by the large pulley. The worm was mounted on an eccentric which permitted its disengagement for rapid return after a cut had been taken. The ordinary feed gears were dispensed with and three gears as shown drove a special lead screw mounted on the back of the lathe.

Although this arrangement might seem at first sight to be unduly delicate and apt to suffer from vibration and tool chatter, it did not prove so in practice but was satisfactory in every way. The small cutters held up surprisingly well, it being possible to finish a thread in one roughing and one finish cut, the resulting threads being fully equal in finish and accuracy to those cut by the usual methods. In addition to cutting the part shown, the fixture was subsequently used for cutting a quadruple thread worm with equal success.

An Adjustable Wheel-Guard

By Milton Wright

The cast-iron wheel guard furnished with the average tool grinding stand is designed to cover a maximum size wheel and, when wheels are new, is not objec-



AN ADJUSTABLE WHEEL GUARD

tionable to the toolmaker; but as it is swung from the same center as the wheel, it follows that when the wheel is reduced in diameter a couple of inches by wear and frequent redressings, the hood will stick out in front and will be an unmitigated nuisance. Under such conditions the hood is quite likely to become "lost" and the operator will again be subjected to the hazard of flying particles of abrasive and to possible serious injury by the breakage of an unguarded wheel.

The guard on the stand shown in the accompanying illustration was designed to meet the objection by doing away with the overhanging lip. The hood *A* is built up of heavy sheet metal by the autogenous welding process and in consequence is not so bulky as a cast-iron hood of equal strength would be. It is also arranged to swivel about a fulcrum near to its lower and rear corner, being held in any position by means of a clamping bolt working in the circular slot in the sector *B* and provided with a substantial wingnut.

Part *C* is a right-angled piece attached to the base of the stand and adjustable in a direction parallel to the center line of the wheel arbor. The sector *B* is held to part *C* by a clamping bolt and wingnut and is adjustable to and from the arbor.

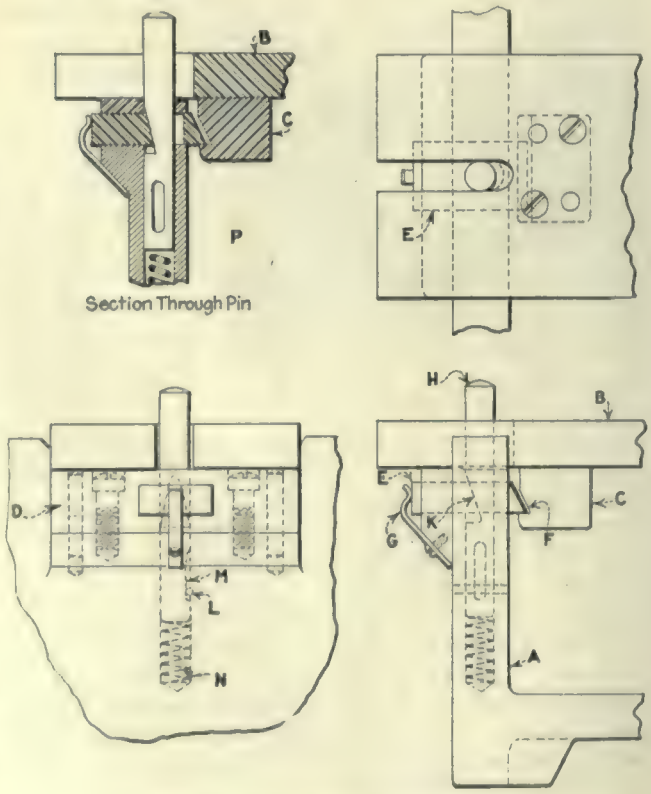
These three adjustments, instantly made with no other tools than the fingers, permit the lip of the hood to lie always close to the periphery, and the side always close to the outer face of the wheel; thus it is not at any time in the way of the operator.

The fact that these guards have been in service for several years without ever being "lost" shows that the average man does not take minor chances when it is convenient for him to do otherwise. If we would change our shop slogan from "safety first," to "make safety convenient," is might not require the exercise of so much executive authority to keep men from being injured.

Self-Locking Leaf Latch

By Gene Phelps

The ordinary method of locking the leaf on a jig or fixture is by a screw, tightened by hand after the leaf is brought into a closed position. The illustration shows a self-locking device which is of simple construction and has been used very satisfactorily. At *A* is shown the body of the jig and on the leaf *B* is fastened a latch plate *C*. The plate *D* is located on the body of the jig as shown and acts as a guide for the latch *E*, which is forced into the groove *F* by means of a flat spring *G*. In operation the leaf is brought down until the corner of the latch plate *C* strikes the latch, forcing it back. When the leaf is all the way down, the latch snaps into the groove as shown. In raising the leaf, thumb pressure is applied on the pin *H* which has a tapered flat machined on it at *K* that forces the latch *E* out of the groove, thus allowing the leaf to be raised. The amount of movement of the pin *H* is controlled by the pin *L* which fits in the slot *M*. The spring at *N* keeps the pin in the upward position. The section shown at *P* is taken through the center line of the pin and shows the general construction.



SELF-LOCKING LEAF LATCH

EDITORIALS

National Thrift Week

WITH the anniversary of the birth of the father of thrift in America, Benjamin Franklin, the National Thrift Week inaugurated by the International Y. M. C. A. is with us again. For those whose memory for dates is unreliable, we offer the reminder that Poor Richard was born on the seventeenth of January.

One of the four big aims of this year's thrift week program is to enlist popular support for a national celebration of Franklin's birthday each year. It is not the intention to have the anniversary declared a national holiday, for that would hardly harmonize with the principles of thrift which it is intended to encourage. A program can be worked out later, perhaps by each community; the main thing now is to get the idea accepted.

A second feature of the plan is a concerted drive for the introduction in half a million families of a household budget system. It is common knowledge that only a small percentage of businesses know their costs of production and distribution and it is equally true that the average family is even more ignorant. Here, then, is a fertile field for sane thrift propaganda. Not only will the family be the gainer but the community at large, as well. To indicate the trend of thought in this direction we have only to quote a far-sighted banker who prophesies that within five years it will not be the assets of a business which the banker will scrutinize, but the ability of the organization as indicated by its methods.

What seems to us to be the most immediately productive factor in the campaign is the slogan "Spend time and money wisely." This slogan is put forward to correct the common misapprehension which regards thrift as miserliness. Real thrift consists of spending nothing unnecessarily, in other words, getting the most for your money and time. Sane spending will start the wheels of industry to turning and aid materially the return of better times.

The fourth point is to enlist 100 cities to carry out the plan of co-operation between schools and banks in explaining to school children the function and operation of banks. This plan was successfully used in Detroit last year and has been adopted by the great mutual savings banks of New York.

The Y. M. C. A. is doing a great public service in its thrift week propaganda and deserves general support. Its ten point financial creed is sound and well-balanced and should be posted in every office and home. We printed it last year and we print it again here:

1. Work and Earn
2. Record All Expenditures
3. Make a Budget
4. Have a Bank Account
5. Carry Life Insurance
6. Own your Home
7. Make Your Will
8. Pay Your Bills Promptly
9. Invest in Safe Securities
10. Share With Others.

Saving Money by Buying Books

IS THERE anything new under the sun? An ancient saw tells us that there isn't and sometimes we are inclined to believe it. The hard-working editor who passes on the practical letters which form so useful a section of the AMERICAN MACHINIST is entirely convinced of it.

Certain "kinks" are sure to be reinvented by every apprentice as he reaches a given stage in his training. He is perfectly sincere in believing that his discovery is original with himself. And so it is as far as he is concerned. Unfortunately, generations of machinists before him have made use of the same short cut and he could have saved himself the pains of giving birth to an idea by reading a technical book.

This is a homely example but the principle applies equally to other cases. Any number of parallel research investigations have been and are in progress which need never have been undertaken had those responsible consulted the leading technical literature on the subject.

If the art of printing is largely responsible for the development of modern civilization then by the same token our present industrial achievements depend in some measure on our technical books. A well-stocked library of such books easily pays for itself in time saved and may be the means of saving large sums of money that would otherwise be wasted in needless duplication of effort.

Local Interest in Aviation Needed

THE growth of commercial air travel in this country, even though small as compared with that of the European air lines, is nevertheless encouraging. If we consider that practically all of the European lines depend upon subsidies for their existence, while ours have been developed without it, we have even more reason to be proud of our pioneers in this line. When it comes to actual miles traveled and the regularity and reliability of service, the United States Air Mail is acknowledged as the model for the whole world.

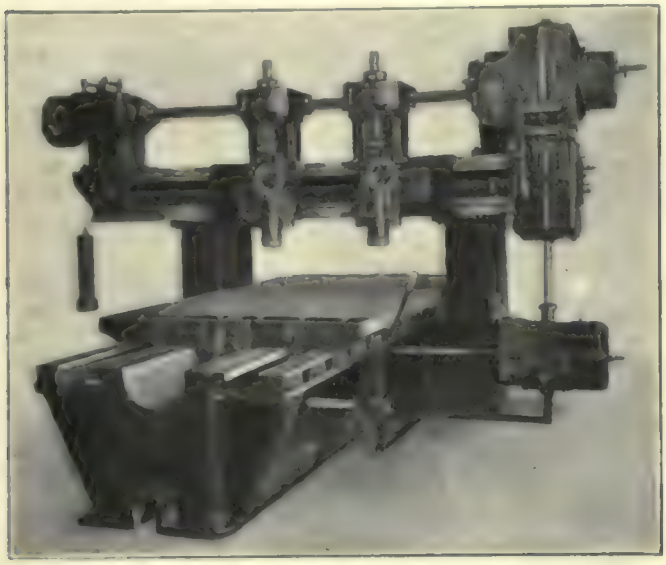
Air travel has become very safe indeed, as statistics will show. It will be safer as new landing fields are provided for emergency landings in cross-country flying. And here is where every live community can do its part in promoting commercial aviation. A standard landing field of suitable grade can be provided and properly marked and will do much to put any town on the map so far as aviation is concerned. In most places the best local garage can furnish supplies and assistance when required, and this will tend to raise the character of the garage as well.

The passage of the bill now before Congress for controlling air navigation will be a step in the right direction. But more than all we need an awakening of the spirit of aviation in every locality. This coupled with a will to do as much as possible, will soon result in landing fields, and then will follow the development of airplane routes, and the regular air service so very much needed in this country.

Shop Equipment News

Beamen & Smith Manufacturing Planer-Type Milling Machines

A large vertical double-spindle milling machine for manufacturing purposes has recently been completed by the Beaman & Smith Co., Providence, R. I. The machine



BEAMAN & SMITH VERTICAL DOUBLE-SPINDLE MANUFACTURING MILLING MACHINE

is of the planer type with a fixed crossrail, upon which are mounted two independent heads that may be used separately or simultaneously, each having power feed.

The width between the housings is 64 in. The table is 60 x 96 in. in size with a traverse equal to its length, and is supported upon four bearing surfaces, to be seen in the accompanying illustration. The spindles have a vertical movement of 12 in. Power feed varying from 1 to 8 in. per minute is available for all movements, the variation being effected through the medium of a gear box. The drive to the spindles is through steel worms on the transverse shaft, meshing with bronze worm-wheels on the upper end of each spindle.

In addition to the feed movements, there is a quick traverse for each movement, the speed of this traverse being constant and entirely independent of the feed. Three conveniently placed levers upon the operating side of the machine control all movements, thus enabling the operator to bring any portion of the work under its respective cutter, lower the cutter to the work, and throw in the feed, all without moving from his position. A handwheel on each head provides an additional quick vertical movement of the spindles when setting up.

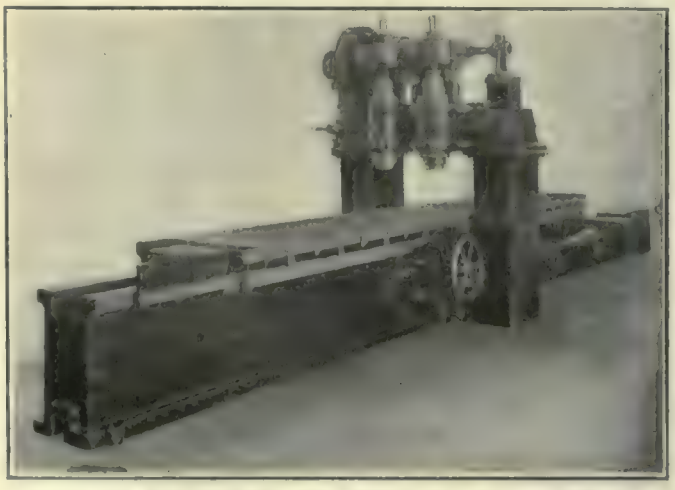
The spindles run in long bronze bearings that give rigidity and provide means of compensating for wear. The weight of the spindle is borne by an adjustable ball bearing that at all times holds the working thrust surfaces in contact and prevents the spindle from "jumping" as the cutter enters or leaves the work. Inserted-tooth cutters 10 in. in diameter are used. The weight of the machine is approximately 50,000 lb., and it covers a floor space of 11 x 16 feet.

A manufacturing milling machine, intended especially for spot milling long castings upon which the surface to be machined is all in one plane but is not continuous, has recently been built by the Beaman & Smith Co. This machine, also, is of the planer type and carries two heads.

The table of the machine is 24 in. wide by 14 ft. long, and has a power feed covering the full length of travel. The crossrail is fixed and the two spindles mounted thereon have a vertical adjustment of 6 in., but are not provided with power movement. The machine is distinctly a single-purpose tool, and its dimensions and capacities are designed in each case for the work it is to do.

The special feature of the machine is the "jump," or intermittent, feed, that is controlled by a series of adjustable cam dogs, shown in the accompanying illustration on the edge of the table, corresponding in position to the reverse dogs of a planer. These cams may be set to cause the table to feed slowly for any definite distance while a cutter is at work; and then, when that surface is finished, to move rapidly on to the next space to be machined. The change from slow to fast movement, and *vice-versa*, may be made by each pair of cams along the edge of the table.

The cutter spindles run in bronze bearings that are adjustable to compensate for wear. The weight of each spindle is borne by a ball-thrust bearing that prevents any downward movement of the cutter as it passes out of a cut. The spindles are positively driven through helical gearing. Taper-shanked cutters are used. A draw-bolt



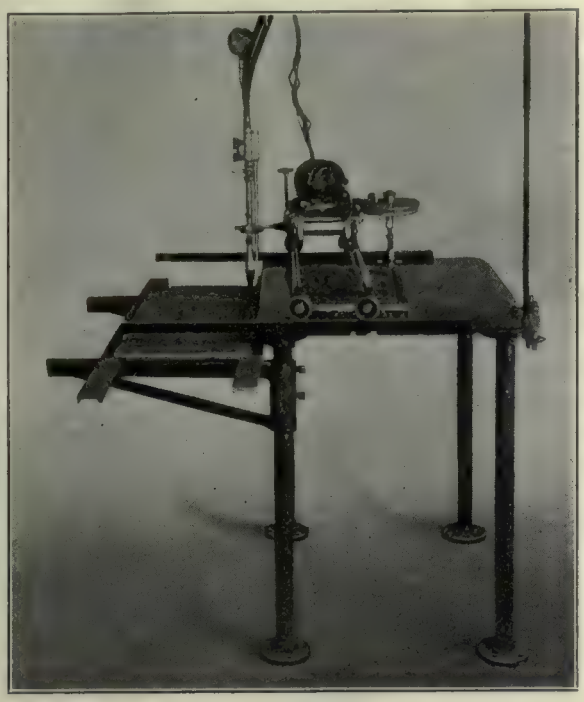
BEAMAN & SMITH PLANER-TYPE MILLING MACHINE

passing through the hollow spindle holds the cutter to its seat, and a driving wing relieves the shank of any torsional strain.

A gear box provides a convenient means of changing the rate of feed, and a pair of three-step cones and belt permit the rate of quick traverse between cuts to be varied to meet the requirements of the work. The machine is built upon the unit plan, and can be furnished with its principal dimensions to suit any piece that is to be machined in quantities.

G. W. & E. Automatic Cutting Machine

The General Welding & Equipment Co., 74 Brookline Ave., Boston, Mass., has recently placed on the market the "Gewe" automatic cutting machine shown in the accompanying illustration. The machine is intended for the cutting of metal parts, such as dies, cams, crankshafts and drop forge tools directly from the steel plate, being especially adapted to large production. The



"GEWE" AUTOMATIC CUTTING MACHINE

machine consists of two carriages, one mounted on the other, so that it is possible to reach any point of the work. The upper carriage supports on one side a cutting torch of the usual oxygen-acetylene type and is mounted in an adjuster for obtaining the proper position. On the opposite side, the carriage supports the driving and the tracing system. There are no intermediate linkages between the tracing and the cutting systems, so that any movement on the pattern is transmitted directly to the torch cutting the plate.

On top of the carriage is an electric motor transmitting its power through a friction wheel running on a disk on the shaft carrying the tracer roller. A template made of fiber and having the outline grooved in it that it is desired to cut in the work, must be used. The tracing roller follows in this groove. The driving shaft carries a collar loaded by spring pressure and having a knurled conical end at the bottom. This knurling rests on the edge of the groove in the template and obtains the traction necessary for driving the apparatus. When the driving shaft is rotated, the driving member runs along one inclined face of the groove in the template, and presses the tracing roller against the other side of the groove. In this way, constant engagement of the driving member and of the tracing roller is insured, giving uniform speed and smooth motion.

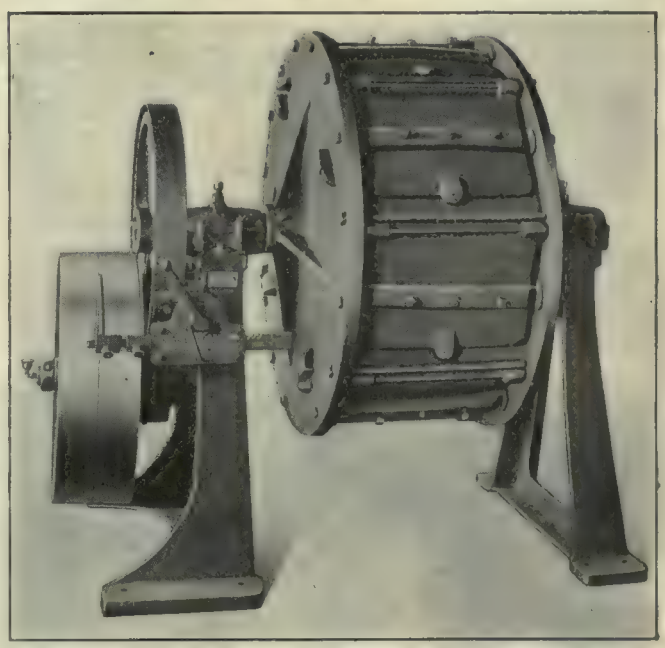
The speed can be regulated either electrically by a rheostat or mechanically by changing the position of the friction wheel on the disk. Any possible variation in height of the driving members due to unevenness of the templates is not transmitted to the torch, due to the construction of the members on the driving shaft. Movement to any part of the horizontal plane is obtained without jumping, jerking or stopping at the corners, a feature which enables the obtaining of a very smooth cut on the work.

The templates used are made of a soft material such as fiber. They can be cut by means of a special milling tool, driven if desired by an ordinary drilling machine. The templates are stated to be very quickly prepared, and to serve for the cutting of hundreds of metal plates. The torch may be operated on either oxygen and hydrogen, or on oxygen and acetylene. The speed of cutting varies from 18 in. per min. for ½-in. stock to 7 in. per min. for stock 4 in. in thickness. The machine is made in two sizes, one having a capacity for work 12 x 12 in. in size, and the other for work 24 x 24 in. The latter machine is illustrated herewith.

Abbott Burnishing Machine

The burnishing machine shown in the accompanying illustration has just been placed on the market by the Abbott Ball Co., Hartford, Conn. The chief feature of the machine is that the articles to be finished are not put into the barrel loosely and allowed to tumble in the mixture of balls, soap and water. The work is held stationary on the inside of the barrel body and as the barrel rotates, the parts are carried through the cleaning mixture. In this way, large parts can be finished without danger of injury due to the striking of one piece against another.

The periphery of the barrel has eight sides, each one having a hand hole provided with a hinged cover. The edges of the openings are beveled, so that the inside cover plates fit them tightly. There are two springs on the back of each plate against which the hinged cover



ABBOTT BURNISHING MACHINE

presses. The hinged cover has packing around the edges, so that when the clamping bar is in place on top of it the opening may be made water-tight.

Fixtures for holding the work are fastened to the inside of the cover plate. Since the machine is intended for handling work in large quantities, several sets of cover plates and work-holding fixtures are usually pro-

vided for each machine, so that while unloading one set of fixtures and putting fresh work into them, the machine may be operating with another set in place. When the work is finished, instead of dumping all of the balls from the barrel, it is merely necessary to remove the cover that is at the top of the barrel, take out the fixture and replace it with a fresh one. By bringing the next hole to the top, the operation can be repeated until a new batch of work has been put in every hole.

When handling work that is to be plated, it is said that three sets of fixtures should be used, so that when the work comes out of the barrel it may be left in place on the fixtures, put through the plating operation, and then brought back to the burnishing barrels for the final finishing.

When it is desired to clean out the interior of the barrel without removing the balls, a straining cover may be placed over one of the holes, the barrel filled with water, and the dirt washed out by running the machine.

Dover Fly-Cutter Holder for Milling Machine

The fly-cutter holder shown in the accompanying illustration is intended for toolroom use in making the manifold form cutters that are required as part of the equipment of screw machines, or in the making of certain forms of small dies. It is made by the George W. Dover Co., Inc., Providence, R. I., and is designed to fit over the spindle nose of a milling machine and clamp to the face of the column.

The inner end of the arbor is tapered to fit the spindle hole of the machine to which the device is to be adapted, and has a bearing in a bronze sleeve housed in the frame of the device. The yoke to take the fly-cutter has a large round hole, to which is fitted a round bushing with an open slot machined to fit the shank of the cutter.

As it is customary in this class of work to take the final cut of 0.001 or 0.002 in. with the cutter stationary and acting as a planing tool, the device is so arranged that by releasing the taper shank and tightening the large hexagon nut, the arbor may be held stationary with the cutter in any desired position. The casting which carries the bearing sleeve can be swiveled to an angle of 20 deg. either way, and is graduated to facilitate the angular setting when planing such work as master tools. When so used, the regular power feed of the milling-machine table is available.

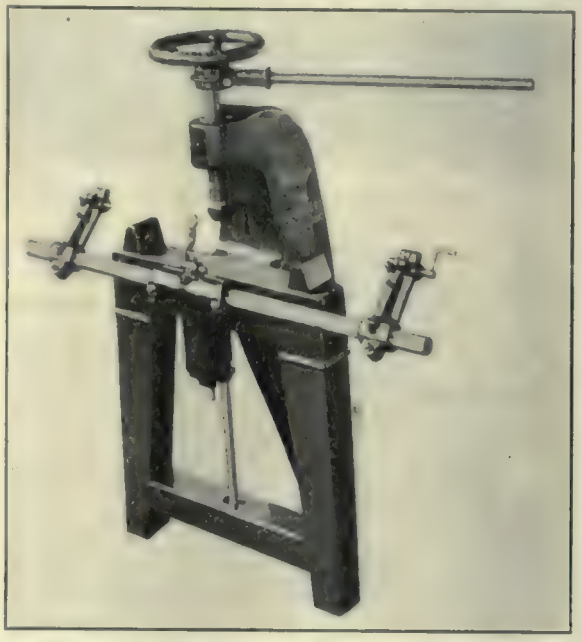


DOVER FLY-CUTTER HOLDER

Geier No. 2P "Production" Straightening Press

In the accompanying illustration is shown a straightening press recently put on the market by the P. A. Geier Co., Cleveland, Ohio. The press is particularly adapted to production work on parts such as crankshafts. It is supported on three legs, the top of the bed being 30 in. above the floor. The press is of the screw type, both a lever and a graduated handwheel being provided for applying the driving force. By turning the handwheel through $\frac{1}{16}$ revolution, a downward movement of 0.010 in. is obtained on the screw. The throat depth is 4 in., and the thrust block of the screw has a range of from 2 to 8 in. distance from the table.

The work is straightened without removing it from the centers. At the front of the machine is a shaft carrying the center points and fitted to a head having roller bearing. This shaft can be freely moved either to the right or to the left, so as to bring the work in the proper position. The head carrying the shaft is pivoted to the body of the press, and is normally held in a horizontal position by means of a vertical shaft having a compression spring on each side of it. A vertical movement is also provided, the head being supported by means of a spring enclosed in the rear leg and connected to the head by means of a cable. An adjustable stop



GEIER NO. 2P STRAIGHTENING PRESS

screw is provided so that the position of the work can be properly adjusted.

The press is equipped with a dial indicator having a stroke of $\frac{1}{4}$ in. It is thus possible to very easily read the eccentricity of the work. The maximum distance obtainable between the center points is 40 in. For the handling of longer work, the rollers mounted above the center points are used, it thus being possible to hold a shaft 3 ft. long by $2\frac{1}{2}$ in. in diameter. Two pairs of thrust blocks are furnished, one for use when the work is on centers and one when it is used on the rollers. The blocks can be adjusted along the bed, which is 26 in. in length. The floor space is $22\frac{1}{2}$ x 82 in., the maximum height from the floor to the handwheel is $55\frac{1}{2}$ in., while the net weight is 500 lb.

Mercury Type-K Tractor

The Mercury Manufacturing Co., 4118 South Halsted St., Chicago, Ill., has recently placed on the market the small industrial tractor shown in the accompanying illustration. The machine, designated as the type K, is intended particularly for light work in close quarters. Being only 29 in. in width, it can be operated through doorways of the ordinary size. Its over-all height is 48 in., and its over-all length 56 in.

The position of the operator is at the rear of the tractor, the seat being placed at one side. In this way, it is possible for the operator to drive with equal facil-



MERCURY TYPE-K TRACTOR

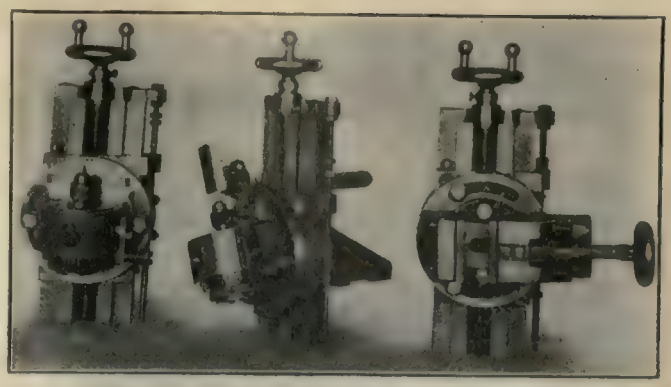
ity in either direction. The operator may uncouple the trailers without leaving his seat. Because the wheel base is only 30½ in., the tread 23¾ in. and the outside turning radius only 57 in., the tractor may be used in crowded and narrow aisles, the trailers being arranged, of course, to follow in its tracks.

The frame is a semi-steel casting, the hood being sheet steel reinforced by angles and riveted to the frame. The machine carries 21 Edison cells or 12 cells of the standard lead-plate type. A General Electric motor operating on 24 volts and 50 amperes at 1,500 r.p.m. is used, the drive being through worm gearing to the rear axle. The drum-type controller gives three speeds forward and one reverse. The brake is of the contracting-drum type and operated by a foot pedal. The machine has a normal draw-bar pull of 400 lb., with a maximum of 650 lb. The speed when running light is about 6 miles per hour.

Dover Milling Attachment for Lathe

A device intended to be bolted to the toolblock of an 18-in. engine lathe for the purpose of doing such small milling work as the fluting of taps and reamers and cutting teeth in small cutters, has recently been placed on the market by the George W. Dover Co., Inc., Providence, R. I. As shown at the left side of the accompanying illustration, the device is supported in a vertical position with the dividing head below the line of the lathe centers, and is used in connection with suitable cutters held upon an arbor between the lathe centers.

The dividing head is mounted on a swiveling plate that can be set to any angle up to 20 deg. on either side of the vertical position, the edge of the plate being graduated to facilitate setting. The dividing head may



DOVER MILLING ATTACHMENT FOR LATHE

be removed by the withdrawal of two bolts, and the small vise seen in position at the right of the accompanying illustration, substituted. The spindle of the dividing head has a taper hole to receive the shank of a chuck or other holding device. A set of index plates cut to give all the most commonly used divisions is keyed to the lower end of the spindle, and these plates may be changed for others by removing the knurled binding screw.

A bolt, the head of which may be seen through the hole in the shell in the view at the left, serves to lock the spindle rigidly in any position irrespective of the index pin. The spindle terminates at the upper end in a flat plate that effectively covers the bearings and excludes oil and chips. For the class of work to which the device is adapted an outboard center is rarely needed, but provision is made for attaching a V-block in any angular position for the purpose of supporting slender work against the pressure of the cut, as in the central view.

The elevating screw is of fine pitch and, in conjunction with the graduated collar, may be depended upon for vertical adjustments to 0.001 in. The slide may be clamped in any position, and the limit nuts upon the threaded bar on the right enable the operator to back the work away from the cut for inspection and to return it to the cutting position with certainty. The nuts also serve as stops when cutting to depth. The device is not intended as a substitute for a milling machine, but is for use in shops where the range of milling work is limited and where no small machine for doing this class of work is available.

Wright Triple-Hook Hoist

The Wright Manufacturing Co., Lisbon, Ohio, has recently placed on the market the triple-hook hoist shown in the accompanying illustration. The three hooks are operated simultaneously by means of one hand chain, being intended for the lifting and conveying of flexible materials such as bundles of long wires, metal bars, tubes and sheet metal, the three-point suspension preventing undue sagging.

The three lifting hooks are connected by lengths of pipe, and are ordinarily placed 5 ft. apart, although this distance may be varied to suit the requirements. The hoist shown has a capacity of 1 ton, although it can be furnished in larger sizes. The hoist is ordinarily suspended from three ½-ton plain trolleys running on an overhead I-beam. The high speed feature of the hoist enables the speedy lifting of the load.

The hoist is submitted at the factory to an overload 50 per cent in excess of its rated capacity, so as to insure sufficient strength. The main drive shafts and



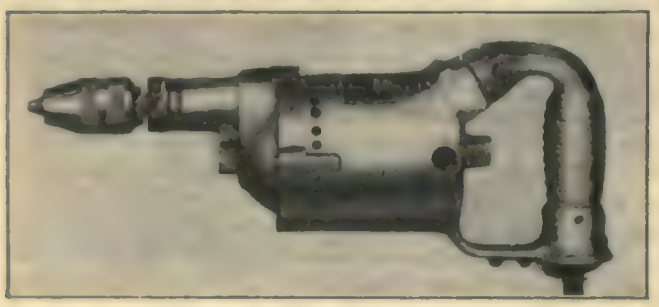
WRIGHT TRIPLE-HOOK HOIST

pinions are made of nickel-steel forgings, the load-chain wheels of electric-furnace steel castings, and the housings of malleable iron. The construction is stated to give great durability and strength.

U. S. Electrical Tool Co. "Buzz" Drill

The United States Electrical Tool Co., Cincinnati, Ohio, has recently placed on the market the portable electric drill shown in the accompanying illustration. The machine is known as the Buzz drill, and is intended both for metal drilling and wood boring. The motor is of the universal type and capable of operation on either direct or alternating current. The casing is made of aluminum, in order to save weight. The controlling switch is located in the handle and is operated by the finger, so that the tool may be easily controlled.

The gears used in the drill are made of hardened chrome-nickel steel, and run in grease in a chamber



U. S. BUZZ DRILL

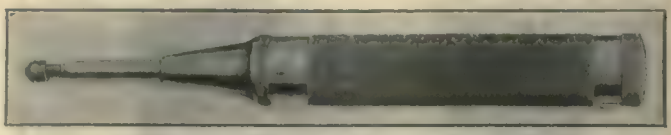
entirely separated from the motor windings. The spindle is fitted with ball thrust bearings, and has an operating speed of 1,100 r.p.m. The weight of the drill is 6 lb.

Punch for Making Hardness Tests

The Case Hardening Service Co., 2283 Scranton Road, Cleveland, Ohio, has recently placed on the market a small portable instrument for the making of hardness tests on the Brinell principle. The device is known as the Auto Punch, and is manufactured by the Rudge-Whitworth Co., London, England. It is made in two sizes. The 12-in. size shown in the accompanying illustration is intended primarily for all work on steel, iron and hard metals, while the 6-in. size is for use with sheet-brass and thin metals.

Inside the barrel is a spring-loaded hammer, while a steel ball is carried inside a cap at the bottom. To operate, the knurled barrel of the punch is gripped in the hands while the ball is in contact with the work. By pressing down on the barrel, the spring hammer is released and strikes the ball, the force of the blow making a depression in the work. The size of this depression is then measured, just as in the ordinary Brinell test. The piece to be tested must rest on a solid support, such as a bench block. The portability of the device is its chief feature, as it can be brought to the work. Large bodies of metal can be tested in position, an example being the flanges of car wheels.

The hardness of steel plate, stampings, forgings and castings can very easily be determined by means of the device, as well as that of case-hardened and heat-



AUTO PUNCH FOR HARDNESS TESTING

treated work. The relation between the diameter of the impressions given by the punch and the Brinell hardness number can easily be established for each punch. A pressure of 850 kgs. on a ½-in. ball gives a depression of the same size as that of the 12-in. punch when testing mild steel. The 6-in. punch can be easily held in one hand when operating. The device is said to maintain its accuracy with use sufficiently to satisfy all commercial requirements.

Pittsburgh Stencil and Tool Co. "Temperite" Tool

In the accompanying illustration is shown a device recently placed on the market by the Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa., for use in determining the proper hardening heat for carbon steel. The principle of operation of the device is based upon the fact that ordinary carbon steel attracts a magnet as long as it is under the correct hardening heat, but that as soon as this heat is reached the steel has no magnetic attraction.

The device, known as the "temperite" hardening tool, consists of a balanced and insulated magnetic tilting bar mounted on the end of a rod. The bar is made of a special steel that enables it to retain its magnetism better than an ordinary magnet, not being affected to any great extent by the heat.

In operation the steel under treatment is heated slowly and tested occasionally with the "temperite" tool by



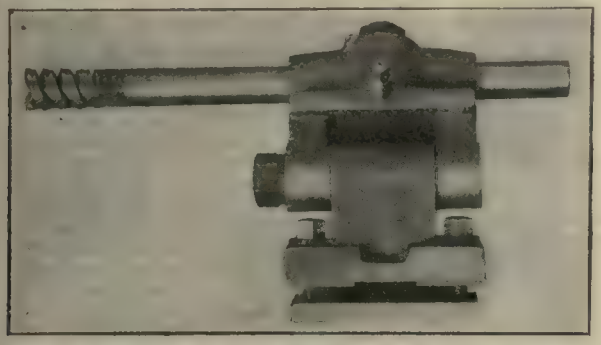
PITTSBURGH "TEMPERITE" HARDENING TOOL

merely bringing the magnet close to it. The bar will tip until the correct hardening temperature has been reached, at which point it is no longer affected. The work is then quenched quickly, and should result in a perfectly hardened tool. The magnetic bar is kept cool by dipping it frequently into water, and when not in use its magnetism is retained by placing a keeper on it, thus lengthening its life.

Dover Swing Boring-Tool Holder

The boring-tool holder shown in the accompanying illustration has recently been placed on the market by the George W. Dover Co., Inc., Providence, R. I. The tool is intended to combine maximum rigidity with a wide range of adjustment. It is held to the toolblock of the lathe by means of two bolts and a strap that fits in the T-slot in place of the toolpost. The bearing about which the swinging member turns is parallel with the bar, and thus no amount of adjustment affects the parallelism of the cutter bar with the lathe spindle after it has once been set. By tightening the bolt the swing member may be held in any position to which it is adjustable.

The hold upon the bar is secured by means of a yoke that is drawn up by means of a large hexagon nut. The



DOVER SWING BORING-TOOL HOLDER

yoke encircles the bar and, when tightened, gives a very rigid grip upon the latter. The square-head adjusting screw that may be seen in the swinging member is provided so that the bar may be swung back out of the way for inspecting or calipering the work and returned to position with certainty, in case it is necessary to repeat a cut.

The Dover double-lipped bar is supplied with the device, thus enabling the operator to make two grindings at each trip to the grinding wheel.

Millersburg Helical-Flute Expansion Hand Reamer

The Millersburg Reamer & Tool Co., Millersburg, Pa., has recently placed on the market the helical-flute expansion hand reamer shown in the accompanying illustration. The device is furnished in all sizes up to 2½ in. in diameter. The helical flutes enable the producing of smooth and clean-cut holes that are accurate in size, these results being due to the shearing action of the blades, and to the elimination of chatter. The tool is stated to cut freely and easily and to have great strength and durability.

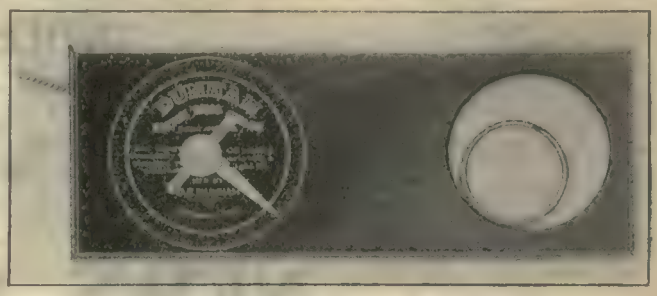
The expansion feature of the tool gives it a much greater life at its original size than is the case with a solid tool. The blades may be expanded to compensate for wear and resharpening, thus maintaining the original size. The maker states that with the tool, 30 to 40 per cent more work can be turned out than when using a straight-fluted reamer.



MILLERSBURG HELICAL EXPANSION REAMER

Dunham Piston-Ring Micrometer

D. F. Dunham, Oxnard, Cal., has recently placed on the market the micrometer or gage shown in the accompanying illustration for automotive piston rings. The



DUNHAM PISTON-RING MICROMETER

device is intended for use in piston-ring factories and in jobbing houses handling piston rings, being also adapted to shops where a stock of rings is handled and cylinder regrinding and repairing are done.

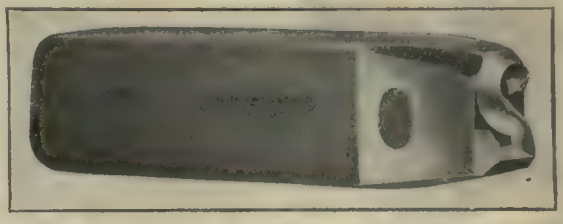
The micrometer is composed of a steel tape secured at one end to a pin and attached to a brass rack at the other end, the rack operating on a pinion. The piston or piston ring to be gaged is placed within a loop of the steel tape in the opening at the right, and the handle at the left is revolved so as to move the rack and tighten the tape on the ring. Rings from 2⅜ to 5⅛ in. in diameter can be gaged, the size being indicated to 0.001 in. on the dial at the left. Since the pressure on the tape closes the ring, its exact size can be easily and quickly determined.

Pittsburgh Stencil and Tool Co. "Super" Steel Stamp

The Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa., has recently placed on the market its "Super" steel stamp for use in stamping numerals or symbols in metal. The accompanying illustration shows one of the stamps made from 1-in. square stock and 4 in. in length, carrying a numeral ¾ in. high.

The stamps are made from a special quality of steel and heat-treated. The head is so tempered that it mushrooms and curls down until the pieces merely drop off under the blows, instead of splitting and flying. This feature insures safety from accidents due to flying particles of the head.

To illustrate the qualities of the stamp, the following statements of the maker are given: "In stamping cold



PITTSBURGH "SUPER" STEEL STAMP

sheets, the shanks were absolutely worn down while the stamp itself was still in good condition." "The stamp has shown remarkable durability when stamping hot steel in a mill." "On automobile-spring steel of 512 Brinell hardness, after an hour of continuous hammering, the shank was made ⅛ in. shorter, the stamp itself was still in fair condition, while the spring was dished out by the cutting action of the stamp."



NEWS SECTION

Tests of Toolbits

The Bureau of Standards, of the Department of Commerce, has been conducting a series of tests on toolbits. A number of toolbits of standard high-speed tool steel were heat-treated in various ways to determine the effect of these treatments on the cutting qualities of the metal. About fifty-five cutting tests were made, and while no new facts were brought to light, the data obtained were interesting and show that it is possible to obtain valuable results from tests made with such small samples. This work is being continued, and an effort will be made to study the time temperature relations in preheating and hardening on the cutting qualities of high-speed tool steels.

Exports of Industrial Machinery

Exports of American industrial machinery show an increase of something like 170 per cent in value in 1921 over 1913, according to the Industrial Machinery Division of the Department of Commerce in a special review of the machinery export situation in which statistics for the first eleven months of 1921 are used to estimate the year's trade.

The impression that our foreign trade has collapsed is not justified in so far as exports of machinery are concerned, says the report in pointing out that exports of such machinery for the first eleven months of 1921 were valued at $238,007,585, against $92,312,457 for all of 1913. While official figures for the calendar year 1921 are not yet available $250,000,000 is a conservative estimate of the total value of the trade during the year which has just closed, in the opinion of the division.

According to the Industrial Machinery Division an extensive statement covering foreign trade in industrial machinery in detail will be prepared and released shortly after the complete figures for 1921 are available.

Auto Service Men Dine

The Automotive Service Association held its third annual dinner-meeting in New York City on Jan. 13. The table was laid in the Automobile Dealers Club, 1895 Broadway.

The dinner was in the nature of an informal get-together, after which an open forum was held. Service problems and methods were discussed from various viewpoints. J. R. Pyle, secretary of the association, was in charge.

Metallography at Brooklyn Polytechnic Institute

A comprehensive course in metallography has been announced by the department of chemistry and chemical engineering of Polytechnic Institute, Brooklyn, N. Y.

The course covers a study of the microstructure of iron and steel and the fundamental physical chemical principles. In the laboratory, samples of steel and iron of varying carbon content are polished and etched by the student, examined by the microscope and photomicrographs made. The effect of varying heat-treatment is carefully studied. The student is also given opportunity for studying a collection of prepared specimens of wide variety on hand in the laboratory.

The laboratory possesses an adequate equipment of grinding and polishing wheels, microscopes, photomicrographic outfits, dark room, pyrometers, electric and gas furnaces and other accessories.

The course consists of fifteen lectures given on Friday evenings and fifteen two-hour laboratory exercises on Friday or Monday evenings commencing Feb. 3.

Further information as to this and other courses, as well as catalogs, may be obtained on application to the director of the evening department, Polytechnic Institute, 99 Livingston St., Brooklyn, N. Y.

Industrial Engineers at Detroit in April

The tentative program for the annual convention of the Society of Industrial Engineers has just been announced. The meetings will be held at the Hotel Statler, in Detroit, from the twenty-sixth to the twenty-eighth of April.

A varied program of technical sessions, luncheons and visits to nearby plants makes up the body of the convention. The speakers have been chosen from the most select fields of industrial engineering. Among the subjects to be discussed are: Industrial engineering as a service to managers, executives, sales and factory managers; production, finance and industrial relations, labor and the public.

Joseph W. Roe, president of the society, will open the convention on the first day. As the program is more fully arranged, further information will be furnished by the secretary, George C. Dent, whose office is at 387 S. La Salle St., Chicago.

Industrial Fair at Manila

A commercial carnival and industrial fair under the auspices of the Philippine Carnival Association will be held in Manila, Philippine Islands, Feb. 4 to 12. All the industrial and commercial phases of the Island's business will be exhibited in specially erected buildings. The slogan of the carnival will be "Boost Business." The auditorium with its many amusement attractions will be a feature of the nine-day celebration.

Several foreign business houses have arranged for a display of their wares, besides the many American firms who will be represented.

The association has two offices in the United States, one at 280 Broadway, New York City, and the other at 681 Market St., San Francisco, Cal.

Oriental Market for American Magazines

The Orient is a particularly attractive field for the development of the circulation of American magazines, which, except to regular subscribers, are now almost unknown, except in a few centers like Shanghai. English is being learned everywhere, and the illustrations are always interesting to an oriental, even when the text is not understood. There are no native publications of the same class. The English popular magazines can not compete in price, outward attractiveness, human interest, illustrations, or text, and other European magazines are barred by language. There is everywhere a great interest in American and things American.

It is suggested that a study be made by American magazines, advertising men, export associations, and manufacturers of the means for utilizing more effectively this powerful agency for the development of American interests abroad.—*Commerce Reports.*

Philadelphia Foundrymen Meet

The 313th meeting of the Philadelphia Foundrymen's Association was held in that city on Jan. 11.

Walter Wood, of R. D. Wood & Co., gave an interesting account of his recent travels in Europe. He told of prevailing conditions in London, Paris, Rome, Vienna and Warsaw. An illustrated lecture on "Sil-O-Cel" was presented by C. A. Frankenhoff of the Celite Products Co.

American Engineering Council Holds First Annual Meeting—Plans for Future Activities

Rounding out a year of improved organization, substantial accomplishment and strengthened purpose, the American Engineering Council of the Federated American Engineering Societies held its first annual meeting at the Cosmos Club, Washington, Jan. 5 and 6. Dean Mortimer E. Cooley of the University of Michigan, president of the Council, presided. Officers were chosen, the work of the past year reviewed and discussed, action taken on important matters of public and technical service, new financial arrangement put into effect, committees named, new policies sanctioned and old ones reshaped, and a broad and definite program outlined for the next twelve months. A leading event of the meeting was a dinner in honor of Herbert Hoover, who, addressing the members of the council and their guests at the University Club, praised the work of the Committee on Elimination of Waste in Industry as a great and lasting public service, pointed the way for new engineering effort in the public interest, and expressed renewed devotion to the ideals of the council. Resolutions of appreciation of the service of the new Secretary of Commerce were presented to Mr. Hoover.

The balloting for officers resulted in the re-election as vice-presidents of Dexter S. Kimball, dean of the college of engineering, Cornell University, and J. Parke Channing of New York. W. W. Varney of New York was again chosen treasurer; L. W. Wallace was re-elected executive secretary by unanimous action of the executive board.

The council made provision for a continuance of its national publicity work under the direction of James T. Grady, director of the department of public information of Columbia University, New York.

The executive board of the council for 1922 is made up as follows: H. E. Howe, Washington, American Institute of Chemical Engineers; Prof. C. F. Scott of Yale, L. B. Stilwell and Calvert Townley of New York, J. H. Finney of Washington, William McClellan of Philadelphia and L. F. Morehouse of New York, representing the American Institute of Electrical Engineers; J. Parke Channing and S. Dwight of New York, Charles H. MacDowall of Chicago and Philip N. Moore of St. Louis, the American Institute of Mining and Metallurgical Engineers; L. P. Alford of New York, E. S. Carman of Cleveland, Dean D. S. Kimball of Cornell, Prof. A. M. Greene of Troy, Dean Perley F. Walker of Kansas, W. S. Lee of New York, Dean M. E. Cooley of Michigan, American Society of Mechanical Engineers; Prof. Joseph W. Roe of New York Society of Industrial Engineers; Morris L. Cooke, Philadelphia, Taylor Society; W. E. Rolfe, Associated Engineering Societies of St. Louis, W. W. Varney, Baltimore.

During the coming year a study will be undertaken of the Water Power Act and its application, so that suggestions may be made as to its administration and amendments to the act itself suggested if it should be decided that the fundamental law can be improved.

Every resource of the federated societies is to be brought to bear immediately in an effort to secure legislative relief for the Patent Office; to secure an embargo on dyes, and to secure authorization for the appropriations to carry into effect the plant of the U. S. Geological Survey for the completion of the topographic map of the United States.

The principal accomplishments of the federated societies during 1921 were cited as follows:

Elimination of waste report.

The securing of employment for 1,221 engineers during the first eleven months of 1921.

Securing the publication of over five hundred articles pertaining to the activities of the society.

Legislative activities which involved active work, or at least a study of the Patent Office relief; topographic map of the United States; commissioned status for sanitary engineers of the United States Public Health Service; Department of Public Welfare; cyclical depressions; Federal road act; water-power act; Muscle Shoals project; reclassification and compensation of engineers in government service; tariff on petroleum; embargo on dyes; war minerals liberalization; Winslow refunding bill; Ladd metric system bill; forestry legislation; St. Lawrence waterway; Department of Public Works, and general executive reorganization.

Participation in such conferences as —Elimination of excess variety of paving brick; standardization of contracts and specifications in the construction industry; unemployment conference; census statistical conference; Board of Surveys and Maps.

Continued study of problems involved in the licensing of engineers and participation in hearings in a number of states.

Addresses before numerous engineering societies.

Stimulation of interest among engineers of foreign countries which has led to the formation of federations of engineering societies in six countries and paving the way for an international federation.

Study of continuous process industries.

Progress toward the more definite establishment in the public mind of the place and prominence of engineers in modern civilization.

Progress in developing a professional consciousness among engineers, giving them reason to take more pride in the fact that they are engineers.

Establishment in the minds of Federal legislative and executive officials that they now have a definite point of contact with engineers as a whole.

Unemployment Figures for December

Unemployment increased by 4.7 per cent during December, according to the telegraphic survey made by the U. S. Employment Service. The survey covered 1,428 firms located in the principal sixty-five industrial centers of the country. These concerns were employing 1,493,107 workers on Dec. 31.

Increased employment is shown in textiles, iron and steel, lumber, leather, paper and printing, and metals and metal products other than iron and steel. The decreases were mainly in the food industries, liquors and beverages, chemicals, stone, clay and glass products, tobacco manufacture, vehicles for land transportation and railroad repair shops.

Of the sixty-five cities covered by the survey, twenty-nine report employment increases during December over November, with percentages of increase, as follows: Philadelphia, 6 per cent; Milwaukee, 5.8; Dayton, 4.9; Los Angeles, 4.8; Toledo, 4.7; Paterson, 3.7; New Haven, 3.1; Albany-Schenectady, 2.9; Columbus, 2.5; Fall River, 2.4; Niagara Falls, 2.4; Reading, 2.3; Indianapolis, 1.9; Rochester, 1.8; Worcester, 1.7; Chattanooga, 1.6; New Orleans, 1.5; Lowell, 1.5; New York, 1.5; Lawrence, 1.4; Youngstown, 1.3; Manchester, N. H., 1.1; Cincinnati, 0.68; Bayonne, 0.6; Boston 0.54; Providence, 0.45; Yonkers, 0.37; Birmingham, 0.3; New Bedford, 0.26.

Thirty-six cities reported employment decreases in the following percentages: Detroit, 47.6 per cent; Omaha, 21.2; Peoria, 17.6; Johnstown, 17.3; Sioux City, 15.6; Seattle, 12; Syracuse, 11; Grand Rapids, 10.7; Memphis, 10.5; Baltimore, 10.5; Minneapolis, 9.6; Portland, 6.9; St. Paul, 6.6; Buffalo, 6.1; St. Louis, 6; San Francisco, 5.8; Atlanta, 5.7; Perth Amboy, 4.9; Camden, 4.7; Jersey City, 4.6; Cleveland, 3.8; Waterbury, 3.7; Richmond, 3; Chicago, 2.7; Passaic, 2.5; Pittsburgh, 2; Kansas City, 2; Kansas City, Kan., 1.6; Louisville, 1.4; Denver, 1; Newark, 0.98; Trenton, 0.87; Flint, 0.8; Brockton, 0.4; Bridgeport, 0.3; Springfield, Mass., 0.12.

Foreign News Notes

The Italian Parliament has just appropriated the amount of 200 million lire for the construction of new merchant vessels. Twenty-five ships costing about 200 million lire will be constructed. Orders will be placed in the very near future. All ships are to be built on Italian yards exclusively.

A Soviet steamer recently touched the port of Bremen where she took several locomotives and about 1,000 tons of agricultural machinery and implements on board.

The Krupps at Essen, after an interval of three years, are paying dividends again. Six per cent is paid on preferred and 4 per cent on common shares. Out of the net profits of 94 million marks, 40 millions will be used for rebuying shares to this amount which the company had sold in Holland for the Krupp family in order to enable them to pay the extraordinary state taxes. The capital stock of the company will be increased by another 250 million marks. Part of the new shares will be offered to the employees of the company.

A British Syndicate, the head of which is Robert William Dunsmiur, only heir of the late Lord Dunsmuir, ex-Prime Minister and Governor of British Columbia who owned large mining properties and railways in Canada, has been granted the largest concession ever agreed upon by the Peruvian government. The syndicate is to construct new railroad lines in Peru of a combined length of 3,000 kilometers, as well as expensive harbors in different parts of the country. The total expenditure for these undertakings is estimated at no less than £13,500,000. All material used in the construction of the railways, as well as all rolling stock, is to be imported from Great Britain, exclusively.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Nineteen hundred and twenty-one, with its disappointments, is fading into the past and men are becoming normally cheerful again. The old year is buried and like soldiers returning from a military funeral the business community is quickening its pace as it marches to the music of hope.

Fundamentally, the better feeling is due to the natural optimism of mankind. It is a blessed fact that as we look forward we are prone to forget the troubles that are behind, but there is also much that is affirmatively encouraging in our domestic situation. First and most important is the growing ease of money. On call it has loaned at 3 per cent and good commercial paper can now be sold at 4½ per cent. In London the open market rate for short bills has fallen to 2⅞ per cent.

The Federal Reserve Banks at Dallas and Minneapolis have reduced their rediscount rates to 5 per cent and it is generally expected that the New York, Boston and Cleveland Reserve Banks will soon go to the 4 per cent rate. The weekly statement of the Federal Reserve System shows a sensational rise in the reserve rate to 74.7 per cent, 3.6 per cent above last week and one of the largest increases ever recorded. It also shows a gain of $20,000,000 in the gold held, which now exceeds by $600,000,000 the $2,300,000,000 of Federal Reserve Notes outstanding.

Bond Market Steady

The first effect of the decline in interest rates has been an advance in bonds. The Liberty and Victory issues are selling at practically the highest prices on record since just after they were brought out and all good investment securities are appreciably stronger.

It is, however, still possible to buy many good bonds and preferred stocks on a basis which yields more than 6 per cent and the gradual absorption of such issues at advancing prices is to be expected. As yet there is but little speculative demand for the low priced railway and industrial stocks that pay no dividends. The theory is that the ease of money reflects a degree of commercial inertia that is incompatible with a bull stock market. It is, however, certain that people will borrow and buy when credit is cheap and easily obtainable.

Therefore it seems entirely probable that a general and a pronounced revival in business will be seen just as soon as some plan for the financial reorganization of Europe is made effective. This is the big "if" and it has become somewhat bigger with the abrupt adjournment of the Cannes conference following Briand's equally abrupt resignation as Premier of France. Even assuming that the Cannes conference will be resumed, which is doubtful, the accession of ex-President Poincare to the Premiership is likely to increase the difficulty of reaching an agreement as to German reparations at the Genoa economic conference.

However, the mere calling of the conference indicates a willingness to co-operate and to forget racial and political differences, in which France is not likely to prove backward, and while as in the case of Disarmament Congress at Washington now closing we shall probably be disappointed at the things actually accomplished there is cause for satisfaction in the spirit of accomodation, compromise and co-operation that find expression in these gatherings.

Optimism in Industry

Meantime it is with gratitude that Ireland's acceptance of the peace treaty is noted as we turn again to our own affairs and read an advertisement of the New York Central Railroad announcing that on Monday morning, Jan. 9, the number of through passengers arriving at the Grand Central Station on limited trains was the largest ever recorded. To accomodate them the eastbound "Twentieth Century" was run in four sections, the "Fifth Avenue Special" in three sections, the "Wolverine" in two sections, the "Detroiter" in five sections, and the "Beaver" in two sections.

The influx was of course directly due to the automobile show, but it is nevertheless important as indicating the optimism felt in what has come to be one off our most important industries. Of the results of the show itself it is too early to speak. The attendance has been large and the price reductions announced have attracted much attention but the effect upon sales will not be known for some time.

Most of the commodity markets have been static but some of them call for special comment. Mr. Hoover's prediction of an advance in sugar has attracted wide attention and has been followed by a very slight gain in the price of raw sugar and contracts for its future delivery. The indications favor a further improvement, for sugar seems to be in much the same position as was cotton eighteen months ago. The present supply is excessive but there is every prospect that production will be curtailed.

Coffee is steady and the statistical position appears to gain in strength as it develops. The Brazilian government is supposed to control the bulk of the supply now held in the United States.

The undertone in cotton is hardly as confident as it was because the large "carry over" is being again exploited by the bears. It is, however, well to remember that those who own the surplus whatever it may be are now able to hold it and make it more valuable by planting less next year. This fact and a mild winter which favors the spread of the boll weevil are bullish factors of the first importance. It is, however, to be admitted that some who are usually accurate in their views expect an increased rather than a decreased planting next year.

Wool continues surprisingly firm and the prices paid at recent auction sales here and abroad are distinctly higher. Statistically the supply seems ample but practically it is so well controlled that it is not a depressing influence. Both woolen and cotton textiles are in good but not extraordinary demand and the trade seems stabilized.

In iron and steel the gradual resumption of ore mining on the Minnesota ranges is significant of the belief that the latent but unsatisfied demand for steel will be manifest before 1922 is very old, and the Iron Trade Review estimates that 100 per cent more ore will be mined this year than in 1921. Copper is firm, with nearly everybody in the trade looking for slightly higher prices. Despite denials from the companies concerned, persons who ought to know state that a merger of porphyry producers is being negotiated, an important addition to the long list of combinations which are being planned to reduce the wasteful cost of competition in an era when wasteful costs cannot be passed on to consumers.

Another cut has been made in Pennsylvania crude oil and gasoline has been reduced in several states. Mid-Continent producers are reported to have a "gentlemen's agreement" to keep up prices, but crude production is at the highest in our history, the Mexia field is turning out 175,000 barrels daily, and it is not likely that the producers can long resist the pressure of supply. Grains are less steady as they meet increasing competition from foreign crops in the export market. A campaign to reduce corn acreage is under way and will result in considerable curtailment if the corn belt farmers contrast the prolonged depression of their markets with the substantial recovery in cotton which followed the Southern growers' control of the production.

Waiting for Lower Rates

Building in December was double that of last year and even exceeded November's total. Railroad net earnings tell a less satisfactory story, dropping to 3.8 per cent on their property valuation in November from 5.4 per cent in October. Traffic is light and will continue so until buyers know definitely whether they will profit by lower freight rates if they postpone their purchasing. More than anything else this uncertainty as to one of the principal elements in calculating costs is delaying the extension of trade which may justly be expected to follow declining money rates and the revival of confidence with which 1922 was generally greeted.

The New York firm of Childs & Joseph doing a large export business with Central and South America, is in the hands of a creditors' committee. Liabilities are estimated at $7,000,000. It is another "hangover" from last year.

Automotive Engineers Hold Nineteenth Annual Meeting

S. A. E. Meets in New York During Automobile Show Week—Large Number of New and Revised Standards Acted Upon—Good Technical Papers Presented

As usual, the Society of Automotive Engineers held its annual meeting at the Engineering Societies Building in New York City during the week of the automobile show. Registration began on Tuesday morning, Jan. 10 and the rest of the day was devoted to the customary meeting of the standards committee. Several new standards were presented, but in the main more attention was given to the revision of adopted standards and practices and the reconciliation of S.A.E. and A.S.T.M. specifications which covered similar materials with only slight differences in wording or figures. With two exceptions the standards were approved and advanced to the stage of letter ballot by the voting members.

The Tuesday evening session was turned over to aviation and was concentrated upon the consideration of a paper on air-cooled engines by Charles L. Lawrence. Mr. Lawrence traced the development of air-cooled airplane engines and laid particular stress on the various cylinder constructions experimented with to obtain satisfactory cooling.

The Wednesday morning program was devoted to an outline of the various activities of the society. President Bucroft opened the meeting by telling of the accomplishments of the organization which he said were out of all proportion to its age. He then introduced aeronautic vice-president H. M. Crane, who made an informal report on the work of the new research department in the absence of Dr. Dickinson, the head of the department, because of illness. Mr. Crane took advantage of Dr. Dickinson's absence to say that the best job done by the research committee was the securing of Dr. Dickinson's services.

At the same time Mr. Crane read a report on the developments in aviation during 1921, laying stress on the commercial achievements and pointing out the great handicap of inadequate terminal facilities.

Vice-president Harry L. Horning read a paper on the international affiliations of engineers calling attention to the world economic problems crying for solution by the engineers of the world.

B. B. Bachman, passenger car vice-president, told of the developments in the passenger car field, giving it as his opinion that all the major problems in this division could be classifield as fuel problems or highway problems. He mentioned the problem of building roads that would last as long as the bonds issued to finance them, and also pointed out the new and serious problem of traffic in metropolitan districts, which he considered as distinctly a highway problem.

The report for the tractor division was read by vice-president E. A. Johnston, who told of the serious setback the industry had suffered because of the hardships of the farmers. Vice-presidents Menges, of the stationary engine division, and Van Blerck of the marine engineering being absent, their reports were not read, the meeting passing on to the report of the treasurer and the reports of the standing committee. The report of the tellers of election followed and the slate chosen at the summer meeting was declared elected. The retiring president then made his valedictory address in which he commented on the economic opportunities and responsibilities of the engineer and more particularly of the automotive engineer.

The new president, B. B. Bachman, of Philadelphia, was introduced and made a very brief address before the meeting adjourned.

Simultaneous sessions were held in the afternoon on lubrication, motor bus transportation and body building and finishing. The high point of the meeting, from a technical point of view, was reached at the research session on Thursday morning where but one paper was presented. It was prepared and read by Harry Ricardo, the famous British automotive engineer who made the trip to the United States as the guest of the society. Mr. Ricardo's subject was "Some Recent Investigations and Deductions," and it was received with the greatest interest. It evoked considerable discussion. Unfortunately, any account of the subject covered is entirely beyond the scope of this story.

Simultaneous sessions were held in the afternoon on the general subjects of engines and fuels, and materials. At the engine and fuel session papers were read by O. C. Berry and C. S. Kegerreis, on "Manifold Vaporization and Exhaust Gas Temperatures," by Thomas Midgley, Jr., and T. A. Boyd, on "Methods of Measuring Detonation in Engines"; and by Thomas Midgley, Jr. and W. K. Gilkey, on "Spectroscopic Investigation of Internal Combustion Engines."

The materials session was of special interest and was enlivened by considerable discussion. C. N. Dawe, metallurgical engineer of the Studebaker Corporation gave the result of many tests on chrome-molybdenum steel for various parts. About 400 tension pieces 2 in. and smaller were tested. J. H. Nelson of the Wyman-Gordon Company felt that these tests were not conclusive and that a higher carbon and chromium content in chrome-nickel and chrome-vanadium would give equally good results.

Mr. Dawe concludes that chrome-nickel steel apparently still holds the first place among commercial steels for case-hardening of important parts, but it is the opinion that nickel-molybdenum steel will be a serious contender. At present they have a heat of approximately 100,000 lb. of nickel-molybdenum steel of the following analysis: Carbon 0.130, manganese 0.380, sulphur 0.022, phosphorus 0.020, nickel 1.580 and molybdenum 0.200 This material is being made into gears, knuckle-pins and the like. This steel should prove a serious contender with chrome-nickel steel for case-hardening purposes, because of its ability, in the hot-rolled condition, to harden in oil after carbonizing. This statement may not be wholly clear to some, but it is a fact that a piece of hot-rolled steel of a given composition after carbonizing will not harden in oil to the degree that a piece of the same composition will if first subjected to forging.

To summarize this portion of the subject briefly, our observations lead us to believe that, for carbonizing purposes, chrome-molybdenum steels should prove entirely satisfactory for parts in which hardness alone is the chief factor, but should be considered carefully before being used for important parts in which combined toughness and hardness are requisite, such as gears, steering-knuckle pins and the like.

The results thus far obtained with nickel-molybdenum steel are very satisfactory in every way when compared with chrome-nickel steel, with the added advantage of the greater hardness that can be obtained from an alloy-steel of the former type.

In a paper on "Continuous Die Rolling," G. R. Norton, works manager of Witherow Steel Co., showed what was being done along this line and compared the results with the usual method of upsetting to obtain a larger cross-section, as in automobile drive shafts. Photo micrographs of etched samples showed the even flow of metal and the freedom from distortion in the rolled section. These photographs were particularly interesting.

The drop forging practice paper presented by J. H. Nelson, of Wyman-Gordon Co., discussed the subject from the standpoint of the materials used and strongly advocated a more rigid inspection and testing of raw products to determine their fitness for use in making automatic forgings.

Seven specific possibilities of actual difference between drop-forgings that are apparently identical are stated, the requirements of the inspection of raw stock are commented upon, and the heat-treatment and testing of finished forgings are considered at some length.

Tabular data of the chemical analyses and physical properties of 107 different heats of carbon-steel used recently were presented and showed a variation in drawing temperatures of 140 deg. F. in steels of practically the same chemical composition to meet the same physical-property specification, based on more than 1,000 tests on this grade of steel taken from production stock. The concluding summary has five specific divisions.

(1) Steels of the same grade and of the same chemical composition do not respond in the same way to heat-treatment. (2) To heat-treat with minimum loss, only steels from the same melt should be included in a furnace charge. (3) Stock subjected to heat-treatment should be carefully segregated into piles of the same melt; it should be kept segregated throughout the entire process of fabrication to produce satisfactory forgings of uniform quality. (4) Tensile and hardness tests should be required on all heat-treated forgings to check the thoroughness with which the various heat-treatment operations were performed. (5) At least one hardness test should be made on all heat-treated forgings to insure that all have responded to the heat-treatment operations in the same manner.

The paper was discussed at length by both steel makers and users.

The last paper of the session was

by Prof. Enrique Touceda, on "Pertinent Facts Concerning Malleable-iron Castings."

A passenger car session was held on Friday morning at which the speakers were J. E. Schipper on "Passenger Car Brakes," S. Von Ammon on "Developing a Method for Testing Brake-Lining," and by August Trowbridge on "Photographic Recording of Engine Data."

The carnival took place on Wednesday evening and was a grand success. Entertainment to suit everybody no matter what his tastes, was supplied and apparently met with the entire approval of the members and their guests.

At the annual dinner on Thursday evening nearly a thousand diners met at the Hotel Astor to enjoy the food, regret the drought and listen to the wit of the toastmaster and the wisdom of the speeches. Charles F. Kettering was toastmaster and as usual mixed some direct shots of hard common sense with his scattering fire of witticisms and stories. Appropriate remarks were made by the retiring and newly-elected presidents. The speaker of the evening, Arthur R. Marsh, editor of *Economic World*, painted a picture of the general economic situation which was very realistic. He laid extra emphasis on the fact that in the long run the only thing that can be exchanged for goods is goods. This being true, we can expect little trade with Europe until her people are able to produce goods which they can exchange for ours. Purchasing power at home depends largely on the farmer and the success of his crops. If, as is now the case, he is asked to pay a price measured in terms of his product for the articles he wants, that is out of all proportion to the basis established before the war by decades of adjustment, then business must inevitably be slowed down. Measured in bushels of corn he now pays five times as much for shoes or clothing as he did in 1913. No wonder he does not buy and we have unemployment in the metropolitan districts.

Mr. Marsh concluded by calling attention to a very definite, if not a very prominent, improvement in the output and willingness to work of the European producers, and said that as this tendency grew, our credit and exchange difficulties would diminish and eventually prosperity would return.

Accessory Manufacturers Elect Officers

The Motor and Accessory Manufacturers' Association held a dinner in the Hotel Commodore, New York City, on Wednesday evening, Jan. 11. A large number of the members, who were in attendance at the Automobile Show, were present at the dinner.

On Thursday morning the members met in the associations rooms on 42d St., and re-elected three members on the board of directors, whose terms had expired. E. P. Hammond, C. E. Thompson and J. M. McComb were the men chosen.

Officers of the association are: E. H. Broadwell, president; W. O. Rutherford, first vice-president; A. W. Copland, second vice-president; H. L. Horning, third vice-president; L. M. Wainwright, treasurer; G. B. Griffin, secretary; N. L. Heminway, general manager.

Auto Show Brings Out Ninety-two Exhibits

Those who recall the early automobile shows in Madison Square Garden cannot fail to be impressed by the tremendous strides that have been made. Perhaps the fact that in the early shows there was a track on which the various makers could demonstrate that the cars would actually run, indicates the state of the business at that time as well as anything. Then too, we had not appreciated the value of safety and we incurred fire hazards which no one would dream of today.

There were ninety-two makes of cars exhibited at the 1922 show, a few of them new, but for the most part those with well known names. Launching new cars is a very different proposition than in former years. The competition of the year seems to be among the builders of small or medium six-cylinder cars and the growth of the closed body is very noticeable. Two makes, the Dort and Essex, show a low priced closed body much nearer the price of open bodies than anything heretofore built.

The following facts and figures, concerning the automobile industry, form a basis for probable business this year:

Automobiles registered in U. S. (approximately)	10,000,000
Motor cars	9,000,000
Motor trucks	1,000,000
Cars and trucks owned by farmers	3,000,000
Motor cars	2,850,000
Motor trucks	150,000
Farm products hauled by motor transport (tons)	134,400,000
Schools using motor bus transportation for children	12,000
Motor buses in operation	20,000
Organized public motor express lines	1,500
Cities having organized motor bus lines	600
Passengers carried annually by motor car	6,000,000,000
Freight hauled annually by motor truck (tons)	1,200,000,000
PRODUCTION IN 1921	
Cars and trucks	1,680,000
Decrease from 1920 production	24%
Cars	1,535,000
Trucks	145,000
Wholesale value of cars and trucks produced	$1,222,350,000
Decrease from 1920 wholesale value	45%
Wholesale value of motor cars produced	$1,088,100,000
Wholesale value of motor trucks produced	$134,250,000
Average wholesale price motor car 1921	$702
Average wholesale price motor car 1920	$897
Average wholesale price motor truck 1921	$968
Average wholesale price motor truck 1920	$1,273
Motor car factories in U. S.	105
Motor truck factories in U. S.	140
States in which factories are located	32
Employees engaged in car and truck manufacture	256,000
EXPORTS	
Value of motor vehicles and parts exported, including engines and tires	$102,945,610
Number of motor cars exported	$30,639
Value of motor cars exported	$33,712,208
Number of motor trucks exported	7,748
Value of motor trucks exported	11,457,616
Number of countries to which automobiles were exported during year	114
DEALERS AND GARAGES IN U. S.	
Passenger car dealers	38,216
Motor truck dealers	24,488
Garages	59,093
Repair shops	55,521

While only two air-cooled cars were in the show itself, another was shown at the Hotel Commodore and a fourth at a local showroom. The Stanley steamer was alone in its class in the show, but had a rival at the Commodore.

One car, the Bournonville, was equipped with a rotary valve motor, this type of valve proving periodically attractive to designers but never as yet surviving the test of time. A section of the Franklin case-hardened crankshaft, fractured purposely to show the depth of the case and the soft center, attracted attention. There seemed to be fewer novelties among the accessories, although the problem of preventing theft has received wide attention.

Machine tools and supplies were well represented; Heald had a new piston ring grinding machine; Landis a cylinder grinding machine; Norton a crankshaft grinding machine; Van Norman, piston grinding machines; South Bend Lathe Works, several lathes and attachments, and the Vibration Specialty Co., a new balancing machine. Among other exhibitors in this section were the American Non-Ferros Metal Corporation, Wallace Barnes Co., Bassick Manufacturing, Champion Pneumatic Machinery Co., Clark Equipment Co., Eclipse Machine Co., Millers Falls Co., Morse Chain Co., Veeder Manufacturing Co., and Wyman-Gordon Co.

Fords To Bid for Lincoln Plant

The receivership for the Lincoln Motor Co., Detroit, Mich., has caused much comment, so that the plan of Henry and Edsel Ford to bid for the plant at the auction of Feb. 4 is of special interest to all in the automotive field. Whether the Ford interests really want the Lincoln plant may be open to question, although all who know of the Ford faculty for producing automobiles at low cost realize that they would make a distinct mark in the high-grade field. At any rate they will force others to pay somewhere near what the plant is worth instead of allowing it to be bought in far below its value. As the court placed a low value of $8,000,000, the bids must at least equal this. Rumor has it that Ford will bid as high as $11,000,000 if necessary.

The old company will be dissolved and the new Lincoln Motor Corporation formed, retaining the Lelands in the management. Every effort will be made to work out a plan to reimburse those who had actually invested cash in the company. The sale will be awaited with interest.

Move To Continue Screw Thread Commission

In recommending to the House of Representatives that it extend the term of the National Screw Thread Commission for a period of five years from March 21, 1922, the Committee on Coinage, Weights and Measures states that "there would seem to be no good reason why the commission should not be authorized to continue its work for the period suggested. There is no division of opinion in the committee."

Representative Vestal, of Indiana, chairman of the committee, in his report to the House, states that the commission "can perform a very important additional work by establishing standards for certain special screw threads—for instance, such as are used in pipes and couplings. Another important work proposed for the commission is that of establishing suitable standards of sizes and shapes for bolt heads and also for standardizing the gages of wire and rods used in the manufacture of screws."

German Machine Tool Industry at the End of 1921

By OUR BERLIN CORRESPONDENT

The year just completed has been for the German machine building industry an eventful time, unparalleled in its history, with the exception perhaps of the year 1919. Like in 1919, business moved in a steep line and jumped suddenly from deep depression to a period of activity which, if it is not a boom, bears a close resemblance to one. The shifting of the scenes from utter dullness to business of great briskness has been so sudden that the industry has been taken entirely unawares, plunging it into considerable confusion. The effects are already becoming noticeable and are threatening to cut short the life of the present boom before it has had time to come into full swing. Manufacturers were reluctant to lay in stock during the time of business depression, and the iron mills reduced their output. The inevitable result was that raw material became scarce when business revived, and the production was unable to cope with the rush of the demand.

It appears that very little has been done since the war by the iron works to follow the fluctuations of the market. The small reserves of material were soon exhausted. The output of raw material being entirely unequal to the present consumption, conditions are getting worse every day, and have already reached such a state of stringency that a number of shops have been forced to reduce working time. As a consequence, the re-establishment of maximum prices and the rationing of raw material are under contemplation. The serious aspect which the coal situation is taking at the same time, puts a limit to the capacity of the iron works, and leaves no hope that conditions can be improved no matter how severe the pressure grows. This is not the only item which makes the present boom appear to be short-lived. In fact, people in a position to view the whole situation have frequently warned the country against illusions in this respect, saying that the crest of the wave can break any day, and declaring the present boom to be a *valuta* boom solely, and no real one. A very serious argument put forward by the skeptics with regard to the duration of the boom is the fact that it is based only in a small degree upon the export market and chiefly upon the domestic market, and that the reigning spirit of the latter is not a serious demand but mainly speculation. As a matter of fact the ratio between the mark and the dollar has become the ruling factor in Germany's economical life. Business expands and contracts almost in the same proportion and nearly as quickly as this ratio changes. Not better can the instability of the present boom and the unsoundness of the whole business situation be characterized than by the fact that the depreciation of the money has become the only stimulant of business.

A gigantic battle has been waged, under the surface, during the last months between the government and the exporting industries for the proceeds of exports, carrying in its train all the various issues and questions which the industries want to be settled in their favor before listening to the claims of the government. It is characteristic of the relation of strength prevailing between both parties that the government has not attempted to enforce those claims. On the other hand, it was unable to accede to the counter-claims of the industry, which fill a whole list of demands like the private ownersship of railroads, revised taxation policy, and the abandonment of socialization schemes. At present, industry can be said to occupy a certain control over the government. Not content with this position, it strives to assume complete control by making use of the upper hand, which it no doubt has, as the sole supplier of the gold money required by the government. At present a truce has been reached between the two parties, in view of the exceedingly serious financial situation of the country, but there can be no doubt the strife will be resumed as soon as conditions permit it. As an effect of this truce, the industrial organizations which appear to be pulled more or less by the same strings, have come to the rescue of the government by deciding to deliver to the government part of the export proceeds. This was lately decided upon in an extraordinary meeting of the German machine builders, which proclaimed the willingness of this industry to surrender 25 per cent of the values of its export returns to the government. For the present this must be considered the limit of the help the industry is lending the government.

Although the buying wave came with a rush right after the breakdown of the German money market, it did not sweep over all parts of the industry with equal force. A marked differentiation could be noted in various branches of industry. The rise of the demand was not general but specific, with regard to quality and types of goods. This is especially true of the machine building industry. The machine tool building industry, for instance, was late to profit from the revival of business. As late as October the majority of the works complained of insufficient business, although such complaints should not be taken too literally, as the machine tool people still remember too vividly the bonanza times of the war years and the boom of 1919, and, having increased the capacity of their works, they are somewhat spoiled. But it is a fact that until September the tools in stock gave little sign of diminishing, nor was there any material change noticeable with regard to delivery times quoted. This change took place during October, and chiefly in November. In the course of these two months quotations from stock have almost ceased, and delivery times, which varied from four to twelve weeks, have been considerably extended. Several of the leading firms have in fact sold out their production until May and June of 1922. The official labor statistics provide a striking illustration of the sudden change which took place. While in August only 45 per cent of the workmen employed in the machine building industry were working full shifts, this percentage was 99.1 per cent at the beginning of December.

Prices have risen quickly in proportion to the increased demand. The Association of German Machine Tool Builders has recently fixed as a minimum a sale price thirty times the pre-war price, or 30 m. per kilogram, the pre-war price averaging 1 m per kilogram. The price policy of the German machine building industry, including the machine tool industry, has recently been laid down at an extraordinary meeting of the Association of German Machine Builders, by Dr. Doehne, president of the Hartmann Machine Building Works in Chemnity, one of the largest German machine tool building concerns. The principle of this policy, Dr. Doehne says, is to base the domestic prices upon the actual manufacturing cost, and to keep the latter as low down as possible. For exports, the price is to be adjusted according to foreign competition, quite independent of domestic prices. It will, he says, be impossible to carry this out strictly, as the "hole in the West" (meaning the occupied territory) has not yet been closed effectively, and as frontier conditions in the East are by no means settled. The foreign competition aiming at ousting German industry from export markets has further to be taken into consideration. Dr. Doehne believes that in certain "high exchange" countries no more than the German pre-war price in gold can be obtained, while in others there is a wider margin. With regard to countries of "low exchange," it has been decided to sell at prices lower than foreign prices, but in every case higher than domestic prices, providing that guarantees are given that such machines will not find their way into countries of high exchange. If the German exchange improves it will make the manufacturer a loser, and for this reason the State Bank, it is declared, will have to arrange to guarantee against such losses, and a large part of the purchase price will have to be paid in advance.

In conjunction with the prices of new machinery, a general rise of prices took place also on the second-hand market. This rise has been further stimulated by the recent considerable increase of scrap prices. For machine tools little better than scrap, prices from 6 to 8 m per kilogram are paid, and in the case of still serviceable tools 15 m and even 20 m per kilogram.

It will be remembered that the German industry has during the last twelve months or more accumulated enormous sums by way of increase of capital, which was not in all cases due to actual needs. These investments, in which a large part of the population participated, as the fever of speculation has swept the whole country, amounted in the average to two billion marks per month. In the first ten months of

1921 over three billion marks face value were invested in new stock companies; eleven billion marks in increased capital; and nearly five billion marks in preferred capital. The total is, however, much higher, as all these sums have been issued considerably above par. In October alone eighteen new stock companies have been formed in the machine building industry, and forty-seven existing companies have raised their capital by three hundred and fourteen million marks. It was somewhat of a surprise that these huge sums did not find an outlet on the market sooner; the explanation is that they were kept back in the expectation of lower prices. When the reverse took place, and depreciation of the currency carried prices upward and the capital reserves were turned loose on the market.

The chief markets of machine tool exports are Belgium, France, Holland, Austria, Czeko-Slovakia and South America. Next to these are Switzerland, Spain and Italy, while France bought from Germany over 6,000 tons of machine tools monthly, Belgium even more, Great Britain took an average of 1,000 tons per month.

In view of the new reparations question, every rumor has an immediate effect on the money market, and through the latter on the industrial market. It is difficult to get a clear view of developments, even of the near future. The fact that the industrial organizations are shaping their policy to a low exchange of the mark indicates that those circles which, in cooperation with the banking institutions, have the money market well under control, believe in a prolonged duration of the present money depreciation. In fact it may be said that the whole of German industry, with the enormous following it has in its millions of stockholders, is viewing a possible improvement of the mark, as the result of revised reparations duties, with decided disfavor. German manufacturers have so far succeeded in keeping the workmen quiet by giving them a part, but never the whole, of their increased profits, by way of higher wages. At the present time wages paid in the machine tool shops are approximately 100 per cent higher than they were a year ago.

Approximately, the wages of hand workers have now risen to twenty times the pre-war standard, and the remuneration of clerical workers to from ten to fifteen times. It is true that in Germany the purchasing power of the mark is considerably higher than in foreign countries, but the ratio between pre-war and present wages is still in disfavor of the working classes. If a reverse movement of the exchange sets in, it will hardly be possible to screw the wages down at once. The real difficulty will commence when wages are forced to follow the retrograde movement of the exchange.

Nothing, or very little, has been done in Germany since the outbreak of the war with regard to higher economy of production. The work then in progress, following the lead of the United States, has been interrupted by the war and has never been resumed. A severe awakening to this fact has recently been caused by Director Hugo, one of the leading men in German industry, who has publicly stated that according to the testimony of German engineers who recently visited the United States, German manufacturing methods have fallen far behind those of America. In the case of a decided improvement of the mark, he declared, if only to ten or fifteen times below par value, German industry has no chance to compete against American industry. A similar but more explicit statement, headed "The Downfall of German Industrial Science," was prepared by one of the directors of the A. E. G. Electric Co., and submitted to the government. This statement has never been made public, but it is known that it dealt rather sharply with the indolence and assuredness of German engineers with regard to their methods of production. Eminent economists argue that the prevailing laxity in the shops is a consequence of a superabundance of profits, and that nothing short of the force of necessity, even culminating in a severe crisis, can again put the industry abreast of times.

As the German industry is unable to cope with different exchange conditions, and its present activity is solely based on the currency depreciation, and for this reason is dependent on the situation of the money market, the outlook for the coming year is a matter of the merest speculation. The only solid foundation which offers itself to the outlook is the agreement reached between Germany and France with regard to paying the reparations in goods. This promises to keep industry employed to a certain degree, together with the possibilities which appear to arise with regard to the rebuilding of Russia. As far as the home market is concerned, there is little illusion as to the probability of the present boom collapsing as quickly as it sprang up.

Business Items

The Black & Decker Manufacturing Co., builder of portable electric tools, of Baltimore, Md., announces that effective Jan. 3, it will make a freight allowance on shipments of 100 lb. or over to points in the United States and Canada. This will make it possible for all jobbers to sell Black & Decker goods in the United States and Canada without adding anything to the price to cover freight.

The Earl J. Bullard Manufacturing Co., with main offices at 219-220 Washington Bldg., Madison, Wis., has been organized and incorporated to manufacture and sell mechanical accessories, machine tools and appliances. E. J. Bullard, president of the new company, was recently granted a patent on a new piston ring, which the company will start manufacturing at once.

The Circle Supply and Machinery Co., a new wholesale establishment dealing in automobiles and machinery opened on Jan. 1 at 335 Decatur St. New Orleans, La. Motley Lewis, for the past ten years treasurer of the A. M. Lockett Co., dealers in machinery in that city, is president of the new concern; A. O. Levert, a large sugar planter of Levert, La., is vice-president, and W. S. Austin is consulting engineer.

Salesmen for the Black and Decker Manufacturing Co., Baltimore, Md., recently ended a sales conference held at the main office of the plant and which continued for a week. In addition to sessions at which business was discussed there also was a program of amusement. About fifty managers and salesmen from all sections of the United States and Canada attended.

It has been definitely announced that the Great Southern Steel Corporation, incorporated a few weeks ago with $105,000,000 capital under the Delaware laws, will shortly start the development of its coal and iron ore properties in the Alabama district, and begin immediate construction of a $500,000 steel plant near Birmingham. Permission to operate in Alabama was obtained a few days ago. During the past several months the corporation has acquired approximately 100,000 acres of coal and ore lands in Alabama.

The Lackawana Bridge Works Co. has purchased the plant and equipment of the Ferguson Steel and Iron Corporation at Buffalo, N. Y. The Lackawana Bridge Works Co., is a subsidiary of the Lackawana Steel Co., with a plant at Buffalo. This announcement was made by R. H. Kellog, secretary of the two companies.

B. Freidus & Co., of Boston, Mass., has opened offices at 1303 Columbus Ave., Boston. The company deals in new and used machinery and electrical apparatus.

The plant of the Davis-Price Foundry Machine Co., at New Cumberland, Ohio, has been sold to the Resistant Alloy Steel Castings Co., and will be opened this month. H. S. Ginger is superintendent of the factory.

The Canton Forge and Axle Co., has been incorporated at Canton, Ohio. Organization has been completed with F. C. Moore, president; H. C. Holloway, secretary; T. F. Dupuy, general manager. F. A. Poor, of Chicago, is chairman of the board of directors. The company will occupy the old plant of the Standard Parts Co., which it recently purchased.

P. & F. Corbin Co., of New Britain, Conn., has purchased from the New Britain Machine Co., the building in that city which was erected by the U. S. Government during the war for the manufacture of gun carriages. The plant will be equipped to manufacture hardware.

The Hart & Hutchinson Co., New Britain, Conn., has sold its land and buildings to the Hart & Cooley Co., but will continue to occupy the premises on a rental basis.

The Exeter Machine Works, Inc., of West Pittston, Pa., has appointed the Allen Engineering Co., of Boston, Mass., as its sales agent in the Boston district. The Exeter company manufactures a line of hoisting and structural machinery, cranes and mill equipment.

The Reed-Prentice Co., and associate companies the Becker Milling Machine Co., and the Whitcomb-Blaisdell Machine Tool Co., announce the removal of their New York office under the direction of P. K. Dayton, from the Grand Central Palace to Room 536, Singer Building, 149 Broadway.

The W. S. Rockwell Co., 50 Church St., New York City, has appointed Gibbons Bros., Ltd., Dudley, Worcester, England, as its sole agent in the British Isles.

The McCabe & Sheeran Machinery Corporation has been organized in New York City with offices at 149 Broadway. Mr. McCabe was formerly vice-president and manager of the McCabe Lathe and Machinery Corporation; Mr. Sheeran was treasurer and sales manager of the same company.

Salesmen of the Oliver Machinery Co., Grand Rapids, Mich., held a two-day convention at the home plant on Jan. 5 and 6. The time was spent in studying and analyzing the selling points of the latest types of machines.

W. H. Smith & Sons Co., planing mill operator, is rebuilding its plant at Johnson, Pa., which was recently destroyed by fire. New machinery in the form of mortising machines, bandsaws, planers, belt sanders, lathes and grinding machines will be installed.

Berggreen & McConnell, industrial engineers, has been organized by Paul H. Berggreen and Henry I. McConnell. The company has offices in the Oliver Bldg., Pittsburgh, Pa., and will specialize in valuation and examination of industrial plants and engineering enterprises.

Personals

O. D. WHARTON has resigned as vice-president and general sales manager of the Crucible Steel Co. of America.

O. M. RAU, formerly consulting engineer with the Philadelphia Rapid Transit Co., has become associated with the Hardinge Company, Inc., of New York City. He will specialize in the building of Quigley pulverized fuel systems.

WARREN D. BLATZ has been made general sales manager of the entire plants of the Bridgeport Brass Co., manufacturer of brass goods, etc., Bridgeport, Conn.

W. O. RENKIN has become associated with the Hardinge Company, Inc., of New York City. He will be managing engineer of the Quigley pulverized fuel department.

E. A. SHRINER has been appointed manager of the Motch & Merryweather Co. branch office in the First National Bank Bldg., Cincinnati, Ohio.

ROY MCNAMARA, road engineer and automotive expert, has joined the staff of the Rickenbacker Motor Co., as experimental engineer. Mr. McNamara was formerly engineer with the Maxwell-Chalmers Co.

CLAUDE SAUREDDE, designing engineer, has joined the staff of the Maxwell-Chalmers Co., of Detroit, Mich.

A. S. FETTERMAN has resigned as manager of the Averill Machinery Co., Spokane, Wash. He will be succeeded by E. W. Jones. Mr. Fetterman will become head of the Spokane Manufacturing Co.

JAMES L. BRIERTON, who has been in charge of all Southern properties of the Central Iron and Coal Co., with headquarters at Holt, Ala., has been named vice-president of the company. He will remain in charge of Southern operations. ROBERT A. ALLISON, who for many years has been treasurer of the company, has been named assistant manager of the southern properties and will also have headquarters at Holt. The company has extensive interests in the Alabama district, including a blast furnace and pipe shops at Holt.

C. W. HART, president and one of the two founders of the Hart-Parr Co., sustained the loss of all the buildings and equipment on his large wheat ranch near Hedgesville, Montana, recently.

JOHN T. CHIDSEY, president of the C. J. Root Co., Bristol, Conn., manufacturer of hardware and automatic numbering machines, has been appointed on a committee of the Connecticut Chamber of Commerce to make a complete survey of the freight transportation situation in Connecticut, and to suggest proper adjustment between the railroad, motor truck and other transportation means.

H. C. DORUS has been appointed assistant superintendent of the foundry division of the Yale & Towne Manufacturing Co. Stamford, Conn. He will have charge of the foundries, pattern shop plant, the core department and the cutting-off rooms.

W. M. TAYLOR has recently been appointed assistant superintendent of the mechanical equipment department, of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Taylor will have immediate charge of the tool and machine shops of the company.

PAUL K. ROGERS, secretary-treasurer of the Skinner Chuck Co., New Britain, Conn., has been appointed on a committee to make a survey of the freight transportation situation in Connecticut, for the Connecticut Chamber of Commerce.

WILSON S. PORTER, has recently been appointed manager of the Chicago sales office of the Locomobile Company of America, Bridgeport, Conn. Mr. Poerter, was formerly with the Wills-Saint Clair Motor Co.

BARNEY G. ROSS, has returned to the Locomobile Company of America, Bridgeport, Conn., as chief engineer. Mr. Roos was with the Locomobile Company for eight years prior to May, 1920, when he left the company to go with the Timken Axle Co., and in April, 1921, he left there to go with the Pierce-Arrow Motor Co., Buffalo, N. Y., as chief engineer.

E. A. TRAVIS, who has had charge of the New York sales branch of the Locomobile Company of America, Bridgeport, Conn., has returned to the factory and home office in Bridgeport, Conn., as general sales manager.

CLINTON B. AMOROUS, formerly with the Daniels Motor Car Co., has been made sales manager of the New England territory for the Locomobile Company of America, Bridgeport, Conn. Mr. Amorous, will make his headquarters at Boston, Mass.

P. C. RICHTER, superintendent of several departments of the Yale & Towne Manufacturing Co., Stamford, Conn., will also have charge of the industrial electric trucks department and the door closer and hoist departments of the company. The two latter departments have just recently been consolidated.

G. E. OAKLEY, who has been assistant sales manager of the fabricating department of the Bridgeport Brass Co., manufacturer of brass goods, etc., Bridgeport, Conn., has just been chosen sales manager of that division.

G. A. BINZ has been promoted to sales manager of the American Steam Gage and Valve Manufacturing Co., Boston, Mass.

H. S. BENSON has left the employ of the Industrial Company of Boston, Mass., and has purchased the A. T. Thompson Co., manufacturer of optical projection apparatus, Boston, Mass.

THOMAS J. FITZGERALD, in partnership with his brother, M. V. Fitzgerald, has formed the Fitzgerald Forging and Heat Treating Co., Springfield, Mass. Mr. Fitzgerald was formerly vice-president and works manager of the Sturdi Truck Manufacturing Co., Holyoke, Mass.

CHARLES H. KNOWLTON, previously assistant supervisor of air brakes for the C. C. C. & St. L. Ry., has entered the service department of the Simmons-Boardman Publishing Co., New York, N. Y.

H. W. CROSS, formerly district turbine specialist with the General Electric Co., Chicago, Ill., is now with the C. H. Wheeler Manufacturing Co. of Boston, Mass., as district manager.

CHARLES W. STEPHEN, formerly with Pratt & Cady Co., Hartford, Conn., is now employed by the American Chain Co., Inc., Bridgeport, Conn.

Obituary

ROBERT LEWIS, fifty-seven years old, assistant mechanical engineer of the Ohio works of the Carnegie Steel Co., died at Youngsville, Ohio, on Jan. 6, from burns received at the plant.

THOMAS P. EGAN, president of the J. A. Fay & Egan Co., manufacturers of woodworking machinery, died in Cincinnati, Ohio, on Jan. 10. He was seventy-four years old. Mr. Egan was a pioneer in the building of woodworking machinery and was prominent in the trade associations in that field. He was one of the organizers of the National Association of Manufactures and of the Manufacturers Club of Cincinnati.

ROLLIN J. PLUMB, president and director of the Eagle Lock Co., lock and hardware manufacturer, Terryville, Conn., died at his home in Terryville, on Jan. 5, from heart failure. Mr. Plumb was fifty-eight years of age, and had been at the head of the Eagle Lock Co., for over twenty-five years. He was also identified with other manufacturing concerns in Connecticut, among them being the Graham Manufacturing Co., of Derby, Conn., and the Norwalk Lock Co., of South Norwalk, Conn.

AUGUSTUS BOYD, age seventy-three, of Columbus, Ind., died recently in that city. Mr. Boyd became a partner in the Columbus Machine Works seventeen years ago, and since that time had been prominent in business.

Forthcoming Meetings

United Engineering Societies: Annual meeting Jan. 26, Engineering Societies Building, New York City. A. D. Flinn, secretary.

National Association of Manufacturers: Special convention on tariff legislation, Jan. 30 and 31, New Willard Hotel, Washington, D. C. G. S. Boudinot, 50 Church St., New York City, is secretary.

American Boiler Manufacturers' Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary. 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

Export Combine for Automobile Industry—Denby Preaches Optimism

An export combine involving 130 companies which do a domestic business of over one billion dollars annually, was considered by the automobile makers at the Export Manager's Convention of the National Automobile Chamber of Commerce held in New York City on Jan. 10.

The combine, as proposed by G. F. Bauer, secretary of the N. A. C. C. Foreign Trade Committee, would enlarge credit resources and lower the overhead cost of foreign trade in cars and trucks.

The credit of the export combine would be greater than any single company or group. It could investigate the financial rating of foreign buyers at small cost to each individual company. Its resources would permit extending credit to foreign markets on a basis competitive with foreign countries.

Combination would mean much lowered cost per company in documentation, stenographic and translation work, packing offices, ocean insurance, financing and research work. Parts and repair stations could be established abroad on a scale which would be virtually impossible under individual competition.

It is proposed to reduce the cost of the normal competitive function of selling by grouping the participating members in non-competitive classes. That is, each group could contain several automobile companies operating in different price classes which could have one central selling agency, just as in this country a dealer often handles several different makes in different price groups.

Gordon Lee, chief of the automotive division of the Department of Commerce, gave an account of the prompt and practical reports which are now being secured by consuls in the foreign field.

Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, outlined a program for road promotion abroad. Further discussion on roads was led by S. T. Henry of the Allied Machinery Corporation.

Charles S. Wall, executive secretary of the National City Company, spoke on the use of bank acceptances in foreign trade.

Declaring that Washington sees the daylight of better business conditions and that a strong navy is the insurance policy of America. Secretary of the Navy Denby sounded a note of optimism and made a stirring presentation of the value of the naval forces, at the annual banquet held in the Hotel Commodore in the evening.

Eight hundred executives of automobile factories gathered to greet the Secretary at the largest dinner of manufacturers held in the annals of the industry. As Charles Clifton, president of the N. A. C. C. and toastmaster of the evening, introduced the Secretary, bugles sounded the regular navy call, the orchestra played the Star Spangled Banner, the American flag was raised at one end of the room and the Secretary of the Navy's flag at the other end, together with flags of the Navy giving the code for "welcome."

"It is a matter of tremendous pride," said Secretary Denby, "to you and to me to think that through this terrible depression through which our country has been going, the automobile industry has more than won its way and held its own, and now I think we begin to see daylight. That is what we think in Washington, and that is what I think you think."

Irvin S. Cobb was the other speaker of the evening, taking for his topic, "Gasoline, the New National Drink."

Names of automobile makers who received the annual decorations of the industry are as follows: C. H. Wills, president, C. H. Wills & Co.; Howard C. Marmon, president, Nordyke & Marmon Co.; George M. Graham, vice-president, Chandler Motor Car Co., Edward S. Jordan, president, Jordan Motor Car Co.; A. R. Erskine, president, Studebaker Corporation.

The Trend of Business Improvement—Plants Resuming

The Advance Stove Works, Evansville, Ind., is arranging for the immediate resumption of operations at its plant, giving employment to about seventy-five men. The plant has been closed for some time past.

The Pierce Arrow Motor Car Co., Buffalo, N. Y., has increased operations to the extent of giving employment to about 3,200 men, as compared with 1,800 operatives a few months ago.

The Southern Railroad Co. has increased the working force at its shops at Princeton, Ind., to approximately 270 men, or well over one-half of normal. Approximately seventy men have been added to the force during the past few weeks.

The Slatington Iron and Steel Co., Slatington, Pa., is arranging for the early resumption of production at its mill, following a shut down for a number of months past. Robert Grant, Woolworth Building, New York, heads the company.

The Milton Manufacturing Co., Milton, Pa., manufacturer of nuts, etc., has resumed operations at its electric steel department, following a shut down of a number of months.

The Southern Stove Works, Evansville, Ind., is arranging for immediate resumption of production at its plant, following a short shut down primarily for inventory purposes.

The Shaw Crane Co., Muskegon, Mich., is increasing the working force at its plant by about 60 per cent.

The Texas and Pacific Railroad Co. has resumed operations at its shops at Marshall, Tex., following a shut down of several months.

The Freeland Bobbin Works, Freeland, Pa., manufacturer of textile equipment, is arranging for the early resumption of operations, following a shut down of a number of months.

The Crescent Stove Works, Evansville, Ind., is preparing for the resumption of operations at its plant. A working force of about 110 men will be employed.

The Ford Motor Co., Detroit, Mich., has resumed operations in all departments of its local plant, following a curtailment since Dec. 21, for inventory. Work will also be resumed at an early date at the Kearney, N. J., assembling plant of the company.

The Richardson & Boynton Co., Dover, N. J., manufacturer of stoves, ranges, etc., has re-opened its plant under a reduced wage schedule.

The Continental Motors Corporation, Muskegon, Mich., manufacturer of automobile engines, is increasing the working force at its plant for greater production.

The Boston & Albany Railroad Co., Boston, Mass., has resumed operations at its shops at West Springfield, Mass., following a shutdown of about two weeks. Employment will be given to about 400 men.

The Buick Motor Co., Flint, Mich., manufacturer of automobiles, resumed operations at its plant on Jan. 9, under a full time schedule, following a shutdown since Dec. 23, primarily for inventory.

The Chicago Bridge & Iron Works, Chicago, Ill., has added a night shift to the working force at its Greenville, Pa., plant. Work is being concentrated on steel fabrication for tank manufacture.

The United States Gas Machine and Pattern Co., Muskegon, Mich., has increased the working force at its plant about 50 per cent.

The International Harvester Co., Chicago, Ill., is adding machinists at its plant at Akron, Ohio, and is also increasing the working force in other departments. It is proposed to adopt an operating schedule of close to fifty farm tractors a day at an early date.

The Chesapeake & Ohio Railroad Co., has resumed operations at its shops at Huntington, W. Va., giving employment to about 1,200 men. The plant was closed on Dec. 17, and has been idle since that time.

The Pullman Co., Chicago, Ill., is increasing the working force at its car works at Wilmington, Del., taking back a number of men recently laid off. About 600 men are being employed on full time.

The United States Steel Products Co., a subsidiary of the United States Steel Corporation, has taken an order for about 13,000 tons of steel rails for the Japanese government. The manufacture will be carried out at the plant of the Tennessee Coal and Iron Co., a subsidiary, at Ensley, Ala.

The Chicago, Burlington & Quincy Railroad Co., Chicago, Ill., will purchase about 7,300 new freight cars and 127 passenger cars, estimated to cost about $15,000,000. This amount has been appropriated for the rolling stock.

Expect Tariff Legislation This Month

Unquestionably an earnest effort is being made by the Finance Committee of the Senate to report out the tariff bill at the earliest moment. Some of the Republican leaders, however, continue to be of the opinion that this is no time to attempt a permanent revision of the tariff and prefer to see the bill delayed still further.

The probabilities seem to be that the committee will be allowed to have its way and it will report out a bill before the end of January. While it is known that there will be material changes in the House bill, including a material reduction in the level of most rates, no definite information as to the plans has gone out from the committee. The committee is supporting American valuation, but it is very apparent that it is beset with uncertainties as to the practical application of that plan.

NEW and ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Cal., San Diego — The Coburn Machine Co., 2nd and G Sts.—one 16 in. tool lathe.

Conn., Meriden—C. E. Miller, 27 Pleasant St.—one small lathe, (used).

Ill., Chicago—The Streets Co., West 48th and South Morgan Sts.—

One single end punch 60 in. throat with triple gag socket 1 x 1 and motor for punching steel car floor and side sheets.

One single end multiple punch with sufficient depth throat and hand operated spacing table and provided with gag sockets for punching of long angles, cover plates, etc., and motor.

One horizontal punch and motor 15 in. throat capacity 1 x 1 for punching miscellaneous parts and odd shapes.

One heavy duty punch and shear and motor, capacity 2½ x 1⅛ provided with coping tool for punching, shearing and slotting heavy channel sections, etc.

Two single end punches and motors provided with triple gag sockets 15 in throat capacity 1¼ x 1 for punching "I" beams, channels, etc.

One multiple punch and motor, capacity 600 ton, two row punching outfit with adjustable bolsters or punch holders, 12 ft. 6 in. length of ram, 10 ft. 2 in. between housings.

One double end punch and shear and motor, 24 in. throat to punch 1¼ in. hole in 1 in. thick material and for shearing long flats and rounds, 2 in. diameter and 6 x 1 in. flats, shear blades placed lengthwise of machine.

One single end punch and shear and motor 48 in. throat to punch 2 in. hole in 1 in. thick material and for shearing 2½ in. rounds and 8 x 1 in. flat bars, shear blades placed lengthwise of machine.

One heavy bulldozer and motor sufficient capacity to form diaphragms and other parts of heavy car material, capacity approximately 300 ton last one inch of stroke.

One bulldozer and motor, face of cross head approximately 16 in. x 70 in. capacity, 390,000 lb. developed last one inch of stroke.

One 300 ton hydraulic press complete with pump, accumulator etc.

One heavy duty drill press and motor for drilling heavy material, capacity approximately 2½ in. to 3 in. hole.

One 16 in. engine lathe and motor approximately 8 to 10 ft. long.

Two double end car axle lathes and motors to take a 6 x 11 in. A. R. A. axle.

One 300 ton car wheel and axle, press and motor to take a 6 in. x 11 in. A. R. A. axle.

Two emery wheel stands and motors suitable for universal grinding.

Two single head or single spindle drill presses and motors to drill all sizes of holes up to 2 in. in diameter, inclusive.

One 4 spindle drill press and motor to drill all sizes of holes up to 2 in. in diameter, inclusive, also suitable for drilling arch bars.

One 12 ft. x ⅜ in. bending brake and motor for flanging steel car floor plates, end plates, etc.

One eye bender and motor to take stock, 1½ in. diameter bent hot around a 2½ in. mandrel.

One 1,500 lb. steam hammer.

One automatic hack saw and motor to cut all sizes of material up to 7 in. x 8 in.

One 10 ton electric overhead traveling crane with magnet, 50 ft. long center to center of crane rails to runway over stripping tracks.

Two overhead electric traveling cranes 10 ton capacity, 90 ft. long center to center of crane rails.

One plate shear and motor for shearing and squaring plates used in steel car construction approximately ⅜ x 144 in.

One 3 in. single head threading machine and motor including dies for bolts and pipe and taps from 1 in. to 3 in. both inclusive.

Two 2 in. triple head bolt cutters and motors including necessary pumps and dies to cut all sizes of bolts from ⅝ in. to 2 in. both inclusive.

One 2 in. 6-spindle nut tapper and motor including pumps and taps from ½ in. to 2 in. both inclusive.

One large blower and motor sufficient to take care of 6 blacksmith fires.

One 2½ in. upsetting or forging machine and motor.

Two bolt headers and motors, one ⅝ in. and one 1½ in.

One medium size engine shaper and motor for handling tools used in steel car work.

One Alligator shear for scrap dock for shearing scrap metal parts, approximately 8 x 1½ in. flats and 3 in. rounds.

One grindstone standard size and motor.

Two 200 lb. Bradley Helve hammers and motors.

Ill., Galesburg—Meyer & Foley Co.—one 14 in. or 16 in. geared crank shaper, (used if in good condition).

Ind., Indianapolis — The Indianapolis & Cincinnati Traction Co., Germania Bldg., C. Henry, Pres.—machine shop machinery, tools, drill, presses and lathes, anvils, trip hammers and wheel presses for proposed machine shop at Cincinnati, O.

Ind., Wabash—The Service Motor Truck Co.—four gear hobbing machines for spur and spiral gears, 2 in. to 15 in. diameter; four 20 in. Bevel gear planners; six National automatic Acme screw machines; three plain grinders; five cylinder grinders and six crankshaft grinders.

Mass., Easthampton—The Easthampton Motors Co., 46 Union St.—one 20 in. upright drill, Barnes preferred (used).

N. Y., Buffalo—F. Albig, 681 Sycamore St.—tin-smith machinery.

N. Y., New York—H. W. Johns-Manville Co., Madison Ave. and 41st St.—two sensitive drills, two emery grinders, two 20 in. upright drills, one No. 1 universal grinder, one 60 in. knife grinder one 20 in. shaper, one pipe machine, one 30 in. open side planer and one 9 in. hack saw.

N. Y., New York—The Manhattan Wire Frame Co., 398 1st Ave.—two welding machines.

N. C., Greensboro—The Greensboro Supply Co.—air compressor, punches and shears.

N. C., Wilmington—Carters Production Wks. 210 South Water St., O. Carter, Purch. Agt.—one 20 in. floor type lever feed press. (send specifications, price and cut, if possible).

N. C., North Wilkesboro—The New William Mill Co., B. L. Johnson, Purch Agt.—one lock corner machine for cutting ⅜ in. lumber ¾ in. thick, 6 to 10 in. wide, (new or used), also a machine for making wire shapes.

O., Cleveland—The Engineering Construction Co., 778 The Arcade—one large air compressor.

O. Columbus—J. W. Brazier Buttles and Factory Sts.—metal working machinery.

O., Columbus—The Central Machine & Tool Co., 208 East Rich St., C. Haydon, Mgr.—machine tools including lathe, grinder and press.

O., Columbus—The Fisher Box Co., 1629 McKinley Ave., O. M. Fisher, owner, wood working machinery.

O., Columbus—The Mathews Lumber & Mfg. Co., 500 South Central Ave., W. A. Mathews, Pres.—woodworking machinery including saws, planers, etc.

Ore., Enterprise—H. E. Walker, P. O. Box 342—catalogues for mining machinery and sawmill.

Pa., Harrisburg—The Harrisburg Machine & Electric Welding Co., 18th and Chestnut Sts., A. A. Hayward, Mgr.—several electric welding machines and grinding machine for grinding engine cylinders.

Pa., Phila.—The Morice Twine Mills, 84 Tasker St., J. H. Morice, Pres.—comber, shuttles and general machinery for twine factory.

Pa., Pittsburgh—T. J. Ward, 333 Carson St.—woodworking lathe with motor, small drill press, woodworking tools and emery wheel (used).

S. D., Brookings—The South Dakota State College, Dept. of Civil Engineering, D. L. Snader, C. E. M. S.—one concrete beam testing machine of size to take fairly large size beams.

Tenn., Fayetteville—The Keethler Quarries, T. Keethler, owner—one 100 ton daily capacity jaw crusher, one 150 ton daily capacity gyratory crusher, one pulverizer (to pulverize limestone) and several conveyors.

Tenn., Nashville—The Baxter Marble & Limestone Co., 638 Stahlman Bldg., Address A. J. Bright, Ch. Engr.—conveyors and pulverizers for pulverizing limestone for agriculture purposes.

Tenn., Nashville—The Rock Asphalt Bldg., Block Co., 638 Stahlman Bldg., A. J. Bright, Ch. Engr.—one Gyratory crusher 150 ton daily capacity; one 16 ft. x 40 in. revolving screen with dust jacket; one 30 ft. belt and elevator buckets for same; one 24 in. x 24 in. friction hoist; one pulverizer for pulverizing limestone for agriculture purposes; shafting belts and pulleys, etct.

W. Va., Huntington—The Landstreet Downey Coal Co., R. & P. Bldg., C. P. Downey, Jr., Genl. Mgr.—machinery, hoisting equipment, mining locomotive, undercutting machines and motors, for mines at Burch.

Wis., Cedar Falls—(R. D. Menomonie)—Houghtaling & Houghtaling grist mill machinery operated by gasoline engine or motor power.

Wis., Eau Claire—Eau Claire County, c/o G. Osborne, Highway Comr.—grinder and lathe suitable for repairing road machinery.

Wis., Fond-du-Lac — The Combination Door Co., 180 Ruggles St., L. Schmidt, Pres.—woodworking machinery for proposed door factory.

The Weekly Price Guide

This Week's Market

Structural shapes, plates and bars, at the Pittsburgh mills, continue at $1.50 per 100 lb. Mill shipments, New York, of steel shapes and bars are quoted at $1.88; plates at $1.88@$1.88. Although mill prices hold firmly, warehouse quotations in New York and Cleveland show a downward trend. Cold finished shafting is quoted in New York at $3.45 as against $3.55 and flats, squares and hexagons at $3.95 as compared with the former price of $4.05 per 100 lb. Cleveland reports a reduction of 15c. on hoop steel, shapes, plates and bars; 25c. per 100 lb. on cold finished shafting and flats, squares, etc.

Copper, lead and spelter markets quiet with slightly improved demand for tin, giving rise to quotations as high as 33¼c., but averaging 33c. per lb. in the New York warehouses.

Linseed oil is quoted in New York at 73c. as against 72c. per gal., in 5-bbl. lots; prices firm in Cleveland and Chicago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	22.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	27.50
BIRMINGHAM	
No. 2 Foundry	17.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil.	21.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	22.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	20.21
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	4.00	3.75	4.15
Nos. 12 and 14	3.10	4.10	3.85	4.25
Nos. 17 and 21	3.40	4.40	4.15	4.55
Nos. 22 and 24	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	3.78
Spring steel (light) (base)	6.00	6.00	....
Coppered Bessemer rods (base)	7.00	8.00	5.88
Hoop steel	3.38	2.96	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.60	....	4.98
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.88
Soft steel bars (base)	2.53	2.36	2.78
Soft steel bar shapes (base)	2.53	2.36	2.78
Soft steel bands (base)	3.13	....	3.48
Tank plates (base)	2.63	2.46	2.88
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
3/16	7.15		11@12
5/16 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			33.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 5.10; New York			5.50
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.00	19.25
Babbitt metal (best grade)	33.00	42.50	36.00
Babbitt metal (commercial)	16.00	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.50	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	7.00	6.50	8.50
Brass, light	5.00	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.73	.76	.74
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$2.75@$3.00	
Coke, prompt foundry, Connellsville	per net ton	3.75@ 4.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	50-10-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$4.50	$5.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.75	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	40-10%	50-10%
Copper burs	40%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$6.16	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	29.48	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.20	.....	3.20

Wis., Fond-du-Lac—D. C. Sargent, 39 South Main St.—mangiers, wash machines and tumblers, all power driven for laundry purposes.

Wis., Hartford — Gehl Bros. Monument Co.—stone crushing machinery, for proposed marble factory on North Main St.

Wis., Hurley — The Raiveri & Norman Motor Co.—auto repair shop equipment, presses and lathe.

Wis., La Crosse—The Tri State Monument Co., 624 South 17th St., E. L. Halmrast, Purch. Agt.—granite and marble cutting machinery.

Wis., Milwaukee—The Auto Service & Repair Station 383, 5th St.—electric drills.

Wis., Milwaukee—Froelick Bros., 799 7th St.—lathe, and grinder suitable for garage use.

Wis., Milwaukee—Matt & Son, 1137 Grant Blvd., F. Matt, Purch. Agt.—one planer.

Wis., Milwaukee—J. Opstad, 975 35th St. —band saw and planer.

Wis. Milwaukee—F. Toepfer Sons 460 National Ave., F. Toepfer Purch. Agt.—one grinder, one 14 in. or 16 in. lathe, air compressor and electric motors.

Wis., Oconomowoc—The Hurtgen Dairy Co.—ice machine, refrigeration, butter and probably ice cream making machinery.

Wis., Plymouth—The Badger Cabinet Co., G. W. Brickbauer, Pres.—woodworking machinery for proposed chair factory.

Wis., Prairie-du-Chien—J. W. Paris—three carding machines, motor power.

Wis., Racine—Bondgard & Christensen, 2223 Kinzie Ave.—woodworking machinery for proposed plant on Mound St.

Wis., Spencer—The Spencer Condensary Co., c/o E. Buss, Marion—dairy and refrigerating machinery for proposed dairy on Main St. here.

Wis., Stevens Point — The Buick Sales Room, 119 Strongs Ave., R. E. Newby, Mgr.—gas storage tanks and pumps.

Ont., Collingwood—The Gourlay Shoe Co. —complete equipment for shoe factory.

Ont., London—B. F. Brighton, 479 Emery St.—complete modern equipment for bakery.

Ont., London—The Ontario Creameries Co., Ltd., 129 King St.—complete refrigeration and ice cream making equipment. Estimated cost, $30,000.

Metal Working Shops

Cal., Porterville—The Porterville Union High School Dist., receiving bids for the construction of a high school. Estimated cost, $270,000. Bids will be received later for shops, etc. Coates & Travers, Rowell Bldg., Fresno, Archts.

Cal., San Francisco — A. Livenais, 1625 Pacific Ave., plans to build a 1 story automobile repair shop on Pacific Ave., west of Larkin St. O'Brien Bros., Inc., 240 Montgomery St., Archts.

Ill., Chicago—The Newberry Library, c/o Mundie & Jensen, archts., 39 South LaSalle St., has awarded the contract for the construction of a 1 story, 75 x 100 ft. garage at 215-219 West Erie St. Estimated cost, $40,000. Noted Nov. 17.

Ind., Indianapolis — The Interstate Car Co., Sherman Drive and Massachusetts Aves., has awarded the contract for the construction of a 2 story, 50 x 110 ft. car factory. Estimated cost, $25,000. Noted Jan. 6.

Ind., Indianapolis — The Reedy Elevator Co., 1026 Kentucky Ave., is having plans prepared for the construction of a 1 story, 45 x 202 ft. elevator factory on South New Jersey St. Estimated cost, $40,000. R. N. Edwards Co., 45 Union Trust Bldg., Archts.

Mass., Palmer—M. H. Davitt, 525 North Main St., plans to build a 1 story garage, etc. Estimated cost, $40,000. Architect not selected.

Md., Baltimore—J. I. Lealmear, 1108 Fidelity Bldg., is having plans prepared for the construction of a 2 story garage. C. H. Heblancke, 2401 Fairview Ave., Archt.

Md., Baltimore—M. N. Tumbler, Wolf Bldg., is receiving bids for the construction of a 1 story garage at 2567 Penna. Ave. Estimated cost, $40,000. W. J. Degenhardt, 917 East Preston St., Archt.

Md., Baltimore—The Wilson Nash Motors Co., 124 West Mt. Royal Ave., is receiving bids for the construction of a 1 story, 120 x 150 ft. garage on Maryland Ave. and Oliver St. Owens & Sisco, Continental Bldg., Archts.

Md., Bridewell (Jessups P. O.) — The Maryland House of Correction, State Bd. of Prison Control, Union Trust Bldg., Baltimore, is having plans prepared for the construction of a 2 story, 45 x 160 ft. shop, here. Estimated cost, $40,000. T. W. Pietsch, Amer. Bldg., Baltimore, Archt.

Mich., Detroit—The Gagnier Stereotype Co., 535 Howard St., is having plans prepared for the construction of a 1 story, 30 x 700 ft. stereotype factory on McKinstry and Plumer Sts. Estimated cost, $75,000. J. Kusurin, 512 Empire Bldg., Archt.

Mo., St. Louis—G. G. Hoffman Magneto Co., 3932 Olive St., is having plans prepared for the construction of a 1 story, 100 x 234 ft. sales room, garage and service station at 3892 Washington St. Estimated cost, $50,000. S. G. Hoffman, Pres. E. Lantz, 600 Post Dispatch Bldg., Archt.

Mont., Bozeman—The State Bd. of Examiners, Helena, will receive bids until Jan. 21 for the construction of a 4 story, 77 x 198 ft. engineering building and a 1 story, 119 x 182 ft. engineering shop for the University of Montana, here. Estimated cost, $225,000 and $100,000 respectively. F. F. Wilson, Owenhouse Bldg., archt.

N. Y., New York—W. M. W. Realty Corp., 116 West 39th St., will build a 2 story, 100 x 100 ft. garage at 841 10th Ave. Estimated cost, $65,000.

O., Cincinnati—The Indianapolis & Cincinnati Traction Co., Germania Bldg., Indianapolis, Ind., plans to build a machine shop, here. C. Henry, Pres.

O., Cleveland—W. Lintern, 8404 Lorain Ave., has awarded the contract for the construction of a 1 story, 60 x 64 ft. factory at 7966 Lorain Ave., for the manufacture of railway supplies. Estimated cost, $40,000.

O., Cleveland—S. Wahl, 799 East 103rd St., is receiving bids for the construction of a 1 story, 56 x 145 ft. garage and commercial building at 8116 Lorain Ave. Estimated cost, $50,000. Private plans.

Pa., Cheswick—The Stonecrete Corp., 6023 Pennsylvania Ave., Pittsburgh, will build a 2 story factory and machine shop, near here. Private plans.

Pa., Harrisburg—E. R. Gelsinger, plans to build a 2 story, 50 x 100 ft. garage on 28th and Main Sts. Estimated cost, $50,000.

Tex., Denison—The Missouri, Kansas & Texas Ry., Railway Bldg., St. Louis, Mo., has awarded the contract for the construction of a freight terminal here, consisting of switching yards, round house, warehouse, shops and other buildings. Estimated cost, $3,000,000. F. Ringer, Ch. Engr. Noted Jan. 12.

Wis., Hurley — The Raiveri & Norman Motor Co., has selected a site and plans to build a 2 story, 50 x 140 ft. garage and repair shop. Estimated cost, $60,000. Architect not selected.

Wis., Stevens Point—The Buick Sales Room, 119 Strongs Ave., plans to build a 1 story, 70 x 125 ft. garage on Main St. Estimated cost, $40,000. Architect not selected.

General Manufacturing

Cal., Santa Ana—The Excelsior Dairy Co., has awarded the contract for the construction of a 1 story, 60 x 240 ft. factory and storage plant. Estimated cost, $50,000.

Cal., Los Angeles—Bedell & Ogg Laundry Co. has awarded the contract for the construction of a 1 story, 110 x 120 ft. laundry. Estimated cost, $50,000.

Cal., Oakland—The Sanitary Ice & Cold Storage Co., 26th and Chestnut Sts., has awarded the contract for the construction of a 1 story ice plant on 26th St. east of Chestnut St. Estimated cost, $11,500.

Ill., Clearing—The Railways Ice Co., 209 South LaSalle St., Chicago, has awarded the contract for the construction of a 2 story, 100 x 150 ft. ice factory, here. Estimated cos, $120,000.

Ill., Henry—The Henry Artificial Ice Co., will build a 1 story ice plant. Estimated cost, $30,000. C. N. Lucas, Pres. Noted Dec. 22.

Ill., Rockford—The Rockford Show Case Co., Elm St., has awarded the contract for the construction of a 3 story, 40 x 68 ft. factory.

Ind., Bloomington — The Bloomington Brick & Tile Co., plans to build a plant. Estimated cost, $200,000. Private plans.

Ind., Bloomington—The Johnson Creamery Co., is having plans prepared for the construction of a 2 story, 50 x 87 ft. addition to its plant. Estimated cost, $40,000. A. E. Neucks, 515 Woods Bldg., Evansville, Archt.

Ind., Elkhart—The Superior Coal Co. is having plans prepared for the construction of a 2 story, 45 x 83 ft. ice plant. Estimated cost, $10,000. R. L. Simmons, 201 South Main St., Archt.

Ind., Garrett—The Garrett Ice Co., Inc. plans to build an ice plant. Estimated cost, $40,000. Private plans.

Ind., Gary—The Superior Sausage Co., plans to build a 1 story, 75 x 100 ft. factory. Esimated cost, $10,000. J. M. LeVee, 673 Bway., Archt.

Ind., Indianapolis — The Indiana Sawed Veneer Co., 324 West 14th St., has awarded the contract for the construction of a 1 story, 90 x 110 ft. veneer factory at 340 West 14th St. Estimated cost, $24,000. Noted Dec. 15.

Ind., Lebanon—N. N. Smith Co., 407 Main St., Frankfort, has awarded the contract for the construction of a 2 story, 38 x 110 ft. cigar factory and office building here. Estimated cost, $25,000. Noted Jan. 6.

Ind., Mishawaka—The Lock Joint Tube Co. has awarded the contract for the construction of a 1 story, 45 x 90 ft. tubing factory. Estimated cost, $30,000. Noted Dec. 22.

Ind., Rochester—Armour & Co., 208 South LaSalle St., Chicago, is having plans prepared for the construction of a 2 story, 100 x 150 ft. packing plant, here. Estimated cost, $75,000. Private plans.

Mass., West Springfield—P. Fossa, 98 Old Bridge St. plans to build a 1 story, 100 x 120 ft. ice cream plant on Old Bridge St. Architect not selected.

Md., Baltimore—The Amer. Concrete Ties & Products Co., 426 Law Bldg., plans to build a factory. Private plans.

Md., Baltimore—The Amer. Woodworking Co., is having preliminary plans prepared for the construction of a planing mill at 5 Uhler St. Estimated cost, $20,000. R. C. Pratt, 325 North Charles St., Archt.

Mo., Cape Girardeau—The International Shoe Co., Washington St., St. Louis, has awarded the contract for the construction of a 3 story shoe factory, here. Estimated cost, $100,000. Noted Dec. 22.

Mo., St. Clair—The International Shoe Co., 15th and Washington Sts., St. Louis, will build a 3 story shoe factory here. Estimated cost, $75,000. Noted Jan. 6.

Mont., Miles City—The Western Creamery Co., 1215 Main St., plans to build a creamery. Estimated cost, $100,000. F. R. Merrill, Mgr. Architect not announced.

N. C., Lenoir — The Union Mirror Co. plans to build a mirror factory. Architect not selected.

N. C., Winston-Salem—W. C. Northup, Engr., Winston-Salem, will open bids latter part of this month for the construction of a 5 story hospital, including laundry, etc., for the State Baptist Convenion. Estimated cost, $2,000,000.

O., Columbus—J. H. and F. A. Sells Co., Chestnut and Pearl Sts., manufacturers of horse collars, plans to construct a 3 story collar factory on Grant Ave. Estimated cost, $35,000. Architect not selected.

Ore., Portland — Rasmussen & Grace, Engrs., Chamber of Commerce Bldg., will open bids about Jan. 25 for the construction of a 3 story, 100 x 100 ft. publishing plant on 11th and Washington Sts., for the Telegram Publishing Co., Washington and Park Sts. Estimated cost, $150,000.

Pa., Harrisburg—The United Ice & Coal Co., Forster and Cowden Sts., has had plans prepared for the construction of a 100 ton daily capacity ice plant and three 5,000 ton capacity storage houses, two on 7th and Schuylkill Sts. and one on Forster and Cowden Sts. Estimated cost, $150,000.

Pa., Wellsboro—The Pennsylvania Textile Co. will soon award the contract for the construction of a 50 x 250 ft. textile mill Estimated cost, $300,000. Scott & Prescott, 34 East 23rd St., New York City, Archts. and Engrs.

W. Va., Charleston—The Diamond Ice & Coal Co., 807 Kanawha St., will build a 2 story, 100 x 100 ft. ice plant. Estimated cost, $50,000.

W. Va., Morgantown—R. A. Wilbourne Co. will soon award the contract for the construction of a 3 story 36 x 160 ft. addition to its ice cream plant. Estimated cost, $55,000. C. Reger, Traction Bldg., Archt.

Wis., Hartford — Gehl Bros. Monument Co. is having plans prepared for the construction of a 2 story, 42 x 106 ft. marble factory on North Main St. Estimated cost, $65,000. Private plans.

Wis., Hortonville—W. L. Schraeder will build a 1 story, 50 x 120 ft. canning plant. Estimated cost, $50,000.

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Industrial Russia Today

Communism on the Wane—Government Losing Hold on People Through Failure of Golden Promises—Factories Being Returned to Private Enterprise

By OUR LATVIAN CORRESPONDENT

READERS who are connected with the machine tool trade will be interested in the future of industrial Russia. There are those who wish to sell their products—if the conditions will permit—to Russia, and they should get acquainted with the Russian industries in their particular line; and again, there are many who would desire—when the proper time arrives—to open their works in Russia—as it was done by foreigners in the pre-war times—using the cheap labor and immediate market. But before one enters into a discussion of future prospects, it is desirable, even necessary, to survey briefly the principal causes which have brought about and aggravated the present deplorable state of the industry of Russia.

Russian Industry Never Strong

Much has been said and written of late about the wrecked industry of Russia, and an opinion has now become established that the sole cause-abettor is the Bolshevist régime. No doubt the Bolsheviki with their absurd experiments and radical doctrines have weakened the industry to such a degree, that a lengthy period must elapse before the regular working can be re-established, but when we look a little deeper, we find that the Russian industry was never strong and that, on the whole, it existed chiefly on the protective custom tariff. The proof of this statement will be found if we look back to pre-war times and examine the records of industrial Russia. The Russian statistics leave much to be desired and it may seem a little strange that the most comprehensive figures about Russian industry are found in the records of the year 1908, when the general industrial census was taken. In later years only the more important industries were registered and tabulated.

In December, 1912, Russia had about 160,000 manufacturing establishments which gave employment during the year to an average of 3,100,000 operatives. Let us put aside 130,000 of these establishments as being insignificant (with only 168,700 operatives); only 29,965 with 2,931,300 operatives were investigated and tabulated. The establishments that were investigated turned out, during 1912, products to the value of $2,926,380,000 or about $1,000 on each operative.

About 25 per cent of all operatives were women and children, the earnings for all operatives being from $60 to $300 per annum. The output was low, owing to the scarcity of machinery, deficient operatives and very primitive management. Among executives 6.9 per cent were foreigners, and of the rest 88 per cent were without any technical education. The motive power was represented mostly by steam engines.

The industry of Russia was created—beginning from Peter the Great—by means of the protection of a very high tariff upon all importations of manufactured products. In the very beginning and up to the war, most of the better works were in the hands of Russian nobility, princes and even the Tsar. It certainly follows that the bureaucratic government of Russia then supported the domestic industry in every possible way.

Much could be said about the advantages or disadvantages of the protection system, but as for Russia, it can be stated without exaggeration, that on the whole, this system caused more harm than benefit. The population overpaid annually about 200 million dollars in the form of custom duties for imported manufactured goods; was obliged to satisfy its own needs with the inferior domestic manufactures, and even the wages in some industries were lower than on the farms. And last of all, the protection system managed the industry carelessly and there was no urgent need of improvement and modernization in the factories.

A great part of the Russian factories leaned upon the government's orders, being paid on a cost-plus-profit basis, without considering the foreign prices for similar products. Being protected by the import tariff and government's orders, the industry was not pressed to introduce improved methods of manufacture which would reduce hand labor to the minimum. Hand labor prevailed, the engine motive-power being comparatively low, only 0.92 hp. per operative, in average, for all branches of industry.

All the foregoing considerations lead to the conclusion, that being artificially cultivated and supported by the government the industry of Russia had enough to keep it content, without using much effort in strengthening its own efficiency.

Handicaps of Russian Industry

It would be unjust to deny that the industry of Russia was handicapped by some factors, the more important of which was the lack of industrial credit. For various reasons banking in Russia has been rather backward. In 1914 there were only forty-two commercial banks in Russia with 601 branch-offices, one for every 250,000 of the population. The paid up capital of these banks amounted to $399,800,000, only few banks being big.

It follows then, that having so little capital in a territory with 180 million inhabitants, these commercial banks were not particularly inclined to open long-termed industrial credits, which was necessary for better equipment, improved machinery and new buildings. The main activity of the Russian commercial banks was the discounting of bills and advancing short-termed loans on various securities. The interest rate was not low, being 8 to 10 per cent per annum. Besides the banks there were many small-credit, municipal and mutual credit banks, but their capital was smaller and

the interest rate was up to 12 per cent. As for the State Bank, it helped only the best and financially stronger enterprises.

The fact must not be overlooked that German capital had a controlling voice in the joint-stock commercial banks of Russia, and was not interested to develop the Russian industry, because Russia was regarded and used by Germany as the chief and best market for her products.

Having discussed the circumstances which affected the Russian industry in the period up to the great war, we come to the war- and communistic- period when the industry experienced many radical changes, which should be traced in order to forecast, to a certain degree, the future of industrial Russia.

The Help of the Great War

The great war, not being fought on the soil of Russia but on territory occupied by the present Poland, Latvia and Lithuania, did not disturb Russian industry, but rather strengthened it. The existing plants were expanded, new ones were erected and small workshops were provided with mechanical equipment. As the war continued, Russia began to feel her dependency on imported foreign products, chiefly of German origin, and so new industries were created and developed—dyes, medicaments, explosives and various chemical products, surgical instruments, optical glasses, agricultural machinery, electrical goods, automobiles and aeroplanes in particular. Under favoring circumstances the growth of the industry continued until it was retarded by the revolution in 1917.

Since March 1917, thanks to revolution, labor has begun to dominate the political and economical life of Russia. Labor began to dictate to the government how it should conduct the business of the state. Everywhere labor began to demand increased wages, not only for the future, but for the past. All those demands, being sanctioned by the new government, were satisfied. On the urgent representations of the workmen the eight-hour day was introduced (April 1917), and the compensation for over-time work was increased 150 per cent above the normal.

In July of this year the manufacturers, frightened by the still increasing demands of labor, began to shut down their plants and in the autumn there were many unemployed, who not being able to find work, returned to the farms.

Russian Industry's Greatest Blow

The most serious blow that the Russian industry has had to withstand, was the control of labor introduced on Oct. 29, when the Bolsheviki seized the power. By a decree of Nov. 14 the factory committees were established. The task they had to perform was to introduce and to maintain order in factories, but in reality they turned their activities to further demands of increased wages, regardless of the actual earnings of the enterprises.

The decree of Nov. 19 directed all manufacturers to insure their laborers against unemployment. They had to deposit in a special "cassa" a premium equal to from 3 to 6 per cent of the wage of the laborer. In case of unemployment the laborer was to receive a full day's pay, together with the usual allowances for lodging, etc.

By a decree of Dec. 16 all banks were nationalized and united in one, called the National Bank, which replaced the State Bank. With that the manufacturers lost the chance to obtain the necessary credit. The new National Bank furnished credit only on recommendation of the factory committees, and it was not always easy to attain an understanding between the manufacturer and the committee. Being deprived of the necessary credit, the manufacturers arrived at a critical stage, and one by one were obliged to suspend their activities.

At the same time the communistic government began to nationalize and confiscate the factories and workshops, the management being handed over to the factory committees. Usually, the confiscation was effected by the request of the committees, who wished to become the managing power.

So disastrous were the effects of these conditions that by April, 1918, the industries in Petrograd employed only 144,530 hands, instead of 365,777 in 1917. The numbers of the unemployed became dangerous and free passage was introduced on all railroads to enable the unemployed to return to the farms, or even emigrate to Siberia, where food was yet abundant. Hence the disappearance of the industrial worker.

Nevertheless the nationalization of the industries was continued (although not until the end of 1920 were the more important establishments united under the government's management), and more radical changes were introduced. All piece work was abolished and the factory committees recognized only the flat rate, thus reducing the difference between the skilled and unskilled, and making the incentive to qualify for the more responsible job much less. An enormous decline in output followed.

The Influence of Hunger

Another factor of almost equal importance commenced to exercise its influence on the crippled industry—hunger. The grain crop of 1917 was 18 per cent below normal, mostly because the big estates of the "pomieschiki" (who possessed about 50 per cent of the whole private land in Russia) were seized by peasants and only part of the land sowed. This bad crop created a scarcity of food in cities, and industrial workers, accustomed to a good supply of food, were obliged to exist and work on almost nothing. The result was a rush of workers to the farms. The emigration to the farm is continued today and according to the census of 1920, the big cities lost three and a half million inhabitants since 1917.

As the result of all this, the productivity of the industry decreased well-nigh to naught. Stores being empty, commerce gradually suspended its activities and small speculants prevailed. Obtaining nothing from cities and industry, the farmer ceased to bring his products to the city and as early as the spring of 1918, the food was forcibly collected from the farms by soldiers. To stimulate this collecting the soldiers of the Red army were allowed to retain, as their reward 15 per cent of the collected foods. Notwithstanding that, it was impossible to collect more than 45 per cent of the fixed amount. There was now the alternative: Factories were abandoned by workers, because the farmers did not supply them with food; but the farmers withheld the food from the cities because neither the cities nor the factories were able to return in exchange the necessary implements and commodities.

The Letts and Poles were at war with the Bolsheviki and the Soviet government was forced to keep the Red army—and feed it. The food was to be obtained

from farmers, mostly in exchange for manufactured products (the valueless paper money was accepted very unwillingly) and consequently, the government was obliged to maintain the existence of the industry and to raise the productivity of it. Besides that, there was a shortage of workers and it was necessary to draw more of them to the factories.

Extreme measures were adopted. In order to raise the productivity the flat rate was not abolished, but the daily ration of food, which was given to the worker in exchange for his work, was raised—if the worker prolonged his day over eight hours. The common ration contained one pound of bread daily for eight hours' work, but for ten hours' it was raised to one pound and a quarter, and to one pound and a half for twelve hours' work. It would seem strange that such a trifle as one quarter of a pound of bread was able to stimulate the worker to prolong his working day two or even four hours longer, but in reality it was so.

At the same time the factory committees were abolished because they did not justify the hopes of the Bolshevist leaders. These committees were formed to maintain order and discipline in the factories but they lost the last remnants of discipline, and even plundered the factories themselves.

By a decree of Jan. 1, 1920, all industrial establishments became militarized, all factory committees abolished and the management handed to individual directors who had unrestricted power, including the right to deprive the worker of his daily ration and to exile him to a punishment camp. It has been said that in March, 1920, these camps contained 240,000 exiled workers.

Taylor System Adopted

The factories being militarized, the discipline grew strong, delays and walk-outs were not allowed. The government began to interest itself in the Taylor system and formed advisory committees composed of representatives of the former leaders of industry. As a result the Taylor system was adopted and applied. Doubtless, the results of the trials were insignificant owing to the hunger, low pay and iron discipline; at least, the Bolshevist press does not mention the system.

By Jan. 1, 1920, of Petrograd's 740 important factories only 434 were open, and only 171 of 681 in Moscow were going. Notwithstanding the militarization and the efforts of the government, production did not increase; in fact it almost stopped when in the spring of 1920, owing to the lack of fuel and wrecked transportation, 75 per cent of the operating factories became idle.

Former Owners Invited

Finally the government became annoyed by the nationalized industry and various projects were invented to save the situation. It was resolved to unite the better factories in trusts, for better management, and to lease the smaller ones to co-operatives or even to private manufacturers. In connection with this it was necessary to restore the rights of private property and the personal rights of private manufacturers. It was accomplished by several decrees and thus, the retreat toward the old capitalistic régime was commenced. The Soviet government by this recognized that the nationalization of industry was a failure.

Offering the wrecked industrial establishments for lease, the Soviet leaders expected there would be a rush of private persons, but their hopes were not justified. By Nov. 1, 1921, only 4,200 enterprises were taken on lease. Among them were 2,400 grain mills, over 1,000 oil mills, 145 tanneries, 55 wood-working mills, and 20 brick works. These enterprises are all of small description, employing a small number of hands each. As for the terms, 499 leases were granted up to six years, some to fifteen years, but the majority from 2 to 3 years. In 1,266 cases the leases were given to private persons (sixty of them were the former owners), in 500 to co-operatives and in twenty-five cases to municipalities. It is worth while to note, that all the leased enterprises are connected with farms and, consequently, they will not be affected by the irregularities of the wrecked transport. They will work only for their immediate market.

From the viewpoint of the foreigner these leases can be used as feelers for the much advertised concessions. If only the small rural industrial establishments are taken on lease, but not the more important urban workshops and factories, there must be deep and serious reasons.

Trusts, Combines

According to the statistics of the Third Internationale, there are 550,000 communists in Russia (among 130 million inhabitants). No doubt this figure is greatly exaggerated. People declared themselves communists in the very beginning of the revolution when there were bright hopes in the future of the communistic state. A great many of them were only "opportunity-communists," desiring to acquire some privilege—to become commissaries. Two years ago Lenin said: "There are in Russia only three real communists —I, Lenin and Ulyanoff (his former pen-name)." The former commissaries and all more or less important communistic officials acquired some fortune and they are representing the "new bourgeousie" of Russia. They do not wish to mix with the common laborers, the word "camrade" is used very sparingly and they are lost for communism. The sole support of the communistic government should be the industrial worker, who has nothing to choose, nothing to lose; but the industrial workers compose only 0.8 per cent of the whole population.

Returning recently to capitalism, the Bolshevist leaders openly declared that labor in Russia will be strong so long as the big industries remain in the hands of labor. Hence the forming of trusts and combines. The Soviet government is trying to keep the country under its control by concentrating the basic industries under its management. That is called the "capitalism of State." The idea is not bad, the question being how long government will be able to manage the industries. If the experience of the world is anything, the government's management will be always handicapped by lack of private initiative. Anyway, the Soviet government is convinced that the course taken is the best one, and is endeavoring to strengthen the industrial trusts or, as they are called, combines.

Collective Pay System

It is worth while to note the collective pay system introduced by the Soviet government to raise the productivity of the individual worker. The main feature of this system lies in the collective responsibility of the employees of a certain enterprise which is more than the well-known sharing in profits. The minimum output of an enterprise is fixed by the government in advance.

Likewise, the budget of the enterprise and compensation for work is fixed. If the personnel of the enterprise, conjointly, will discharge the less efficient members and will produce the fixed output, the fixed amount of pay, as compensation for the work, goes in full to the remaining personnel and is distributed according to the efficiency of each individual operative. Thus, the operatives are interested to reach the fixed amount. Further, if the output is higher than the fixed amount, an additional adequate compensation will be allowed.

So much for the theory; as for the results, they are good, if the Bolshevist reports are true, the productivity being raised 10 to 15 per cent. In theory the private initiative of the individual operative is stimulated and improved; the question is how justly will the output be fixed by the government. There are many reports that the Soviet government is not able at present to deliver to its industrial enterprises the promised money, food and other products, and this fact, undoubtedly, will check the good will and efforts of the employees.

It appears from what has been said, that American capital and American enterprise should be more interested to exploit the potential possibilities of Russia in the immediate future, than to allow the country to be overrun by others.

The Automobile Outlook for 1922

By Alfred Reeves
General Manager, National Automobile Chamber of Commerce

The close of the year 1921 found the automobile industry of the country in a better condition than was anticipated. Production for the year was 1,690,000 motor-driven vehicles, of which 145,000 were motor trucks. This is approximately 24 per cent less than the number of motor vehicles built in 1920, the average value, however, being about 35 per cent under that year. A very considerable saving to the public is indicated owing to the lowered prices.

It must be remembered that the automobile industry was among the first to lower prices and to liquidate its inventory of high-priced materials and to give buyers the saving to be effected in the future by lowered replacement costs. The industry also took care of its 33,000 dealers, paid off its loans, and has handled a business of approximately $2,000,000,000.

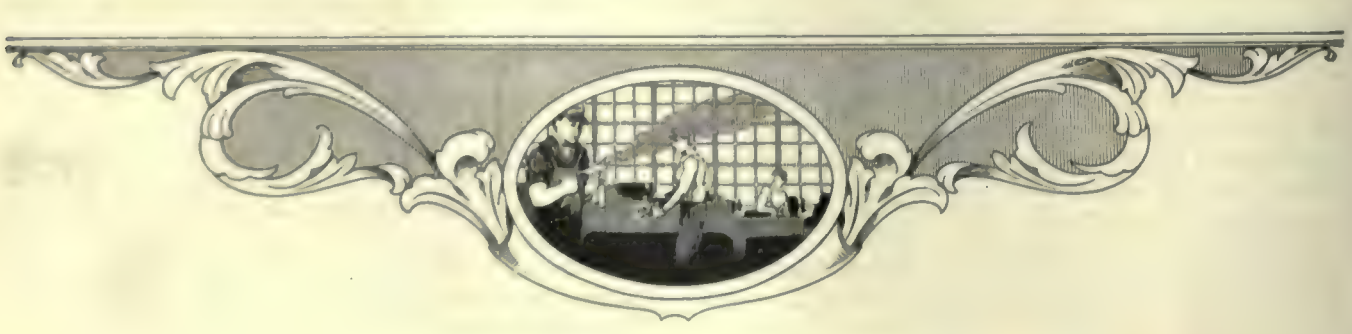
In spite of the criticism as to the cost of large display advertising space in high priced publications, the advertising cost of the industry as a whole is in the neighborhood of 2¼ per cent, the lowest known percentage of any large industry, being but little over half the amount expended by the collar manufacturers and less than half that used in calling attention to California.

It has been pointed out in many quarters that there are too many kinds of automobiles being built at the present time. This has been a feature of the development of every manufacturing industry in this country, and there is little doubt that we shall see elimination in certain grades of cars where there is extreme duplication at the present time. It must, however, be remembered that the motor car, probably more than anything else, is a family affair and that it must be considered from more different angles than almost anything else. Details, which may not affect the actual service to be obtained if the car is considered solely as a method of transportation, have a marked effect on the satisfaction and favor of the different members of the family. Then there is a psychological effect of the car as some sort of a criterion of a man's social or financial standing, which is bound to have its effects for many years to come.

One feature which stands out pre-eminently among the automobile builders who are members of the National Automobile Chamber of Commerce, is the system of cross-licensing as to the use of patents taken out by members of the body. This eliminates expensive and annoying litigation and gives each manufacturer an opportunity to use the latest development of the industry as a whole. This distinct benefit to the users of automobiles has done much to promote the development of practical improvement in automobiles generally.

As an alternative to this cross-licensing, any member of the N. A. C. C. can withhold his patent for his own use, but if he does so, he must then pay a royalty on any patent which he uses, after arranging with the party who controls the patent. An arrangement of this kind, in such lines as the machine tool industry, would greatly facilitate the manufacture of highly productive machine tools and would be of great benefit not only to the machine tool builder, but to the user as well.

Prophecies are always dangerous. Those who have carefully studied the situation are looking forward to 1922 with confidence. While it is quite possible that the total number of cars built may not greatly exceed the output for 1921, the liquidation which has taken place, the evident desire on the part of nearly every automobile builder to make prices that will give the utmost possible value to the customer, points to a renewed era of good feeling between builder and user. Then too, the growing appreciation of the need and value of service will be of distinct benefit to the industry as a whole. Any increase in business generally can hardly fail to be reflected in the automobile industry, as the motor vehicle has become such a necessity in our every-day life that we will do without many other things rather than give up the conveniences due to its use.



Automotive Service Methods and Equipment

VII. Tools Used for Servicing Hudson and Essex Cars—Fixtures For Testing and Straightening—Attachments for Lapping Pistons and Cylinders

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

THE service equipment of the Hudson Motor Car Co., of New York, includes a number of excellent tools, both as regards efficiency and simplicity of operation. Fig. 1 shows a valve grinding machine which is so light that it can easily be lifted by one man, and occupies but little space on a bench. The machine

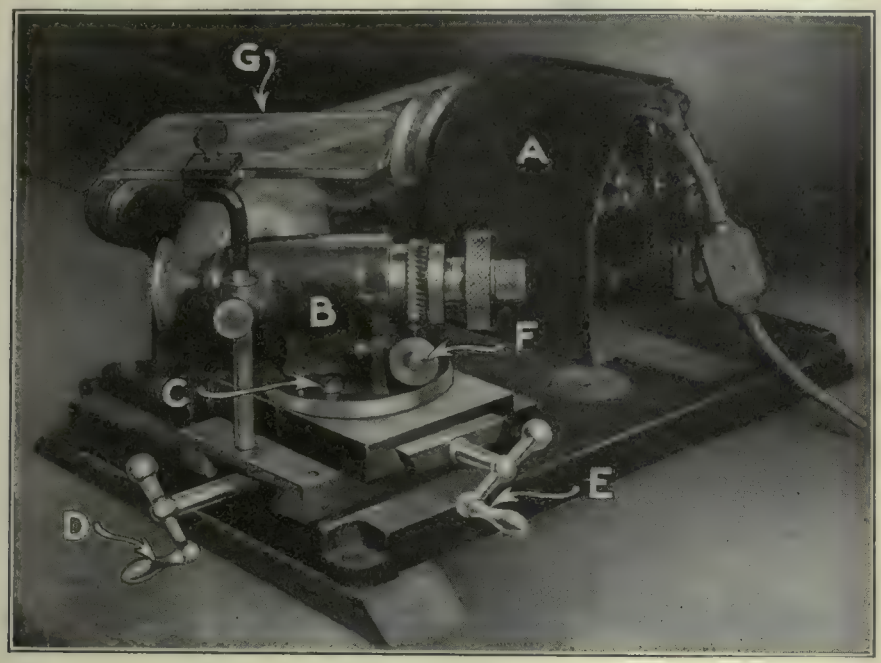


FIG. 1. BENCH VALVE-GRINDING MACHINE

is made by the Franklin Machine Tool Co., Springfield, Mass. The machine is motor-driven, the motor being back of the guard *A*. This guard is to prevent flying particles from lodging in the mechanism of the motor. The part *B*, which contains the spindle in which the valve is held, can be swung to any desired angle and locked in that position by means of the locking screw *C*. The handle *D* feeds the work to the wheel and the handle *E* controls the traverse. The spindle is driven by a wormwheel and gear, the worm being connected to the end of a flexible shaft which can be seen at *F*. On the opposite end of this shaft is a pulley which is driven by belt from the motor. The wheel runs at a speed of 4,500 r.p.m., and the valve rotates at a speed of 43 r.p.m. A guard made of heavy plate glass is held over the wheel at *G*. This protects the operator's eyes from flying particles, while giving him the opportunity of watching the operation of the work.

The method of straightening connecting rods, shown in Fig. 2, is very efficient, considering the simplicity of the apparatus. An angle plate *A* has been bored and tapped on one side for the plug *B*, which holds the large end of the connecting rod. This plate is bolted to the cross-slide of an engine lathe. A rod ground to the size of a wristpin, and tapered to a point at either end is inserted in the small end of the rod as shown at *C*. As the angle plate is perfectly square with the lathe centers, if the rod is straight the ends of the pointed rod should touch the points of the centers. Rods that are bent or twisted are straightened with a claw-bar as shown.

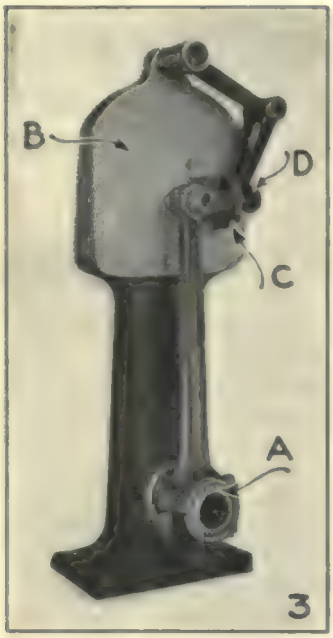
Figs. 3, 4 and 5 illustrate the working of another tool for testing the straightness of connecting rods. The pin *A*, on which the large end of the rod is held, is square with the surface *B*. A wristpin is put into the small end of the rod and the rod is tested for straightness in both planes by using a small angle plate *C*. The method of holding this plate is best illustrated in Fig. 4. The face of one angle, which is flat, rests against the faceplate *B*. The other angle is made with two square legs or projections so that the end of the rod will be cleared, as shown in Fig. 4. A spring-pin *D* is made with a ball on the end, which locates in a seat in the back of the angle and, while allowing free play, holds it tight against the faceplate. In Fig. 4 the angle is set for testing the rod for straightness in one plane; in Fig. 3 the angle is swung around for testing the straightness in the other plane. In Fig. 5 the angle is raised and turned with the legs toward the reader. A clearance slot is milled in the side of the angle so that the rod can be tested for off-set. Thus the rod can be tested for straightness for twist, and for off-set in a few seconds and without the use of extra tools. The rod can be straightened while on the fixture with the use of a claw-bar.

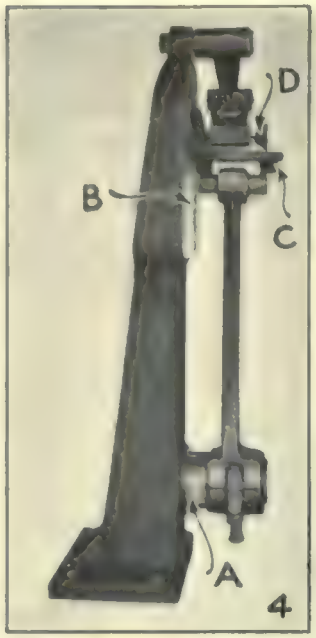
The fixture shown in Fig. 6 is for testing the



FIG. 2. STRAIGHTENING CONNECTING RODS

straightness of pistons after they have been assembled to the motor. The connecting rod has just enough side play on the wristpin so that the piston should touch





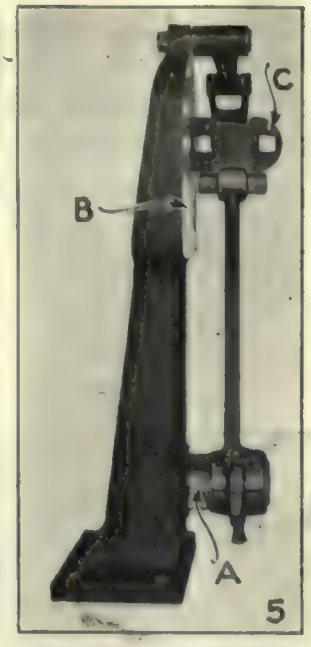


FIG. 3. TESTING CONNECTING RODS FOR TWIST. FIG. 4. TESTING CONNECTING RODS FOR STRAIGHTNESS. FIG. 5. TESTING CONNECTING RODS FOR OFF-SET

both the outer bar *A* and the inner bar *B*. This assures that the piston will have play enough so that it can center itself properly in the cylinder. If the rod is perfectly straight, the side of the piston will be parallel with the rods. The tool is located by the studs in the crankcase, and is light enough so that it can be handled easily.

A unique device for testing the roundness of piston rings is illustrated in Figs. 7, 8 and 9. It consists of a hardwood box containing an electric light. A counter-bored ring *A* is set into the upper surface of the box at a convenient angle for the operator. The plate *B* fits into the ring *A*, being placed so that the slot *C* is at the bottom. The plate *D* is now placed over plate *B*. The inner edge on plate *D* comes just half-way over the slot *C*, letting the light shine through one side of the slot. The piston ring to be tested is now placed in the hole in plate *D*. The ring is of sufficient thickness to cover the exposed half of the slot so that no light will shine through unless the outer circumference of the ring is defective. By rotating the ring, any flat or uneven spots on the ring can be seen instantly as an aperture of 0.001 in. or even less can be very easily seen against a strong light. The spot where the rings have been rotated can be seen on plate *B*. All light from outside sources is excluded by the use of a tube *E* similar to that on a fluoroscope. The tube can be raised for the insertion and removal of the rings.

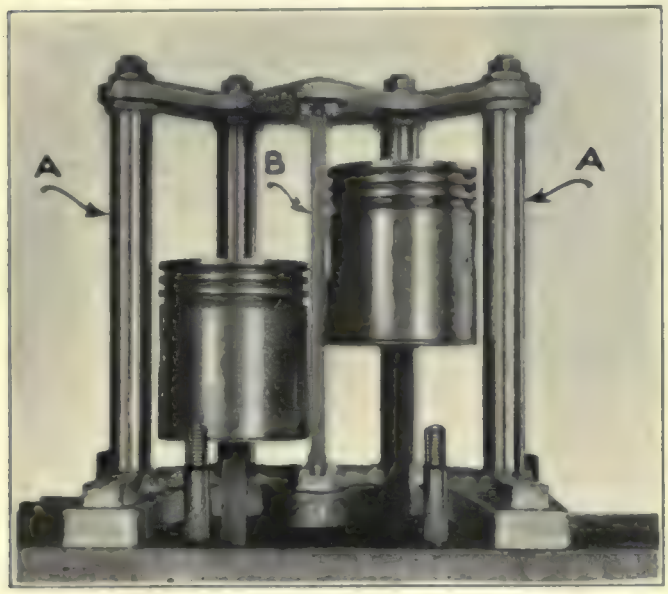
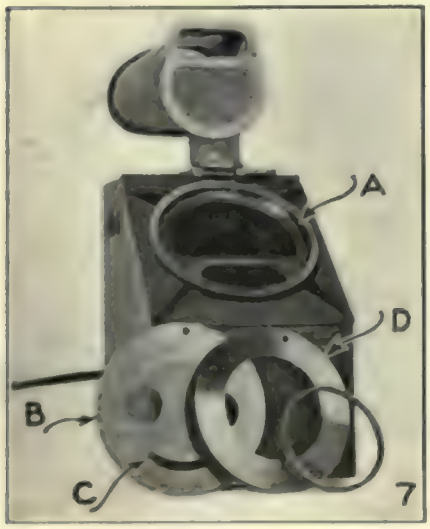


FIG. 6. FIXTURE FOR TESTING STRAIGHTNESS OF PISTONS AFTER ASSEMBLING

An attachment for lapping cylinder bores is illustrated in Fig. 10. This tool consists of a spindle *A*, the top and bottom collars *B* and *C*, the cones *D* and *E*, the spring *F*, and the three sections *G*. A slot *H* in the bottom of each of the three sections engages a corresponding projection on the collar *C*, which prevents the sections from slipping as the tool rotates. The action of the spring *F* tends to draw the cones *D* and *E*



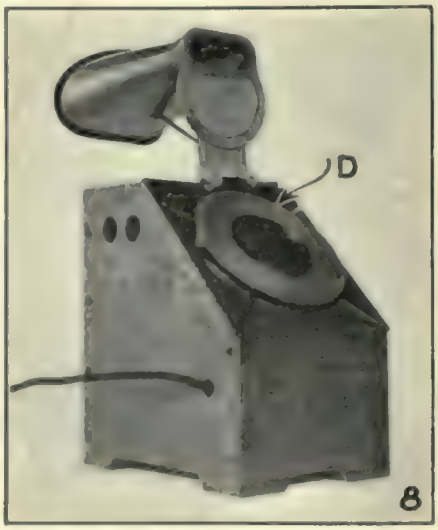




FIG. 7. DEVICE FOR INSPECTING ROUNDNESS OF PISTON RINGS. FIG. 8. FIXTURE WITH PLATES AND RING IN PLACE. FIG. 9. DEVICE IN POSITION FOR OPERATION

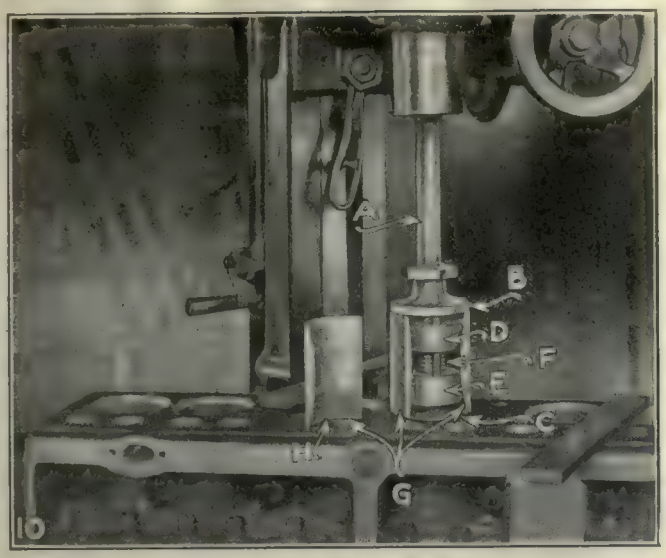


FIG. 10. CYLINDER-LAPPING ATTACHMENT.

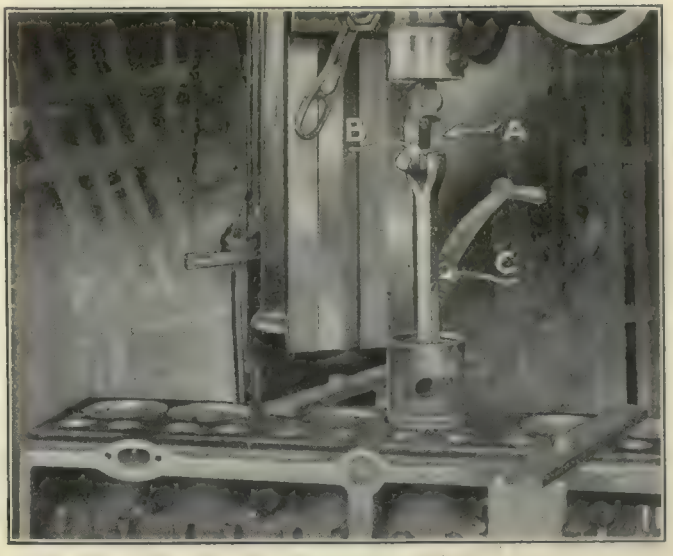


FIG. 11. DEVICE FOR LAPPING PISTONS

together, so that they have to be forced apart with the hand in order to place the sections *G* in position. Once in, they are held by hand until inserted into the cylinder bore, when the action of the spring holds them against the wall. The collars and cones are made of steel and the sections *G* are made of cast iron with a thickness of sheet copper riveted to the outside. A shoulder is cut in the ends of the sections into which the edge of the collars fit. Thus the sections project beyond the edges of the collars, which insures that only the copper will touch the cylinder wall.

A mixture of oil and carborundum is used for the lapping process, No. 60 carborundum being used at the start and No. 180 for finishing. From 0.010 to 0.015 in. can be removed with this tool in approximately 15 minutes.

Lapping in the Pistons

After the cylinders have been lapped to size, pistons are selected which will be a "push" fit in the bores. Then the pistons are lapped in, using the attachment shown in Fig. 11. The yoke *A* is forged with a spindle which is turned taper so that it can be inserted into a drilling machine spindle. The arm *C* is attached to the piece *A* by means of the block *B*. One yoke is held to the block by means of a bolt which goes through both block and yoke-arms, while the arms of the other yoke are held to the block by means of short screws. The lower end of the piece *C* is made with a hole through it similar to a piston-pin hole. A wooden piston-pin is used to hold the piston to the piece *C*; thus if the pin works to one side of the cylinder, the cylinder walls cannot be injured. The pistons are lapped to a size 0.0025 to 0.003 in. smaller than the bore of the cylinder, using a mixture of oil and ground glass for the process.

Old Times in the Hartford Shops

By A. J. Strong

The article on page 849, Vol. 54, of the *American Machinist*, by E. A. Dixie, on the use of paper in the machine shop, interested me and brought to mind some of my shop experiences of former days which may also be of interest to some of your readers.

The virtues of paper used in the manner described so thoroughly by Mr. Dixie were well known to the ancients, for when I was an apprentice with the Pratt & Whitney Co., in 1881 and 82, all time cards, which were about the size and thickness of a playing card, were saved by the time-keeping office, tied up in bundles, and placed in the various toolcribs where they were considered as essential to the equipment as waste, file handles, emery cloth and other supplies. Each workman kept himself supplied with these cards, and they were used extensively in the various ways described by Mr. Dixie.

After some years spent as a roving mechanic, which included a period with the Elgin Watch Co., I returned to the Pratt & Whitney Co. and worked on models and gages, making personally all of the model breech block mechanism for the one, three, and six-pound Hotchkiss guns. The time cards were still very much in evidence, and they were of far more value on the finer class of work than in the machine departments. They were handy to figure on and would prevent a strap or clamp from bruising the work in a way which was pleasing.

My bench vise had smooth jaws but they were seldom without a couple of these cards folded in the middle as false jaws, and each jaw was fitted with a flat spring about 3 in. long, one end being riveted to the soft part of the body, and extending up to the top, the cards being slipped under the springs to hold them in place. This prevents the work from coming in contact with the hard jaws of the vise and being bruised and dented, and in addition the grip is much more secure for the reasons explained by Mr. Dixie.

Mr. Dixie mentions the late Mr. Smith, whose reputation as a planer hand has been carried all over the country by men who have worked for the Sigourney Tool Co. At the time I worked there they were building some automatic machines for making brass-head upholstering tacks, for a concern down Waterbury way. A new man who had been hired to do the fitting and assembling took a cast-iron gib or strap to Charlie Smith and complained that it was sprung, suggesting that he plane it over. Charlie put it down on the table of his planer, tapped it gently with a piece of babbitt, and the tell-tale rattle proved that it was as represented. He then made a remark which we will omit, and slammed the piece of work down on the floor, appearing very much put out, which you will understand was disconcerting to the man who was making the complaint about his

work. He then picked the piece up, carefully tested it again on the planer table, and as it was perfectly straight handed it back saying "there you are my friend." It is needless to say that another man right then concluded that Charlie Smith was " some planer hand."

He knew cast iron from every angle, and could tell from looking over a casting just what it would do under certain conditions, and, like Ty Cobb, he could outguess it and turn its eccentricities to his advantage. In spite of Charlie's knowledge of the planing game we "got his goat" one day by springing on him the problem of planing a square taper bar against an angle plate. After giving the problem a little thought he allowed that if he had a square angle plate he could plane anything square against it and there was no occasion for argument. To further prove how he felt about it he offered to bet his farm on the proposition; he did not care to have tenderfeet argue with him on planer problems. All planer hands who can do the above may hold up their right hands.

In those days Charlie drove in from his farm with his horse and carriage, and stabled them in a barn adjoining the factory. Dave Weir who was a David Harum toolmaker drove to work also and stabled his horse in the same barn; it was worth while to hear them discuss their horses at noon after lunch.

I rode to work on a full nickel expert 52-in. Columbia high bicycle which stood under a shed during the day. This was at the time when the Stiles & Parker press plant at Middletown burned and some of their men came to the Sigourney to work. One of them told me if Mr. Stiles should see one of his men ride to work on a bicycle, he would cut down his pay; evidently he did not believe in his men living in a reckless manner.

It seems safe to assume that Mr. Stiles would not have been able to get much pleasure out of the manufacturing proposition in Detroit during the war, for the story was current of the toolmaker who secured a job and asked if there was a place to park his car. The employer seemed surprised at such a question and told him he was not wanted as they only employed toolmakers who had private chauffeurs to bring them to work and call for them at night.

The factory in those days was lighted by gas, and one of our stunts was to arrange two jets about four or five feet apart, light one and turn on the other without lighting, then cup the hands over the unlighted jet, filling the inverted cup with gas, swing them swiftly to the lighted jet, lighting the gas in the hands, and swing them back, lighting the second jet from the burning gas held in the hands. It is needless to say that this called for quick action. Another was to stand on some insulated material, hold the fingers of one hand close to a belt, and light the gas with the spark which would shoot from a finger of the other hand. It is probable that the later generation of mechanics who know nothing of gas lighting, have never had an opportunity to amuse themselves in this way.

In the days in question the principal business of the Sigourney Tool Co. was building the Smythe Book Sewing Machine. I was working with the engineer on development work, and the problem at the time seemed a serious one and was causing a lot of worry. The machine was perfected so that running straight ahead it worked in a very satisfactory manner, but if the operator happened to stop it and turn back the handwheel provided for control there was serious trouble. This was because a series of hooks which picked up the thread were provided with very light wire springs which shed the thread at the proper position, the tension of the thread being sufficient to hold the springs down until the proper position was reached, when the hooks were backed up slightly so the springs could release the thread. If the handwheel was reversed and the tension released before the proper position was reached, the threads were released at the wrong position.

One day there was an addition to our force, a man who wore a full beard and a pair of most kindly gray eyes. This was the late A. W. Jacobs, who had been making a wire stitching machine for books, in Worcester, and who had been bought out by the Smythe Co.

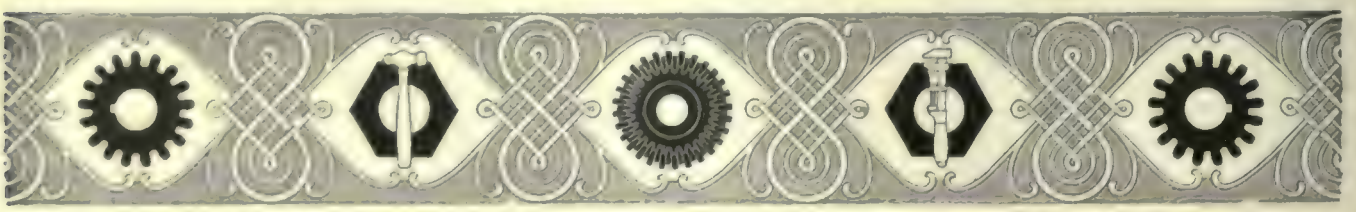
As soon as Mr. Jacobs saw the trouble which was occasioned by the spring hooks, he seemed to know just what to do to overcome it and he started a sample to demonstrate his idea.

He omitted the spring from the hook and in its place put a tongue on the order of a knitting machine hook, the tongue being pivoted about the middle on a pin. It was interesting to see A. W. make a drill of No. 70 drill rod to drill his holes. He then placed small pins in the stationary members of the machine, one for each hook, at a proper position so the tongue in the hook acted on it at the proper time, thus making the shedding of the thread positive at the desired point and preventing shedding at any other time, even if the machine were turned back and the thread slackened. This was long before he conceived his scheme of tightening a chuck with a gear instead of the spanner wrench which we used on the Almond chucks.

A. W. Jacobs was a born mechanic and a gentleman; a man whose friendship was well worth while. The phenomenal success he made of his chuck business indicates clearly the type of man he was.

C. D. Rice of the Underwood Typewriter Co., worked for the Sigourney Co. at that time. He made a vertical milling attachment on his own account to fit a Brown & Sharpe No. 2 universal milling machine, and I believe sold it to B. & S. It is my impression this was the start of vertical spindle milling attachments.

As I look back over the various shops I have been connected with, my impression is that the Sigourney Tool Co. did better work, and made less fuss about it than any other shop I have known. There seemed to be a strong feeling of pride in the organization, and a desire to excel. It was a good shop to work in.



Gear Tooth Shapes

A Study of Fundamentals in Principles of Involute Gearing in the Endeavor to Find a Suitable Standard Form and Pressure Angle

BY E. W. MILLER
Chief Engineer, Fellows Gear Shaper Co.

PROBABLY there is no subject closely touching things mechanical concerning which there is a wider range of opinion, than gear tooth shapes. We have as heirlooms from another generation a number of erroneous notions which should be eliminated at the outset, thus doing away with the nonessential and that which tends to confuse and divert from the important factors.

It is believed none will contend for a tooth design other than involute, so that the involute system only will be considered.

The advantages of a recognized gear standard are apparent to those engaged in the manufacture of gears and those who make the various appliances for cutting the same. A standard means economy of production, uniformity of product, minimum equipment, and a definite knowledge of what is required. It also furnishes a definite basis for checking the product.

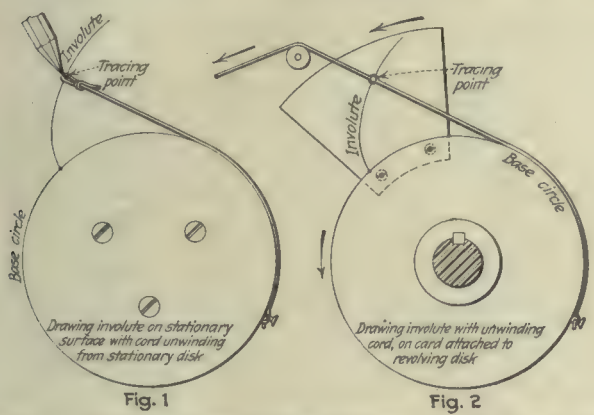


FIG. 1. DRAWING INVOLUTE CURVE. FIG. 2. TRACING CURVE ON CARD

A standard should be that tooth shape and that tooth proportion precisely defined by graphics, formula, or written words (and if necessary, all three) best suited to the great bulk of gear requirements. It is desirable for the sake of economy that, as far as feasible, such a standard shall accord with present-day practice. But present-day practice, economy or abstract theory should not interfere with the choice of a standard which broadly covers the field and at the same time assures a satisfactory product. As an absolutely perfect standard is obviously not attainable, the usual compromise is undoubtedly necessary. When a standard is finally adopted, its value would be much enhanced by a definite and carefully described system of inspection. Not only should the method of inspection be thoroughly worked out, but a system of inspection of the gear inspection devices should be carefully arranged. In this connection sets of limits should be established in strict accordance with quality required. The limit system should be set forth in plain, every-day language as free as possible from formulas, mathematics, and technical expressions. Not every man is, or can be, technically educated, and every effort should be made towards simplicity of procedure and clarity of description.

Let us think about an interchangeable system consisting of all toothed members from 12 teeth to a rack, inclusive, and in which each member of the system will run satisfactorily with any other member. The involute curve stands pre-eminent in the field of gearing.

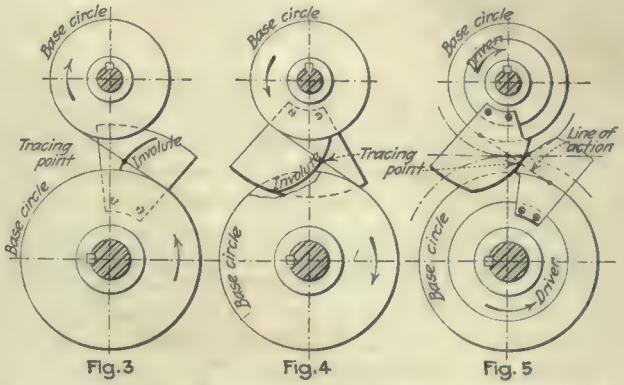


FIG. 3. TRACING CURVE FOR LOWER GEAR. FIG. 4. TRACING CURVE FOR UPPER GEAR. FIG. 5. TOOTH CURVES IN UNIFORM ACTION

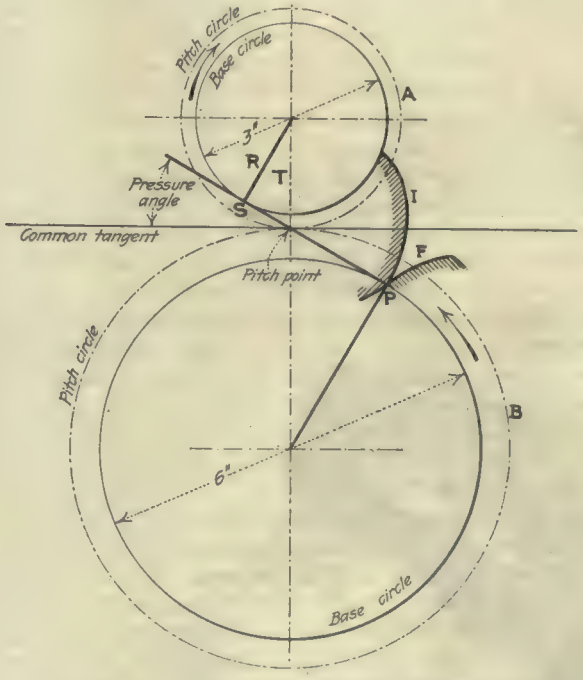


FIG. 6. GEARS OF DIFFERENT SIZES

With teeth shaped to involute outlines, gears are today performing feats which with other shapes seemed impossible a few years ago. The involute is not alone responsible for this advance, but it has been a great factor, due to the comparative ease of its duplication and its ability to operate properly at various, and sometimes varying, center distances.

The involute is that curve traced by a point on a

Paper presented at Rochester meeting of American Gear Manufacturers Association.

cord as the latter is unwound from a cylinder, known as the base circle. The pencil point, Fig. 1, fastened to the cord traces the involute curve as the cord is un-

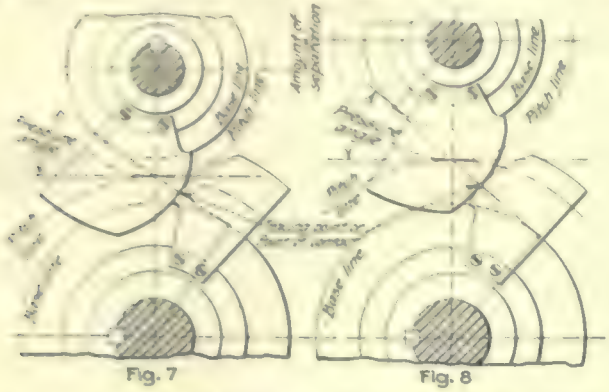


Fig. 7 Fig. 8

FIG. 7. GEARS IN NORMAL ACTION. FIG. 8. GEARS WITH CENTER SEPARATED

wound from the base circle. In Fig. 2 a card is attached to a base circle of the same size and a cord carried by the same is passed over an idler pulley. If the cord is pulled in the direction of the arrow, with a frictional resistance on the base cylinder to keep the cord taut, the base circle with the cord will rotate in the direction of the arrow, and a tracing point in the cord will draw a curve on the card. Obviously the curve developed is identical to that traced in Fig. 1, since each curve has been traced by points on cords unwound from base circles of identical diameter.

In Fig. 3 is a pair of disks, the upper one being two-thirds the diameter of the lower. If the cord with the tracing point be wrapped about the two disks and the lower disk provided with the recording card, an involute will be drawn upon that card as the upper disk is rotated so as to wind up the cord and unwind it from the lower member. In similar fashion an involute is traced on a recording card mounted upon the smaller disk, as shown in Fig. 4. If the cards are cut carefully on the involute line and mounted as shown in Fig. 5, it is plain that as the cord is wound upon the one disk and unwound from the other, the two cards will be in continuous contact at the tracing point, since the curves are simultaneously traced by that point. If the cord is removed and one disk member is rotated uniformly, the other disk will also uniformly rotate, since its rotation is brought about by contact of involutes developed by the same tracing point. The straight portion of the cord is called the line of action, because contact of the involute surfaces takes place along this line.

In Fig. 6 are shown two base circles of 3 in. and 6 in. diameter. A cord wound about the two and tightly drawn is assumed to have developed the two involutes shown through the medium of a tracing point therein. It is apparent that two complete revolutions of the 3-in. circle will wind up an amount of cord equal to the circumference of the 6-in. circle, and will thereby cause one complete revolution of the latter. It is also known that the involute faces *I* and *F* will be in continuous contact along the line of action, the contact beginning at *P* and ending at *S*. If several involutes, as *I* and *F*, are properly spaced about their base circles, and the base circle of 6 in. diameter is rotated continuously, it follows that the set of involutes carried on the larger, engaging those on the smaller, will at each revolution cause two revolution of the smaller.

If from the base-circle centers, other circles having the same diameter ratio as the base circles, are drawn tangent to each other, we may consider them as a pair of properly proportioned disks upon which may be located involute projections developed from the base circle, thus effecting a positive drive. These circles are called the pitch lines and their point of tangency is called the pitch point. The pitch point is also defined as that point at which the line of action crosses a straight line drawn through the base-circle centers. The common tangent is a line at right-angles to the line of centers and passing through the pitch point. The pressure angle is the angle which the line of action makes with the common tangent.

In Fig. 7 is shown a pair of base circles with templets and involute shape obtained as in Fig. 5. The cord

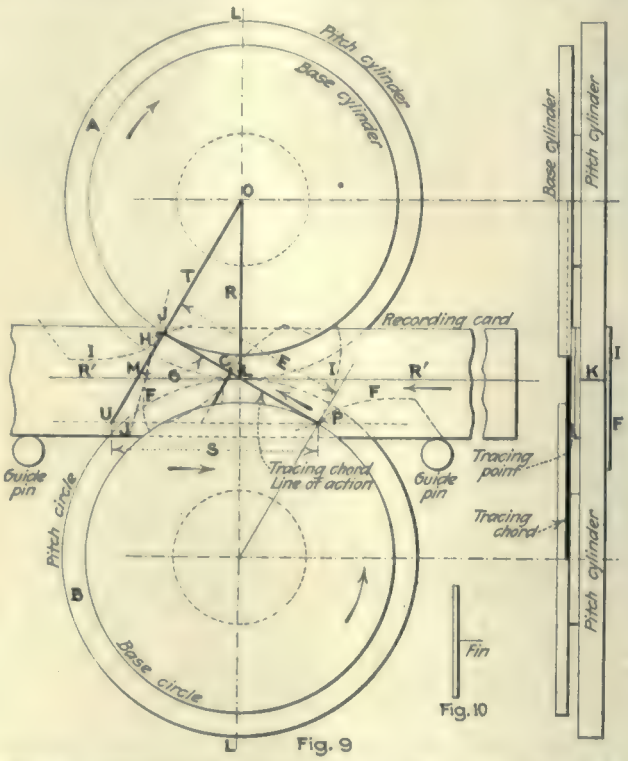


Fig. 9 Fig. 10

FIG. 9. RECORDING ACTION ON CARD. FIG. 10. END VIEW OF TRACING DEVICE

wound about the two disks represents the line of action. If the two centers are further separated, as in Fig. 8, and both disks are free to rotate upon their centers, the cord will inevitably keep the profiles in contact, since the involutes cannot possibly escape from the tracing points which define them. It is apparent, too, that the line of action makes an increased angle with the common tangent, denoting increased pressure angle. It is evident also that the pitch point appears in a new position.

In Fig. 9 are shown two base circles *A* and *B* of identical diameter. Involutes *I* and *F* have been developed from these base circles by methods previously described. It is assumed that the two involutes are securely fastend to the base circle. If involutes *I* and *F* are mounted on the back faces of the disks, they may act as means of rotation, permitting the installation of a recording card and tracing cord with tracing point as shown. As *F* is rotated in the direction of the arrow, thus driving *I*, contact of the two involutes takes place along the line of action. The recording card is

of rectangular shape, running on guide pins and free to move endwise. In Fig. 10 is shown an end view of the recording card having a fin of infinitesimal thickness. This fin is tightly pressed by the pitch cylinders at *K*, and it is assumed that their rotation causes endwise movement of the recording card at exactly the peripheral speed of the disks and at right-angles to the line of centers. If the tracing point is pulled along a distance *E*, any point in the base circle obviously moves the same distances, but a point in the pitch circle moves a greater distance, and by amount in direct ratio of the radius of the pitch circle to that of the base circle. Therefore, when the tracing point moves a distance *E*, the recording card moves distances *S*. Evidently then

$$S = \frac{R \times E}{T}.$$

It should be plain that line *M* is traced on the recording card as the tracing point travels the distance *E*, and the starting point on the card moves the distance *S*. *M* is the resultant of both forces acting in a straight line. Therefore *M* also is a straight line.

The involutes *I* and *F* and the straight line *M* have all been traced by a point in a cord being wound upon *A* and unwound from *B*, and the three are in simultaneous contact in any position along this line. Note contact at *C*. It can be mathematically determined that line *M* stands perpendicular to the line of action. It will be noted from observation of the straight line *JJ* that this line has been drawn at an angle other than 90 deg. with the line of action and just touching, or tangent to, involute *F*. It does not pass through the point of contact of involutes *I* and *F*, and therefore does not meet the conditions for satisfactory operation with the involute curve. From all this it is evident that a member traveling in a straight line tangent to a circle struck from a base-circle center must be provided with a straightedge or tooth to properly engage a surface of involute outline. This straight-tooth member is known as the involute rack.

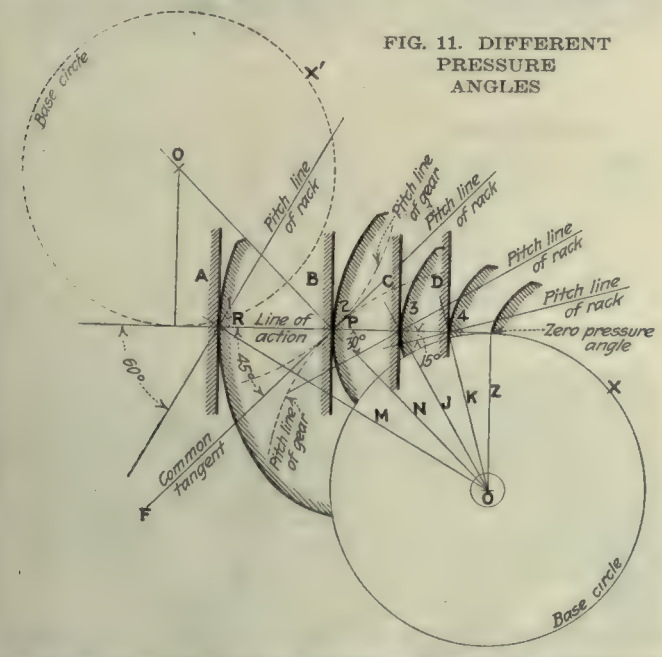


FIG. 11. DIFFERENT PRESSURE ANGLES

In Fig. 11 is a base circle *X*, and tangent to it is drawn a straight line *P* representing the line of action. Straight lines perpendicular to line *P* will evidently function properly as involute rack teeth since they fulfill the conditions already set forth of being straight and at right-angles to the line of action. The line *CO* is drawn through the intersection point of one of the straight lines and the line of action. The center of circle *X'* is the same distance from this intersection point as is the center of circle *X*. Circles *X* and *X'* have the same diameter. The line of action becomes also tangent to *X'*. Here is a condition like that shown in Fig. 9, and it is evident that the pitch point *P* is determined by the distance in a straight line from centers of the base circles to the intersection of line *B* with the line of action. This is represented by line *N*. The common tangent of the gear pitch circles becomes the pitch line of the rack.

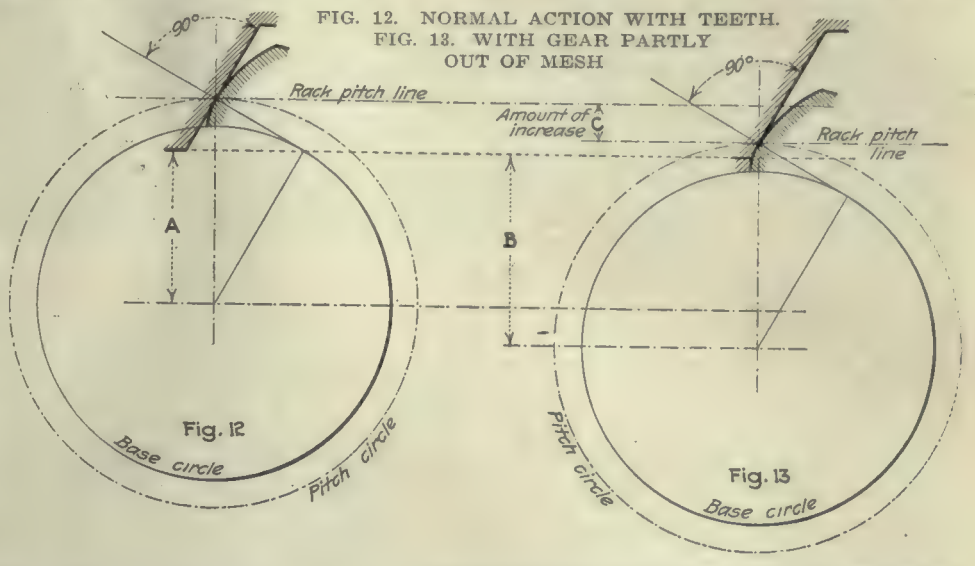


FIG. 12. NORMAL ACTION WITH TEETH.
FIG. 13. WITH GEAR PARTLY OUT OF MESH

The Pressure Angle

The pressure angle, being the angle which the line of action makes with the common tangent, is determined by the direction in which the straight line action as a rack tooth, moves. Obviously, the length of the gear pitch radius (as line *N*) determines the common tangent, thereby establishing the direction of travel and the pressure angle. It is interesting to note the effects of the lengths *M*, *N*, *J* and *K*. They result in the various rack pitch lines indicated, and the pressure angles are 60, 45, 30, and 15 deg. If the radius *Z* is used as a pitch radius, the straight line representing the rack tooth becomes a point. Its direction of travel is that of the line of action, and its pressure angle is zero. The gear pitch radius must intersect the line of action. Base circles must have radii of some length, as for example *Z*. It is therefore apparent that however great we may imagine the pitch radius to be, it must still make an angle (however slight) with the line of action. We conclude that the greatest theoretical pressure angle is almost but never quite 90 deg.

It has been demonstrated that a change in base-circle center distance affects the pressure angle of two involute curves developed from these circles. This is not true

when involute and rack are brought into contact. It has been demonstrated and laid down as fundamental, that the line of action must lie at right-angles to the rack tooth line. Fig. 12 shows these members in mesh at distance *A*. Fig. 13 shows distance *A* appreciably increased and indicated by *B*.

In order to keep the line of action at right-angles to the rack face, the pitch point has moved a distance equal to *C*, and established a new position for the rack pitch line. It is noteworthy that increasing the distance of base-circle center from rack has not affected the pitch circle of the involute. From the foregoing we may make the following conclusions concerning the involute curve, the term involute being used in a broad sense as being of an indefinite length and not confined to our usual conception of a gear tooth:

The involute is wholly determined by the diameter of the base circle.

An involute moving about its base-circle center, imparts rotative motion to a contacting involute in the exact ratio of their respective circles.

An involute has no pressure angle until brought into contact with another involute or a rack.

The pressure angle is determined by the center distance of the base circles.

The pressure angle once established is constant.

An involute has no pitch diameter until brought into contact with another involute or a rack.

The pitch diameter of an involute contacting another involute is determined by the center distance.

The pressure angle of an involute contacting a rack is unchanged when the base-circle center is moved toward or away from the rack.

The pitch diameter of an involute contacting a rack is unchanged when the base-circle center is moved toward or away from the rack.

The pitch line position of an engaging involute and rack is determined by the intersection of the line of action with a line passing through the base-circle center and perpendicular to the direction of rack travel.

(*To be continued in next week's issue.*)

Joining Bars by Thermit Welding

Long Bars Needed for Making Lead Screws of Rifling Machines—Aligning the Sections—Making the Mold and Weld—A Trussed Shipping Crate

By L. I. GRINNELL

RECENTLY two long rifling machines for rifling 10-, 12- and 16-in. guns were built for the U. S. Arsenal, Watervliet, N. Y., by the Driggs Ordnance and Manufacturing Co., New Haven, Conn.

The screws for operating the rifling bars were 64 and 74 ft. respectively. To make these screws, bars of the above lengths and 4¾ in. in diameter were necessary, but as bars of such length were not available, they were made by welding a number of shorter bars together by the Thermit process.

The sections to be welded together were lined up, two at one time, in V-blocks so that a 1-in. gap was left between the two pieces, as shown in Fig. 1. The usual operations customary in Thermit welding were then followed, namely: inserting the pattern wax between





FIG. 1. GAP FOR WELDING. FIG. 2. ONE OF THE WELDS

the parts to be welded and shaping a wax collar around the gap, surrounding the wax by a mold, burning out the wax by means of a preheating torch, preheating the sections to be welded and tapping the liquid steel (generated at about 5,000 deg. F. by the Thermit reaction) from the bottom of a crucible into the mold. Fifty pounds of Thermit were used in making each of the welds. Fig. 2 shows one of the welds after removing the mold. Fig. 3 shows about one half of the welded bar.

After the collars of the welds were turned off and the stock threaded to form lead screws, it was practically impossible to detect the location of the welds. Cutting one of the screws is shown in Fig. 4.

The transportation of the screws was one of the difficult parts of the job, as the screws were very flexible

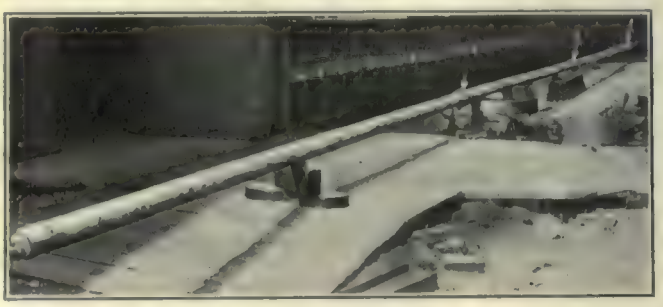


FIG. 3. PART OF A WELDED BAR

and all precautions had to be taken to prevent springing them in transit. It was necessary to box them and build a truss to hold the box in line. This truss was mounted on two-wheel trucks which were towed to the flat cars by a small caterpillar tractor, as shown in Fig. 5. Another tractor was used to hold the outfit back when descending grades. Owing to the great length, it was necessary to use three flat cars to trans-

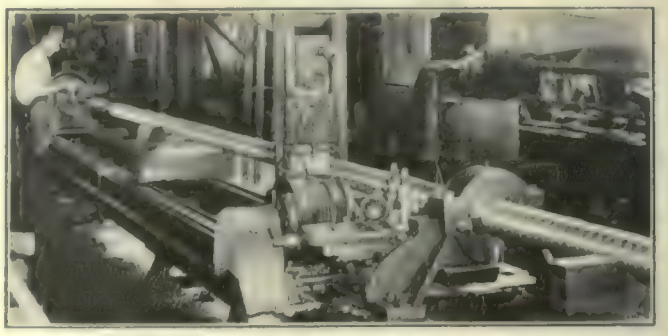


FIG. 4. CUTTING ONE OF THE SCREWS





FIG. 5. TAKING THE CRATE TO THE RAILROAD. FIG. 6. THE CRATE ON THE CARS

port the crated screws by railroad. The weight was carried by the center car and the extra length overhung the other two cars, as shown in Fig. 6. In this way the truss construction prevented the overhanging ends from springing and made it possible to carry all the weight on the center car, preventing the screws from being subjected to any motion while the cars were going around curves. The screws arrived at the Arsenal without damage.

Suggested Readings in Economics

In our attempts to acquire a working knowledge of economics we are likely to be hard put to know what to read. Of considerable value, therefore, is the following list of suggested readings, compiled by Alvan T. Simonds, president, Simonds Saw Manufacturing Co., Fitchburg, Mass.

In referring to the list Mr. Simonds says, "These suggestions are made in response to many inquiries. They are for beginners. Doubtless there are many other books just as good, except in the case of Adam Smith. A dozen titles might easily be added to the advanced list and hundreds to the special list."

FUNDAMENTAL

The Wealth of Nations, by Adam Smith. Macmillan Company.

ELEMENTARY

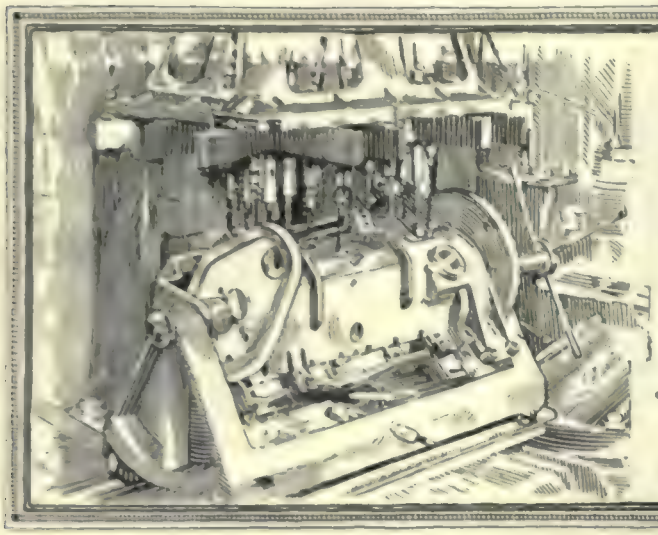
American Economic Life, by Burch. Macmillan.
Elementary Economics, by Carver. Ginn & Company.
Our Economic Organization, by Marshall & Lyon. Macmillan.
An Introduction to Economics, by Laing. Gregg.
How the World Makes Its Living, by McPherson. Century.
Readings in Industrial Society, by Marshall. University of Chicago Press.
The Unsolved Riddle of Social Justice, by Leacock. John Lane.
Wealth—Its Production and Distribution, by Kirkaldy. Dutton.
Economics for the General Reader, by Henry Clay. Macmillan.

ADVANCED

Principles of Economics, by Taussig. Macmillan.
Current Economic Problems, by Hamilton. University of Chicago Press.
Economic Development of the United States, by Lippincott. Appleton.
The Wealth and Income of the People of the United States, by King. Macmillan.
Profits, Wages and Prices, by David Friday. Harcourt, Brace & Howe.

SPECIAL

The Case for Capitalism, by Withers. Dutton.
The Flow of Value, by McPherson. Century.
Stabilizing the Dollar, by Fisher. Macmillan.
History of Labor in the United States, by John R. Commons. Macmillan.
The Theory of Business Enterprise, by T. Veblen. Scribner's.
The Meaning of Money, by Hartley Withers. Dutton.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Boring Tools Continued—Methods of Adjusting Cutters—Use of Round and Rectangular-Section Cutters —Piloted Boring Bars—Multiple-Cutter Boring Bars

THE matter of provision for the adjustment of cutters in boring bars is an important one, yet it is not generally given the consideration to which it is entitled. The method provided should be such that it will be convenient, easy of access and accurate. There is some difference of opinion as to whether adjustments can be made more conveniently by means of a wrench on a square-head screw, or by the use of a screwdriver in the slotted end of a screw. The writers favor the latter method, as the position of the tool can be more easily controlled by means of a screwdriver than by a wrench. Existing conditions in the construction of the bar and the location of the cutter make it necessary to use different methods, but the matter of convenience and ease of setting should always be considered.

In Fig. 305 are shown a number of examples to illustrate the different methods which can be used for the purpose mentioned. In the case *A* the tool *B* is set straight across the bar and held by a setscrew at *C*. The adjustment provided for this tool is made by means of a headless slotted screw *D* of slightly larger diameter than the tool itself. The hole is, therefore, tapped nearly half way through the bar in order to permit of considerable adjustment. This tapping of the hole takes away a part of the bearing for the tool, and it is therefore objectionable. A better arrangement is shown at *E*, in which the tool *F* is backed up by a screw smaller than its own diameter. This screw can be used with a filler block to follow up the tool until the latter becomes so short that the limit of its life has been reached. A similar arrangement using a headless screw is shown at *G*.

In the example *H* the tool *K* is of rectangular shape and the hole is broached entirely through the bar. To provide for adjustment, a recess is milled at *L* and into this the block *M* is fitted. A headless setscrew, shown at *N*, is used to make the adjustment. It may be well to state here that adjusting screws are preferably made of fine pitch, usually between 24 and 30 threads per inch.

Another method of adjustment sometimes found convenient for confined situations is shown at *O*. The tool *P* is ground to an angle of 45 deg. at *Q*; and against this surface the shoe *R* bears, so that when it is acted upon by the screw *S*, it will force the cutter outward. This construction can be varied somewhat by using a cone point screw instead of the shoe.

A method that can be used to operate and adjust a cutter which is inconveniently situated is shown at *T*. This design also employs an angular principle by using the rod *U*, which is beveled at each end and acted upon by the screw at *V*. A method like this can hardly be recommended, except in extreme cases where difficulty is found in placing a screw so that it will act directly against the end of the cutter. In the example *W*, the tool *X* is adjusted by means of a lever *Y* which lies in a slot on one side of the bar. It is acted upon by a screw *Z*, which causes the tool to move outward when pressure is applied.

In the example *Z-1* the tool *Z-2* is adjusted by means of a plug *Z-3*, which is tapered as indicated and drawn up by means of the nut at the end of the bar. This method provides exceptional stability under the tool and the adjustment can be readily made.

When rectangular tools are used, two methods are employed; one of these is to tap the rectangular hole so that a screw of suitable diameter can be used and the other is to drill a hole of slightly larger diameter than the rectangular one and fit it with a screw, using if necessary a small shoe between the end of the screw and the tool. This method is illustrated at *Z-4*.

Flat cutters are frequently used in boring bars instead of the round or square variety which have been described. There is considerable difference in the cutting action, as the flat-blade type is usually double ended so that each end cuts. Strictly speaking, boring bars with flat cutters do not generate the hole; but they are nevertheless very useful, as they are capable of removing considerable stock. There is, however, no adjustment for diameter other than the grinding of the cutter to the specified size. This construction avoids the possibility of errors caused by an inaccurate setting of the cutter, and the tool can be used with considerable success by inexperienced workmen. It is subject to several objections, however, the first being the fact that the hole is not generated. The second is that there is no up-keep to the cutter, so that after it becomes worn it must be reground and used for some diameter

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smaller than that for which it was originally intended. For certain classes of work and under some conditions, excellent results can be obtained by the use of flat-blade cutters of various kinds.

In Fig. 306 is shown at *A* a portion of a boring bar furnished with a flat-blade cutter *B*. The method of fastening this cutter in place is by means of a wedge *C*. The bar *D* is milled away on two sides at *E* and *F* equidistant from the center. The cutter is carefully fitted with shoulders which exactly fit the bar at these points, thus giving it the correct location. Relief is provided at *G*, so that the action of the wedge *C* causes the cutter to bear only at the outer portions of the bar. A wedge like that shown is rather objectionable for several reasons. One of these is the fact that there is a slight tendency to distort the bar, another is that it is inconvenient, and a third reason is that the projecting end of the wedge may interfere with chip clearance. It is often used, however, although there are other methods which are to be preferred.

The example *H* shows an end-cutting, flat-blade boring tool at *K*. This tool locates in the bar in the same manner as that previously described, but it is held in position by means of a round pin *L* flatted off on one side to a taper. When this pin is driven into the bar it enters a hole in the cutter and draws the latter back strongly against the shoulder. This method is much superior to the wedge shown at *C* and is used in many bars for holding both flat cutters and the round variety.

Another method which can be used for a cutter of this general type is shown at *M*. The cutter *N* is of rectangular shape and locates in the bar as in the previous

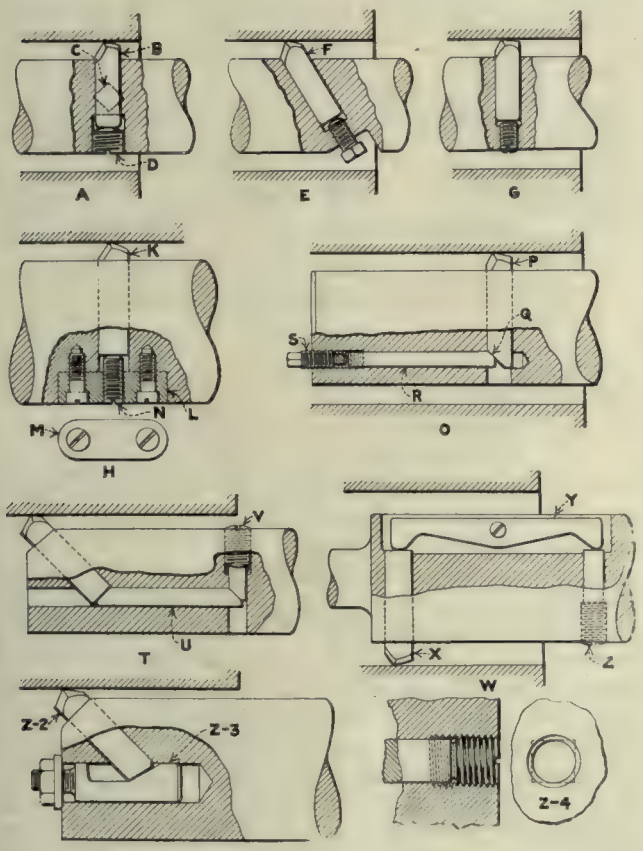


FIG. 305. METHODS OF ADJUSTING BORING TOOLS

example. It is held in place by means of two setscrews at *O* and *P*, instead of by a wedge. A point of importance in connection with the use of double-end cutters is the grinding of the tool at the point, so that the opposite faces are in line with each other and at the same time in line with the center of the bar. The sectional view at *A* brings this point out clearly.

Flat cutters are sometimes made so that they can be

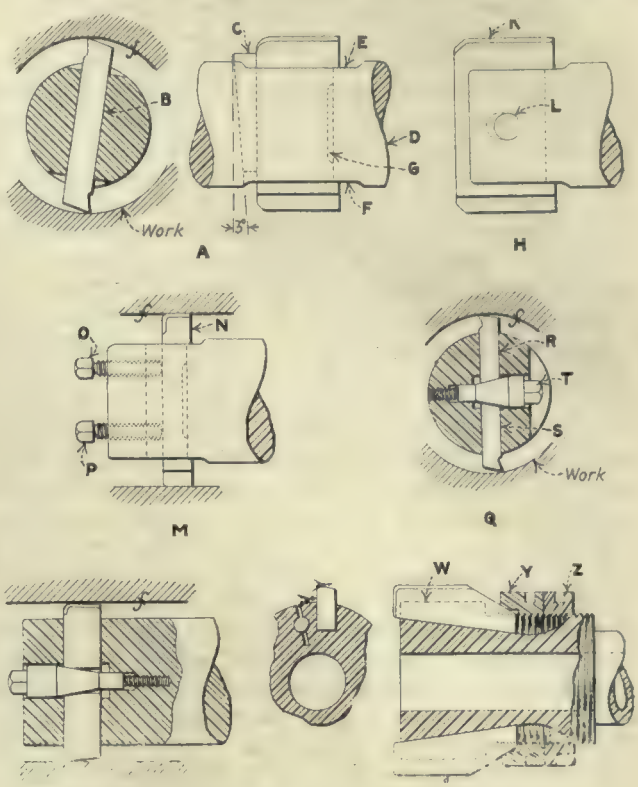


FIG. 306. FLAT CUTTERS FOR BORING BARS

adjusted for diameter. Various methods are in use, several of these being shown here. In the example *Q* the tools *R* and *S* are separate, and are expanded by means of the special tapered screw *T*, which bears equally on the inner end of each cutter. A suitable method of fastening the cutter after it has been adjusted must be provided. In the example *U* the principle used is much the same, but the adjusting screw enters the end of the bar instead of the side. Care must be taken in either of these two cases to make sure that the screw has a cylindrical bearing on both sides of the taper, in order to insure accuracy.

Another method of adjusting flat-blade cutters is shown at *V*. The cutters *W* and *X* are fitted to the taper slots shown, and adjustment is obtained by means of the lock nuts at *Y* and *Z*. The nut *Y* is beveled, so that it has a holding-down action on the cutters. The other end may be secured by means of a tapered pin in a slot, as indicated in the end view. There are other methods of adjusting and fastening cutters of this kind, but the principles illustrated here cover those which are best known and most used in tool designing.

Piloting Boring Bars

The advantages of a piloted boring bar have been previously mentioned, but the method of piloting has not been taken up. Fig. 307 shows a number of examples which illustrate the use of the pilot in connection with bars for boring. In the example A the work B is held on a faceplate fixture in which a bushing *C* is fixed. The bar *D* has a pilot *E* which enters the bushing, and guides as well as supports the bar under the pressure

of the cut. This is the simplest type of piloted boring bar. It is, perhaps, unnecessary to state that both bar and bushing should be hardened and ground.

Another example, shown at *F*, indicates a method which can be used for piloting a boring bar used in a blind hole in the work *G*. The fixture is so arranged that it carries a bushing *H* in a suitable position to act as a support for the bar *K*. The bushing is a sliding fit on the bar and remains on it at all times, as indicated by the dotted lines at *L*. When indexing the turret the bar is pulled out and carries the bushing with it. It depends somewhat on the size of the hole whether this arrangement is necessary, as in some cases it might be possible to make a bushing larger than the diameter of the hole which is to be bored and proportion the bar accordingly. When a blind hole is to be machined, a method like this can often be used to advantage.

Another method of piloting a bar for a blind hole is shown at *M*. Here the bushing *N* is supported in a bracket *O* which is attached to the ways of the machine. The bracket may be made in such fashion that it can be thrown back out of the way if a number of tools are being used in the turret in the same operation. The method of attaching to the ways of the machine is clearly shown.

When a large diameter is to be bored, like that shown at *P*, the work may be supported and located on a pilot *Q*, which is fastened into the face plate fixture. The toolholder *R* can be furnished with a bushing, as indicated, so that the pilot on the fixture will enter it and steady the tool against the pressure of the cut. This construction assists in producing accurate work. Care should be taken whenever a pilot is used to provide means for the releasing of any air compression which may be caused by the pilot entering a blind hole. The hole *S* takes care of the matter in the example shown.

The bar *T* is not greatly different from that shown at *D*, except that it is provided with oil or chip grooves. Many manufacturers provide all boring bars with grooves of this sort, both for the purpose of lubrication and to prevent trouble which might be caused by chips being carried into the bushing and scoring both it and the bar. A point of importance in connection with the length of the pilot should be mentioned here. In the example *T* the pilot enters the bushing only a short distance before the cutting tool starts on the work. It is much better to proportion it so that it will have more support, as indicated at *U*. While the short distance that the bar *T* enters the bushing might be sufficient when both bar and bushing are new and are accurately ground to size, after a time both bushing and bar will become worn somewhat and the bushing may be "bell-mounted." As any freedom of motion here would produce chatter, it is better to allow for a greater length of pilot in the hole before the cutting tool starts.

In designing pilot bushings for boring bars it is common practice to make them with a round corner, as shown at *V*. This is not good practice, however, and should be avoided in all cases, as the round portion permits chips to gather on the bar and to be drawn into the bushing. If the bushing is made as shown at *W* with a sharp corner and if the bar is chamfered on the end as indicated, there will be no trouble caused by chips, even if the bar is not grooved. It is not advisable to round the end of the bar as shown at *X*, as this construction is likely to cause the same kind of trouble.

When several diameters are to be bored, it is customary to arrange the tools in one bar whenever possible. There are several points in connection with the arrangement of the tools which are important. They can best be illustrated by means of examples. Fig 308 shows a piece of work *A*, which is bored to two different diameters by means of tools *B* and *C*. For work of this kind the tool *C* can be set either straight or at an angle, but it must be placed so that it will pass through the hole a short distance before the completion of the cut made by the tool *B*. If tools are arranged in this way, it is not necessary to be particularly careful as to the grinding of the faces of the tools. In the example *D* a similar condition is shown. Both tools

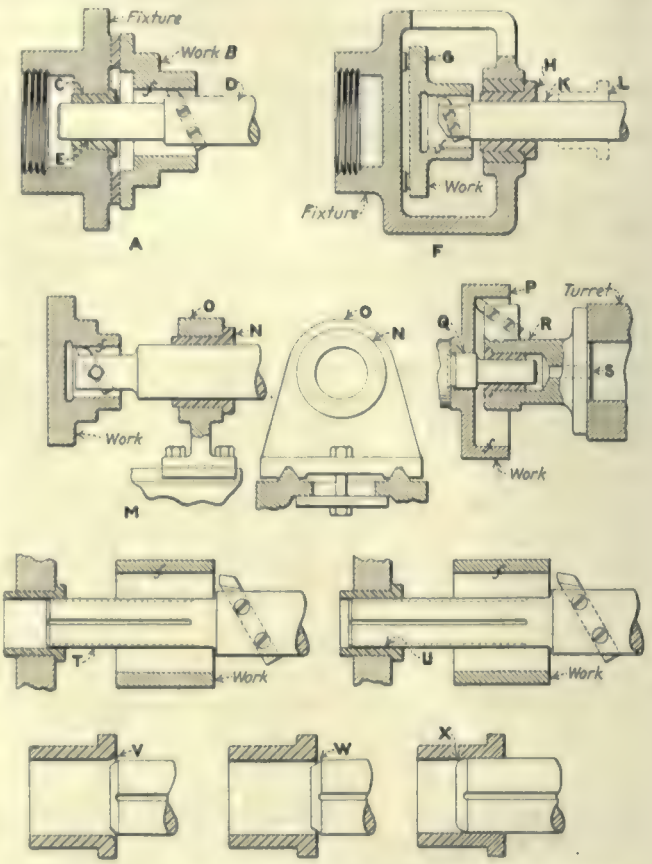


FIG. 307. METHODS OF PILOTING BORING BARS

E and *F* are placed at an angle, but as the tool *F* passes through the work no great difficulty would be experienced in grinding the faces.

In the example *G* there are three tools, *H*, *K* and *L*. The tool *H* passes through the work, but tools *K* and *L* stop against the shoulder. The tool *H* can be set at an angle; but the tool *K* is also at an angle, and it must be carefully ground to preserve the distance from one shoulder to the next, and at the same time the diameter at the point must be taken into consideration. This means that a great deal of care would be necessary to preserve both shoulder distance and diameter when grinding the tool *K*. A better way to arrange the tools for a piece of work like this is shown at *M*. Here the tool *N* extends through the work and is set at an angle. Tools *O* and *P* are set straight and the distance between the shoulders is determined by grinding the faces of the tools. The setting is much simplified when

tools are arranged in this way. Another example, at *Q*, shows boring tools at *R* and *S* and a facing tool at *T*. The tool *R* extends through the work and is set at an

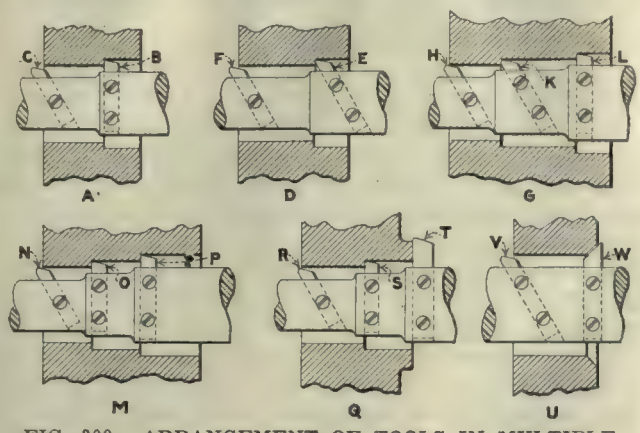


FIG. 308. ARRANGEMENT OF TOOLS IN MULTIPLE BORING BARS

angle, but both of the tools *S* and *T* are set straight for the reasons previously mentioned.

In the example *U*, tool *V* extends through the work and tool *W* cuts a chamfer, as indicated. The tool *V* is set at an angle while that at *W* extends straight across the bar. The principles shown in these diagrams are valuable, yet they are frequently not considered by a tool designer. Multiple bars are often made with three or four angular tools which are intended to bore diameters and preserve shoulder distances at the same time. When this is done it is often necessary to make up a special gage for grinding, and a great deal of trouble is usually experienced in setting the tools correctly.

It is not always profitable to bore large and small diameters at the same time on account of the difference in the speed at the various points. A great deal depends upon the work which is being done in combination with the boring tools. If an outside diameter is being turned while a small diameter is being bored, the speed of the work must be proportioned according to the speed of the largest diameter. In such cases, it is good practice to bore as many diameters at once as the tool set-up will permit.

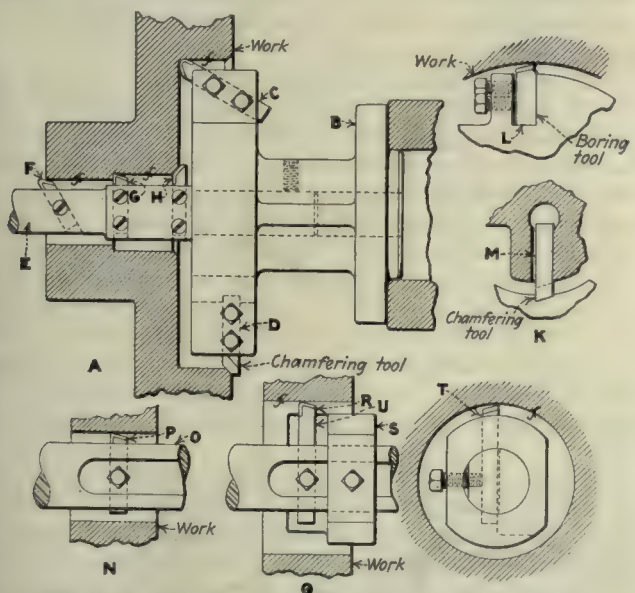


FIG. 309. MULTIPLE BORING BARS FOR LARGE AND SMALL DIAMETERS

In Fig. 309 is shown an example at *A* which requires a multiple set up of boring tools. A special holder *B* is fastened to the turret face and contains a boring tool *C* for boring the large diameter and a chamfering tool *D* for finishing the angular portion. The holder *B* is also provided with a multiple boring bar *E* in which are three tools, *F*, *G* and *H*, used for boring, cutting to shoulder and chamfering, respectively. In the matter of setting the tools for work of this kind, the principles which have been previously described should be employed. The detail at *K* shows a method of fastening the tools in the holder. The casting is slotted out at *L* and *M* to receive the tools, and square-head setscrews are used to hold them rigidly. No provision for adjustment is made in either case, other than by hand. It would be easily possible to provide the tool *C* with a backing-up screw for convenient adjustment.

When bars of a standard type are being used, there is an occasional necessity for boring a hole considerably larger than that for which the bar is designed. In the example *N*, *O* is a standard bar provided with a square tool *P*. It is evident that for other considerably larger diameters the tool would overhang from the bar so much that it would be likely to chatter. Provision can be made for this condition, as shown at *Q*, in which the cutter *R* is much longer than that shown at *P*. A head *S* is fitted to the bar in such a way that the tool is well supported by it. This method is of considerable advantage when machines are equipped with standard bars which must be adapted to a considerable variation in the diameter of work. Care must be taken when using a supporting member of this kind to make sure that it fits the tool closely at the points *T* and *U*, so that it will resist the pressure of the cut in both directions without permitting vibration.

Italian Automobile Manufacturers Active

By H. C. MacLean
Commercial Attaché, Rome

American automobile manufacturers, especially of low-priced cars, will have to meet considerable competition from Italian manufacturers.

The Ansaldo Co., which during the war manufactured war material solely, including guns, armored cars, war vessels, etc., is turning out small, popular passenger and commercial cars. These cars, while not having the pretensions of well-known Italian makes, are to combine the advantages of a convenient price and low running cost and upkeep. The four-passenger touring car sells f.o.b. factory at 30,000 lire, chassis without body ($1,185 at exchange rate on Oct. 21, the date of the commercial attachés letter), and 42,000 lire, chassis with body ($1,659).

Details are on file in the automotive division of the Bureau of Foreign and Domestic Commerce and will be furnished on request by referring to Exhibit File No. 49255.

The Fiat Co. is gradually returning to normal working conditions, according to the "Agenzie Economic Finanziaria," difficulties with the personnel having been overcome. During August 600 automobiles were turned out; 800 during September; and 1,000 were planned for October, all of which have already been sold. The warehouses of the company are practically empty, there being only 200 motor trucks on hand, and these are expected to be readily absorbed by the domestic market. The construction of commercial cars will be suspended during the coming year.—*Commerce Reports.*

Significance of Standardization

Need for Co-operation Between Industry and Federal Government—Work of Committee in Harmonizing Conflicting Standards and Formulating New Ones

By A. A. STEVENSON
Chairman, American Engineering Standards Committee

TO THOSE of us who have been actively interested in standardization work for a number of years, the significance and importance of standardization to industry and to the Federal Government seems almost axiomatic.

From the many advantages to be derived by both industry and the Government from standardization along these lines, I have selected a few of the most important:

(1) Mass production, with its obvious advantages to the producers, means reduction in cost, and competition would insure to the consumers, including the Government, the benefit of a reduction in price.

(2) The elimination of side varieties and sizes permits producers to concentrate on those retained, and makes possible improvements in methods and equipments that will ultimately result in the elimination of waste and the reduction of cost to the consumers, including the Government.

(3) Fairness in competition in both domestic and foreign trade is promoted by putting all tenders on an easily comparable basis, to the benefit of both the producer and the consumer.

(4) The elimination of indecision in both production and utilization removes a prolific cause of inefficiency and waste.

(5) Stabilization of production and employment means for the producers the uninterrupted manufacture of stock during periods of depression, and it is of vital interest to the Government as being of benefit to the country as a whole.

(6) The accumulation of stock means prompt deliveries by the producers, and eliminates the necessity of the Government itself carrying a large inventory of material. What has just been said by way of reference to the significance of standardization to industry and the Government brings out forcibly the mutuality of the interests of these two in standardization, and shows how the benefits which accrue to industry from standardization, in turn prove beneficial to the Government. Does it not show conclusively the desirability and necessity of their friendly and hearty co-operation in the standardization movement?

The present is a particularly opportune time for the launching of extensive co-operation between Government and industry. The U. S. Government is probably the largest purchaser of materials in the world. It maintains an unrivaled group of research organizations, the one object of which is the furthering of the development of our industries. In addition to the continuing work of the Government in promoting the national welfare through such aids as it may properly give to industry, the efforts of the present Administration have shown a keen appreciation of the importance of standardization and of its bearings upon industry as a whole, and constitute a most significant development in the relation of the Government and industry. The War and Navy Departments obviously have certain special requirements with reference to their military needs, but aside from these the interest of the Government in standardization is the same as that of all other consumers.

The World War showed us the need of standardization along national lines. The desirable results obtained therefrom were of unlimited services to the country as a whole. Would it not be a calamity for us not to profit by the lessons taught us by these experiences, adapting them to peace time conditions? The advantages to be derived from national standardization are no less real in the midst of the post-war readjustment struggle.

In outlining some of the factors tending to emphasize the significance of standardization, I have not mentioned the great importance of standardization in helping to retain our foreign trade and meet keen competition from abroad. In both Great Britain and Germany national standardization is being carried on intensively.

Industry and Government at Fault

For reasons for which neither can be blamed exclusively, there is no doubt that the industries of this country and the Government departments in many instances have not co-operated in a way to insure best results in standardization along national lines. In my opinion both have been at fault. In national standardization the co-operation of the Government is necessary to industry, and the co-operation of industry is just as necessary to the Government.

In order to obtain the maximum of benefit from co-operation with industry, the Government should not attempt to set up standards at variance with standards acceptable for use by others for identical purposes. It should consider itself one (although a very large one) of the many consumers, and in its dealings with the manufacturers should co-operate with other consumers in formulating standards acceptable to both the producers and the consumers.

The great benefit to be derived from having only one set of standards is so great that the producers should be willing to comply with more severe requirements that are uniform, in preference to less severe requirements that are different for each consumer or group of consumers; the consumers should be willing to accept less severe requirements, thereby obtaining the benefit derived from economy in manufacture, rather than insisting on the more severe requirements with the accompanying added costs. An ideal specification is one which can readily be met by a producer who is competent and willing. When a specification is so severe that it condemns much good material, it results in economic waste.

The relation of the great Federal research bureaus to industrial standardization is no less important than is that of the great purchasing bureaus. Research and standardization are very closely related, and in many ways they are supplementary to each other. By showing the need of reliable information as to the facts, in order to determine what is the best practice, and to

Abstract of paper presented at meeting of American Engineering Standards Committee, Dec. 9, 1921.

secure agreements on moot questions, standardization acts as a powerful stimulus to research and development. But what is of even greater importance, standardization is one of the principal means of getting the results of research and development work into actual use in the industries, so that the industries themselves, and finally the general public, may reap the advantage.

One of the most direct and effective methods of getting the results of the investigational work of the research bureaus introduced into, and of service to the industries, is by co-operation between the research bureaus and the industries, through working standardization committees, which must necessarily be joint committees of the various bodies interested in each specific project. The many advantages of such co-operation, both to the industries and to the bureaus, are obvious.

What is no less important, such co-operation is very effective in helping to extend a knowledge and appreciation of the work of the bureau in the associations that speak for the industry. As illustrating the significance of this matter, it may be mentioned that more than a hundred national organizations are now co-operating through accredited representatives, in the work of standardization committees which are working under the auspices and rules of procedure of the A. E. S. C. In this work the Bureau of Standards, the Bureau of Mines, and the Forest Service are taking a very active part, and in so doing, are rendering extremely important service to their respective industries.

The various governmental departments need not fear that encouragement given and aid extended to such activities will in any way detract from, or militate against them in their own field of work. Quite the reverse, as I am positive the final result would be greater appreciation by industry and the public at large of the benefits to be derived from close co-operation with governmental agencies already established, and in turn these agencies would receive more of the credit they are entitled to for what they have done and are doing.

In order that standardization along national lines may be brought about, it is necessary that there be some central body to act as a clearing house in standardization work. The need for closer co-operation in order to prevent duplication and the promulgation of conflicting standards in America crystallized in the appointment of a committee by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials, which formulated a plan resulting in the organization of a permanent committee made up of representatives of the five societies mentioned and the three Government Departments of War, Navy and Commerce. The constitution of this committee, known as the American Engineering Standards Committee, was broadened later to permit the representation of other bodies.

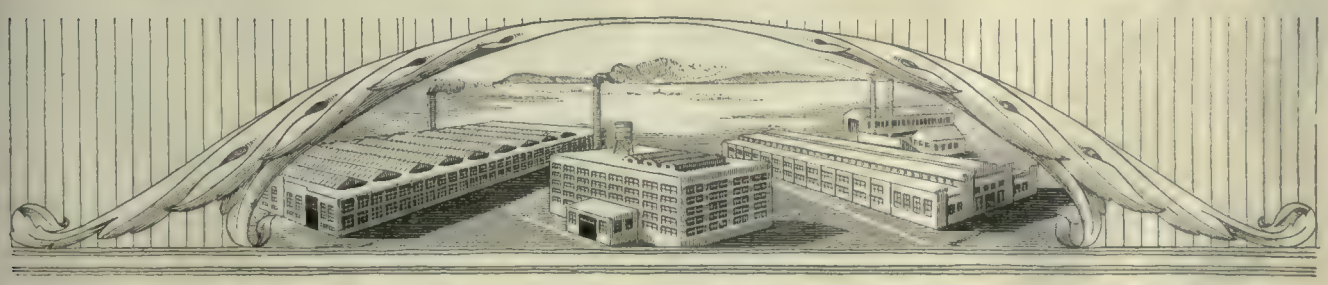
As a result of the work in which the American Engineering Standards Committee is now actively engaged, existing conflicting standards are being brought into harmony, and there are being created truly representative committees to formulate new standards. The methods employed in accomplishing these admittedly desirable results obviously differ somewhat from methods utilized hitherto, and it must be acknowledged that they are not yet fully understood by many of the organizations in America that should be co-operating in standardization along national lines.

The decision of the American Engineering Standards Committee not to deal with technical details has proved a source of great strength in its real work which is to insure the full co-operation of organizations producing standards that are not in conflict.

In determining the desirability of undertaking the development of a proposed standard, it has proved highly satisfactory to initiate the movement by calling a conference of the bodies interested, which the American Engineering Standards Committee does upon request from a responsible organization or organizations.

The plans laid down for carrying out the work of standardization will insure that the co-operative spirit brought into being by the conference will continue to be the controlling feature of the work of eliminating existing conflicting standards and "Americanizing" the standards that will be formulated hereafter. I do not think too much emphasis can be put upon the advantages of the conference method of initiating work on any particular standard or set of standards, provided the conference is truly representative. When men get together in such a conference, from an interchange of ideas they obtain a comprehensive view of the whole field.

It cannot be too often repeated, that a national standardization program means almost unlimited advantage to the manufacturer in cheapening the processes of production and stabilizing his market; to the distributor in clarifying and simplifying his problems; and to the ultimate consumer by lessening costs and expediting deliveries with whom the Government as a purchaser is to be included; and to the Government as a body of great research agencies, by selling the results of its researches to industries in return for an increased prestige with the general public and an increased support from industry. In my opinion the real significance of standardization to industry and the Federal Government—what it may mean and what it can accomplish, will not be fully realized until there is a sincere co-operation, sympathetic, systematic and comprehensive, between industry and the Federal Government, in which co-operation the general consumer has a part.



Manufacture and Use of Diamond Cutting Tools

II. Polishing or Lapping the Stone—An Operation in Which Lack of Skill May Prove To Be Very Expensive—Wire Drawing Dies

BY ELLSWORTH SHELDON
New England Editor, *American Machinist*

OWING to the extreme hardness of the stone, the only method of cutting or shaping the diamond is by lapping it, using as an abrasive the dust formed by pulverizing fragments of the diamonds themselves.

In shaping a diamond to form a cutting tool, advantage is taken of the cleavage lines and a piece of the stone is split out of a crystal as nearly as may be possible to the size and shape required.

The diamond cutter never "grinds" a diamond. The operation is always referred to as "polishing" or "lapping," though the result to be accomplished is exactly

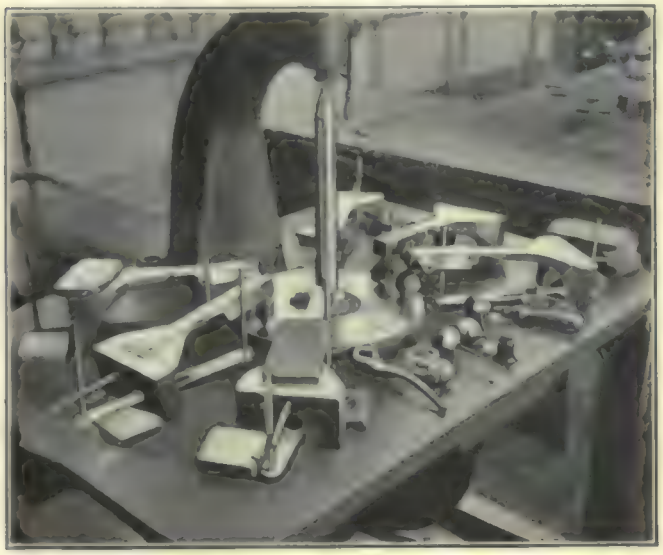


FIG. 9. SHOWING HOW THE STONES ARE HELD TO POLISH THEM

what a machinist would call grinding—that is, the cutting away by abrasion of a portion of the stone to produce a flat surface.

The diamond cutter's lap, upon which most of this work is done, is a disk of cast iron about 11 in. in diameter mounted upon an arbor of steel that is held in a vertical position upon centers, or "pivot" bearings, and rotated at a speed of approximately 2,200 r.p.m. by means of a quarter turn belt from below. The side of the disk that is uppermost is faced off true and smooth and is charged with diamond dust by covering it with a mixture of the dust in oil. The fine particles of diamond dust become embedded in the iron by the pressure and rubbing of the work.

One of the machines is shown separately in Fig. 9, and in Fig. 10 is one of the devices, called by the diamond worker a "tong," by means of which the diamond is held upon the lap.

The lapping or polishing is one of the most important parts of the diamond cutting trade, and his value as a workman depends upon the speed and accuracy with which the diamond cutter can reduce a rough stone to the required shape and dimensions.

Not a little of his skill is manifested in the way in which he cares for his lap. These disks are of a special grade of cast iron imported from Holland and Belgium especially for this purpose, and out of three or four castings the diamond worker will pick one that he thinks is most suitable for fine polishing. This lap he will jealously guard from his fellow workman, for he does not want to entrust a tool upon which he has expended so much time and labor in making it smooth and free from scratches to another, who, he suspects, will not be so careful of it.

The working surface of the lap is first ground true, after which the workman painstakingly rubs it criss-cross fashion with an "emery stone," filling it full of minute scratches or burs, running in a radial direction, that will later enfold and retain the fine particles of diamond dust that constitute the real cutting medium.

The lap runs continuously and a worker may have as many stones upon it as there is room around the periphery to accommodate the tongs. Flat bars of iron called "tong plates" are fastened to the bench by means of lag screws, each bar having an upwardly projecting steel pin at either end which holds the tong from being swept out of place by the friction of the stone upon the revolving lap. The position of the tong plate is readily adjustable as a lag screw passes through a slot in the bar. The manner in which the tong plates are disposed about the lap may be clearly seen in Fig. 9.

The tongs are made of wood with "feet" at one end to rest upon the bench and a clamp at the other to take the

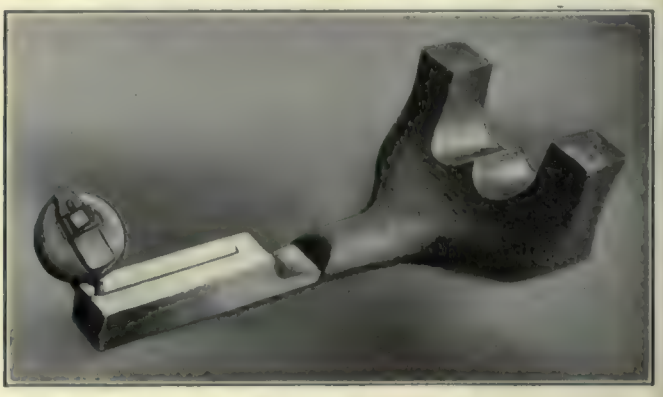


FIG. 10. A DIAMOND CUTTER'S TONG

stem of the inverted cup into which the diamond to be ground is set. Pressure is added as necessary to speed up the grinding by laying slabs of lead on top of the tong as may be seen in the case of the tong nearest the observer in Fig. 9. The pressure may be very nicely graduated by sliding the slab nearer to or farther from the end of the tong that is over the lap.

The cup-shaped contrivance of iron that holds the stone to be ground is called in the diamond cutter's parlance a "husk" or "dop." The cup only is of iron; the stem being a piece of stout copper wire by which the dop is held in the clamp end of the wooden tong. The stone to be ground is held in the dop in the same manner as was described in connection with Fig. 6, except that metallic lead or solder is used instead of wax; the reason for the substitution being that the

heat generated by the friction of the stone upon the lap would melt the wax and allow the stone to become displaced.

There is no adjustment to the dop except by bending the wire stem, but a diamond cutter becomes so expert at this little trick that he can set the stone at any required angle by a casual push with his thumb, guided

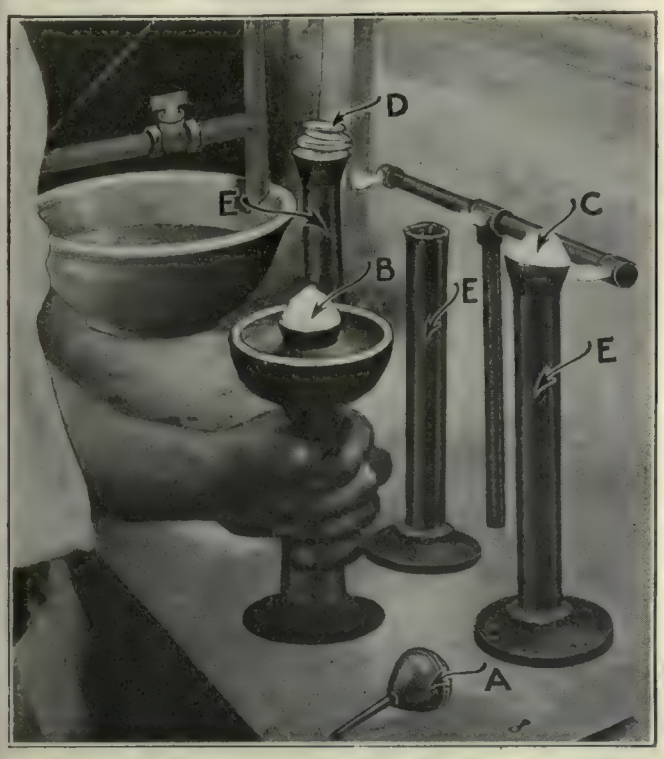


FIG. 11. MOUNTING A DIAMOND IN THE "DOP"

by his experienced eye, and rarely has he to try twice.

The polishing of the stones upon the dust impregnated surface of the lap is, of course, a very slow operation, requiring hours at best, and in case of a particularly refractory diamond, sometimes days, to reduce even one small surface to anything like flatness. It is a job that cannot be hurried, and when the diamond worker strikes a "knot" or extra hard spot in the diamond, he may have to grind for a week to get it out.

Strange as it may be in a material that is already the limit in hardness, some diamonds seem to possess this peculiarity. A hard spot that is exactly like a knot in a piece of wood is sometimes encountered, and unless the particular pieces wanted can be finished by

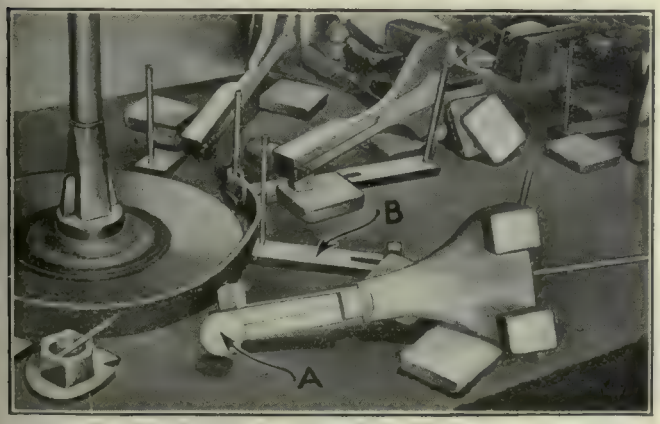


FIG. 12. TONG AND DOP WITH DIAMOND SET, READY FOR POLISHING

breaking, the stone must be laid aside or used for some other purpose.

The diamond worker has a way of mounting a stone in the "dop" that is rather startling to the beholder at first. We all know how a plumber will pour a mass of sticky, plastic lead upon a pipe, and, with a thick piece of felt in each hand, deftly "wipe" the lead around the pipe into a neat though bulbous looking joint. The diamond worker goes the plumber one better; he pours the plastic lead into the dop, sets in the diamond with a pair of pliers, and wipes the lead around it *with his bare fingers*. This sounds incredible, but so quickly are the movements performed that burned fingers rarely result.

In Fig. 11 a dop may be seen lying on the bench at *A*, and three others at *B*, *C* and *D* respectively; the two latter resting in the tops of the gas burners *E*, where the lead is heated. The lead is not allowed to reach the actual melting point but is brought so close to it that it becomes plastic, at which stage it is worked roughly into the shape of a cone by means of any small piece of wood or metal that may be handy.

The stone to be mounted is now placed upon the apex of the cone and pressed a little way into the soft lead; after which the dop is lifted from the burner—with tongs—and placed in the inner cavity of a sort of double cup, made of wood. The dop at *B* is shown in the cup.

The outer rim of this double cup is separated from the inner one by a distance of an inch or more, and the diamond worker, holding the cup in his left hand, passes the bare fingers of his right hand over and around the cone of hot lead and back across the outer edge of

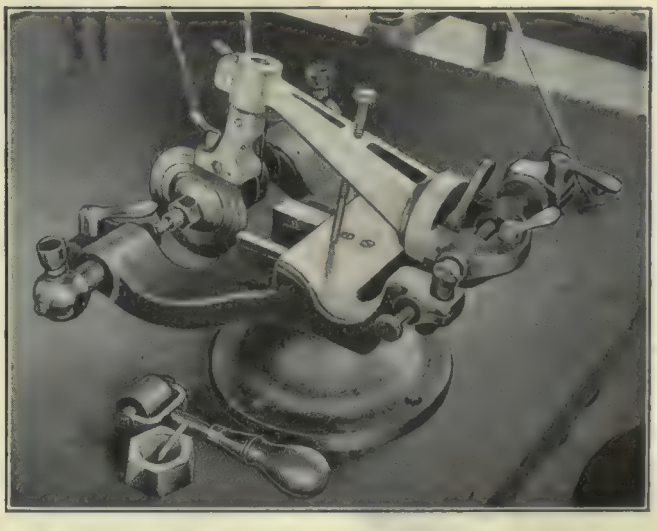


FIG. 13. A MACHINE FOR SAWING DIAMONDS

the cup with a movement so deftly and quickly performed that he scarcely seems to touch it; yet the lead is gradually but surely worked around the stone until the latter is almost completely enclosed, leaving exposed only that part which is to be polished. The office of the outer edge of the cup and the reason for drawing the fingers across it at each pass is to wipe off particles of lead that might otherwise cling to the fingers and burn them.

When the lead has cooled sufficiently, the wire stem of the dop is clamped in the wooden tong, as at *A* in Fig. 12, and so placed upon the tong-plate *B* that the exposed face of the stone bears upon the lap, where it is allowed to remain—being moved about from time

to time to forestall any tendency to wear grooves in the lap—until that face is reduced to the desired condition.

The diamond may be so set in the dop that the operator can by a push with his thumb bend the wire stem to bring another surface in contact with the lap, but this is possible only to a limited extent in tool work, though in polishing gems an expert worker will so calculate the setting that all of the many facets of a brilliant may be polished without resetting the stone. In making tools, the surfaces to be ground are usually at right angles and resetting is necessary.

The diamond worker may have as many as six stones upon his lap at one time, and though each may take a long time to finish, he is kept busy in resetting and changing them about to avoid roughing the surface of the lap.

In a previous section of this article a description was given of the method of splitting a diamond along the lines of cleavage to obtain pieces of suitable shape to make the required tools. Though it may require hours of study to determine *where* to split it, the actual operation of cleaving a diamond is a matter of minutes, and if the required shape can be approximated in this way a great saving of time is effected thereby.

Sometimes, however, it is necessary to cut a diamond in a direction that does not coincide with any line of cleavage; in which case the stone may be sawed apart. The little machine shown in Fig. 13 is a diamond "saw." The blade is a thin disk of phosphor bronze and the actual cutting medium is always diamond dust.

An overhanging arm, made of aluminum for the sake of lightness, is provided with a clamp at one end to hold the diamond to be cut, and is adjustable in all directions so that the diamond may be presented to the saw at any desired angle without loosening the clamps. The arm swings freely in a vertical plane upon pivot bearings and is provided with a stop screw near the center to limit the downward movement so that a stone may not be cut entirely apart during the absence of the operator. The feed is entirely by gravity.

Once set, the little machine will saw quietly away for hours or days, if necessary. Sometimes it is without attention, picking up diamond dust from the stone it is sawing and thus automatically recharging itself. The operator visits it occasionally to see that it is working properly and to add more oil as the blade gets dry.

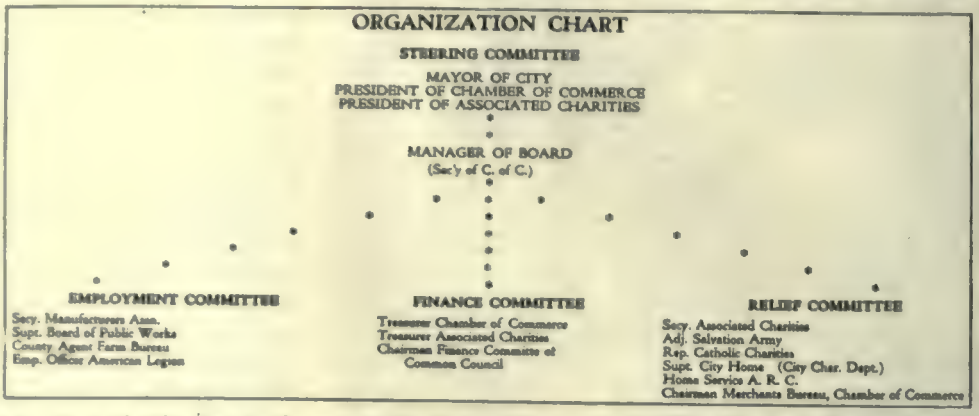
The bronze blades vary from 3 to 5 in. in diameter and from three to ten thousandths of an inch in thickness. The thicker blade is usually used to start a cut, and after it has gone deep enough so that the sides of the kerf will support it, the thin blade is substituted so that no more of the bulk of the diamond than is absolutely necessary may be wasted. Small ring-shaped weights of lead may be placed upon the arm to speed up the cutting if a large stone is being sawed, while on small stones the weight of the arm and clamp is more than sufficient. A one carat stone (roughly about ⅛ in. through) will, if it is free cutting, be sawed apart in from three to five hours.

Poughkeepsie's Relief Work

By H. A. Schatz
President, the Federal Bearings Co.

It has given me a great deal of personal pleasure in reading on page 939, Vol. 55, of American Machinist, a very fine editorial that you have devoted to the Chamber of Commerce of Poughkeepsie and its activities in connection with unemployment relief.

It may interest you to know that forty-eight hours after we received a telegram from Col. Arthur Woods and another from Joseph H. Defrees, president of the Chamber of Commerce of the United States, requesting the co-operation of Chambers of Commerce in the unemployment situation, we had our plan worked out and a copy of it on the way to Washington, to both Mr. Hoover's office and the U. S. Chamber of Commerce; and seventy-two hours after we had received the telegrams, we were operating the plan in Poughkeepsie, and it is working continuously and successfully.



We have co-ordinated all of the charities in the city and clear them through the secretary of the Chamber of Commerce, thereby avoiding all duplication, and this even includes the City Home, which is municipal. Our scheme of organization is shown in the diagram.

The steering committee is intended to be the general guidance committee of the board. It receives the reports of the manager and acts as a directing committee for the solution of the entire situation.

The manager of the board, who is secretary of the Chamber of Commerce, is the executive head of the board responsible to the steering committee. His duties are to receive the reports on unemployment, the listing of jobs and general employment conditions from the employment committee; to recommend loans to the finance committee and to recommend relief to the relief committee. All applications for employment, loans or relief are made to the manager individually making one head in the city for all classes of relief.

The manager classes relief cases as *A*, *B* and *C*; *A* being the most destitute for which emergency relief is required; *B* being cases where employment is essential and some relief aid needed; *C* being cases where unemployment will bring distress in the near future; the *A* cases being given the preference on all openings.

The organization of the employment committee includes the secretary of the Manufacturers' Association, whose duty it is to devise means for the creation of new jobs, the proposed rotation of labor and other methods for making employment in industry after consultation with the directors of the Manufacturers' Association; the superintendent of the board of public works, whose duty it is to know of all openings on

public work in the city; to consult, suggest and try to put through the promotion of additional public work with the Board of Public Works of the city for the creation of more employment; the county agent of the Farm Bureau for the listing and securing of openings on farms; for the securing of seasonable occupation for part-time employment; the employment officer of the American Legion, for the general assistance in securing of odd jobs, day work, etc., not covered by the three above-mentioned members of the committee.

It is the duty of the employment committee to secure openings for employment; list the same with the manager of the emergency relief board; devise means for the creation of jobs; report to the manager the increase or decrease of employment by a careful survey weekly.

The members of the finance committee are the chairman of the finance committee of the Common Council of the city, representing the city funds for relief, charitable and employment work; the treasurer of the Chamber of Commerce, for the securing of funds from the mercantile, financial and manufacturing interests; the treasurer of the associated charities, for the representation of private interests and associated charities.

It is the duty of the finance committee to supply funds necessary for the general operating expenses of the board. Practically no overhead is to be paid due to the fact of using existing agencies; to establish a fund by the securing of a joint guarantee signed by fifty business men, establishing a credit on a note for $5,000, the liability to each signer to the guaranty not exceeding $100.

A plan has been devised whereby a credit of $5,000 has been established in the bank by the finance committee, secured by a guarantee as mentioned above. Loans are made by this committee upon the recommendation of the manager of the board after a careful investigation, loans being classed as moral loans, the individual borrower's note being accepted.

Loans are classed as follows:

(a) To individuals who are essential bread-winners, loans are made in amounts not to exceed $100 after a careful examination and investigation of the man's character.

(b) To the single unemployed man whose references are satisfactory, loans are made in amounts not to exceed $50.

(c) To applicants who might be classed as doubtful, loans are made in amounts not to exceed $25.

Notes are issued for a period of ninety days with the privilege of renewal if a substantial payment has been made and the circumstances warrant it. A small amount of interest is charged to remove any idea of charity which might enter therein and to cover any loss which might accrue from failure to pay on any individual note.

The relief committee is composed of the active, executive heads of all charitable relief organizations of the city, representing all denominations, as well as the charity department of the city.

Applications for the relief of destitute cases, such as medical aid, fuel, food and clothing, are made by this committee after a careful investigation by the social workers upon the recommendation of the manager of the board. A complete file of all charitable cases in the city is kept in the office of the board manager.

A daily report is made to the manager's office known as a confidential exchange, giving the name of the applicant, address and other particulars, as well as the relief given, which report is entered upon the individual card made out for each applicant, this file being the clearing house for the charity cases of the city. It prevents duplication of relief and investigation.

Forms used for the promotion of this plan and other information will be gladly supplied upon request by the Chamber of Commerce of Poughkeepsie, N. Y.

Grain vs. Flesh Side for Leather Belts

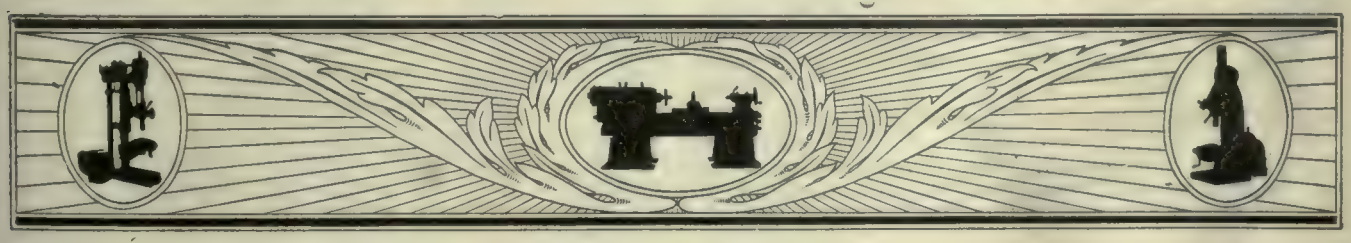
From the time when leather belts were first used for power transmission until the present, men have argued the question of whether a leather belt should be run with the grain or flesh side next to the pulley, without having any definite facts upon which to base their opinions or any more really concrete evidence than that of individual observation.

During the latter part of the past summer, tests of the capacity of the grain and flesh sides of leather belts were begun by the Leather Belting Exchange in its Research Laboratory at Cornell University. Covering a period of more than two months continuous tests were run on the testing apparatus belonging to the Leather Belting Exchange, which is being operated under the supervision of Cornell University, using five 4-in. single belts, 30 ft. long, of different manufacture. Every effort was made throughout the tests to standardize conditions and to reduce the probable error to a minimum, and this unquestionably was accomplished. All five belts were run long enough previous to the experiments to have been thoroughly "run-in," and had reached a condition of constant capacity.

The method of procedure was to take horsepower readings from the belts, first when running on the grain sides, and then when running on the flesh, the power being gradually increased until about 4 per cent slip had been reached.

To review the details of each individual test would require more space than is here available. Suffice it to say that a summary of all of the results is clearly in favor of the grain side from the standpoint of power transmission. In fact, it may be concluded from it that under reasonable shop tension, the flesh side will average ony 50 to 60 per cent as much horsepower as the grain side. At higher tensions the flesh side will do better, averaging from 50 to 100 per cent as much power as the grain, depending upon the belt, the tension and the conditions of service.

In short, the evidence produced from the mass of data obtained leaves no reasonable doubt but that there are distinct advantages in power transmission to be had from running leather belts on the grain side.



Changes in the Machinery Trade of China

Data Collected from Chinese Sources—Increase in Volume of General Machinery Business Done by America—Specific Figures on Textile Machinery and Machine Tools

By W. H. RASTALL
Chief, Industrial Machinery Division, Department of Commerce

THE PROGRESS made by American machinery manufacturers in developing export business and the superior position of American engineering equipment in the markets of the world is shown very plainly by the experience of China since 1911, as is illustrated very forcibly by the charts published herewith. It should be noted that this data is from Chinese, not American sources, being developed from the returns of the Chinese Maritime Customs.

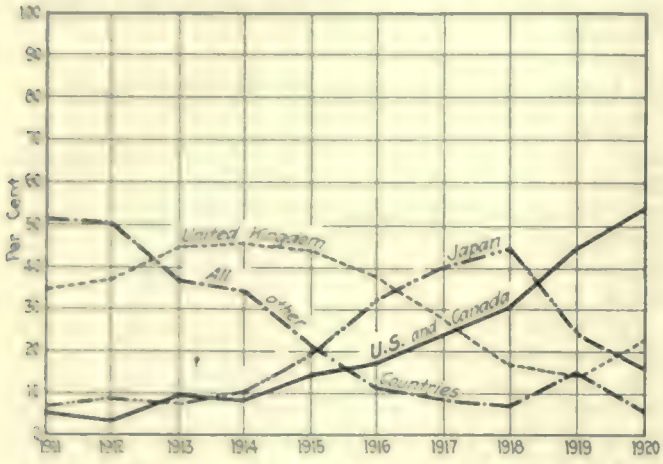


FIG. 1. PER CENT OF TOTAL VALUE OF IMPORTS OF INDUSTRIAL MACHINERY INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920

All machinery, except agricultural, embroidering, knitting and sewing machinery.

Conditions in China have differed radically from those in the other markets of the world because business there has been influenced very strongly by political forces, as has been called to public notice in connection with the Armament Conference. It has been customary to specify in loan agreements that the machinery required shall be purchased in the country furnishing the money with the result that the United States supplied China only about 30 per cent of the machinery she imported in 1918, as compared with 80 per cent supplied in the same year to Japan, which is and has long been an openly competitive market. Consequently it should be recognized that the progress indicated below has been made in spite of the difficulties encountered by those who sell machinery in China without financial assistance.

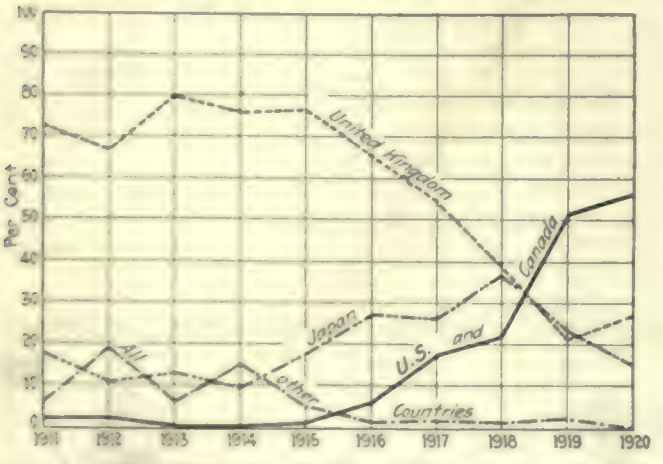


FIG. 2. PER CENT OF TOTAL VALUE OF IMPORTS OF TEXTILE MACHINERY INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920

The customs authorities in China always credit consignments to the last port of shipment, so that machinery built in the United States and shipped to China via Vancouver would be credited as from Canada. In recent years very important amounts of machinery have been shipped in that way and for this reason the charts show the total of the shipments from the United States and Canada, as it is felt that practically all of the machinery leaving Canada originated south of the boundary. Similarly it should be remembered that the shipments from "other countries" includes not only machinery from Germany, but important shipments from Holland, Belgium, Sweden and other sources, although in the period prior to 1914 Germany was the most important of these sources of supply. The progress made has been shown as a percentage in order to demonstrate clearly the comparative position of American exports in the China machinery trade, but this is a rather inadequate expression of the true situation as there has also been a most astonishing increase in the volume of this business, making it worth while to submit the accompanying figures showing the value of the shipments of the leading countries. These values are given in haekwan taels, the exchange value of which fluctuates very seriously, being worth about 65 cents in 1911, $1.03 in 1917, etc.

TABLE I. VALUE IN HAEKWAN TAELS OF MACHINERY IMPORT INTO CHINA

(Excluding agricultural, embroidering, knitting and sewing machinery)

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Sources
1911	382,054	2,330,209	465,122	6,561,020
1912	179,803	1,762,916	388,475	4,704,485
1913	673,227	3,241,590	548,522	7,137,048
1914	681,170	3,749,149	852,934	8,157,270
1915	659,722	1,994,518	851,185	4,485,867
1916	1,078,530	2,350,903	1,991,031	6,131,258
1917	1,411,141	1,648,869	2,419,813	5,982,715
1918	2,390,332	1,313,604	3,569,909	7,860,290
1919	6,407,727	2,073,968	3,604,905	14,328,249
1920	12,181,382	5,229,026	3,727,604	22,536,254

Increase in Exports Since 1911

From Table I it is evident that American machinery exports to China have increased 3,100 per cent since 1911. From Fig. 1 it is seen that the American share of the business of China has increased from 5.8 per cent, the lowest of the countries here mentioned, in 1911 to 54.1 per cent or more than all others combined in 1920.

Even this statement does not adequately describe the situation because American machinery transshipped in Japan, especially for points in North China and Manchuria, is credited to Japan in the above returns. Unfortunately, it is not possible to submit figures to show the volume of this trans-shipment business, but there is reason to believe it is very large

and during the war was strongly influenced by the demand in Siberia for war equipment.

The above refers to the experience covering all classes of machinery. If one wishes to be more specific, it is possible to submit corresponding charts regarding particular classes of machinery and in Fig. 2 is a corresponding record of Chinese imports of textile machinery. In this diagram the line representing Japan is also deceptive, as a considerable amount of the textile machinery exported from Japan is of a type employed in cottage industries as distinguished from the factory machinery shipped from Europe and America. For Americans the interesting part of the diagram is the comparison between the experience of the United States and the United Kingdom in this trade. The superiority of American engineering as represented by cotton mill design and cotton mill equipment has been clearly recognized in China as also certain other countries, and it is anticipated that European designs will soon incorporate certain American features. The values involved in this trade are shown in Table II.

TABLE II. VALUE OF HAEKWAN TAELS OF TEXTILE MACHINERY IMPORTS INTO CHINA

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Countries
1911	7,161	241,234	60,159	331,582
1912	9,885	307,283	50,229	458,616
1913	2,615	672,150	112,500	839,724
1914	2,530	1,540,100	187,661	2,038,460
1915	15,446	1,076,229	253,490	1,419,511
1916	115,431	1,257,961	531,437	1,934,141
1917	218,928	669,649	302,607	1,235,800
1918	379,867	669,402	642,948	1,714,994
1919	1,944,350	813,254	897,760	3,767,406
1920	3,897,204	1,925,696	1,071,201	6,927,728

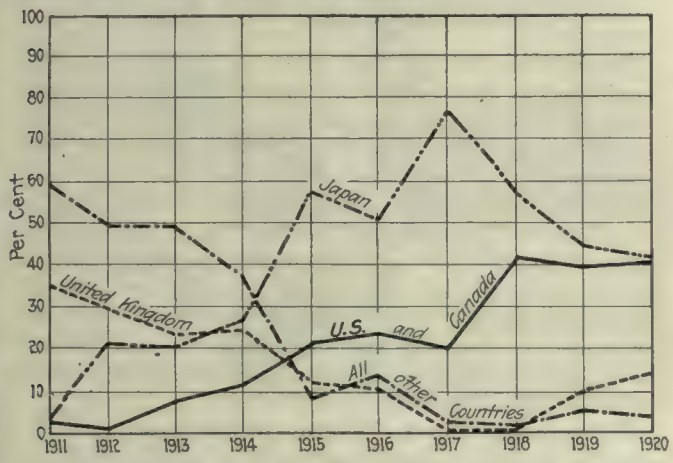


FIG. 3. PER CENT OF TOTAL VALUE OF IMPORTS OF MACHINE TOOLS INTO CHINA, ORIGINATING IN COUNTRIES INDICATED, 1911 TO 1920

It is thus very clear that the textile industry in China is growing very rapidly and the American interest in the trade is making even more rapid progress.

TABLE III. VALUE IN HAEKWAN TAELS OF MACHINE TOOL IMPORTS INTO CHINA

Year	U. S. A. and Canada	United Kingdom	Japan	Total from All Countries
1911	615	9,699	1,067	27,726
1912	133	5,726	4,112	19,629
1913	3,773	12,112	10,234	51,288
1914	11,001	24,040	25,771	96,912
1915	15,494	9,052	42,094	72,811
1916	23,403	10,772	49,740	97,778
1917	40,983	1,254	160,475	208,394
1918	145,547	2,598	198,954	349,108
1919	197,859	50,477	221,996	499,853
1920	305,780	111,038	316,636	761,073

Correspondingly, Fig. 3 illustrates the experience in connection with machine tools. This class of machinery is of a type that is strongly influenced by the loan and concession agreements being used very largely in connection with railways, mines, arsenals, dockyards, etc., and it is this that explains, to a large extent, the situation in 1911 and 1912. Subsequent experience is largely self-explanatory, but the above remarks regarding the trans-shipment of machinery from Japan should be remembered. It is true that Japan is trying to develop a machinery building industry and has paid especial attention to the production of machine tools, having more than twenty-six shops engaged in this business in 1918. It should also be remembered that Fig. 3 is plotted in percentages so that the high value shown on the Japan curve for 1917 is very deceptive. In that year European and American manufacturers shipped very little of this class of machinery because of the war embargoes. The volume of this machine tool business is shown in Table III.

Eight Reasons for Buying Now

Future profits of producers, wholesalers, and retailers depend as much upon taking advantage of the well-liquidated condition of the materials markets now as they did upon sensing the dangers of the inflated price position eighteen months or so ago. Paul Clay, well-known economist, writing in *Forbes Magazine* (N. Y.), enumerates the following eight reasons why the manufacturer and merchant should buy materials and supplies now:

(1) Labor Efficiency—Profits during the coming year will be much increased by the extra high efficiency of labor which invariably results from general unemployment.

(2) Interest Costs—Time money and commercial paper have come down from the 1919 maximum of 9¼ per cent to a minimum of about 5⅞ per cent, which reduces the interest cost of carrying materials and supplies bought in advance of requirements.

(3) Fixed Charges—The typical manufacturing concern when operating at 40 to 60 per cent of capacity has to pay most of its fixed charges and often some wages and salaries out of surplus. To increase output from 50 or 60 per cent to 70 or 80 per cent adds but little to operating expenses.

(4) Cheapness of Materials—In very many instances raw materials are selling so low as to be out of line with finished products, and, therefore, quite attractive.

(5) Statistical Positions—The statistical position of one material after another is becoming bullish; the ratio of supply to consumption is becoming such as to indicate higher prices.

(6) Visible Supplies—Large visible supplies of metals, minerals, textiles, and foodstuffs should be taken to indicate, not that raw material prices are going to continue declining, but rather that supplies of finished goods have been drawn so low as to insure a buying movement in raw materials.

(7) Material Prices—No one disputes the law of supply and demand; but the point now is that almost every leading raw material has already passed through its period of forced liquidation, with the result that prices, instead of being weak, are beginning to grow strong.

(8) Unemployment — General unemployment has been discounted. Moreover, re-employment has already begun in both Europe and America, and as labor gets back to work total consumption of goods and products must necessarily increase.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Roughing Miter Gears on a Milling Machine

By Bernard Gottschalk

Having occasion to cut several hundred miter gears of 1¼ pitch, 19 teeth, 3½ in. face, we rigged up an Ingersoll milling machine with the device shown in the sketch, Fig. 1, to make the stocking cut and thus save the time of the gear cutters.

The angular face of a 45-deg. angle plate was bored to receive two disks, the hubs of which fitted the bore of the gear blanks. The opposite hub of each disk extended through the thickness of the angle plate and

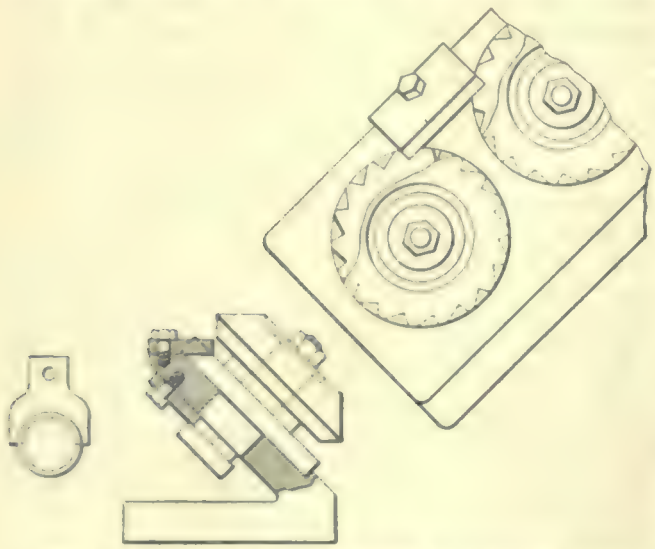


FIG. 1. OUTLINE OF SET-UP FOR STOCKING MITER GEARS IN A MILLING MACHINE

was grooved to take a forked piece that held the disk down to its seat, but did not prevent it from turning.

Angular notches in the peripheries of the disks provided the index plates, and a rectangular block held to the angle plate by a capscrew was so placed that a corner coincided with a notch on each disk at each indexing position; thus locating and clamping both disks with one movement.

The reproduced photograph, Fig. 2, shows the gear blanks in position with the cut well started. The indexing was, as a matter of course, done by hand.

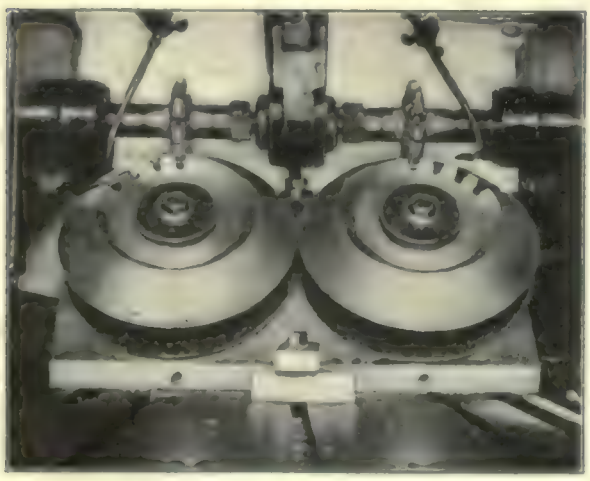


FIG. 2. SHOWING THE RIG AT WORK

Bushing a Blind Locating Hole

By John A. Yungwirth

On page 978, Vol. 55, of American Machinist, Charles Reimchissel tells us how to prepare a blind hole so that a bushing, once forced into it, may easily be removed.

The way he describes is, no doubt, an excellent one, *provided* the man who put in the bushing did it that way. But how about the many bushed holes in the preparation of which the toolmaker's only concern was to get the bushing *in*—let him worry who had to take it out.

Such bushings may be removed as easily and as quickly as by the method described by Mr. Reimchissel, without the necessity for any prearrangement whatever. All the tools necessary are a plunger, rod or pin, nicely fitted to the bushing, and some oil.

Fill the bushing about half full of oil (any kind of oil) and set in the plunger until it rests upon the surface of the oil. Now take a hammer and hit the top of the plunger a smart blow. The effect of the blow will be transmitted by the oil to the under side of the bushing and the latter will rise out of the hole as promptly as if the blow had been delivered directly by the hammer upon its under surface.

There is but one precaution; the plunger must be a *close* fit for the bushing, practically oil tight, or you will get a shower of oil instead of the bushing.

Collet Stop for Short Work

By Elam Whitney

On page 935, Vol. 55, of American Machinist, Gene Phelps describes a very good locating stop for use with the collet of a hand screw machine or turret lathe, for work not made from bar stock. The writer would suggest an improvement which he has tried and found satisfactory.

Instead of locating the threaded bushing or stop holder, between the collet and the closing tube, it is made a light press fit in the rear end of the collet. All collets used for chucking are provided with these bushings, which should all have the same size of thread. The collet and stop are thus self-contained and may easily be removed for adjustment and cleaning.

When practicable to do so it is advantageous to make the stop hollow to allow for an ejecting rod which is operated by the regular wire feeding mechanism of the machine.

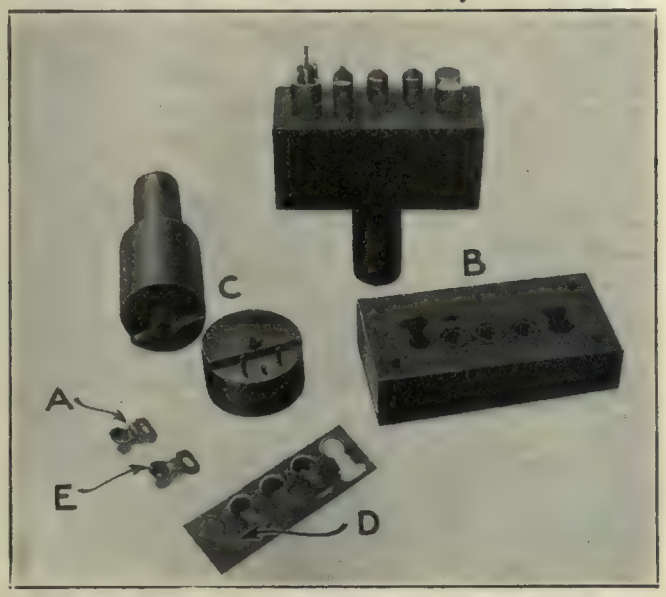
Progressive Operation Tools

By William Clancy

Thousands of the little pieces, shown at *A* in the illustration, are used on the spinning frames in textile mills, and the job of maintenance assumes a magnitude all out of proportion to the size of the piece unless some way is devised to make them at very small cost.

In our shop the tools shown at *B* were worked out to blank, pierce and partly form them in successive steps. The material is half hard brass 0.017 in. in thickness and the stock is fed from a roll to a small bench press that cuts them out very rapidly. Up to the present time a second operation is required to put in the final bend and complete the piece, and this is a hand feed proposition; the tools being shown at *C*.

As may be seen in the strip of metal at *D* the first stroke of the press cuts out the contour part way round to blank. leaving the flat end still attached to the stock like the tongue of a reed. The second and third strokes draw up the bowl-like depression, the fourth stroke pierces the small round hole at the bottom of the bowl and the oblong slot in the flat end at the same time,



PROGRESSIVE FORMING AND BLANKING DIE

while the fifth stroke severs the partly finished piece and pushes it through the die. Thus, after the press has made five revolutions each step of the die is full and a semi-finished piece as at *E* is produced at each succeeding stroke.

The final bend is a double right-angle and no attempt has yet been made to incorporate it in the progressive tools, but the writer is of the opinion that it is quite feasible to do so and means to have a try at it some day.

An Adjustable Jig for Drilling Round Stock

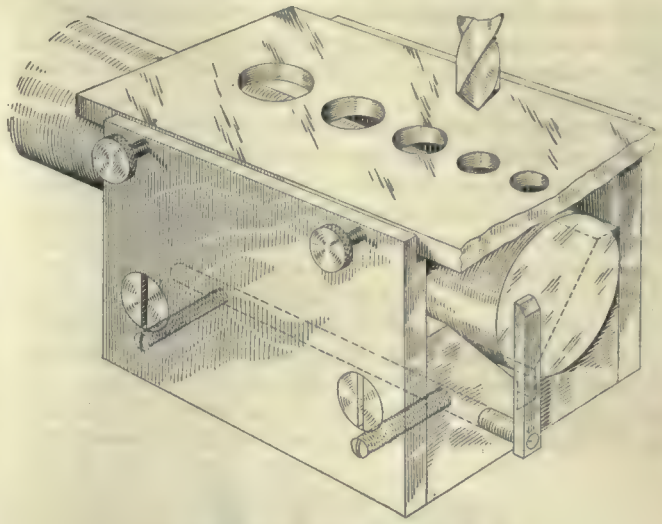
By H. H. Parker

The sketch shows a method of adapting a V-block to drill crossholes in round stock.

Side plates are screwed to the block, as indicated, and the upper edge of each plate rabbetted to form a groove in which the jig plate slides. Setscrews or thumbscrews in one of the side plates provide means for holding the jig plate in endwise position.

The jig plate should have a row of holes of the sizes commonly used, accurately located with reference to the center-line and the plate should be hardened.

If many pieces are to be drilled, a hole may be drilled



JIG FOR DRILLING ROUND STOCK

lengthwise of the block, under the V, and a rod and stop plate inserted as shown.

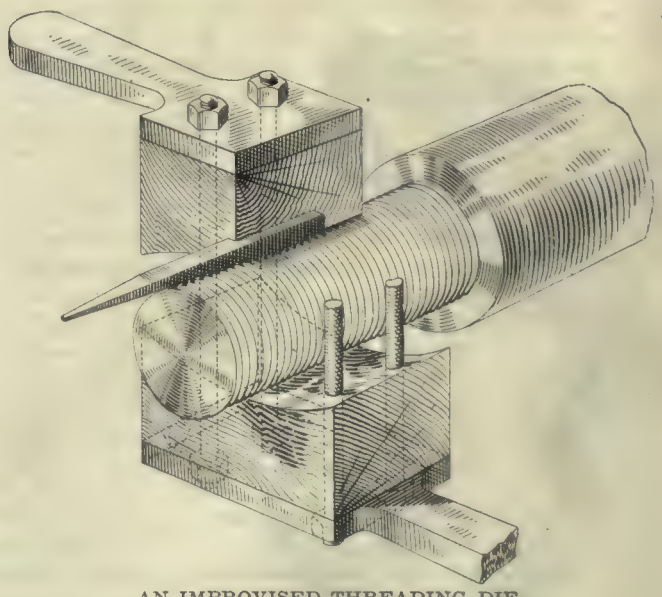
Redressing a Damaged Thread

By John Corey

The other day there came into our jobbing shop a shaft too long for any of our lathes. It had upon one end a much battered 8-pitch thread which required redressing.

As re-threading in a lathe was out of the question, I procured an 8-pitch inside thread chaser of the kind that was commonly used in the earlier days, set it into one of a pair of hardwood blocks, as shown in the sketch, and bolted the device together upon the damaged thread.

Clamping the shaft in the central slot of the planer table with the threaded end projecting, the "die" was worked back and forth by hand, tightening the clamping bolts a little at each pass until a clean, smooth thread was produced.



AN IMPROVISED THREADING DIE

Milling Machine Dynamometer

By R. Poliakoff

On page 929, Vol. 55, of the American Machinist, a "Thrust and Torque Measurer" was shown and described as used by John Airey and Carl J. Oxford in their experiments with milling cutters and milling operations.

In connection with same, permit me to say that practically an identical apparatus was designed and built by me as far back as 1913 and described in the technical press. In Fig. 1 the apparatus is shown mounted on a milling machine, and the principles of its construction are shown in Fig. 2.

The piece to be milled is bolted to a slide, the longitudinal movement of which is guided by grooves in the lever *A*, fulcrumed on points of screws passing through the lugs *B*, secured to the table of the machine. The slide bears against the point *K* of screw *L*, pressing the hydraulic support connected with a pressure gage.

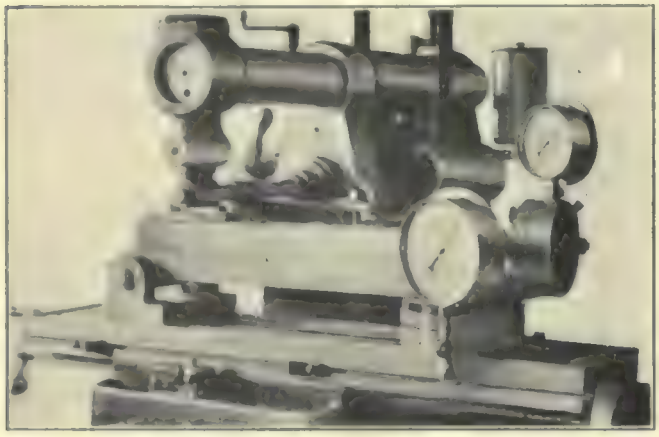


FIG. 1. THE DYNAMOMETER ON A MILLING MACHINE

In a similar way the lever *A* bears on the point *N* of the screw *O* which transfers the pressure to the support *P* connected with another pressure gage.

When the cutter rotates in the direction indicated by the arrow, the force exerted by the teeth resolves into a longitudinal pressure acting parallel to the table and a downward pressure acting at a right angle to the table. These respective pressures are transmitted to the gages and can therefore accurately be determined.

It can readily be seen that the leverage of the downward pressure changes as the table moves, in relation to the fulcrum about which the lever swings. As the feed is known, however, the leverage of this pressure can be determined at any moment.

The downward pressure also produces a frictional resistance which decreases the longitudinal pressure indicated by the gage *R*. But by determining the coefficient of friction between the two sliding surfaces in the usual way before starting the test, it is possible to correct the reading for friction and thus obtain the true value of the longitudinal pressure. Comparing this design with that shown on page 929, it can be seen that in the latter the pressure gages are replaced by pipes and mercury columns. From a practical point of view, the gages are, of course, more preferable.

As to the third piston (or hydraulic support) there is no necessity for it at all. Its purpose is to take care of changes in the pressure when the table travels from left to right. The same object can be accomplished by setting up an initial pressure in one of the vertical pressure gages and thus eliminating the other one.

The same drawback pointed out by Messrs. Airey and Oxford in their device, i.e., the changeability of the

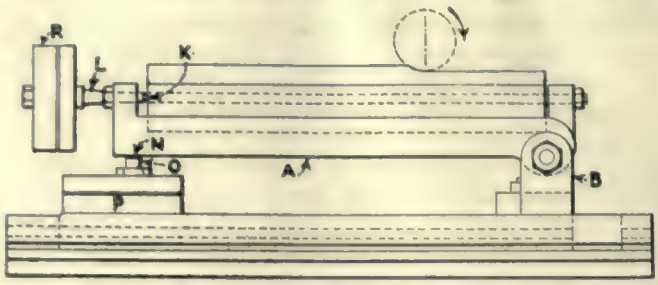


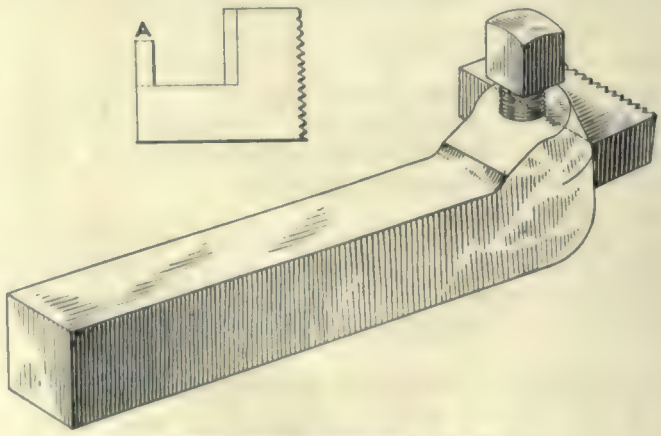
FIG. 2. PRINCIPLES OF THE DYNAMOMETER

leverage of the vertical pressure, applies as I have shown to mine. In order to avoid this, the dynamometer has to be built so that the reading of the lower gages will not be dependent upon the location of the cutter with respect to the table. This object has been accomplished by a later instrument of my design shown on page 114, Vol. 55, of the American Machinist, and which is now manufactured by the Cincinnati Milling Machine Co. Not only does it embody the feature of making the readings independent of the location of the cutter, but it eliminates also the friction element inherent to the design of Messrs. Airey and Oxford, and my own, as shown here. Besides, it is an entirely practical design which can be applied to any milling machine and allows tests with both slab milling cutters and cutters with spirals; in other words, it measures the forces in three, instead of two, directions—longitudinal, lateral and vertical.

Using a Chaser for a Threading Tool

By Paul Bedell

Having a large number of 1⅜-in. diameter brass pieces to be threaded 16-pitch and no time to waste for special chasers, we adopted the expedient herein described for threading them. The result was that the pieces were



CHASER IN ARMSTRONG HOLDER

turned out almost as fast as could have been done with a regular die head and with as perfect threads.

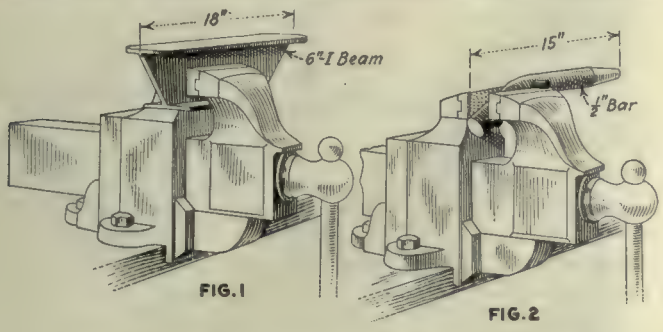
The pieces were threaded on centers in a lathe and the tool used was a 16-pitch Hartness chaser with the projection *A* ground off, as shown in the illustration, so that it could be held in an Armstrong toolholder. One pass over each piece was sufficient.

Handy Vise Attachments

By G. A. Luers

In the work of straightening parts that are bent or buckled, the vise attachments shown in the drawings are of exceptional service and are readily made up of odd parts about the shop. The first of these, Fig. 1, is made from a foot-and-a-half length of I-beam. This is clamped in the jaws of the vise, where it can be used for straightening out steering rods, brake rods, connecting rods and other similar parts.

Another attachment, Fig. 2, is made from an axle bent and drilled for retaining pins as shown. This is also held in the vise. The shaft or bar used should be 1½ to 2 in. in diameter and about 15 in. long. This tool serves as a horn for straightening tubular parts, as



FIGS. 1 AND 2. HANDY VISE ATTACHMENTS

manifolds, exhaust pipes, mufflers, etc.; also for riveting axle housings and flanges, and can be used where the larger and shorter anvil horn will not reach.

Avoid Danger When Drilling in the Lathe

By H. L. Gibbs

In reference to the article by G. E. Clifford under the above title, published on page 936, Vol. 55, of American Machinist, I would like to say that the carriage should not be "kept a little in advance of the toolholder," for the reason that the operator does not know just when the drill is going to break through.

If he will place a tool or a piece of tool stock in the toolpost in such a manner that the handle of the drill holder will rest on top of it, and at the same time have the toolpost *against* the back of the drill holder, the pressure of the tail spindle will push the carriage ahead of it as the drill advances, and the resistance of the carriage is thus *always* interposed to prevent any "digging in" of the drill.

The carriage feed must of course be in neutral position so that the carriage itself will be free to advance with the feeding movement of the tail spindle.

Attachment for Milling Automobile Front Spring Brackets

By R. E. D. Delrue

Amsterdam, Holland

The milling attachment described and illustrated herewith is used for milling the insides of the bosses of automobile spring brackets.

The device which was attached to the overarm bracket of the milling machine has a frame of forged mild steel provided with three recesses for carrying the gears. The cover *A* is screwed on the frame in order to give the gears a good bearing on both sides. This cover, as well as the frame, has oil holes in order to lubricate the bearings. The three gears are of the best grade of chrome nickel steel, the driving wheel and the driven gears being hardened.

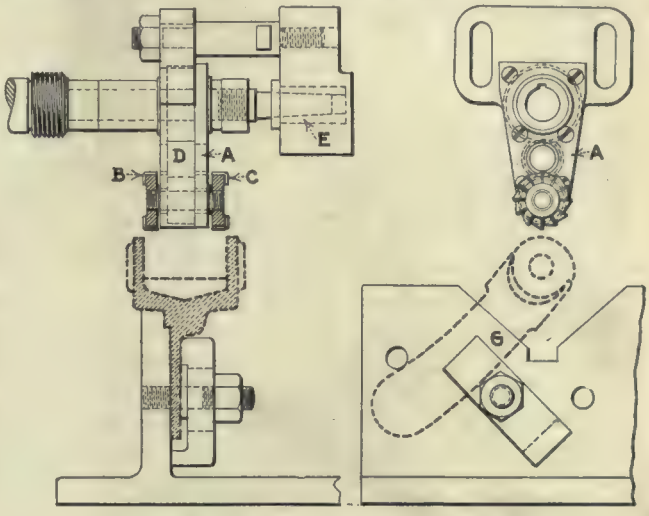
The lower gear has trunnions projecting outside the frame and cover and these trunnions are provided with left- and right-hand threads, on which the milling cutters *B* and *C* are screwed. In order to remove the cutters easily copper or bronze washers *D* are inserted between the cutters and the shoulders of the trunnions of the driven gear. These washers are also used as a means for adjusting the mills for wear, grinding, etc., keeping them always at the same width.

The illustration shows the way in which the fixture is mounted on the milling machine. The heavy lines give the fixture; the dotted lines represent parts of the machine, the work to be milled and the milling jig.

As can be seen, the fixture goes between the face of the column and the outer support. The outer end of the arbor enters the bushing *E* in the bracket in the same way as when being used in milling operations.

The front spring bracket to be milled is seen at *G* and is held in a fixture which can be used for either left- or right-hand work. The work is fed to the cutters by raising the table, using the elevating screws.

The device has proved to be very helpful but care must be taken to oil the gears well and to have them made out



SPECIAL MILLING ATTACHMENT

of the best grade of chrome steel, this being the only material that will stand the heavy pressures due to the milling.

Notwithstanding the attachment is rather small, it is very stiff and rigid and chattering is practically eliminated.

Using an Automobile Fan Bracket and Pulley as an Idler

By George A. Luers

As a roller guide to keep a grinding machine belt from running off a pulley, a local shop has found an old automobile fan pulley and bracket of advantage as a cheap means of prevention. The blades of the fan were removed, leaving the fan pulley in place on the bracket. This pulley is set against the edge of the belt on the side toward which it tends to run off. As the belt slipping off is common occurrence on some types of machines, regardless of how well aligned the pulley may be, this remedy is worth trying to correct the fault.

EDITORIALS

Reducing the Cost of Handling Freight

THERE is no doubt that high freight rates are playing their part in delaying return of business. The railroads, however, are protesting against a decrease until they can reduce the cost of operation materially and, in common with many other kinds of management, seem to feel that they should start by cutting wages.

While there are certainly cases where wages were increased beyond a reasonable point and should be reduced, we must not forget that the advance did not take place until long after other labor was receiving large increases in pay, and that one reduction has already taken place. It is also true that many of the shop rules make economical work difficult, if not impossible. Economic errors of this kind should be corrected, not in any spirit of revenge or a desire to "get even," but in order to help put business on a sound foundation.

There is, however, another method of reducing operating costs which is lost sight of in too many cases. This is by the use of modern machine equipment in the railroad shops, and there are few shops where new equipment is not needed.

It is to the honor of the designers and builders of some of our earlier railroad shop machine tools that so many of them are still in use. But it might have been better for the railroads had they worn out long ago. For, good as they were and are, it is costing far more to get out the work than it should. And this is particularly true with the higher wages of today.

With better machine equipment locomotives and cars can be repaired at a much lower cost. Locomotives can be kept in commission a much greater percentage of the time if the machine equipment enables repairs to be made promptly. And it is only when the locomotive is hauling trains that it is earning money for the roads.

The one great opportunity for better railroad earning is in better machine equipment for its shops. There is no time like the present—it should be ordered now.

Increase the Air Mail Service

THE destruction by fire of five mail planes at Chicago calls attention to the needs of the mail service for continuing its air routes. Some of these routes have already been curtailed in order to keep within the appropriations so that instead of flying daily they are restricted to four days a week in some cases.

The air mail has made a wonderful record and is looked to as the best yet attained in any country. It provides an excellent training field for commercial fliers and a chance to aid in developing commercial types of machines. It is to be regretted that the development should be so seriously curtailed.

While all agree that this is a time for curtailing unnecessary expenditures, the development of air transportation can hardly be classed under this head. With planes built especially for commercial work the cost of carrying air mail can be considerably reduced. This development will also aid commercial work of all kinds. The machines in use at present were built primarily for military work and are not as economical in performance as the newer and better commercial machines.

With such an excellent foundation as has been laid by the men of the air mail service, it is to be hoped that sufficient funds will be allotted the Post Office Department to enable it to increase, rather than to curtail, its activities. To these men is due the brightest spot in aviation in this country—may its brilliancy increase rather than be dimmed by insufficient appropriations.

Trend in Service Station Work

ONE of the notable changes in connection with the motor vehicle is the growth of real service stations and motor repair shops, in place of the earlier garage with its motor tinkerers and half-baked mechanics. The older type of motor repair shop had few tools and fewer machines. A few wrenches and files, a decrepit drilling machine and perhaps an oxy-acetylene welding outfit usually completed the equipment. And lucky was the customer whose car would run properly after he got it home.

The early service stations of the automobile dealer were not much better, except that the dealer had an added interest in keeping his cars in running order. It was Henry Ford who first stipulated that his dealers carry a stated amount of spare parts and that they have a certain minimum of machine equipment for handling repairs on Ford cars. He also inaugurated the flat rate method of charging for repairs which is now being practiced by some others, and is advocated by most service station men who have a real interest in the business. Both of these methods make for better and more satisfactory repairs and for satisfied customers.

Another development has been made possible by the education of users to the advantage of having a real motor overhauling include grinding of the cylinder bore, with new pistons to suit, and of grinding crankshafts where necessary. This has brought a better grade of mechanic into the automobile repair business. and has improved both the quality of work and the reliability of service stations.

The depression through which we are passing also has left its mark of improvement on automobile repairs. Many good mechanics formerly employed in large shops have been forced to find new fields of employment and have started little shops of their own. Being good mechanics they have improved the quality of work done, and this has been stimulated by the necessity of building a firm foundation for future business. Many of these men have brought cylinder grinding machines on time payments and are making good, their former experience and the responsibility of having a business on their hands aiding materially in urging them to get into the front rank.

All this is to the ultimate good of the user and of the motor industry. And, as elsewhere, the basis of it all is good machines and tools, without which good work cannot be acomplished.

Shop Equipment News

Heald No. 25 Automatic Ring-Grinding Machine

The Heald Machine Co., Worcester, Mass., has recently placed on the market the machine shown in Fig. 1, for grinding the sides of piston rings, ball and roller bearing races, collars, washers, gears and such work. This rotary-table surface grinding machine is intended for

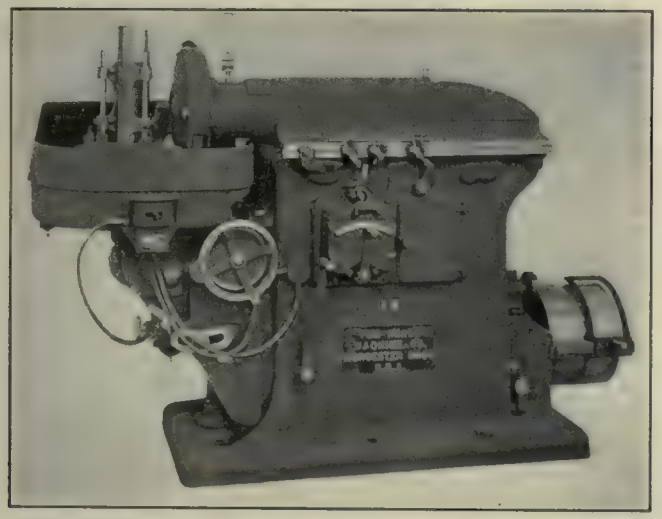


FIG. 1. HEALD NO. 25 AUTOMATIC RING-GRINDING MACHINE

large-scale production, being built heavily and with sufficient rigidity to withstand constant use. It is known as the No. 25 automatic ring-grinding machine, and can be furnished with either an 8-, 12- or 16-in. magnetic chuck.

In Fig. 2 is shown a view of the arrangement for automatically feeding the work, here automotive piston rings, to the chuck. With this arrangement, it is only necessary to load the magazine and then take away the finished product, all operations being entirely automatic. The feeding arrangement consists of a plate having five holes bushed to take rings up to 5 in. in diameter. As the plate indexes, a ring is slipped from the magazine to the center of the chuck, ground, and then slid off the chuck.

The feeding plate is indexed by a lever connected to the crank disk at the back of the machine and operated by a friction device. This disk is held stationary by means of a latch while the wheelslide is moving forward, thus grinding the ring on the chuck. As the wheelslide comes back, the latch is tripped, allowing the crank to make one revolution and indexing the feeding plate from one hole to the next. The finished ring is thus slid off the chuck and the new one put in place. There is a guard over the ring being ground, to prevent it from flying, should it break. This automatic feeding device is furnished for the 8-in. size of chuck only.

The wheelslide is a heavy casting having wide flat and V-ways provided with liberal oiling facilities. The slide is driven by means of an hydraulic system utilizing oil as the liquid. It enables the operator to instantly obtain any feed from nothing up to the maximum, the steps being made in any size desired and the changes being made smoothly and without shock. It is possible to reverse the motion of the slide at any point without shock or noise.

The spindle is made of chrome-vanadium steel, and is mounted at the grinding-wheel end in a straight, plain, adjustable bearing $2\frac{7}{8}$ in. in diameter by $6\frac{3}{8}$ in. long. Adjustment of this bearing can be readily made through an opening in the top of the wheelslide provided for that purpose. This is the only adjustment required, as the rear of the spindle is mounted on a self-aligning ball bearing. A sight-feed oiler is utilized to insure the constant flow of the oil.

The main drive shaft on the rear of the machine is mounted on roller bearings. It carries a two-step cone, so as to enable the maintaining of the proper wheel speed. The chuck spindle is mounted on ball bearings, the housing being oil tight, so that the bearings and the gears may be immersed in oil. Grit and dirt cannot work their way into the bearings. When the machine is used for general work, without the automatic feeding device, the chuck bracket can be adjusted to allow for grinding concave and convex surfaces.

The diamond is located on the chuck pan and can be adjusted so as to true the wheel to give the desired thickness of the ring. In doing this, the left-hand reversing dog is thrown up, allowing the slide to go by until the reversing lever engages a safety dog. The slide is then reversed back and forth the right distance for truing the wheel. Movement of the dogs on the

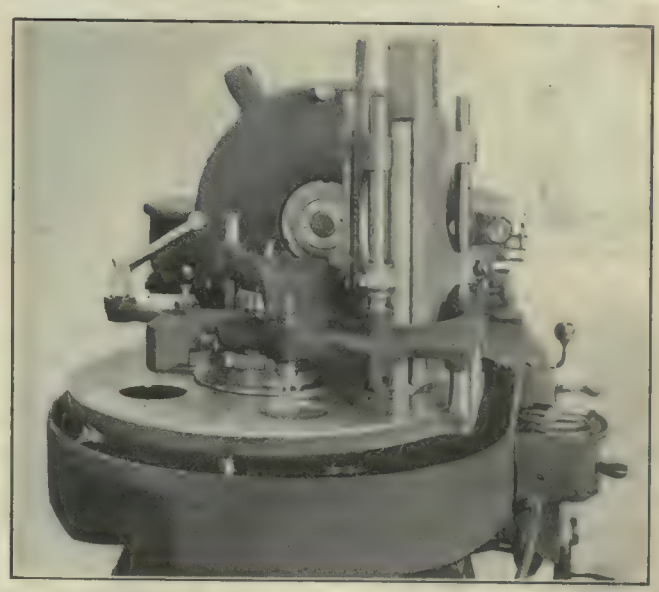


FIG. 2. AUTOMATIC FEED FOR PISTON RINGS

front of the machine controls not only the travel of the wheelslide, but also the action of the feeding device.

A disk at the rear of the machine has an electrical contact so as to furnish current for the chuck during the time that the ring is being ground. As the disk revolves, the current is automatically shut off for an instant and reversed, thereby demagnetizing the chuck

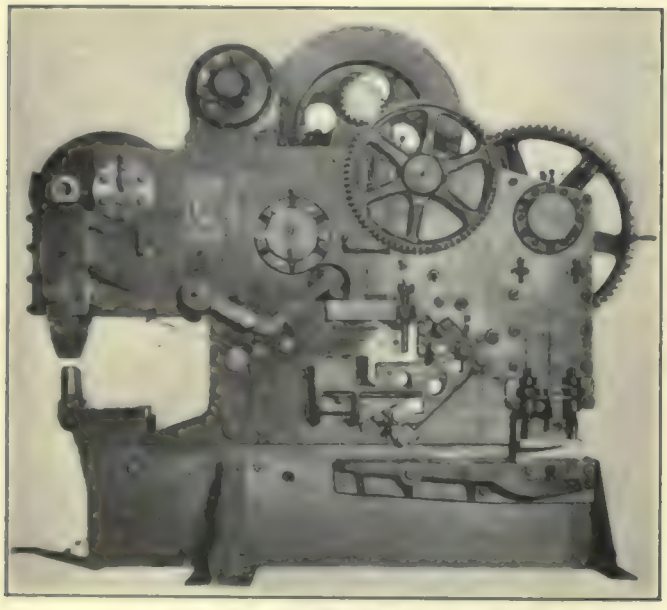
before the ring has been moved. By the time the next ring has been slid into place, the current is automatically switched on again.

A pump, tank, water guard and connections can be furnished for the supplying of water to cool the work. The distributing nozzle has a swivel joint, so that the flow can be directed to any desired point. An automatic vertical feed can be furnished, although it is not adaptable to a machine furnished with a ring-feeding device.

The machine carries a wheel 14 in. in diameter and from ¾ to 1¼ in. face width. It is driven at a speed of from 850 to 1,200 r.p.m. by means of a 10 to 15-hp. motor. The chuck may be operated on either 110 or 220-volt direct current. The chuck has a vertical adjustment varying from 7¼ to 8¼ in., according to the size. The belt-driven machine requires a floor space of 90 x 40 in. The approximate weight is 4,000 pounds.

Buffalo No. 26 Universal Punch, Shear and Bar Cutter

In the accompanying illustration is shown the No. 26 universal diagonal-stroke, "armor-plate" frame, punching, shearing and bar-cutting machine recently brought



BUFFALO NO. 26 PUNCH, SHEAR AND BAR CUTTER

out by the Buffalo Forge Co., Buffalo, N. Y. The frame is guaranteed against breakage, being made of two rolled-steel plates, with cast-steel throat pieces. The high tensile strength of the plate permits of a considerable reduction in weight, when compared with cast-iron and cast-steel frames on machines of like capacity. The machine is said to be capable of taking care of every punching, shearing and bar-cutting requirement of a modern steel-fabricating shop.

The various operating points of the machine are so located that three distinct operations can be performed at one time without interference. One of the principal features is the fact that it is not necessary to tilt out of the horizontal plane the piece being cut, when beveling or mitering. This is due to inclining the shearing end at an angle, so that the shears will strike the work properly when the latter is in a horizontal plane. Even the heaviest sections can be cut in this manner without the necessity of lifting them out of the horizontal position, a procedure which saves work in handling the pieces.

Two sets of punch holders and dieblocks are furnished with the machine. Thus, means are provided for punching beams, channels, girders and columns of any size, in both the flange and the web. Holes can be punched in any part of the web without turning the section over. The gears are machine cut, and the bearings are of large proportion and bronze lined. A ring-oiled flywheel bearing is used. A 7½-hp. motor is ordinarily required to operate the machine. The machine has a punching capacity of 1¼ x ¾ in., or 1 x 1 in. It will shear ¾-in. plates, or 3½ x 1 in. flats. A special upper knife permits of shearing 8 x ⅝ in., or 2¾ x 1 in. flats. Angles up to 6 in. in size may be placed in the throat for trimming. The bar cutter has a capacity for 2¼-in. round or 2-in. square stock, 8-in. I-beams of 18-lb. weight, or other sections in proportion to the cross-sectional area.

The punch has a throat 24 in. in depth and 19 in. in height. It is engaged by a handle or a treadle. The shear is engaged by means of a jaw-clutch, and the bar cutter by shifting the ram by means of a counterweighted lever. The universality and adaptability of the machine are its principal features.

Bennett "Detectorod"

A device, called a "detectorod," has recently been brought out by the Bennett Metal Treating Co., Hartford, Conn., for the purpose of determining the atmospheric conditions in steel-treating furnaces. It indicates when a furnace that is to be used for hardening or heat-treating steel is in a reducing, or non-oxydizing, condition and therefore safe for the introduction of the work, without danger of scaling it. Its operation is based on the fact that a hydro-carbon gas is, in itself, non-inflammable.

The rod is of steel, about ½ in. in diameter, and has a hole 0.025 in. in diameter passing lengthwise through it. For a short distance near the outer end of the rod the hole is enlarged to form a chamber, and the end of the rod is sealed by welding. A transverse hole of 0.030 in. diameter forms the outlet. The handle is in two parts, one part forming a reservoir and the other part a pneumatic pump. The reservoir is filled with kerosene oil, and air pressure is raised by a stroke or two of the pump.

To determine when a furnace is in a condition safe for the work, the rod is introduced, so that the end will reach as nearly as possible to the place to be occupied by the work. A pressure of the thumb upon the conveniently placed button of a needle valve, shown in the accompanying illustration, releases a small quantity of



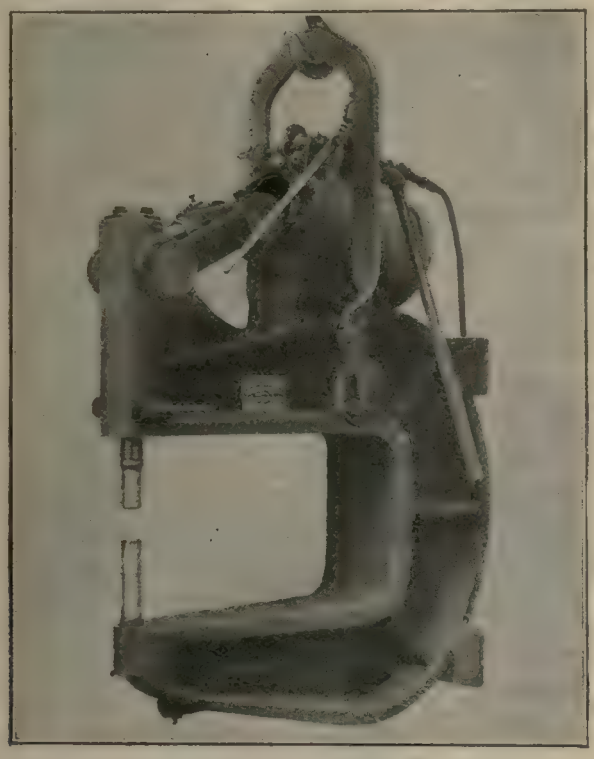
BENNETT "DETECTOROD"

the oil, to flow through the small hole to the chamber at the end of the rod, where it is immediately vaporized by the heat and issues from the side outlet as a hydro-carbon gas.

If the jet of gas ignites, it indicates that too much oxygen is present in the furnace, and the air and fuel supply valves must be regulated, until repeated trials with the detectorod give no flare at the end when the button is pressed.

Southwark Pneumatic Riveter

The Southwark Foundry and Machine Co., Philadelphia, Pa., has recently placed on the market a line of pneumatic riveters of the type shown in the accompanying illustration. The machine is of the compression yoke type, and employs a toggle action to impart the desired movement to the die. When the air is turned into the cylinder, the die is caused to move rapidly during the first part of the stroke of the piston. This permits of bringing the die up to the rivet. The latter part of the piston travel produces a comparatively small movement of the die. Since the relation between the movement of the two members is practically constant during the last half of the stroke, it is unnecessary to drive the rivet at the very end of the travel of the die and piston. The position of the die is set for the work being performed, so that the rivet is headed when the piston has moved through three-fourths of its stroke. Consequently, sufficient travel of the die at full pressure on either side of this position is available to take care of variations in the length of the rivet, the thickness of the plates or dimensions of the holes. This eliminates the necessity for further adjustment of the die screw.



SOUTHWARK PNEUMATIC RIVETER

The operating valve is of the plain slide type, having but one wick packing on the stem end and a removable valve seat to enable regrinding. The pull-back is accomplished by using the line pressure, the air being admitted back of the piston. Two separate pressures can be obtained on the die by simply turning a plug cock in the valve plate. This admits air at full pressure on the pull-back area of the piston, thus reducing the resultant pressure on the piston, and consequently on the die. Pressure regulating valves and auxiliary storage tanks are not used.

The riveter frames are steel castings of I-section. The portable machines are provided with suspension bails. When machines have a reach above 36 in., feet are provided for mounting in a stationary position. The simplicity of the mechanism should be noted, since but one thrust bearing and four bushings are required.

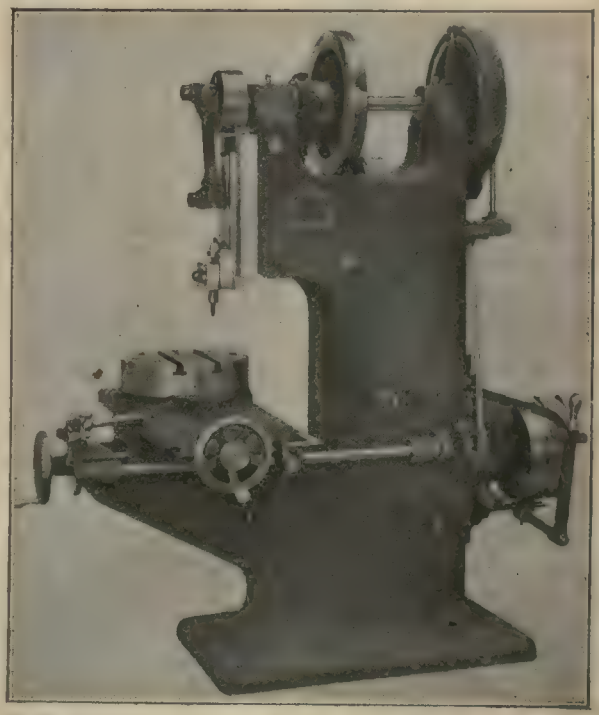
The machine is made in the following capacities: 10, 17½, 30, 50, 75, 100, 125 and 150 tons. The cylinder diameters vary from 7¼ to 20¾ in. The smallest size of the machine has a reach of 4 in. and a gap of 10 in. The largest has a reach of 21 ft. 6 in., and a gap of 24 in. The specifications and the equipment of the machine can, of course, be varied to suit the conditions peculiar to the installation.

Peters-Bossert Die Slotting Machine

The accompanying illustration shows a vertical slotting machine recently placed on the market by the Peters-Bossert Co., 617 East Pearl St., Cincinnati, Ohio. The machine is intended especially for work in making dies and punches of either regular or irregular shape. It is fitted with a special mechanism for producing a curved relief on the die.

The ram slides in vertical ways, is fitted with a gib, and driven by means of a crank on the main shaft. The crankpin on the driving shaft can be adjusted in its position on the disk, so as to vary the length of stroke from zero up to 4 in. The ram is slotted and fitted with a pin, the position of which can be adjusted so as to change the height of the ram to suit the work.

The ways carrying the ram are hinged at the upper end. The lower end is connected by means of a toggle joint arrangement to an eccentric on the main shaft. In this way, the ram and slide can be moved forward while on the down stroke, so as to give relief to the die. Due to the construction, the tool moves in an arc, so that after the tool has entered the die, it is possible to cut a curved relief for the punchings. On the up stroke, the tool automatically clears the work. The magnitude of the lateral motion can be varied to suit the requirements.



PETERS-BOSSERT SLOTTING MACHINE

By simply using a pull pin, the cam mechanism can be disengaged, so as to permit of taking straight vertical cuts on the work.

The machine is provided with cross, longitudinal and circular hand feeds, each operated by means of a separate screw and handwheel. Power feeds may be furnished when desired. A variable-speed gear box mounted inside the frame gives three changes of speed, being operated by means of a shifting lever. The machine is ordinarily driven by belt on tight and loose pulleys at the back of the base.

Davis-Bournonville Tube-Welding Machine

The accompanying illustration shows an oxy-acetylene welding machine intended particularly for the large-scale production of tubing having a large diameter and



DAVIS-BOURNONVILLE TUBE-WELDING MACHINE

made from thin-gage steel. The machine is a recent product of the Davis-Bournonville Co., Jersey City, N. J. It is especially intended for use in tube-making plants where it will be used for long runs on one size of tubing. It is equipped with two pairs of rolls, one set being for feeding, and the other for welding.

The machine is ordinarily driven by a belt on a three-step cone pulley mounted at the rear. Motion is transmitted from the drive shaft to the feed rolls and to the welding rolls through worm gearing to one spindle of each pair of rolls. The wormwheel driving the feed rolls is in a vertical position, and that on the welding rolls in a horizontal position. The welding roll at the back is fixed in place, while the one in front is relatively adjustable, its spindle bearing being in a slide, the position of which is controlled by means of a screw and handwheel. The mating gears have teeth of comparatively large diametral pitch and of involute form, so that the adjustment within the limits required can be made without affecting the smoothness of the tooth action. The gears are protected by guards, the front guard being removable.

The upper and the lower feed rolls are geared together, adjustment being made in this case also by moving one of the rolls and its mating gear, sufficient latitude in the meshing of the gears being available for the slight adjustment needed. The welding rolls are made with annular depressions on the top for the holding of cooling water, and a circulating system can be attached if required.

A welding torch of the multiple-jet, water-cooled type is employed. Both the tip and the barrel of the torch are cooled by the circulation of water, thus maintaining the conditions necessary for continuous welding. The holder provides for vertical and horizontal adjustment of the position of the torch, and also for varying the angle at which the tip is presented to the seam to be welded.

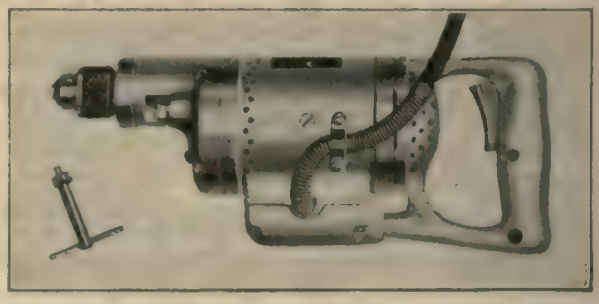
The maximum capacity of the machine is for tubing 6 in. in diameter and of No. 10 gage. No matter whether large or small diameter tubes are used, the rolls are made the same size overall, the mean center distances of the mating gears remaining the same for different sizes of work. This enables the setting up of the machine for any diameter and gage of tubing within the capacity, by using rolls grooved to suit the work. In this way, welding can be done on more than one size of tube with any given machine.

"Willey" Portable Electric Drill

The James Clark, Jr., Electric Co., 520 West Main St., Louisville, Ky., has recently placed on the market the portable electric drill shown in the accompanying illustration. The device, designated as the "Willey" universal automatic drill, is intended particularly for production work with small sizes of twist drills. It is made in three sizes, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$ in. The diameter of the motor frame is $3\frac{1}{4}$ in. in each case. The lengths overall of the machine equipped with a Jacobs chuck are $11\frac{7}{8}$, $12\frac{1}{8}$ and $13\frac{1}{4}$ in., respectively. The weights are $6\frac{1}{2}$, 7 and $7\frac{3}{4}$ pounds.

The switch for operating the motor is incorporated in the handle, being in such a position that it is closed when the operator grips the handle. As soon as the operator releases his grip, the switch automatically disconnects. In this way, the current is always turned off when the drill is not actually being used. Although the switch is operated at the handle, there are no wire connections made there, all connections being on the inside of the motor frame or body.

The motor may be wound for either 110 or 220-volt alternating, single-phase current of 60 cycles or less,



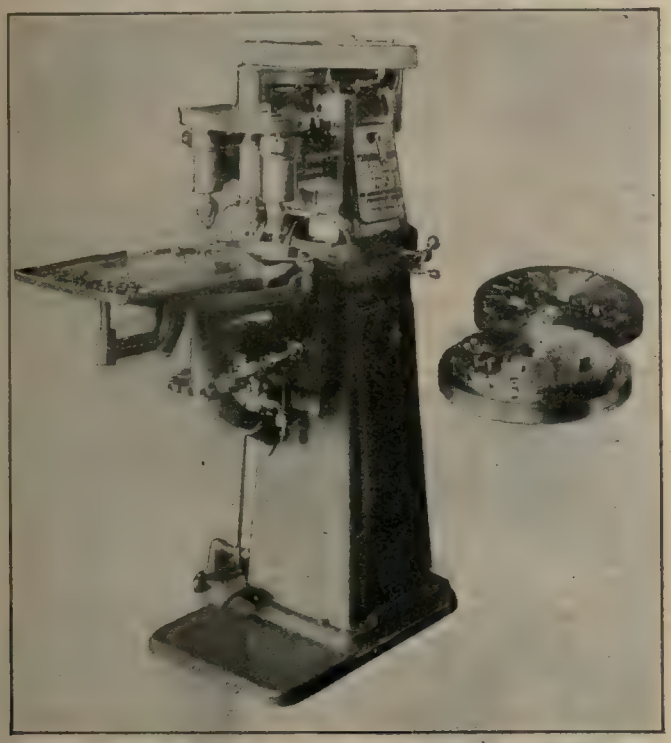
"WILLEY" UA PORTABLE ELECTRIC DRILL

and is capable of operation on direct current of the same voltage as the alternating.

The device is smooth in contour. It is stated to be compact, well-balanced, light in weight and well finished. It has no projecting corners to interfere with close-corner drilling. It is made up of three sub-assemblies, the spindle with the gears, the motor body, and the handle with the automatic switch. It is provided with 15 ft. of electrical cord.

Anderson Dial-Feed Multiple-Spindle Tapping Machine

The Anderson Die Machine Co., Bridgeport, Conn., has recently developed and placed on the market the tapping machine shown in the accompanying illustration. The machine is equipped with three spindles, and is intended for high production when tapping small brass and steel pieces, such as those used in electrical appliances. The chief feature of the machine is in the method of feeding the work to the spindles, a dial being used in which stations are provided for holding the works. The device is similar in its method of operation



ANDERSON DIAL-FEED TAPPING MACHINE

to dial-feeding arrangements employed on small punch presses.

Clutches are not used for reversing the spindles, which are driven in opposite directions by means of a toothed segment and train of gears. The segment is controlled by a crank disk at the upper end of the vertical shaft extending through the central part of the main frame. To this vertical shaft are secured the cams for indexing the dial and for locking it in its proper position. The ratchet which controls the dial is regularly furnished with eighteen teeth, being used when dials having eighteen openings are employed.

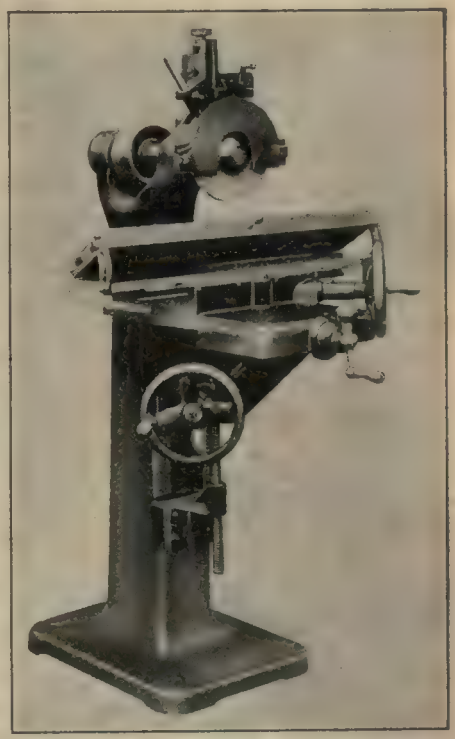
The dial is made of relatively thin material and has openings to fit the particular pieces to be tapped. Any piece with one, two or three holes can be tapped at one passing; on account of the construction of the chuck spindles, three taps of entirely different lead can be used at the same time.

The two tap spindles at each side are adjustable, so that any combination or location of the three holes can be obtained. The dials are made to suit the primary or central spindle, which is not adjustable in position. They are located and rotated to bring one hole in register with the fixed spindle; and then the two auxiliary spindles are adjusted to suit the location of the two adjacent holes. The machine is equipped with ball bearings on high-speed shafts.

This machine when holding from No. 4 to No. 10 taps is ordinarily run at a speed of fifty-six strokes per minute. Either o. two or three holes can be tapped in each piece. On pieces where only one hole is tapped, it is possible to double the production by doubling the number of slots in the dial, and by adjusting one of the auxiliary spindles, to tap the additional hole. This would give a production of approximately 112 pieces per minute on single-hole tapping. The machine can be used to advantage in tapping nuts and small pieces containing a number of holes to be tapped, as for instance spindles for door knobs, which, as a rule, have three holes to be tapped in each end of the spindle. A cam and slide can be furnished to work in conjunction with the dial, so that round pieces can be tapped. The form of drive employed permits of timing the various movements very accurately, and without any danger of this timing being upset. The production can be thus accurately scheduled and determined.

Wilmarth & Morman Surface-Grinding Machine With Tilting Table

The Wilmarth & Morman Co., Grand Rapids, Mich., has recently equipped its No. 1 hand-feed, surface-grinding machine with a tilting table, in addition to the plain and swivel-table styles. The arrangement is particularly adapted to grinding small work on a magnetic chuck when surfaces at angles are required to be finished. Instead of blocking up one edge of the chuck, it is securely bolted to the table, which is then tilted to the required degree. By this means, the work can be held rigidly, so as to produce accurate results. The table is provided with T-slots for the holding of a magnetic chuck, vise or other fixtures, and it is graduated in degrees so as to facilitate setting to the proper angle. The truing device is located on the wheel hood, and it dresses the grinding wheel horizontally or at any desired angle without the necessity of removing the work from the table. If desired, a radial truing device which operates from the table can also be furnished.

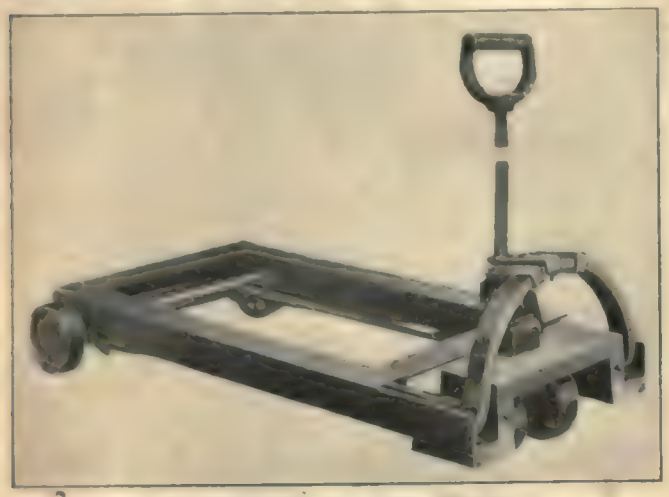


WILMARTH & MORMAN NO. 1 TILTING-TABLE GRINDING MACHINE

The machine is intended for accurate work both in the toolroom and on production in the shop. It is stated to have a considerable field of application in the handling of small parts, and a battery of them may in some circumstances work more efficiently than larger automatic machines.

Western Lift Truck

The Western Tool and Manufacturing Co., Springfield, Ohio, has recently placed on the market the hand-operated lift truck shown in the accompanying illustration. The truck is made of iron and steel. With it one man can raise a load of 2,000 lb., the lift of the platform being 1½ in. The platform is ordinarily 23 x 38 in. in size, and 7½ in. above the floor when raised.



WESTERN HAND LIFT TRUCK

The truck can be turned in its own length, the front wheels swiveling about a ball thrust bearing. Roller bearings are employed on all wheels.

Jacobs Chuck for Small Drills

The Jacobs Manufacturing Co., Hartford, Conn., has brought out a special No. 0 size of its drill chuck, to hold the small drills used by jewelers and others whose work requires the drilling of very small holes. The parts are so made as to insure true running and even gripping of the drills, and also to secure accurate running balance at the high speeds necessary.

Though constructed upon the same principle and having the same number of parts as the larger sizes made by the same company, this chuck is but 1¼ in. long and measures a trifle under ¾ in. in diameter. The size of the chuck may be gaged by comparing it with the size of the ruler in the accompanying illustration. It is furnished, when desired, with a sleeve of even smaller diameter, so that the chucks may be run in multiple at ¾-in. centers. In this case the sleeve is not knurled.

The maximum holding capacity is ¼ in., although the chuck is claimed to be capable of holding a hair tightly. It weighs 2 ounces.



JACOBS NO. 0 DRILL CHUCK

R. & C. Lapping Tools

The R. & C. Lap Co., Davenport, Iowa, has recently placed on the market a line of standardized laps having interchangeable and replaceable shells. The laps are intended for use not only in tool making, but on production work in the shop, so as to enable both rapid and very accurate work. The abrasive shells are supplied in two grades, depending upon the speed of cutting and the type of the work. The laps are made for both external and internal use in sizes from ¼ in. up.

In Fig. 1 is shown the cylinder lapping tool, one section or shell of the lap being removed so as to show the interior construction. The lap consists of a floating shank and an expanding device for adjusting the size, as well as for taking up the wear of the soft metal shell, which is charged with the abrasive. During the expansion of the lap, the diameter is kept constant throughout its length, so as to produce a true bore, free from taper or a "bell-mouth."

In Fig. 2 is shown an external lap intended for use on crankshafts, although such laps can be supplied for all purposes. Exceedingly accurate and smooth finishes can be obtained by the use of the lap, even when very large production is required.

A small internal lap for tool-room use is shown in both the sectional and the full view in Fig. 3. The lap is stated to be made of the most suitable materials for the purpose. Due to its construction, a slight contraction is permitted, in case the hole is rather small, thus preventing sticking. However, the laps cannot expand beyond the original micrometer setting, thus assuring accurate work. As the lap is expanded, it maintains its true cylindrical form. By means of the expansion feature, the life of the tool is greatly increased. The lap is made with a standard shank, and may be fitted in a lathe or drill press, or operated by hand. It is expanded to the required size by means of the adjusting nut, and then fastened in this position by means of a lock-nut. The abrasive is then applied and the work is lapped in the usual way.



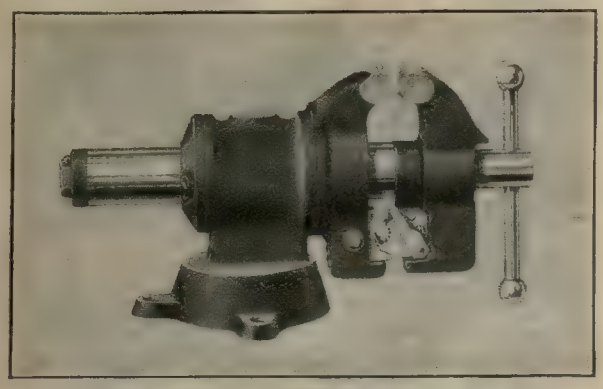




FIG. 1. R. & C. CYLINDER LAP. FIG. 2. EXTERNAL LAP. FIG. 3. SMALL INTERNAL LAP

Atlas "Nutyp" Vise

On page 160, Vol. 55, of the *American Machinist*, vas described a vise made by the Fulton Machine and Vise Co., Lowville, N. Y., under the name of the



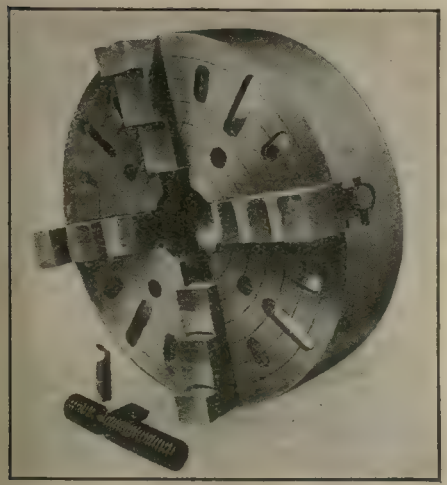
ATLAS "NUTYP" VISE

"F. & R. Combination Special Vise," and sold by the Boker Cutlery and Hardware Co., New York, N. Y. The vise is now made by the Atlas Vise Co., Inc., Lowville, N. Y. The accompanying illustration shows the "Nutyp" vise, which is fitted with a swiveling base, although the vise previously mentioned had only a plain clamping base.

The jaws of the vise are 3 in. wide and have an opening of 3½ in. On the opposite side of the screw from the plain jaws is mounted a pair of pipe jaws having a capacity of 1⅜ in. diameter. In addition, a shearing device for cutting stock ¼ in. in diameter is incorporated. The jaws can be swung about the axis of the screw and locked in any desired position. With the swiveling-base type, the whole vise can be swung about a vertical axis and locked in position. The swiveling vise has a net weight of 40 lb. It is said to be particularly adapted to use in garages and repair shops.

Cushman Steel-Bodied Lathe Chuck

The Cushman Chuck Co., Hartford, Conn., has recently brought out an improved design of its lathe chuck, and is making it in all sizes from 10 to 30 in. The body is of cast steel and the jaws are pack-hardened and ground. All parts are finished to master gages and are interchangeable. The screws are of chrome-nickel steel, surface hardened, and have a greater length of bearing than in the former Cushman chucks. The thrust bearing is a special feature of this type of chuck. It is made in two parts and completely encircles the screw at a point about midway of the length of the latter. A screw and both parts of the thrust bearing are shown separately in the accompanying illustration.



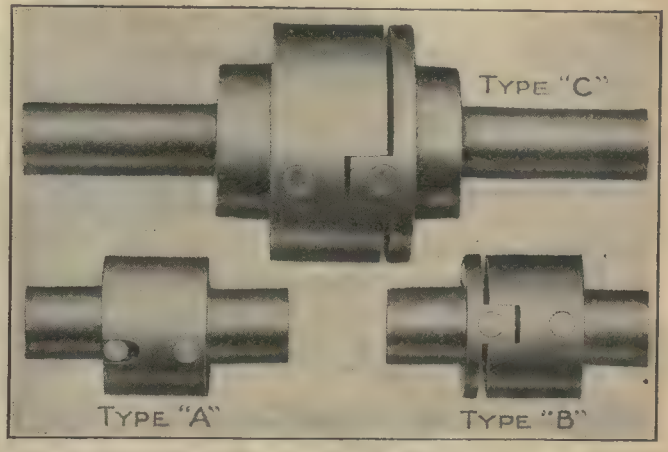
CUSHMAN TYPE-214 STEEL-BODIED CHUCK

The stem of the thrust bearing is round when the two parts are placed together and, in assembling, it is driven into a round hole in the chuck body. It is therefore self aligning and, being symmetrical, cannot be put in a wrong position. When in place it holds the screw to the chuck body whether the jaws are in place or not, thus allowing no opportunity for dirt or chips to work under the screw threads when changing or reversing the jaws. It also provides a firm bearing against thrust in either direction. The net weight of the chuck ranges from 64 to 452 lb., according to the size.

Bartlett Flexible Shaft Couplings

C. H. Breaker, 4226 Broadway, Indianapolis, Ind., has recently placed on the market the Bartlett flexible shaft coupling. There is no bending of material or looseness of construction in the coupling, all parts fitting closely. The flexibility is derived from a turning motion around hardened steel pins, and also from a sliding motion taking place in a tongue-and-groove construction. The power loss due to friction is stated to be very slight, and the absence of bending strains reduces wear.

The coupling maintains a uniform angular velocity ratio between the two shafts, no matter what the degree of angular or parallel misalignment. End float is also allowed, an important consideration for alternating-current installations. The machine is simple in construction, and can be easily installed, no screws or bolts being used in the parts. To assemble or disassemble, the two sliding members are merely pushed into or out of engagement.



BARTLETT FLEXIBLE SHAFT COUPLINGS

The parts are made of machine steel and heat-treated. It is stated that the coupling is capable of carrying the full allowable load that the shafts can transmit. By a slight change in the construction, positive transmission wih a uniform angular velocity ratio can be obtained between shafts set at any angle to each other up to 90 deg. In such installations, the coupling operates satisfactorily, even though the shaft ends are not in the perfect alignment which is necessary when bevel gears are used.

The coupling is made in three types, shown in the accompanying illustration. The Type A has one collar pinned directly to one shaft end. A hardened pin in the other shaft end slides in a slot in this collar. The Type B coupling has a collar or ring pinned to each shaft end, the connection being made between the two

parts by means of a groove and slot. The Type C coupling has a hub keyed to the end of each shaft. Bearing pins fasten the outside rings to the hubs, the rings being engaged with each other by tongue and groove construction. The first two types mentioned have the advantage of simplicity, compactness and low price, being used especially where the duty is not severe. The Type C coupling is made for heavy service, high torque and high speed.

Roberts Lever-Operated Ratchet Screwdriver

William Roberts, 457 Main St., Springfield, Mass., has recently placed on the market a lever-operated ratchet screwdriver, the tool being made by the Cogswell Manufacturing Co., also of Springfield, Mass. By means of the device, considerable torque may be applied in the turning of slotted-head screws. It is intended to replace the use of a wrench when turning a screwdriver.

The auxiliary handle, normally at right-angles to the shank, has a cam-shaped bearing against the shank of the screwdriver, thus acting as a ratchet and binding the shank when tightening the screw. It can be operated in either direction. The handle shown is so made that by turning it end for end after using it to drive a screw, it can be folded against the screwdriver itself so as to



LEVER-OPERATED RATCHET SCREWDRIVER

be out of the way. The device may be furnished, however, with a plain handle that remains at right-angles to the shank.

The device is made in several styles. In one style, it may be easily attached to and removed from any screwdriver of suitable size. A split taper collet is first placed on the shank and then clamped by means of a tapered nut screwed down on it. The ratchet and lever fit on a collar on the collet, so that the whole screwdriver may be turned by means of the handle. The device may also be furnished with a hollow head for fitting bolt and socket-wrench heads. Its use permits the turning of the screwdriver with considerable force, and when space is limited with only a small swing of the lever.

H & G Socket and Ratchet Wrench Set

A set of socket wrenches provided with a ratchet has been put on the market by the Eastern Machine Screw Corporation, of New Haven, Conn. The set is intended to give convenience in handling, as well as flexibility of operation. It is packed in a wooden box in which a place is provided for each part, so that the absence of any part may be readily noticed.

Ten sockets for hexagon nuts from $\frac{7}{16}$ to 1 in. in size are provided. The hexagon hole in each socket is made by drilling a hole with a diameter equal to the distance across the corners of the nut at the maximum point. The rim is then pressed in to form the hexagon, during which process the metal is condensed and toughened. A hexagon head is provided on the top for turning the socket, all of the wrench parts fitting over this head. The sockets are heat-treated and hardened.

An adjustable T-handle is provided. The crossbar



H & G SOCKET WRENCH SET

in it can be used in a central position for fast work or slid to one side to obtain greater leverage. The ratchet is compact, and may be made either right- or left-hand by simply raising and reversing the position of a ball-headed pin. An extension piece is provided to be used between the T-handle and the socket, to turn nuts otherwise difficult to reach or to bring the handle to a more favorable position. A universal joint is furnished for turning nuts located at angles to the wrench handle. The parts of the joint are milled from bar stock. Two screwdrivers are provided to fit the attachments.

A drop-forged box wrench is included in the set primarily to permit of getting at nuts in connection with the sockets where the limited head room over the nuts will not permit the use of the other tools. Each outside part of the wrench attachments has a spring-steel split screw, so as to provide the proper amount of friction to hold the parts together while in use.

Mayhew Hacksaw Blades

A complete line of blades for hacksaws has recently been placed on the market by Mayhew Steel Products, Inc., 291 Broadway, New York, N. Y. The carbon-steel blades are sold under the trade name of Marathon, while for the high-speed-steel blades the name Mayhew is used. Both styles can be furnished in either the all-hard or the flexible type. The Marathon blades are for use in hand frames only, while the Mayhew blades, which are made from tungsten steel, are for both hand frames and power-driven machines.

For use in hand frames, the blades can be furnished in lengths from 8 to 18 in. The widths vary from $\frac{1}{2}$ to $\frac{3}{4}$ in., the thicknesses from 0.025 to 0.032 in., and the number of teeth may be either 14, 16, 18, 24 or 32. For use on light power-driven machines, blades from 8 to 17 in. in length can be furnished, the widths being $\frac{7}{8}$ to 1 in., and the thicknesses 0.028 to 0.032 in. For use on heavy power machines, the lengths run from 10 to 24 in., the widths from $\frac{3}{4}$ to $1\frac{1}{2}$ in., and the thicknesses from 0.049 to 0.065 in., the number of teeth per inch varying from 7 to 18, depending on the size of the blades.



NEWS SECTION

U. S. Chamber to Consider Railroad Situation

The railroad situation and what should be done about it from a business standpoint, will be considered at a meeting of the national council of the Chamber of Commerce of the United States, to be held in Washington, Feb. 8 and 9. The council is made up of one representative each from the 1,400 business organizations within the membership of the chamber.

The chamber's railroad committee, which has just concluded a meeting in Washington at which the situation was gone over, is of the opinion that the Transportation Act can be left untouched and at the same time there can be worked out a constructive plan which will help solve the problem. It will prepare a report to be presented at the council meeting, suggesting a program for dealing with the situation. This report when completed will propose means for keeping the national interest in adequate transportation foremost in all measures which may be taken in relation to transportation.

British Industries Fair Next Month

The British Industries Fair, the greatest trade fair in Europe, will be held concurrently in London and Birmingham from Feb. 27 to March. 10, each section of the fair covering different fields of industry.

The fair, which is Great Britain's annual display of her manufactures and industries, is especially organized to bring buyer and seller together and is a stimulus to competition, as the principal manufacturers exhibit side by side. An important section of the fair will be devoted to general machinery of all descriptions.

Further information may be obtained from the British Consulate-General at Chicago, or any British Consular Officer.

Canadian Marking Regulations Changed

The Department of Customs and Excise, of Canada, has changed some of the rulings in connection with the marking of goods with the name of the country of origin. The changes are too extensive to enumerate or describe here, but those vitally interested in the matter may obtain full particulars from the department headquarters at Ottawa.

Bullard Co. To Make Motorcycles

The *Bridgeport Post* announces that the Bullard Machine Tool Co., of Bridgeport, Conn., has begun the manufacture of motorcycles on a quantity production basis. The machine is a four-cylinder equipped with side-car. All parts are to be made and assembled at the Bullard plant, but the company, it is understood, is not engaged in the sales or distribution of the product. The surplus capacity of the Bullard plant is being utilized for the purpose and the new work will not in any way interfere with the manufacture of the regular product.

Exports of Industrial Machinery in 1921

Exports of American industrial machinery show an increase of something like 170 per cent in value in 1921 over 1913, according to the Industrial Machinery Division of the Department of Commerce. The figures are contained in a special review of the machinery export situation.

The impression that our foreign trade has collapsed is not justified in so far as exports of machinery are concerned, says the review in pointing out that exports of such machinery for the first eleven months of 1921 were valued at $238,007,585, against $92,312,457 for all of 1913. While official figures for the calendar year 1921 are not yet available, $250,000,000 is a conservative estimate of the total value of the trade during the year.

Automobile Production

In analyzing business conditions as of Jan. 1, the Federal Reserve Board makes the following reference to the automobile industry:

"Manufacturers are awaiting the results of the automobile shows before determining their manufacturing schedules for the coming year. November production is apparently less than for the previous months, manufacturers having 63 per cent of the passenger car output of District No. 7 (Chicago) producing 69,125 cars in November, as compared with 84,913 cars in October. November carload shipments were 14,061, as compared with 17,676 carloads in October, while drive-aways decreased from 12,808 to 10,509 machines. Factory sales in November are, however, stated to have increased over October.

Marvin Heads U. S. Tariff Commission

A statement issued at the White House announces that the President has designated Thomas O. Marvin, of Massachusetts, to be chairman of the United States Tariff Commission for the year beginning Jan. 15, 1922, and William S. Culbertson, of Kansas, to be vice-chairman of the commission for the same period.

Mr. Marvin has been a member of the commission since his appointment by President Harding in March, 1921. Mr. Marvin succeeds to the chairmanship held until this time by Thomas Walker Page, of Virginia. Mr. Page will remain as a member of the commission.

Mr. Culbertson has been a member of the commission since its organization under the provisions of the Act of Sept. 8, 1916. His first term expired in 1921 and he was reappointed, first by President Wilson and later by President Harding, for the term ending in 1932.

Jones & Laughlin To Build Steel Plant

The report from Chicago that the Jones & Laughlin Steel Co. of Pittsburgh, is negotiating for approximately 1,000 acres of land in the Chicago steel-making district to be used as a site for a steel works, has been confirmed by an official of the steel company.

The company is negotiating for a large parcel of land in Hammond, Lake County, Indiana, to be used as the future site for blast furnaces and steel works. The conclusion of the transaction is contingent upon certain things being done by the interests in Hammond, which, if satisfactorily performed, will result in the land being acquired for the purpose stated.

Screw Thread Commission Will Stay

In view of any lack of objection to the continuance of the term of the National Screw Thread Commission, it is probable that no hearings will be held on this bill by the Senate Committee on Manufactures. The Committee will discuss the bill, which has already been favorably reported in the House of Representatives, at its next meeting.

The sentiment of the committee is said to be favorable to the bill and it is expected to pass.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Last week the State of Oregon sold $10,000,000 soldiers' bonus bonds bearing 4¼ per cent interest at a little above par. Soldiers' bonus bonds previously sold by other states total $169,000,000. Many of the remaining states that have not yet sold bonus bonds have actually authorized or contemplate issues of from $5,000,000 to $45,000,000.

The news from Washington indicates that before the end of the present session Congress will find a way to distribute a bonus of from one to four billions among the soldiers. This is not written in the hope of preventing such prodigality but to call attention to its probable consequences. Most of this money will be spent as soon as it is received by those for whom it is intended.

To it will be added the enormous sum realized from the other state securities and the municipal, county, road, drainage and irrigation bonds that have been marketed of late. Their aggregate is unknown but it runs into the billions. At the National Roads Congress held in Chicago last week J. E. Pennypacker, secretary of the National Asphalt Association estimated that "nearly $1,250,000,000 is available for road building this year from Federal, State and County appropriations, tax levies and bond issues and that more than 700,000 men will be employed in road construction and patrol work" while this money is being spent.

The railroads and other corporations who have recently been able to sell bonds will also spend most of the new money raised in construction work in which labor will be employed. The Union Pacific ordered $10,000,000 worth of new equipment the other day. The Burlington is arranging for a bond issue of $30,000,000 the proceeds of which are to be spent for additions and improvements and numberless other borrowers are taking advantage of the present money market to supply themselves with funds that will sooner or later be disbursed in wages.

False Prosperity

Some may call this inflation and condemn it. They will probably be right in so far as the bonus gratuities are concerned, but it is futile to rail at what we cannot prevent. It is a condition and not a theory that confronts us and the fact is that during the next twelve months an unusual amount of "easy" money will be put into circulation. It promises to be a year of expansion as 1921 was one of contraction and since expansion generally fosters speculation, advancing prices with what we call prosperity now seem indubitably indicated. I say "what we call prosperity" for it is doubtful whether real prosperity can be created by taxing one class of the people that the Government may distribute largess among another class but that is what the politicians seem bent upon and while all patriotic business men should protest against such wastefulness they must in self protection be opportunists in dealing with conditions that must be endured because they can't be cured.

Another development that must be reckoned with is the possibility that a new political party may shortly come into existence. After the Civil War we had the Greenback Party. It grew strong enough to induce the eminent philanthropist, Peter Cooper, to accept its nomination for the Presidency in 1876 and at the Congressional elections of 1878 it polled over a million votes and elected fourteen Congressmen who held for a time the balance of power in the House.

Strength of Farmer Party

The strength of what is called the "Agricultural Bloc" in Congress suggests that this bit of history may be in some respects repeated and that a well organized agrarian party may be born of the travail of the post war period. If this shall come to pass the probability is that the credit resources of the nation will be somewhat lavishly used in the interest of agriculture, for the successful insistence of the Senate "Bloc" upon the enlargement of the Federal Reserve Board so that a farmer can be added to it is not, to say the least, suggestive of further deflation. The protests of the bankers against the recognition thus accorded agriculture upon the ground that it is "class legislation" hardly seem consistent with the fact that the present law expressly provides that at least two members of the Federal Reserve Board shall be men of banking experience.

The Agricultural Conference convened by the President to meet in Washington Monday is another evidence, as it is a recognition, of the farmer's political self consciousness and power.

These quasi political considerations are dealt with at length this week because their economic importance is great and is being gradually recognized. On the Stock Exchange where it would naturally be first appreciated the feeling has been almost buoyant. One group of securities after another has advanced. The improvement in each case is attributed to a different reason but underlying the upward tendency is a recognition of the ease with which money can be and is being borrowed. As the buying has turned to stocks, bonds have been somewhat quieter but the demand is still equal to the offerings.

The commodity markets are not, however, as yet affected. The single exception is sugar, which is slightly higher and growing firmer despite the widely exploited surplus. Cotton has been more resilient than it was last week and has recovered some of the decline recorded earlier in the year.

It is another case of a surplus that has been over exploited. There is enough cotton for the world's immediate requirements but the owners are able to hold it and unwilling to sell it unless they can get what they think it is worth.

Wool continues surprisingly firm. Prices seem to advance at each successive auction sale. The woolen goods trade is waiting for its cue on the American Woolen Co.'s opening to be held this week. At the convention of the National Wholesale Dry Goods Association held in New York last week the feeling seemed cheerful and confident. There is nothing new to say about the other staples of civilization except that the merchants who handle them and the manufacturers who fabricate them seem to be cheerful and hopeful.

The Disarmament Conference is still in session at Washington but the public have ceased to be much interested in the maze of Oriental politics through which the conferees are now trying to find their way. Americans have also grown a bit weary of trying to interpret the kaleidoscopic changes in European politics that are reported from day to day. The disposition is to wait upon the economic Congress that is to be held in March at Genoa.

Pending that event international trade is marking time except as Europe is able to find the gold or sell us goods that we will take in payment for the necessaries that she must buy from us. The stock market in London is booming on easy money. Rates are down to 1 per cent on call loans and 2¾ per cent on 90-day acceptances.

The newspaper despatches indicate that there has been a distinct revival of both confidence and activity in Canada since the beginning of the year. The Province of Quebec is said to be making $4,000,000 a year out of the liquor business, now a governmental monopoly in that Province.

Gold Reserve Grows

The weekly statement of the Federal Reserve System shows a reserve ratio of 76 per cent, which is an advance of 1.3 for the week. The gold on hand has been increased by about $3,000,000. The total now amounts to $2,899,000,000, which exceeds by nearly $500,000,000 the total of Federal Reserve Notes outstanding. These figures portray a financial situation that is without precedent in the history of this or any other country.

If the plethora of lendable credit that they reflect does not soon commence to make itself felt in increased commercial and industrial activity, then we shall have to revise a theory that even the most orthodox economists have always accepted.

Briefly stated, it is that when interest rates are low and money can be easily borrowed people will borrow and buy.

The Trend of Business Improvement—Plants Resuming

The Osgood Bradley Car Co., Worcester, Mass., is arranging to increase its working force, now numbering about 600 employees, at an early date. The plant is working on a 48-hour week schedule. A recent contract placed with the company covers the construction of thirty all-steel passenger cars for the New York, Ontario & Western Railroad Co., estimated to cost about $600,000, or approximately $20,000 a car.

The Cadillac Motor Car Co., Detroit, Mich., a subsidiary of the General Motors Corporation, has resumed operations at a normal rate of production at its plant.

The Delaware, Lackawanna & Western Railroad Co. has resumed operations at its repair shops at Scranton, Pa., Kingston, Pa., and East Buffalo, N. Y., giving employment to about 3,000 men. The plants had been closed for about three weeks.

The American Radiator Co., Chicago, Ill., is operating its southern plants, including the Birmingham, Ala., works, at full capacity, with frequent overtime schedule.

Smith & Wesson, Springfield, Mass., manufacturer of revolvers and pistols, resumed operations at its plant on Jan. 16, after a shut down dating from last July. A wage reduction of 20 per cent has been made effective.

The General Motors Corporation has resumed operations at its motor truck manufacturing plant at Pontiac, Mich., following a shut down for the holidays and inventory. A production of schedule of twenty-five trucks per day has been arranged, the majority to be of the lighter models.

The Missouri-Pacific Railroad Co., St. Louis, Mo., has resumed operations at its different repair shops, including the works at Kansas City and De Soto, Mo., Hoisington, Kan., Sedalia, Mo., and Little Rock, Ark. The company has awarded a contract to T. S. Yeake & Co., 608 South Dearborn St., Chicago, Ill., for extensions in the engine house at the Hoisington plant, to cost about $12.000.

The Chandler Motor Car Co., Cleveland, Ohio, has doubled the working force at its plant recently, and plans to make further increases within the next month. The production schedule for the first quarter of the year calls for a larger output than for the same period of a year ago.

The Cumberland & Pennsylvania Railroad Co. has resumed operations at its shops at Mount Savage, Md., giving employment to about 200 men.

The West Penn Steel Co. has resumed full operations at a portion of its plant at Brackenridge, Pa. Other departments at the works are running on a part time schedule.

The General Electric Co. is operating its plant at West Lynn, Mass., on a five-day week basis at the present time, as compared with a low point of production at about 50 per cent capacity during last summer.

The Hornell Repair & Construction Co., which has been operating the repair shops of the Erie Railroad at Hornell, N. Y., for about two years past, has taken over the shops of the same railroad at Susquehanna, Pa., and will operate that plant in the future. Operations will proceed at once for contract repair work for the road.

The Fairbanks Steam Shovel Co., Marion, Ohio, is planning for the early resumption of operations at its foundry, following the installation of additional furnace equipment at the plant, now under way.

The United States Steel Corporation is arranging to convert and utilize a portion of the plant of its subsidiary organization, the Chicksaw Shipbuilding & Car Co., on the Chicksaw River, near Mobile, Ala., for railroad car construction, and has taken an order for 2,000 cars from the Seaboard Air Line Railway Co.

The Willys-Overland Co., Toledo, Ohio, is increasing the capacity of its subsidiary, the Wilson Foundry and Machine Co., Pontiac, Mich., for the production of motors for the Willys-Knight automobiles, and will inaugurate operations on the new manufacturing basis at the plant early in February. Equipment from the Elyria, Ohio, works of the company is being removed to the Pontiac plant for the enlarged production. Two of the buildings of the former Flanders automobile works at Pontiac will be used by the company for motor assembling operations. Employment will be given to additional workers at the plants.

The Western Maryland Railroad Co., Baltimore, Md., has leased its repair shops at Hillen and Port Covington, Md., to private interests, headed by C. J. Wolf, heretofore general foreman of the Baltimore terminal of the company. The change became effective on Jan. 15. The plants will continue in operation for car and locomotive repair contract work for the railroad.

Civil Engineers Convene at New York

The sixty-ninth annual meeting of the American Society of Civil Engineers was held in New York City on Jan. 18, 19 and 20. The business meetings and technical sessions were held in the Engineering Societies Building, Thirty-ninth Street. The annual reception and dinner-dance was held in the Hotel Pennsylvania on the evening of the eighteenth.

A series of excursions in and about New York gave the visiting members ample opportunity to inspect some of the biggest industrial plants and construction works in the vicinity. Among the places visited were the Stock Exchange, Federal Reserve Bank (now in process of construction), American Bank Note Co., Hell Gate Power Station and the plant of the McGraw-Hill Publishing Company.

The technical sessions covered water and rail transportation, public highways, financing and banking, public works, and administration. General discussion followed each subject.

On Wednesday morning the society conferred honorary membership on the following: Eugene Schneider, of Paris; M. Luigi Luiggi, of Rome; Samuel Rea, Ambrose Swasey and Howard A. Carson, of the United States. George A. Webster, president of the society, made the presentation addresses.

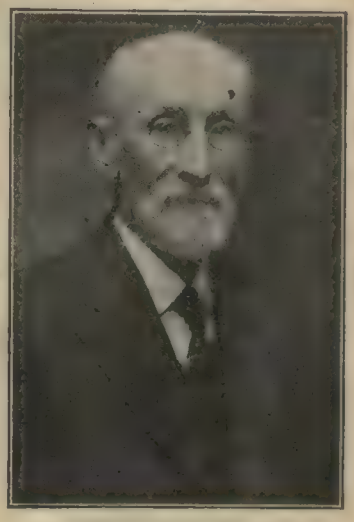
John Ripley Freeman, of Providence, R. I., was elected president for 1922. Carl Edward Grunsy, of San Francisco, and Robert Ridgeway, of New York, were elected vice-presidents.

Christopher Miner Spencer Dead at Hartford

Christopher Miner Spencer, one of the old time "Yankee" inventors and a pioneer in many of the lines that now form important units in the machinery and machine tool industries, died on Saturday Jan. 14 at the home of his son Roger Spencer, in Hartford, Conn. He was eighty-eight years old.

Mr. Spencer was born in South Manchester, Conn., June 20, 1833, a descendant of early colonial settlers. His boyhood was spent in his home town and at an early age he entered a local machine shop as an apprentice. From 1854 to 1857 he was employed at Colt's Armory in Hartford, where was developed the interest in firearms that led to the invention and patenting in 1860 of the Spencer repeating rifle which was used in the Civil War, and which Mr. Spencer personally demonstrated to President Lincoln.

In 1869 he, in company with Charles E. Billings, organized the Billings & Spencer Co., for the manufacture of drop forgings, sewing machine parts, and similar articles. He later turned his attention to screw machines and with George A. Fairfield organized the Hartford Screw Machine Co. in 1876. Both these concerns are large factors in the industrial life of Hartford at the present time. Mr. Spencer was instrumental in developing the crude and half-complete screw machine of that early period into marvelously perfect full automatic machines of the present day and, up to the time of his death, was retained in an advisory capacity by the New Britain Machine Co. in the turret machine manufacturing department.



C. M. SPENCER

The wonderful mechanical potentialities of such a machine as the automobile could hardly escape the attention of such a thoroughgoing mechanic as Mr. Spencer, and it is said that he experimented upon a steam driven wagon or buggy, and actually drove such a machine through the streets of Hartford as long ago as 1862. In later years the airplane attracted his interest. For the past two years he has been deeply engrossed in the study of the mechanical details of aircraft and, despite his advanced years, had made about twenty flights in and about Connecticut.

McCabe and Sheeran Organize Machinery Corporation

Harry McCabe, formerly vice-president and manager of the McCabe Machinery Corporation, and Frank Sheeran, formerly treasurer and sales manager of the same company, have organized the McCabe & Sheeran Machinery Corporation with offices at 149 Broadway, New York City.

This concern will act as machine tool agents in the East and will also carry a complete line of second hand machines.

Hibbard Resigns as Commissioner

The executive committee of the National Metal Trades Association has accepted the resignation of John D. Hibbard as commissioner of the organization. Mr. Hibbard has held this position since December, 1912.

Mr. Hibbard has been succeeded by Homer D. Sayre, who has been secretary of the association since 1907, and the secretaryship has been filled by Louis M. Fischer.

The headquarters of the association are in Chicago.

Gov. Hartness Better

The many friends of Governor James Hartness, of Vermont, (president of the Jones & Lamson Machine Co., Springfield, Vt.) will be pleased to hear that he has passed the crisis and is reported to be out of danger. The Governor has been seriously ill with pneumonia.

Taft-Pierce Officials in Reorganized Fraser Co.

Five former officials of the Taft-Pierce Manufacturing Co., of Woonsocket, R. I., have severed their connections with that concern and have become stockholders in the reorganized Warren F. Fraser Co., of Westboro, Mass., which was incorporated in 1914, to manufacture cylindrical grinding machinery. The men are Sydney Player, Joseph N. Bethel, Richard S. Staples, Herbert S. Indge and Alfred Box.

The executives of the reorganized company are: Warren F. Fraser, president; Frank H. McCloskey, vice-president; Sydney Player, general manager; M. J Cashmer, treasurer; R. S. Staples, assistant treasurer and metallurgist; H. S. Indge, chief engineer; A. E. Box, factory superintendent.

Buffalo Engineers in Permanent Quarters

Announcement comes from Buffalo, N. Y., that the Engineering Society of Buffalo has established a permanent headquarters in the Iroquois Hotel, in that city. Clubrooms and a meeting hall have been fitted out for the comfort of the membership, which is now reported as six hundred. A series of luncheon meetings has been very successful. On Feb. 14 the regular monthly meeting will be addressed by Prof. R. H. McKee, of Columbia University. He will speak on "Gasoline from Oil Shale."

Business Items

The Morely Machinery Corporation, of Rochester, N. Y., has purchased the plant formerly occupied by the Defiance Check Writer Corporation, at 792 St. Paul St., Rochester. The Morley concern manufactures iron planers and special machinery, and is the successor of the W. A. Wilson Machine Co. and the Rochester Boiler Works.

The property of the Mutual Truck Co., of Sullivan, Ind., which was to have been sold recently by the receiver, the National Bank of Sullivan, will be offered for sale again about the first of February. At the sale held last week the highest bidder was Sherman Osborne, of Bloomfield, who offered $9,750 for the property. The property will be readvertised for sale. The property was appraised at $124,466.21 and the liabilities are $83,401.10.

The Ansted Engine Co., recently organized at Indianapolis, Ind., to make an automobile motor invented by George Moore, of Connersville, Ind., has received an order for 30,000 motors from the Durant Motor Co. These motors will be put in the new Durrant cars.

Negotiations extending over the past nine months have culminated in the purchase by the Warren Tool and Forge Co., of Warren, Ohio., of the properties of the American Block and Manufacturing Co., and the General Malleable Co., which henceforth will be operated under the name of the Warren Forge and Tool Co. The Warren Tool and Forge Co., will continue to operate under the management which has conducted its affairs since its organization. James D. Robertson, of Pittsburgh, is president; M. J. Konold, of Warren, vice-president; George Konold, of Warren, treasurer and general manager; George F. Konold, Jr., secretary. The capitalization of the company under the purchase is $1,800,000.

Announcement was made recently by William S. Carleton and Edward E. Dean, proprietors of the Kokomo Machine Co., Kokomo, Ind., that Cleo W. Adams has been employed as general manager of the plant. Mr. Carleton and Mr. Dean recently acquired the interests of P. A. Wiley and Charles Wiley, and are now sole owners of the stock. The company reports that its business has grown rapidly in the last two years.

The Keller Foundry Co., of Knoxville, Tenn., will increase its producing capacity approximately one-third through the construction in the near future of two all-steel factory buildings, according to R. A. Keller, head of the business. The new factory will be located at East Jackson Ave. and the Southern Railway.

At a meeting held at Marietta, Ohio, last week, of directors of the Pittsburg Tin Plate and Steel Corporation, Samuel L. Black, of Columbus, was re-elected president; A. V. Somers of Marietta was named vice-president, treasurer and general manager; and O. G. Toner, secretary.

At the annual meeting of the Greenfield Tap and Die Engineering Club, in Greenfield, Mass., held on Jan. 9, C. H. Norton, of the Norton Grinding Co., gave an address on "Industrial Relations." L. M. Lamb succeeded Walter G. Carpenter as president.

The Chapman Valve Co., Springfield, Mass., opened its new steel foundry building for public inspection on Jan. 17. The machinery is electrically operated throughout.

The Rose Machine and Spring Co., formerly the Buckeye Machine and Spring Co., Canton, Ohio, has been incorporated here for $50,000. D. H. Rose, who has operated the Buckeye Machine and Spring Co. for several years, will be the head of the new concern. Other incorporators are Wendell Herbruck, F. B. Melchoir M. Sanafranek and J. Stinson. Enlargement of the plant along general lines is planned.

J. K. WILLIAMS has been elected a director of the Franz Foundry and Machine Co. at the annual meeting of the stockholders. Other officers elected were C. Franz, president; C. W. Franz, vice-president; John A. Brittian, secretary; W. H. Parry, treasurer; J. M Alderfer, R. J. Coleman and C. M. Mishler, directors.

A new 600-ton blast furnace, just completed at a cost of $5,000,000, will be put in operation this week by the Trumbull Cliffs Furnace Co. at Warren, Ohio.

The Thompson-Copeland Co. Inc., has been incorporated under the laws of Massachusetts to manufacture nuts, lock-washers, cotter pins, light stampings, screw machine products, etc. The capital stock is $50,000. The officers are: President, John T. Brierly, formerly with the Hobbs Manufacturing Co.; vice-president, Eugene A. Copeland; treasurer and manager, H. C. Thompson. The new concern has taken over the interests of the Worcester Nut Co., and will continue this line in connection with its other products. The offices are on Vine St., corner of Cherry St., Worcester, Mass.

The Harley Co., Springfield, Mass., has opened under new management with 100 men and will add to the number as becomes necessary. It is stated that negotiations are well advanced for contracts for castings and drop forgings amounting to $6,000,000, half of which will be sublet to other concerns.

The William Powell Co., Cincinnati, Ohio, manufacturer of valves, has acquired the plant of the Cincinnati Grinder Co. and will use it as a manufacturing plant to make iron and steel valves. The old plant at 2525 Spring Grove Ave., will be used to manufacture brass valves only. The new plant is located on Colerain Ave.

The Lanston Monotype Machine Co., of Philadelphia, has purchased the plant and equipment of the Barrett Adding Machine Co., of Philadelphia. The manufacture and distribution of listing and adding machines will continue under the new management.

The Seneca Iron and Steel Co., Buffalo, N. Y., reports that it is at present working on a 50 per cent production basis, having seven of its fourteen mills in operation. Officials of the company are optimistic as to the future and expect to employ many men before spring.

Personals

GEORGE R. OLSON, formerly salesman in the Middle Western States for Landers, Frary & Clark Co., New Britain, Conn., has recently joined the sales staff of Wiebusch & Hilger, Ltd., 110 Lafayette St., New York, and will cover the Middle Western States for the company, making his headquarters in the Chicago office of the firm.

P. T. IRVIN, formerly sales manager of the Lincoln Twist Drill Co., Taunton, Mass., has recently been chosen manager of the small tools division of the Greenfield Tap and Die Corporation, Greenfield, Mass.

EDMUND S. WOLFE, president of the First National Bank of Bridgeport, Conn., has recently been appointed receiver of the Coe-Stapley Manufacturing Corporation, West Haven, Conn., manufacturer of sheet metal goods, etc. Mr. Wolfe states that the present proceeding is largely for the purpose of reorganization.

P. LEROY HARWOOD, of New London, Conn., has been appointed receiver of the Groton Iron Works, Inc., Groton, Conn. The appraisers named are Archibald M. Main, of Groton, and Elias F. Morgan, of Norwich.

A. V. WILSON, who for fifteen years has been engaged in engineering construction work in the southern field, has organized the Southern Machinery and Equipment Co., in Atlanta, Ga., a new concern to handle machinery and cover the entire Southeastern territory. The company's address is Healey Bldg., Atlanta, Ga.

G. D. EAST has been appointed district sales manager for the Newton Steel Co., Youngstown, Ohio, with headquarters in Cleveland, Ohio.

FRED J. GRIFFITHS has announced his resignation as superintendent and vice-president of the Central Steel Co. of Massillon, Ohio. He has been identified with the company since 1914.

EDGAR BOURQUIN, 1347 Main St., Waltham, Mass., has recently arranged to act as distributor in the East for the Ames lettering instrument made by the O. A. Olson Manufacturing Co., Ames, Iowa.

H. A. FISHER, plant engineer of the Worcester Pressed Steel Co., has taken over the duties of the chief engineer, Mr. Marcheseault, who recently resigned, and will hereafter have charge of all new development work in addition to the duties of plant maintenance.

ELIOT B. DRURY has resigned his position as chief of the research department of the Greenfield Tap and Die Corporation to become sales promotion manager for the American Wringer Co., Woonsocket, R. I.

ARTHUR H. GRAEFENHAN, formerly chief draftsman for the John Steptoe Co., is now connected in the same capacity with the Cincinnati Ball Crank Co.

W. C. STRIPE, previously engineer of the Philadelphia office of the Combustion Engineering Corporation, is now in charge of the new branch office at Pittsburgh, Pa. OTTO DE LORENZI, test engineer, has been transferred from the New York to the Chicago office of the Combustion Engineering Corporation.

CHARLES D. BLACKWELDER, mechanical engineer, formerly with the American Machine and Manufacturing Co., has recently returned to this country after several years' service in India and Ceylon on engineering work. He is now located in Greenville, S. C.

ZENO D. BARNS has been appointed manager of the Cleveland office of the Ajax Metal Co., of Philadelphia, Pa. Mr. Barns was formerly with the Westinghouse Electric and Manufacturing Co.

W. A. PATTERSON, who has been associated with the Westinghouse Electric and Manufacturing Co. for the past sixteen years, has resigned to become vice-president of the Kaestner & Hecht Co, electric elevator builders, of Chicago.

W. D. BLATZ has been appointed general sales manager of the Bridgeport Brass Co., Bridgeport, Conn. Mr. Blatz has been connected with the company for six years.

C. H. DAVIES has resigned his position as head of the sales department of the S. E. Bowser Pump and Tank Co., Chicago, Ill. He is now in charge of advertising and marketing with the Citrus Products Co., of Chicago.

ROLAND GERRY, a director in the Jones & Laughlin Steel Co., Pittsburgh, Pa., has been appointed special sales representative of the company for the United States and Canada.

WILLIAM B. TODD, vice-president of the Union Drawn Steel Co., Beaver Falls, Pa., has been appointed manager of the cold-rolled department of the Jones & Laughlin Steel Co., Pittsburgh, Pa.

WILLIAM N. MCMUNN, formerly with the Whiteman & Barnes Manufacturing Co., Chicago, Ill., is now with the Parish & Bingham Corporation, Cleveland, Ohio.

JOHN M. MURPHY, of the J. H. Murphy Iron Works, was re-elected president of the New Orleans Metal Trades Association, at its annual meeting held recently. C. F. Rantz was elected vice-president, and Warren Johnson secretary-treasurer.

W. C. STARKEY, who has been chief engineer of the Ohio Brass Co., for a number of years, has become vice-president and directing engineer of the Stevenson Gear Co., Indianapolis, Ind. Mr. Starkey is prominent in engineering circles and an expert on tool equipment and gear cutting devices.

W. W. CLARK, export manager of the Hart-Parr Co., tractor manufacturers, is now in Australia where the company has established a business in the past two years. Before returning to the United States Mr. Clark will spend sometime in the Philippine Islands on Hart-Parr business.

R. W. FUNK, superintendent of the Titan Metal Co. since the erection of the plant here six years ago, has resigned.

Obituary

GEORGE BALDWIN SELDEN, who has been called the "Father of the Automobile," died at his home in Rochester, N. Y., on Jan. 17. He was a graduate of Yale University, studied law under his father, and in 1871 became a practicing lawyer. From childhood, however, his mind had turned toward mechanical inventions and while studying law he began experimenting with various devices for automotive vehicles. An engine supplied with kerosene and nitrous oxide gas proved a failure, but his next scheme was triumphant. This consisted of an engine of the compression type, with gasoline for fuel. In 1879 he applied for letters patent thereon. In 1900 he began the suit against the Ford Motor Co., the Panhard and Levasseur, and other concerns in this country and in Europe, for infringement upon his patent. The case was a long and vigorously contested one, but was finally decided against Mr. Selden. Mr. Selden was president of the Selden Motor Co. of Rochester. He retained and greatly prized his first successful gasoline engine, which was made in the shop of Frederick Michel, in Rochester.

ROBERT BAILEY, retired vice-president of the Morris & Bailey Steel Co., of Wilson Station, Pa., died at his home in Cleveland, Ohio, last week.

T. CLARK DILL, founder of the T. C. Dill Machine Co., Inc., Philadelphia, died on Jan. 6 of heart failure. Mr. Dill began as a machinist and his early experience with slotting machines led to the designing of the well-known Dill slotter with the adjustable head. Mr. Dill, although of a quiet and retiring disposition, was well known among his fellow members of the National Machine Tool Builders' Association, and his genial manner and consistent attendance will be missed at the coming conventions.

HARRY O. STACE, president of the H. O. Stace Iron Works, of New Orleans, La., died last week. He was fifty-one years old.

JAMES A. BRADY, founder and president of the James A. Brady Foundry Co., Chicago, Ill., died in that city on Jan. 9. He was seventy-four years old. Mr. Brady organized the company which bore his name in 1899, and was its president and general manager until his retirement about ten years ago.

HERMAN HEROLD, owner of the Herold Machine Works, Lima, Ohio, died in that city on Jan. 11. He was forty-eight years old.

ARTHUR SEYMOUR BROWN, vice-president of the Ansonia, Conn., branch of the American Brass Co., Waterbury, Conn., died on Jan. 11 at his home in Orange, Conn. Mr. Brown was forty-five years of age. He has been with the American Brass Co. for some time, and was also identified with other industrial concerns of Connecticut.

Forthcoming Meetings

National Association of Manufacturers: Special convention on tariff legislation, Jan. 30 and 31, New Willard Hotel, Washington, D. C. G. S. Boudinot, 50 Church St., New York City, is secretary.

American Boiler Manufacturers' Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24. Engineering Societies Building, New York City. B. Staughton, secretary.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Gage, Surface

Union Tool Co., Orange, Mass.

"American Machinist," Sept. 1, 1921

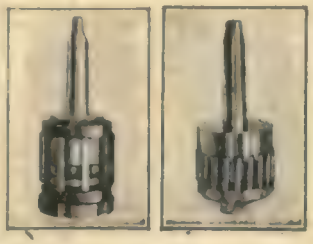


The upright or spindle may be set at any angle with the base over a radius of 270 deg., and tightened in position by means of a draw-sleeve and knurled nut. Close adjustment is provided in any of the positions by the small regulating screw at the end of the lever that carries the spindle. A V-slot in the base provides for the use of the tool in connection with round work, and a pair of push plugs in each end of the base enables the lining up of work from the top, side or bottom of a plate. Weight, 2 lb.

Reamer and Burnishing Tool, Ford Cylinder

Indiana Tool Co., Richmond, Ind.

"American Machinist," Sept. 1, 1921.



This reamer and burnishing tool are for refinishing the cylinder bores of Ford and Fordson engines. It is claimed that the use of them gives the cylinder walls a smooth, hard finish. The reamer contains ten inserted blades of high-speed steel and of length sufficient to allow for grinding. The method of holding the blades keeps them at the proper adjustment. The pilot, which is of tool steel, hardened and ground, is free to turn and guide the reamer. The burnishing tool contains twenty floating rollers, made of high carbon steel, and hardened and ground.

Control, Spindle Speed, Variable, Liquid

Oilgear Co., Milwaukee, Wis.

"American Machinist," Sept. 8, 1921.

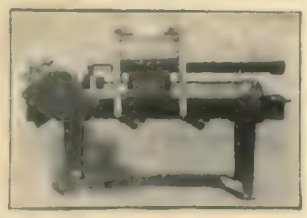


This device is intended for transmitting the power from a lineshaft or constant-speed motor to the spindle of a machine tool, giving any speed desired between the limits. The drive is through liquid pressure, both a pump unit and a motor unit connected hydraulically being provided. By varying the stroke of the pump, the speed of the hydraulic motor and of the spindle can be readily varied. An automatic overloading gear is provided to reduce the speed, also by reducing the stroke, when the lathe is taking too heavy a cut. The thrusts of the plungers are taken on roller bearings, and no connecting rods are used.

Lockseaming Machine, Automatic

Stolp Co., Geneva, N. Y.

"American Machinist," Sept. 8, 1921.



The machine produces lock-seamed articles direct from the blank without an extra operation, and it is also equipped with a self-feeding attachment, by which lock-seamed tubes can be produced direct from a coil of metal. It will lock-seam tubes of any thickness of metal, and taper tubes within certain limits. The machine can be used for the manufacture of such articles as tin cans, mailing tubes and muffler tubes.

Screw-Plate Sets

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 1, 1921.

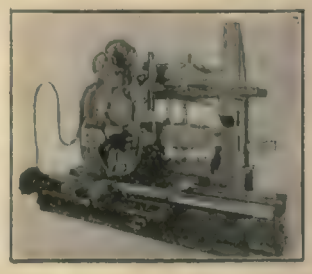


The taps and dies included in these sets are some of the regular product of the company. The various sets include from five to nine sizes of taps, either taper or plug or both, with corresponding dies. Either U. S., S. A. E., or Whitworth Standard threads can be furnished. The sets containing five or seven sizes of taps and dies include one tap wrench and one die stock, while the sets of nine sizes contain two tap wrenches and two die stocks. Each set is packed in a case, together with a screwdriver.

Die-Sinking Machine, Automatic

Keller Mechanical Engraving Co., Brooklyn, N. Y.

"American Machinist," Sept. 8, 1921.

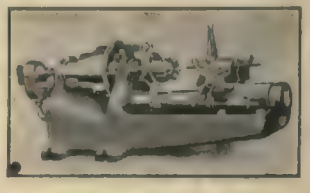


The machine can be operated either automatically or semi-automatically, reproducing in iron or steel the master form, which can be made of wood or plaster. Very light pressure is applied by the tracer on the master, although a heavy pressure can be applied to the cutting tool. The machine is electrically operated, and hand wheels are not provided. By means of push buttons, all the movements, feeds and rapid traverses can be controlled. The machine is adapted to making dies for drop-forging work, as well as for sheet-metal forming.

Threading Machine, Bench

Geometric Tool Co., New Haven, Conn.

"American Machinist," Sept. 8, 1921.



The machine is fitted with a self-opening rotary die head to cut threads of fine pitch on diameters from ⅛ to ¼ in. The bed of the machine consists of a single casting, and carries a spindle mounted on bronze bearings and driven by a three-step cone pulley. Adjustable stops, arranged on the trip rod, govern the point of opening and closing the die head. The carriage is equipped with a two-jawed chuck, operated by a handwheel, and it travels on a round shaft. The machine is arranged for bolting to a bench, or it may be mounted on a separate pedestal.

Filing Attachment, Drill Press

Utility Tool and Manufacturing Co.,
2717 Lafayette Ave., St. Louis, Mo.

"American Machinist," Sept. 8, 1921.



This filing attachment is intended for application to drilling machines. It consists of a housing which slips on the spindle sleeve, and which contains a pair of bevel gears operated by the machine spindle. To one of the gears is attached a crank that serves to reciprocate a shaft, the lower end of which carries a file. The attachment will accommodate files up to 16 in. in length. The ram is adjustable for any angle up to 90 deg. with the spindle.

Clip, paste on 3 x 5-in. cards and file as desired

NEW and ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Cal., Los Angeles—The Atchison, Topeka & Santa Fe Ry., Kerckhoff Bldg.—traveling crane extending length of proposed machine shop, 65 x 510 ft., at San Bernardino.

Conn., Danbury—R. M. Beers, 51 Main St.—one ton chain hoist for automobile repair work.

Conn., Seymour—F. Holbrook, Derby Ave. one small grinder for farm work.

Ill., Chicago—The Chicago Machine Tool Co., 649 West Washington Blvd.—one 26 in. Libby turret lathe, late type.

Ill., Chicago—A. B. Segur & Co., 728 West Madison St.—one punch press, 14 in. back opening clutch on sliding ways.

Ill., Chicago—F. P. Smith Wire & Iron Wks., 2346 Clybourn Ave., A. McClure, Purch. Agt.—one power press 14 or 16 ft. long also a 43 ft. span crane about 5 ton, motor height.

Ill., Chicago—The Quick Service Radiator Repair Co., 2341 Cottage Grove Ave., B. Wade, Purch. Agt.—one ¼ in. electric drill, tinner's tools, one small power hammer and machinery for making radiator cores.

Ill., Chicago—J. A. Toff, 1228 Winnimac Ave.—one lathe and one drill press.

Ill., Chicago—W. E. Williams, 28 East Jackson Blvd.—one 20 in. crank shaper.

Ill., Streator—The Streator Community High School Dist., R. C. Osborn, 202 East Main St., Pres.—manual training equipment for proposed Community High School.

Ill., Sycamore — The Chicago Insulated Wire & Mfg. Co.—one surface grinder, capacity to swing up to 24 in. in diameter (used).

Ill., Virden—The Bd. Educ., F. H. Shriver, Secy. — manual training and domestic science equipment.

Ill., Waukegan—J. S. Heath Co., J. S. Heath, Jr., Purch. Agt.—one Smurr & Kauren No. 2 automatic wire crimping, cutting and counting machine.

Md., Cumberland—The Cumberland Sales & Service Station, Virginia Ave. and 5th St.—machine shop equipment for repair and service departments of proposed sales station.

Mass., Lowell — The Lamson Co., 196 Walker St., manufacturer of carrier tubes, steel conveyors, etc.—one double end punch, with capacity ¾ in. hole through ¾ in. plate, 36 in. gap on one end and 12 in. gap on the other, also one double angle shear, capacity 6 in. x 6 in. x ¾ in., for plant at Eastwood, N. Y.

Mich., Detroit—The Grennan Cake Corp., 1230 17th St.—equipment for bakery, including machinery for mixing dough and handling cakes.

Mich., Detroit—The Grosse Pointe Motor Service Garage, 16701 Jefferson Ave.—automobile service station machinery.

Mich., Detroit—Lamb Co., 1938 Franklin St.—No. 60 Heald internal grinders, also cylinder reboring tools.

Mo., Hannibal—C. Miner, 313 Main St., will receive bids until Feb. 15, equipment for general shop and radiator repair shop, including cornice brake, bender and automobile radiator core, boring machine, etc.

Mo., Joplin—The Spotless Cleaners & Dyers, 106 Main St.—cleaning machinery.

Mo., Webb City—The Rock Hill Paint & Cloth Co., R. Porter, Secy.—paint making machinery, rock grinders and pulverizers.

N. J., Newark—The Wigder Mfg. Co., 28 Wickliffe St.—one automatic drop hammer, 600 or 800 lb. (used if in good condition).

N. Y., Buffalo—H. Schumacker, c/o E. S. Williams, 59 Highgate Pk. — small foot power lathe.

N. Y., Buffalo—One 12 ft. machine for corrugating flat and galvanized steel sheets with forms for 2½ in. and 1¼ in. standard corrugations. Address W. F. Schweigert, Secy. of the Niagara Machine & Tool Wks., 637-697 Northland Ave.

N. Y., Buffalo—J. M. Sparks Wholesale Dairy, 146 Prospect Ave., J. M. Sparks, Purch. Agt.—metal turner and bench folder for repairing milk cans.

N. Y., New York—The Janusch Mfg. Co., 282 East 135th St.—four speed lathes, two turret lathes and one screw press.

N. Y., New York—Kays Inc., 204 East 107th St.—one bench lathe and one milling machine.

N. Y., New York—The Natl. Biscuit Co., 10th Ave. and 15th St.—equipment for proposed factory and warehouse at Cincinnati, O.

N. Y., New York—The Progressive Die Cutting Co., 204 Greene St.—three shears, 45 in. long.

N. Y., Rochester—The Bd. Educ.—equipment for foundry, automobile and sheet metal shop, in connection with proposed high school on Hudson and Norton Sts.

N. C., Wilmington—Carter's Production Wks., 210 South Water St., O. Carter, Mgr. —one automatic saw sharpener for single saws.

O., Ada—The McCurdy Mfg. Co., S. M. McCurdy, Purch. Agt.—metal working machinery of all kinds.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., H. C. Jones, Purch. Agt.—one double crank geared press, similar to Bliss, No. 2½, 35 to 40 ton pressure.
One 1,000 ampere plating dynamo, 8 to 12 volts.
One belt driven 200 lb. drop hammer.
One No 60 Heald cylinder grinder.

O., Cincinnati — W. Powell Co., 2525 Spring Grove Ave., R. McFarlan, Purch. Agt.—equipment for the manufacture of iron and steel valves.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave.—two 12 in. woodworking speed lathes, motor driven, with 55 in. beds and two with 72 in. beds, also one 20 in. pattern maker's lathe, motor driven.

O., Cleveland—The city, J. F. Maline, Dir. of Pub. Serv.—one direct heat rotary dryer.

Ore., Portland—The Treasury Dept., J. A. Wetmore, Superv. Archt., Wash., D. C., will receive bids until Feb. 10, for the installation complete of mail conveying machinery in the United States Post Office, here.

Pa., Dormont — The Bd. Educ. — shop equipment including lathes for vocational department of high school now under construction.

Pa., Johnstown—The Benshoff Printing Co., 1110 Franklin St., H. M. Benshoff, Prop.—linotype machine, presses, etc.

Pa., Phila.—The Boice Folding Box Co., Ogden and Hallon St. W. S. Boice 4020 Spruce St., Pres.—automatic folding and cutting machines, also general equipment for paper box manufacturing.

Pa., Phila.—L. F. Seyfert's Sons, Inc., 437-41 North 3rd St., L. J. Hay, Purch. Agt.—several 24-36 and 42 in. Bullard New Era type vertical boring mills.

Pa., Phila.—The Tasty Baking Co., 2335 Sedgley St.—automatic mixers, automatic formers, conveyors, electric furnaces, etc.

Pa., Pittsburgh—Hubbard & Co., 6301 Butler St., manufacturer of shovels—two 12 ft. rotary annealing furnaces with conveyors.

Pa., Pittsburgh—The Pittsburgh & West Virginia R.R., Wabash Bldg.—one 42 in. car wheel borer.

Pa., Sharpsburg—J. E. Klug, 205 8th St. —small woodworking lathe or speed lathe (used if in good condition).

Pa., Washington—G. Kestrick, 988 Bruce St.—metal working machinery including lathe, drill press and shaper (used if in good condition).

Tenn., Camden—R. R. Melton—machinery and materials for the manufacture of patent auto license plates.

Va., Richmond — Hackley Morrison Co., 16½ North 9th St.—one punch, 24 in. architectural jaws with motor, ¾ in. or 1 in. capacity.
One punch, 12 in. architectural jaws with motor, 1¼ in. capacity.
Two riveting hammers, capacity ¾ in. rivets.
One chipping hammer, Little David, or equivalent.
One rivet forge, oil, portable, compressed air blaze, 300 rivets per hour.
One portable electric drill, capacity, 1⅜ in. holes.
Bridge reamers, drills, rivet sets, ¼ in. to 1 in.
One grinder, motor or belt type, 2-12 in. x 2 in. wheels, heavy work.
One bolt and pipe threading machine, capacity to 1¼ in. bolts and 2 in. pipe.
One pipe bending machine to take up to 2 in. pipe, hand operated.
One power hack saw, capacity 6 x 6 or 8 x 8, high speed.
Four span geared hoists, capacity 2 ton, Yale preferred.
Hand threading stocks and dies, ⅜ in. to 1¼ in.
One 16 or 20 in. crank shaper.
Eight compound rests for 19 in. LeBlond lathes.
One No. 3 or No. 4 stone crusher.
One No. 5 Champion portable crusher with screen and elevator.
One 25 to 40 ton standard gage, saddle tank locomotive.
One 4 in. sand pump.
One 6 in. sand pump.
One 10 to 15 ton complete raw water ice plant.
One 20 ton wagon scale.
One No. 5 or No. 6 Roots or Connorsville positive blower.
Advise as to shipping points.

Va., Wytheville—R. P. Johnson, O. M. Johnson, Purch. Agt.—one 6 or 8 in. x 24 or 30 in. heavy planer and matcher; must be modern, good fast feed (used).
One 10 to 20 ton ice plant, complete with boiler.
One ½ yd. clamshell bucket, Hayward preferred.
One set of 12 x 12 in. derrick irons and sheaves, complete, for wood beam derrick.

The Weekly Price Guide

This Week's Market

Tank plates are quoted at the Pittsburgh mills at $1.50; structural shapes and soft steel bars at $1.50@$1.60 per 100 lb. Heavy tonnages seem to be maintaining the $1.50 price very firmly with slight tendency to move toward $1.60.

Chicago mill quotations on structural shapes, plates and bars range from $1.60 to $1.70 or 10c. per 100 lb. above the Pittsburgh base.

Reductions in dealers' purchasing prices, at the New York warehouses, are quoted on old metals. Copper, light, and bottoms are quoted at 9c. as against 9½c.; heavy brass at 6c., reduced from 7c., and light brass at 4½c., as compared with 5c. per lb. one week ago.

Copper and zinc show considerable dullness in the New York warehouses, with tin quiet and lead fairly steady.

Linseed oil is quoted in New York at 75c. as against 73c. per gal. in 5-bbl. lots.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil.	20.76
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.37½
Tin, 5-ton lots, New York	33.00
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 5.10; New York	5.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.25
Babbitt metal (best grade)	33.00	42.50	36.00
Babbitt metal (commercial)	16.00	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.50	11.00
Copper, heavy, and wire	11.00	11.00	10.00
Copper, light, and bottoms	9.00	9.00	8.75
Lead, heavy	4.00	3.75	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.00	6.50	6.50
Brass, light	4.50	4.50	5.00
No. 1 yellow brass turnings	5.75	5.50	5.75
Zinc	3.00	2.50	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.75	.76	.79
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$2.75
Coke, prompt foundry, Connellsville	per net ton		3.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	50-10-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$5.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.75	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	3.50	3.43
Cone heads, ditto (net)	3.60	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	40-10%	50-10%
Copper burs	40%	15%	10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$6.16	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	29.48	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.20	.....	3.20

Wis., Belgium—Allen-Spiegel Shoe Mfg. Co.—modern shoe making machinery, electric power.

Wis., Cudahy—L. Joslin, 724 Layton Ave.—drilling machine, boring mill and drill press.

Wis., Eau Claire—Eau Claire County, G. Osborne, Purch. Agt.—machinery including lathe, drills, presses, etc., for machine shop now under construction.

Wis., Fond-du-Lac — The Combination Door Co., 180 Ruggles St., L. C. Schmidt, Pres.—several sanders, mortisers, planers, and special woodworking machinery.

Wis., Hurley—The Raineri & Norman Motor Co.—gasoline storage tanks, pumps and air compressor.

Wis., LaCrosse—Starch Bros. Co., Front and Pearl Sts.—auto cylinder grinder.

Wis., Madison—Feldman Paper Box Co., 515 Regent St., I. Feldman, Purch. Agt.—folding machine and printing machine, motor power.

Wis., Milwaukee — The Fenske Tire & Radiator Wks., 2709 Grand Ave.—vulcanizing machine and air compressor.

Wis., Milwaukee—Filer & Stowell Co., 219 Becher St., J. Monaghan, Purch. Agt.—one cupola and forge for foundry.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St.—gasoline storage tank and pump.

Wis., Milwaukee—Jensen & Lindemann, 1105 11th St. (manufacturers of sheet metal), A. Jensen, Purch. Agt.—one punch press.

Wis., Milwaukee—Marks Bros. Dye Wks., 1107 Wells St.—vats, etc., for proposed dye works on North Ave.

Wis., Milwaukee—The Phoenix Knitting Co., 208 Bway.—special dye work machinery.

Wis., Milwaukee — O. Rathmann, 912 22nd Ave. (stone cutter)—one 5 ton crane.

Wis., Milwaukee — O. C. Resech, 1284 North Pierce St.—one lathe, one drill press and one grinder for auto repair work.

Wis., Milwaukee—C. Utech, 906 11th St. (manufacturers of screens and sash)—one shaper about 4 ft.

Wis., Monroe—P. A. Ruf Co.—mechanical baking equipment, including mixers, etc., motor power.

Wis., Rhinelander—Rhinelander Box & Lumber Co.—woodmaking machinery and nailing machine.

Wis., Sheboygan — Verhulst Bros. Co., Erie Ave.—special woodworking machinery for proposed plant on Calumet St.

Wis., Sheboygan—The Wisconsin Hotel Co., A. N. Merritt, Pres., Hotel Foeste—two 10 hp. ice machines, laundry equipment including two washing machines, manglers, etc.

Wis., Stevens Point—R. E. Newby, 119 Strongs Ave.—auto repair shop equipment, presses, etc.

Wis., Sturgeon Bay—The Sturgeon Bay Fruit Co.—special machinery for proposed canning factory.

Wis., West Allis—The Kroening Constr. Co., 68th and Greenfield Aves., R. Kroening, Purch. Agt.—woodworking lathe.

Ont., Dresden — The Dresden Machine Shop & Garage—equipment for machine shop and auto repair shop.

Ont., Kingsville—The Canadian Tobacco Growers' Co.—equipment, tanks, cutters and special machinery for the manufacture of fertilizers for tobacco growers.

Ont., Listowel — A. Malcolm Furniture Co.—equipment for machine shops, small metal working tools, drills and lathes.

Ont., St. Marys — Divinneys Garage—equipment for garage and auto repair shop.

Metal Working Shops

Cal., San Bernardino — The Atchison, Topeka & Santa Fe Ry., Kerckhoff Bldg., Los Angeles, is receiving bids for the construction of a 1 story, 65 x 510 ft. machine shop, here. Estimated cost, $300,000. Private plans.

Conn., Hartford — J. Reibert, Mountain Rd., West Hartford, is having plans prepared for the construction of a 1 story, 52 x 220 ft. garage and repair shop on Park St. Estimated cost, $52,000. G. H. Matthews, 48 Campfield Ave., Archt.

Conn., Southington—Peck, Stow & Wilcox Co., Railroad Sq., is receiving new bids for the construction of a 1 story, 67 x 180 ft. hardening shop, a 2 story, 56 x 156 ft. grinding building, and a 1 story, 59 x 100 ft. addition to forge shop. Estimated cost, $225,000. Private plans.

Conn., Stratford (Bridgeport P. O.)—Hollander Bros., 360 George St., are having plans prepared for the construction of a 3 story, 55 x 104 ft. factory on Seymour St., for the manufacture of metal goods. Estimated cost, $50,000. Davis & Dane, 1024 Main St., Bridgeport, Archts.

Conn., Wallingford — Lockwood Greene & Co., Archts. and Engrs., 101 Park Ave., New York City, are receiving bids for the construction of a 5 story, 80 x 100 ft. hardware factory on Cherry St., for H. L. Judd & Co., 43 South Cherry St. Estimated cost, $100,000. Noted Aug. 25.

Ind., Evansville—The Evansville Structural Supply Co., 215 1st Ave., is having plans prepared for the construction of a 1 story, 100 x 200 ft., fabricating plant on Division and Kerth Aves. Estimated cost, $40,000. Private plans.

Kan., Wichita—W. P. Innes, 112 North Lawrence Ave., is having plans prepared for the construction of a 1 story, 85 x 147 ft. garage. Estimated cost, $50,000. E. Forsblom, 405 Sedgwick Bldg., Archt.

Md., Baltimore — J. Lample, 15 North Fremont Ave., is having plans prepared for the construciton of a 1 story, 60 x 65 ft. garage on North Fremont Ave. Estimated cost, $75,000. J. R. Forsythe, 232 St. Paul St., Archt.

Md., Cumberland—The Cumberland Sales & Service Station is having plans prepared for the construction of a 100 x 150 ft. sales and service station on Virginia Ave. and 5th St. Estimated cost, $100,000. T. W. Biddle, Jr., Cumberland, Archt.

Mich., Escanaba—The Wolverine Delta Motor Co. will open bids about Feb. 1 for the construction of a 1 or 2 story, 100 x 140 ft. garage. Estimated cost, $60,000. Hubert & Nelson, Menominee, Archts.

Mo., St. Louis—The Audrey Realty Co., 614 Chestnut St., is having plans prepared for the construction of a 1 story, 100 x 125 ft. garage. Estimated cost, $45,000. Wedemeyer & Nelson, Wainwright Bldg., Archts.

Mo., St. Louis—G. G. Hoffman Magneto Co., 3932 Olive St., has awarded the contract for the construction of a 1 story, 100 x 234 ft. salesroom, garage and service station at 3872 Washington St. Estimated cost, $50,000. S. G. Hoffman, Pres. Noted Jan. 19.

N. Y., New York—I. Langner, c/o J. DeHart, Archt. and Engr., 1041 Fox St., will build a 2 story, 35 x 50 ft. garage on 185th St. and Bway. Estimated cost, $90,000.

N. Y., New York—The Tunnel Garage, 2 Charlton St., plans to build a 100 x 120 ft. garage on Broome and Thompson Sts. Estimated cost, $75,000. G. L. Stevers, Pres. Private plans.

N. Y., Rochester—The Bd. Educ. has had preliminary plans prepared for the construction of a 3 story, 346 x 450 ft. and 100 x 100 ft. high school, including a machine shop, auto shop and foundry, on Hudson and Norton Sts. Estimated cost, $4,000,000. E. S. Gordon, 125 Sibley Bldg., Archt.

O., Cleveland—The Mueller Electric Co., 2143 Fairmount Rd., has had plans prepared for the construction of a 1 and 2 story, 63 x 94 ft. factory and garage on East 31st St., near Payne Ave. Estimated cost, $50,000. G. S. Rider & Co., Century Bldg., Archts.

Pa., Oil City—The Oil Well Supply Co., is building a 60 x 170 ft. steel foundry.

Pa., Phila.—J. Feldman, Lincoln Bldg., will receive bids until Feb. 1 for the construction of a 1 story, 60 x 120 ft. garage at 119 Wildey St. Estimated cost, $40,000. I. W. Levine, Liberty Bldg., Archt.

Pa., Pittsburgh—The Standard Sanitary Mfg. Co., Preble Ave., has awarded the contract for the construction of a 1 story, 117 x 130 ft. plating plant.

Pa., Pittsburgh—The Westinghouse Electric & Mfg. C., East Pittsburgh, will soon award the contract for the construction of a 4 story, 100 x 200 ft. manufacturing and storage building on Lang and Susquehanna Aves., here. B. H. Prack, Keystone Bldg., Archt.

Pa., Royersford—The Royersford Needle Wks. has awarded the contract for the construction of a 2 story, 50 x 150 ft. and 24 x 32 ft. needle factory. Estimated cost, $20,000.

Pa., Sharon—The Wilton Tool Co., 2123 Grand Ann Ave., Detroit, Mich., is having plans prepared for the construction of two 1 story factories, one 50 x 200 ft. and other 20 x 100 ft. Hydraulic Steel Craft Co., Illinois Bldg., Cleveland, O., Engrs.

Wis., Hurley — The Raineri & Norman Motor Co. is having plans prepared for the construction of a 1 and 2 story, 50 x 140 ft. garage on 3rd Ave. Estimated cost, $50,000. Private plans. Noted Jan. 19.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St., is receiving bids for the construction of a 1 story, 50 x 100 ft. garage on Reed St. Estimated cost, $40,000. Private plans.

Wis., Sheboygan—J. Hamacheck & Sons, Two Rivers, are having plans prepared for the construction of a 1 story, 40 x 50 ft. garage on 9th St., here. Estimated cost, $50,000. Address E. A. Juul, Imig. Bldg., Sheboygan, Archt. and Engr.

Wis., Stevens Point — R. E. Newby, 119 Strongs Ave., purchased a site on Main St. and plans to build a 1 story, 71 x 125 ft. garage. Estimated cost, $40,000. Architect not selected.

Ont., Welland—The Welland Machine & Fdry Co. plans to build an addition to its plant. L. R. Weeks Eng. Co., Erie, Pa., Engrs.

General Manufacturing

Cal., Eureka—The Bd. of Supervisors of Humboldt County will soon receive bids for the construction of a heating and laundry plant addition to its Tubercular Hospital.

Cal., Marysville — The Virden Packing Co. 1300 Bryant St., San Francisco, has awarded the contract for the construction of a packing plant on J St. from 5th to 9th Sts., here. Estimated cost, $250,000.

Conn., Hamden (New Haven P. O.)—A. W. Flint Co., 407 Winthrop Ave., plans to build a 1 story, 50 x 200 ft. factory on Dixwell Ave., for the manufacture of ladders, etc. Architect not selected.

N. J., Bloomfield—The Amer. Book Co., Washington Sq., New York, has had plans prepared for the construction of a 1 story book plant, here. Estimated cost, $150,000. Austin Co., 217 Bway., New York, Archts. and Engrs. Noted Jan. 6.

O., Cincinnati — The Natl. Biscuit Co., 10th Ave. and 15th St., New York, and 401-07 Lock St., Cincinnati, is having plans prepared for the construction of a 7 story, 140 x 463 ft. factory and warehouse at 617 Hunt St., here. Estimated cost, $2,500,000 Private plans.

O., Cleveland—The Leatherkraft Co., c/o J. J. Metcalf, 1255 West 4th St., plans to build a 2 story, 60 x 100 ft. commercial building and factory at 5914 Cedar Ave. Estimated cost, $50,000. Architect's name withheld.

Pa., Johnstown—The Benshoff Printing Co., 1110 Franklin St., plans to build a 3 story, 90 x 100 ft. printing plant on Franklin St., to replace one destroyed by fire. Estimated cost, $150,000. H. M. Benshoff, Prop. Architect not selected.

Pa., Phila.—C. E. Wunder, Archt., 1415 Locust St., will receive bids until Feb. 15 for the construction of a 2 story twine factory on Delaware Ave. and Dickenson St., for the Morrice Twine Mills, 84 Tasker St.

Wash., Tacoma—The Tacoma Ice & Refrigerating Co., South 26th and Adams Sts., plans to build a 5 story cold storage plant, (400,000 cu.ft. capacity) and ice plant (output, 100 ton every 24 hours). Estimated cost, $250,000.

Wis., Fond-du-Lac — The Combination Door Co., 180 Ruggles St., has awarded the contract for the construction of a 2 story, 50 x 90 ft. door factory. Estimated cost, $60,000. L. Schmidt, Pres.

Wis., Oconomowoc—The Hurtgen Dairy Co. has awarded the contract for the construction of a 2 story, 30 x 104 ft. dairy. Etimated cost, $25,000.

Wis., Plymouth—The Badger Cabinet Co. plans to build a 2 story, 60 x 135 ft. chair factory. Estimated cost, $50,000. Architect not selected.

Wis., Racine—Bondgard & Christensen, 2222 Kinzie Ave., is having plans prepared for the construction of a 4 story, 150 x 150 ft. plant on Mound St., for the manufacture of wood products. Estimated cost, $50,000. A. A. Guilbert, Robinson Bldg., Archt.

Wis., Spencer—The Spencer Condensary Co., c/o E. Buss, Marion, plans to build a 2 story, 45 x 110 ft. dairy on Main St. here. Estimated cost, $75,000. Architect not selected.

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Does Uncle Sam Owe You Anything?

Amortization, What It Is and Who May Claim It—How It Is Determined—How Affected by Salvage—Claims Must Be Filed by March 15, 1922

By ERNEST F. DuBRUL
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MOST manufacturers engaged in so-called essential industries during the war, made additional capital investment during the years 1917 and 1918—investment of the class that Congress designated as allowable deduction from income in computing taxes. Few manufacturers entitled to this deduction have taken it, and consequently many have overpaid taxes, particularly in 1918, because of ignorance of their rights under the law. Congress, in the law of 1921, put a time limit—March 15, 1922—beyond which date amortization claims may not be filed. The manufacturer who sleeps on his rights beyond that date will be unable to recover such overpayments.

Under the law, amortization is permitted in case buildings, machinery, equipment, or other facilities were constructed, erected, installed, or acquired on or after April 6, 1917, *for the production of articles contributing to the prosecution of the war*. This broad and elastic inclusion would cover any industry that was considered essential by the War Industries Board. Blast furnaces, steel mills, machine-tool shops, shipyards, smelters, sugar refineries, food canneries, clothing factories, etc., erected, equipped or irrevocably contracted for between April 6, 1917, and Dec. 31, 1918, would likely be entitled to claim amortization. It is not necessary that the product was sold to the Government, nor even to government contractors, to bring the manufacturer of essentials within the rule.

What Is Amortization?

The dictionary defines amortization as meaning to destroy, to kill, to deaden. In the accounting sense, as in the Revenue Law, it is a deduction which destroys book values representing plant or equipment used for the production of articles contributing to the prosecution of the war. If the useful value of that equipment has been entirely lost, the book value should be wiped out. If the value in use has not completely disappeared, but has been reduced, then the book value should be written down to the figure that will reflect only the fair value as a productive asset.

The law is very plain, and the discussion of this provision by Congress is very plain. Senator Simmons on Feb. 11, 1919, said, "If by reason of the investment of his profits he (the manufacturer) had constructed a plant which was necessary in time of war to meet the demands which were made upon him at that time for production, but which after the war has depreciated in value because not needed; in that case, under the amortization provision, he will be allowed to amortize to the full extent of the depreciation in value. Of course, if there is salvage, he would be allowed to amortize only down to the salvage value."

Congress recognized that large investments contributing to the prosecution of the war had little value left after the war was over, and allowed a reasonable deduction from income for such amortization before a taxable income is considered to be earned. Many concerns who tremendously expanded their plants and equipment to furnish the articles demanded, now find themselves not only burdened with this over-expansion in plant facilities, but at the same time they find demand entirely too small to even use their normal or pre-war facilities. On the over-expanded facilities they have to pay carrying charges, such as maintenance, repairs, insurance, etc., to their great financial loss. Far from being an asset, such facilities are a liability; instead of producing revenue they are a source of expense. These carrying charges of the unnecessary plant must be paid from the earnings of that part of their investment that existed before the United States entered into the war.

To get back to a readjustment basis, the manufacturer so over-expanded must re-concentrate his activities. If he can sell off the excess plant the solution is simple, but where such disposition cannot be made, it is not so easy to solve the problem. Still, unless the manufacturer creates a new starting point from which he can being again in closer harmony with normal conditions he is at a disadvantage compared to the competitor who did not contribute to the prosecution of the war to the same extent of expansion. The law is drawn, and is plain in its intent, to permit taxpayers to write off all the excess investment as quickly as possible. Economically considered, the taxpayer had no net income until such excess had been returned to him through revenue.

Amortization may exceed income for one year, and in such case the amortization should be carried forward and deducted from operating income of succeeding years, until the amortization has been fully compensated by income.

Though the law is very plain, the Revenue Department has made conflicting regulations, which the taxpayer will often find it best to ignore, and rely on the law itself. Some taxpayers have made inadequate deductions under early regulations, and in such cases the taxpayers should re-open their returns in the light of conditions which are now entirely different from what they were when the first regulations were made.

Amortizable property must have been provided between April 6, 1917, and Dec. 31, 1918, or irrevocably contracted for during that time, even though paid for after that time. No property installed prior to April 6, 1917, is subject to amortization. If construction was commenced before that date, but completed after that

date, only the part completed after that date can be amortized. It may be, of course, that a plant completed before that date became obsolete later on, but in such case its value is deductible as obsolescence, or loss of useful value, and not as amortization.

How Amortization Is Determined

The total amount to be amortized is the difference between the cost of the property and its value at the close of the period of the war. The property lost its value when the war ended, and when property is sold at a specific price there is no question about the loss. The sale itself is complete evidence of the total amortization or loss of value that can be claimed. The same is true of property definitely discarded, or that will be discarded at a known date.

Another class covers buildings, machinery, and equipment which still have and probably will continue to have a certain value in use to the taxpayer in his going business. This is called "Class II Amortization." If the value of such property for sale is greater than its value in use to the taxpayer, the useful value must be disregarded, and allowance may be claimed only on the basis of the sales value. This is perfectly reasonable, as the taxpayer should sell property that is not worth as much to him in his business as its salvage value. If, on the other hand, its worth to him in his going business is more than its salvage value, but less than its original cost, then his claim for reasonable amortization is only this difference between its value in use and the original cost, and he cannot claim down to the salvage value.

The only way that a sales value can be determined is on a bona fide offer to buy. The mere asking price which one puts on his property does not determine its value unless someone were willing to take it at that price.

The Treasury Department's regulations of April 17, 1919, attempted to limit the allowance to 25 per cent of the cost price. But the law did not put any specific percentage as to the amount of claim, but said the allowance should be "reasonable." Any regulation that would limit the claim to 25 per cent when the loss was more than that would go contrary to the law. The department has attempted to preserve a margin of safety, and does not seem to grant in the "tentative allowance" all that the taxpayer may finally be entitled to.

The law was based on the assumption that war facilities produced an income only while being used. If profitable use was diminished or extinguished by the war's end there should be an adjustment of the apparent profits by taking the amount of the loss actually sustained. The department put into the regulations, Article 183, the words "under stable post-war conditions," but no one has any trustworthy information even as yet as to what is to be considered a stable post-war condition, and the law does not mention any such limitation.

The taxpayer has the privilege of fixing the amount to be deducted for amortization purposes, and as long as such amount is reasonable he cannot be required to make a guess as to what future values might be. On that ground, once his claim is filed within the statutory period ending March 15, 1922, either the taxpayer or the Government may re-open it after tentative allowance, in the light of trustworthy information procurable, up to March 3, 1924. If the taxpayer retains the property and does not sell it, he does so in the hope of some profitable use at some future time, but if this hope does not materialize he is not bound by the prospective valuation which he may have put on the property at the time of its retention.

The commissioner may, before March 3, 1924, require an appraisal and a redetermination of the tax. If such appraisal indicates an unreasonably large claim, the taxpayer would be subject to penalties for understatement of tax. To prevent understatements

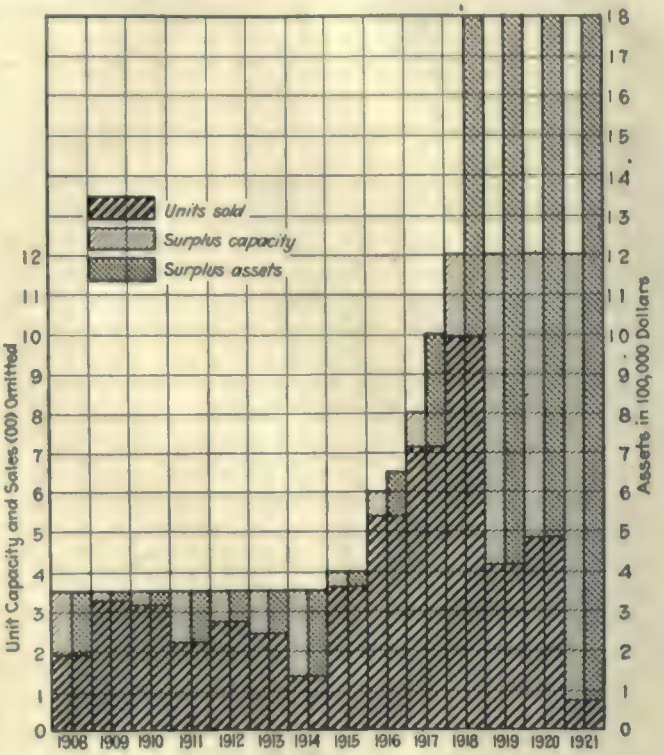


CHART 1. RELATIVE UNIT SALES, UNIT CAPACITY AND PERMANENT ASSETS, 1908-1921 INCLUSIVE

the department has not been allowing as large sums as would seem reasonable in many cases. It may be that the courts will broaden the regulations to comply with the law.

Computation of Amortization

Class I amortization is relatively simple to determine. This covers buildings, machinery and equipment that have been discarded or will be discarded at a known date. Class II, the more difficult of determination, covers property which still has and probably will continue to have a value in use in the going business, when the useful value is not to be taken at less than the salvage value. Salvage value was ruled to be the value ruling during the first part of 1919, but this value is abnormally high; later interpretation and application of the law and regulations has become more reasonable and liberal.

It is not necessary for the taxpayer to actually wreck buildings or to scrap or sell equipment in order to obtain relief to the maximum degree of a Class I amortization. Buildings may be abandoned so far as productive activities are concerned, and the cost, less salvage value of the material that entered into construction of the building, can be claimed as amortization. By so doing, the taxpayer receives relief for such period during which the building is not necessary to the productive activities of the plant. If, before March 3,

1924, that particular building is needed, it is merely a matter of restoring to the Government the part of the replacement cost of the building which had been taken as amortization. This can be accomplished by filing with the Government an affidavit to the effect that the building is not in use and will not be used without reporting such use to the Government and making proper restoration. This naturally promotes the most efficient use of all the facilities remaining, and is consistent with the best shop practice. If the building is not suitably located, or is of a design which would not be used later, it remains discarded until torn down.

Machinery and equipment may be left in position and not put to use. It can be tagged as indicating it to be out of use or of no particular value, so far as the immediate future demand indicates. Such items must be reported to the department in due form, together with an affidavit that they have no value in use and will not be used without notifying the department and making the restoration of the percentage of the replacement value previously allowed as amortization of such items. The management is not required by the law to make wild guesses that may not be realized. Discarded equipment might be entirely superseded by new and more desirable machinery by the time that the discarded machinery could be used for production. When the old machinery would be sold and the transaction closed, the full proof of amortization should be made. The entire difference between the cost to the company and the sales realization would determine the amount to be returned to the taxpayer by the Government, or restored to the Government, as the case might be.

In many cases there is a partial use of equipment that would not have been provided had it not been for the war. In such case a determination must be made as to its value in use, compared to its salvage value, and the building or equipment amortized down to the larger figure of the two.

A table such as the one shown will be of assistance in determining how much amortization exists. The figures in column II, "Units Shipped," and column III, "Unit Capacity," show typical experiences in actual cases. Column IV, "Percentage of Shipments to Capacity," shows a high degree of productive efficiency reached in years of active demand. Column V, "Permanent Assets," assumes these to have been $1,000 per unit of capacity in 1914; and that the units added in 1915 cost about the same as those installed before the war; that those in 1916 cost 25 per cent more; that the 1917 additions cost 75 per cent more; while the 1918 additions cost 100 per cent more than the pre-war units.

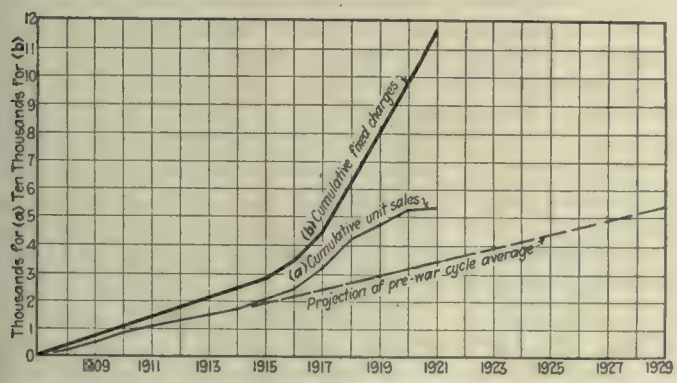


CHART 2. CUMULATIVE CHART, SHOWING UNIT SALES, FROM 1918 TO 1921, INCLUSIVE, COMPARED TO FIXED CHARGES ON PERMANENT ASSETS

Chart I shows Permanent Assets, Shipments, and Capacity. Chart II shows Shipments and Fixed Charges plotted cumulatively, and particularly shows by projecting "Shipments" from 1908 to 1914, that the height actually reached by 1921 would not likely have been reached until 1928 were it not for the war demand. It also shows how fixed charges will be out of all proportion to future production. The maximum demand in the pre-war cycle was supplied by operating with over 92 per cent efficiency in 1909. In no year was the 1909 demand equalled until the year 1915, when more demand was created by the war.

Looking at Chart I, it is evident that except for another war there is no human probability for this concern to use the extra capacity installed to fill war orders. It is a reasonable conclusion that all the capital invested after 1914 is dead; that from a business point of view it has no useful value, and is today worth only what it will bring on the second-hand market. As the second-hand market is glutted with similar equipment offered by others, and probably will continue glutted for some years, it would be manifestly unreasonable for the Revenue Bureau to take as salvage value the figures of early 1919, before any one had a chance to dismantle and sell off the surplus whose existence causes the glut. In this case the facts apply to all investment made after 1914, so the investment made in 1917 and 1918 comes under Class I amortization. The 1915 and 1916 investment should be written off as obsolescence, or loss of useful value.

FIGURES OF COMPARSION TO HELP IN DETERMINING AMORTIZATION

Year	Units Shipped	Unit Capacity	Percentage of Production to Capacity	Permanent Assets End of Year
1908	183	350	52.3	$350,000
1909	324	350	92.6	350,000
1910	318	350	90.9	350,000
1911	221	350	63.1	350,000
1912	274	350	78.3	350,000
1913	243	350	69.4	350,000
1914	131	350	37.4	350,000
1915	361	400	90.2	400,000
1916	539	600	89.8	650,000
1917	709	800	88.6	1,000,000
1918	990	1,200	82.5	1,800,000
1919	416	1,200	34.7	1,800,000
1920	486	1,200	40.5	1,800,000
1921	76	1,200	6.3	1,800,000

This particular case is not exceptional, but is rather typical of various whole industries whose peace time product had a use in the prosecution of the war. Any concern who can secure through its trade association composite figures of unit sales, compiled from reports of other manufacturers in its own line can better sustain a claim than if such figures are lacking.

Amortization Claims Must Be Reflected in The Books

Article 186 of Regulations 45 is very clear on the point that amortization claimed must be reflected in the books and accounts submitted to stockholders, and in credit statements made to banks. If written off the books, amortized capital will more likely be blotted out of all deluded hopes that it will some day be productive. This should help in readjustment. Retained as physical property, even at salvage value, dead equipment becomes a continuous burden. It takes money to maintain and shelter it. It creates continuous expense for taxes and insurance. Its idleness cost is increased through loss of interest on the salvage value that could be invested in securities producing a net revenue. Retained too

long and in too great an amount, it leads to ruin, and its final liquidation takes place through bankruptcy.

Every unit of unnecessary capacity depreciates the value of all the necessary capital required in an industry. Coming years will likely be highly competitive and only those concerns will survive who have stripped for the race and carry no surplus weight. Over-expansion that was caused by the war demand must and will be liquidated either voluntarily or through bankruptcy. Over-expanded plants that do not work to the highest efficiency will suffer needless loss through unnecessary costs due to idleness. War-expanded plants must be put to work, or their owners will pay a pretty penalty in carrying charges. These cannot be absorbed over a small production made in competition with plants that are of efficiently small size corresponding to small output.

There are not many ways to make excess plant valuable by putting it to work. One is by widening the normal market for the old line of goods. This way requires no reorganization of the busines or its policies. In some lines having a relatively elastic demand, price reduction would widen the demand, but in other lines lower prices do not provide any stimulus. In such cases price reductions merely decrease total income as well as unit profit. A variant of the "widening" method is to bring out some revolutionary design of an old product that makes all previously made product of that class obsolete or undesirable. Style changes do this in the clothing trades.

A second method is by consolidation of direct competitors, thereby concentrating production that would otherwise be scattered. This involves dismantling and selling off discarded plants, but enables the product of the consolidated concern to be produced at a profit.

A third method is by merger of concerns making allied, but non-competing lines. Besides the dismantling and sale of the discarded plants, this involves some reorganization of business policies.

A fourth method is to seek out some entirely new product to be made either along with the old or as an entire substitute. This involves additional investment, much change in policy, and the usual risk and cost of entering a new field.

Unless some means are found to put this idle capital to work, or to discharge it by selling off the excess plant and equipment, the sheriff's red flag may tell the final story.

Have You Deducted for War Facilities?

Reasons for Permitting Amortization—Conditions Under Which Amortization Can Be Claimed—How To Proceed in Presenting the Case to the Tax Authorities

By F. R. WEAVER
Thompson & Worley, 14 Wall St., New York City

THE most important act of the special session of Congress called just after President Harding took office, was the passage of the new tax law known as the Revenue Act of 1921. It does not differ greatly from the earlier act of 1918, except that it reduces rates and abolishes the Excess-Profits Tax after 1921. There is, however, one feature that engineers and practical manufacturers are certain to find of interest. Every one was familiar with the fact that the 1918 act permitted a deduction for what was called the amortization of war facilities. The new law repeats the provision of the old relating to this deduction, but has made a most significant addition in prescribing a limit to the time within which claims for amortization can be made. It requires such claims to be filed not later than the time for filing the returns for the taxpayer's taxable year 1921, which, for persons who do their business on a calendar year basis, means March 15, 1922. The time remaining for those taxpayers who have not yet filed a claim is thus very short. There are many such who have never filed a claim because they were uncertain whether they had one. Such uncertainty may arise out of lack of understanding as to the limits of what may be included as war facilities, or out of lack of familiarity with what constitutes amortization. This article will sketch in broad outline the conditions under which amortization can be claimed, and the way to proceed in presenting the case to the tax authorities.

The history of the past few years is familiar to every one. We all know how the country's industrial, mining and transportation plant was expanded during the war to meet the demands of the Government for war materials of all sorts; how the country built up a great merchant marine to transport to the battle front the men who fought, the supplies on which they subsisted, and the materials that literally blasted the enemy into surrender. The Government itself put up a small part of this additional plant; private capital did the rest. Few expected that after the war they would find a use for peace time purposes for the whole of their expanded plants, mines and fleets. Furthermore, the cost of the new facilities created for war purposes was invariably inflated by high war-time costs. It was generally believed that, once the country got back on a normal peace-time basis, a large part of the added plant would be unusable, or at least not fully utilized for a long time, and that part which could be actively employed would have a value much less than its cost. Here, then, were two kinds of losses that everyone foresaw would occur with the transition from war to peace. Who were to bear these inevitable losses? Congress, wisely and with an instinctive feeling for fairness and justice, said that a part of them should be borne by the Government by permitting the taxpayer to deduct such losses in computing his taxable income for the years when he was getting war profits. Such was the purpose of the sections of the tax laws that deal with amortization.

The first question that the law, both present and former, requires the taxpayer to put to himself, in determining whether he is entitled to claim amortization, is: Did I, on or after April 6, 1917 (the date war was declared), make any expenditures on buildings, machinery and equipment, or other facilities, that produced articles contributing to the prosecution of the war, or on vessels that transported men or materials contributing to carrying on the war? He will have no doubt as to whether such expenditures were made, but may be

uncertain as to whether they were for war purposes. If he used the added plant on work on a government contract, or subcontract, he is clearly entitled to amortization; if it was used to produce luxuries, such as fine lingerie for the wives of the new-rich, he is as certainly not entitled to it. But between these two extremes there are many cases that involve real doubt. No hard and fast rule exists for definitely determining whether a given industry was in the "contributory" class. The Treasury Department has shown a broad and enlightened attitude in applying this test. Each case must, however, finally stand on its own legs. If the taxpayer used his added plant, in whole or in part, in prosecuting—directly, or as a sub-contractor or supplier—any business included among the essential industries by the War Industries Board, he is justified in answering the question, put at the beginning of this paragraph, in the affirmative.

Many taxpayers, legally entitled to make a claim, are defeated because of inability to substantiate any amount. The laws contain no formula for computing the amortization deduction; they do not even indicate the factors for deriving such a formula. The only provisions are that the deduction must be a "reasonable" one. The Treasury Department has promulgated certain more or less indefinite rules as to what it thinks that means, in its Regulations 45. These are all statements of rather general principles that require experience and the exercise of an informed judgment in their application to the many and varied situations and combinations of facts that confront the individual taxpayer whose problems are inevitably concrete and definite.

Basis for Computing Amount of Claim

Many war contracts were made on what is known as the "cost-plus" basis. These frequently provided for including in cost an amount for what they described as "amortization of additional plant." The Government made similar allowances to contractors in the general final settlements that followed the hurried cancellation of commitments after the signing of the armistice. The amount of these allowances was usually based on appraisals of War or Navy Department engineers. Those contractors received a shattering shock when the tax gathering arm of the Government told them they would have to include such allowances in their gross income. Some of them, misled by the similarity in names, thereupon proceeded to claim an amortization deduction for tax purposes equal to the amount of such allowances, thus completely offsetting their inclusion in gross income; but the Treasury had a second surprise in store for them. It told them they could do no such thing, and that the amount deductible for tax purposes would be computed according to Treasury rules, without regard to any contractual expressions of other departments of the Government. For example, if a war contractor had expended $100,000 on additional plant which the War Department appraised at $25,000 at the end of the war, he would receive an allowance of $75,000 in the settlement. Now comes the Treasury and requires him to include that allowance in income, adding it to his profits. If he seeks to offset this by an "amortization" deduction of $75,000 and the Treasury considers $10,000 enough, his claim will be disallowed as to $65,000 thereof. Thus he is taxed by one government department on $65,000 which he was allowed by another government department for amortization of war plant. The glad feeling of relief felt when the War Department allowed him the $75,000 vanishes before the worry of providing funds to pay tax on $65,000. The Treasury still maintains its position on this matter, and no one can hope to prove the amount of his amortization claim by merely showing how much he was allowed therefor under a government contract or settlement.

The Situation after the Armistice

Most war work ceased rather abruptly soon after the armistice. The manufacturer who had expanded his plant for war work then found himself in an uncomfortable situation. Part of the added facilities were useless when war production stopped; the rest were usable in his regular peace-time pursuits only if there were sufficient demand for all his output from the increased plant. The first class presents no great difficulties and the rules presented for it are rather simple. If the nonusable facility was sold the deduction is the difference between the selling price and the cost, less depreciation to Jan. 1, 1918; if it has been set aside for sale but not yet sold at the time the claim is made, present regulations permit the estimated selling price to be substituted for the actual selling price in that formula. Some of the facilities may not have been salable, and now rest quietly in the industrial graveyard without hope of resurrection. These can be amortized down to their estimated value at the time they were discarded, or will be discarded as war facilities; and, if at the time the claim is made, they have only junk value, they can be amortized down to that figure. These rules do no more than recognize what every practical person knows. Even apart from the law on amortization the taxpayer would be allowed to deduct losses incident to sale or abandonment of plant. But the important distinction between taking it as an ordinary loss and as an amortization deduction is this: If it is merely deductible as a loss it will have to be taken in the year of sale or scrapping; if as amortization, it is deductible during the period of war-work which includes the high tax years.

The really difficult problems of amortization arise in cases where the facilities were transferred to peace-time production. Many manufacturers found that they could fully use their entire additional plant during the over-flow of prosperity that came just after the armistice. The present industrial depression sharply reminded them that their plants were too large for normal periods. Accordingly, some of the facilities have now been abandoned with small hope of ever being used again; some are only partly employed. The Treasury's present rules permit the cost of such facilities to be amortized down to their value in use to the taxpayer in his going business. That value in use must be measured by applying physical factors of present use to average normal capacity. The proof of such excess capacity to the satisfaction of the Treasury Department requires the presentation in properly organized form of a mass of detail and analysis that can be no more than suggested within the compass of a short article which aims solely to outline the problem and its underlying principles.

Reference was made near the beginning to the inflated costs of war-time plant additions. If the teachings of past history furnish any guide, it is certain that the normal post-war price level will settle below that prevailing during the war period. What with the slogan, "Win the war at any cost," the inflation of credit through the Federal Reserve Bank system, and the reduction of the labor supply as the armies were gathered,

there was loosed an orgy of competitive bidding for material and labor that drove prices to heights theretofore undreamed of. Even if a taxpayer can fully employ his pre-war plant and its war-time additions under his normal post-war situation, he will be at a decided disadvantage with new competitors who can get the same size plant at a much smaller capital cost. There is no doubt that Congress intended to permit the amortization to cover this financial factor of excess costs as well as the mere loss due to over-expansion of the physical plant. Unfortunately, the Treasury has not up to the present time applied this method. It is difficult to escape the conclusion that force of economic circumstance will soon compel it to permit "squeezing out" the excess war costs through the amortization deduction.

The preceding discussion has been almost exclusively limited to the law and the Treasury's interpretation of it. Some readers may have filed claims less favorable than the law allows; or, if as favorable as the law permitted at the time of filing, for less than they feel they could now claim and substantiate. In either case, there is nothing to prevent them from amending their earlier claims. Others may have filed no claim through oversight or ignorance of their legal rights. Such persons must hasten to file claims prior to filing their return for 1921, which will ordinarily be March 15, 1922. All will be interested in the practical steps necessary to present their cases before the Treasury. One thing is as certain as death itself, the department is not going to expend its energy putting the taxpayer's claim in proper shape. Its business is to collect taxes, not to show the taxpayer ways of saving them. The latter must prepare his own claim, and be prepared to prove it when subjected to the rigorous examination of the Treasury's amortization engineers and accountants, who will most certainly examine his property and books. In the normal course of events the taxpayer receives a letter from the Treasury announcing the results of such examinations in the form of an additional assessment or refund, usually the former. He then has thirty days to file exceptions before the assessment is listed with his local collector. Thereafter he can file various claims, but, if his claim involves an amortization problem, he must prepare this in the form the Treasury requires.

The Treasury has to pass on thousands of amortization claims. To facilitate its own processes, it has evolved a standard set of forms and method for presenting such claims before it. Detailed schedules must be submitted which require painstaking care and familiarity with technique in their preparation. The wise taxpayer cannot afford to turn over the entire preparation of his claim, which may involve very large amounts, to his accounting department. The technical questions involved can be correctly answered only by persons familiar with engineering and industrial technique. The co-operation of his tax department is equally indispensable. The amortization section of the income tax unit consists of highly specialized technicians competent to pass on the engineering, economic, accounting and financial aspects of a claim. It numbers among its members expert tax men and accountants, technical engineers and men with practical shop experience. The knowledge and experience that collaborate to prepare a claim for amortization should be no less broad and inclusive than that which will pass on it to determine its validity. The accountant functions in that the taxpayer's books of account must reflect the deduction in the reduced value of the assets; the appraisal and industrial engineers, in their knowledge of cost of construction and of value in operation; the tax man in his ability to correlate the facts with the Treasury's rules. It is exceedingly important for those who hope to make their claims stand up under the minute scrutiny of the experts of the amortization section, to base them on the true opinions of practical shopmen and engineers.

The taxpayer should go to the men who are using the facilities, to the plant engineer, the shop's foremen, and even the mechanics operating individual units in question. He should view the facilities through their eyes before deciding as to their value and utility in his going business. Thus let us imagine the general manager in his daily "walk through" the plant has his attention drawn to a large radial drill press, which he has not seen in operation since the war. On inquiry he learns that it is occasionally used, but that it merely performs the functions of a much smaller machine. Here then is something which represents excess capacity, some item of equipment that may be amortized. As seen through the eyes of the casual observer this machine is a powerful productive unit in excellent condition; but as seen through the eyes of the foreman directing its use it is a cumbersome, almost useless element in his department, performing the functions of a similar machine which would represent less than half the capital investment.

This article would miss part of its purpose if it did not reiterate the provision of the present law requiring claims to be filed not later than the time of filing the tax returns for 1921. The time remaining is short. Get your foot in the door even if you have to change shoes later. It is hoped this discussion may help taxpayers, first to determine whether they have a fair claim that can be substantiated, and next to understand the way to proceed to get what the law intends them to have.

Painting Machine Tools White

By D. A. Nevin

On page 1013, Vol. 55, of American Machinist, Mr. Sheldon advances some excellent reasons for painting machine tools white.

There is much difference of opinion in regard to this practice, as was evidenced some fourteen years ago at the old factory of the Remington Arms Co., Ilion, N. Y., where a number of old machines were to be repainted and the writer scraped away a small area upon them, exposing alternately several colors as: white, dark grey, green, and even red.

A few of the large factories that have painted their machines white have returned to the universal grey-black because, for one reason, the operator was using all of his spare time in keeping the machines clean.

The writer is of the opinion that white machine tools are like white automobiles—very good looking when new, but impracticable. Machine-tool builders realize this and have almost universally adapted the various shades of iron grey. Machines operating on cast iron, such as planers, shapers, milling machines, drill presses, etc., do not retain a clean appearance, and certainly no attempt should be made to clean them when in operation.

The flow of lubricating oil over a white screw-machine or turret-lathe gives to the machine an untidy appearance; but there may be exceptions where lighting conditions are of more importance than appearances.

The American Valuation Plan

By H. L. Henry

Manager, the Geneva Cutlery Corporation, Geneva, N. Y.

(Editors Note: In a recent editorial we gave the grounds upon which the professional economists, as a group, take a stand in opposition to the American Valuation plan. We are fortunate enough to have as a result the following comment which very definitely favors the plan and which we are glad to publish as presenting the subject from another point of view.)

I was interested in reading the editorial that appeared on page 80 of the AMERICAN MACHINIST, entitled "The American Valuation Plan," and I am wondering just how much the statement of such men as Professor Tausig and his brother economists means to a magazine like the AMERICAN MACHINIST, and particularly to that large proportion of your subscribers who are directly and indirectly affected by the reaction that invariably results from near free-trade conditions in the United States.

Without holding any brief for Professor Tausig and the average economist, you know, as well as everyone else, that these men are born free-traders, and in the arguments set up by them they never go into statistics which show trade conditions in the United States as related to any particular tariff bills. Further, it is very easy to check up trade conditions and their relation to tariff.

In a way, I am digressing somewhat from the subject. The American Valuation Plan was the title of your editorial, and I am wondering if it has ever occurred to you that the administrative end of nearly every tariff bill that we have had in this country has been practically written by the importing interests. Has it occurred to you that we are the only civilized people in the world who allow the foreigner to appraise the goods that he lands in our ports? A casual examination of Customs House conditions will easily prove that statement.

Under today's tariff, and under practically all of our tariff bills, every United States appraiser, when he walks into his office in the morning, is supposed to know the foreign market value of every one of the thousands of articles shipped from abroad into the United States; these invoices are supposed to represent the export value; and he is required by law to know the impossible. For more than one hundred years this condition has existed, and by virtue of it, our appraisers have learned to look for undervaluations; and although they are able to open only one case in ten, on an average, they find 25 per cent of the invoices presented each day have to be arbitrarily raised.

Approximately one hundred and ten foreign countries are using our ports. We are today the easiest market in the world for the foreign exporter, and I would suggest, Mr. Editor, that you acquaint yourself with the conditions in the many factories subscribing to your magazine.

Why should not the American Valuation Plan be used? It does away with the present premium of the cheapest foreign labor; it will do away with the present subsidizing of foreign employers who pay the lowest wage in a country of lowest exchange; it will prevent the wholesale undervaluation now existing, by doing away with the incentive to undervalue; and it will tax every foreign country the same, regardless of exchange conditions and labor conditions, for the privilege of selling goods in the American market. Further,—and this is an important reason that is not always mentioned—the rates intended to be collected will be collected; the revenue will undoubtedly be increased, but that does not mean that the man on the street is going to pay more for his goods. What it does mean, however, is that the importer is going to shorten his profits. Otherwise, why this hectic struggle with the expenditure of well over one million dollars on propaganda by the imported?

The American Valuation Plan has nothing to do with rates. It is simply a method of providing a basis on which to collect rates. The adoption of the American Valuation Plan does not necessarily mean higher priced goods—it has invariably worked out that if, through some mistake in Washington, an article is over-protected, then domestic competition will very shortly reduce prices to a low level.

We would like to have our work shops full; we hate to have the United States of America trying to absorb, at the expense of American industry and the American work bench, the hundreds of millions of imports now flooding our markets. And I am complimenting you to the extent of supposing that you are for an adequate tariff, and I hope a tariff based upon American valuations.

Safety First

By Robert Grimshaw

To lessen the danger arising from carelessness on the part of foreigners who do not understand English, I have prepared the following list. It shows the spelling of the words "Notice! Danger!" in eighteen different languages. The translations have been verified by competent persons and by the foreign language bureau of the American Red Cross.

CZECH,	*Pozor!*	*Nebezpečí!*
DANISH,	*Vær!*	*Forsigtig!*
DUTCH,	*Achting!*	*Gevaar!*
ENGLISH,	*Notice!*	*Danger!*
FLEMISH,	*Achting!*	*Gevaar!*
FINNISH,	*Huom!*	*Vaarallista!*
FRENCH,	*Avis!*	*Danger!*
GERMAN,	*Vorsicht!*	*Gefahr!*
HUNGARIAN,	*Vigyázz!*	*Veszélyi!*
ITALIAN,	*Badate!*	*Pericolo!*
LITHUANIAN,	*Tëmyk!*	*Pavojus!*
NORWEGIAN,	*Vær! Forsigtig!*	*Fare!*
POLISH,	*Baczność!*	*Niebezpieczeństwo!*
RUSSIAN,	*ВНИМАНІЕ!*	*ОПАСНОСТЬ!*
SERBO-CROAT,	*Pozor!*	*Opasno!*
SLOVENE,	*Pozor!*	*Navarno!*
SWEDISH,	*Se upp!*	*Farligt!*
YIDDISH,	נעפאהר	אויפמערקזאם

Payment of Unemployment Relief

By S. N. Bacon

On page 1001, Vol. 55, of *American Machinist*, Mr. Watts points out that unemployment relief is actually being paid but in a most inefficient manner. Would not some lasting service be eventually accomplished if a number of readers would express their opinions on this subject? Especially the many who are in a position which gives them intimate knowledge of these matters.

Why not the compulsory application of a portion of every employee's wages to a fund for unemployment relief, on a plan similar to that now used extensively for the purpose of sick benefits.

Gear Tooth Shapes

By E. W. MILLER
Chief Engineer, Fellows Gear Shaper Co.

(Continued from last week's issue)

THE involute curve has its origin at the base line, but its length may be anything from zero at the starting point on to infinity. The tracing point carried in a cord being many times unwound from the base cylinder may extend the involute to any desired length. An example of involutes developed by unwinding the cord the complete circumference of the base circle is presented in Fig. 14, and results, as shown, in a pair of one-tooth gears in theoretically perfect action. The application of the involutes as here arranged offers an interesting study. Although of little or no value as actual driving members, the extremities at which involute action may take place is here made plain and the nature of the curve made clearer.

It will be noted that each of the two involutes constitutes an unsymmetrical tooth. If *A* acts as a driver, turning in direction indicated by the arrow, *B* will rotate in the opposite direction. Contact will take place along the tracing cord exactly as in cases previously cited. The length of the line of action represents the circumference of the base circle, and in this case is the normal pitch of the involute. It is rather startling to realize that the circular pitch of these two involutes developed on a base circle of only 1½ in. is 15.537 in. It is of passing interest to note that the pressure angle must always be 72 deg. 21 min. when a single involute effects complete rotation of a single engaging involute. The pressure angle of 72 deg. 21 min. is excessive, and these curves are obviously incapable of transmitting any but the lightest loads.

To transmit power smoothly and positively from one pitch line to another it is necessary to provide a number of teeth, thus permitting a selection of that part of the involute best suited for the purpose. In Fig. 15 a long involute *I* has been developed from the base circle *B*. Any point on this involute may be taken as determining a pitch diameter upon which teeth may be produced, the number of teeth being determined by service required. Circles *C*, *D*, *E*, *F* and *G* represent such pitch lines. Upon these pitch circles teeth have been drawn and one side of a tooth upon each pitch circle is composed of an involute *I*. Teeth of various pitches have been drawn to make plain the possibility of a wide choice. The pressure angle increases as the larger pitch diameters are utilized and in the case of circle *C* it has reached 60 deg. If, after due consideration, it is decided to produce teeth on circle *D* to run with similar teeth on a pitch circle of identical diameter, it is necessary first to establish the center distance. Since the two gears are to be of equal pitch diameter this center distance is determined by making *L* equal *R*. Then the center of the mating gear is at *O'*. A base circle *A* described from *O'* and having the same diameter as *B* becomes tangent to the line of action.

Involutes developed from this second base circle *A*

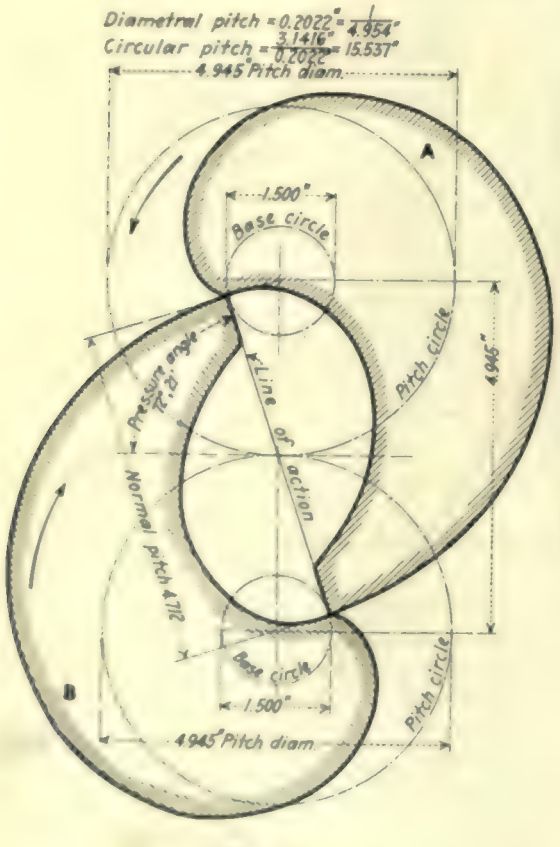


FIG. 14

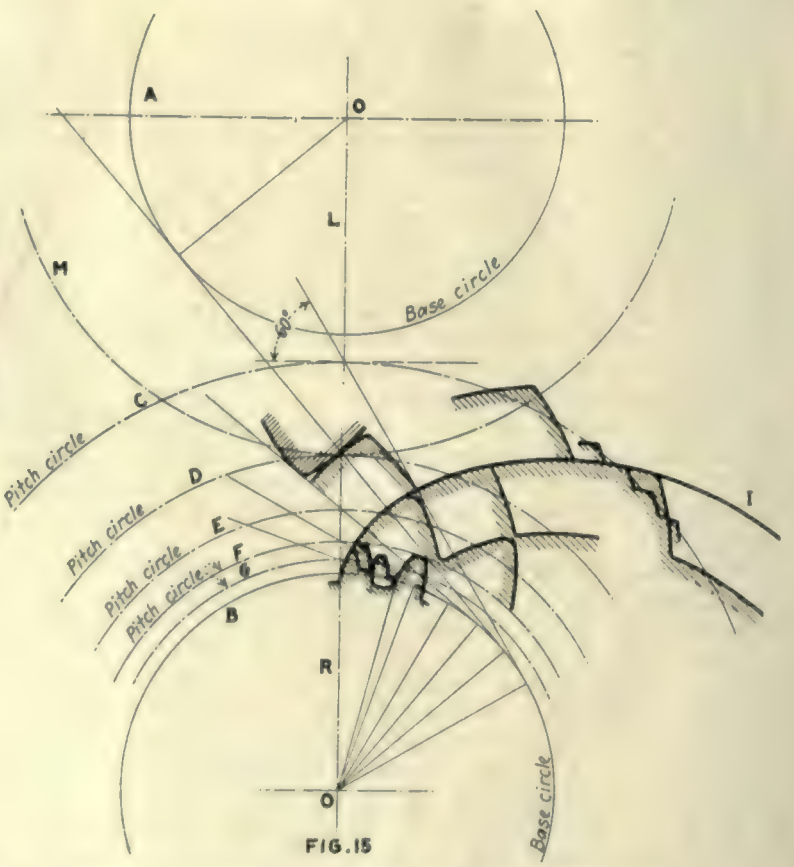


FIG. 15

FIG. 14. SINGLE TOOTH GEARS. FIG. 15. PRESSURE ANGLE VARIES WITH PITCH DIAMETER

and so spaced on line M as to accord with tooth spacing on D will operate satisfactorily provided: (1) That there is no involute interference; (2) that there is ample arc of action; (3) that excessive slippage is avoided; (4) that a proper pressure angle is selected.

These four points are of vital importance in standardization work, and each will receive careful attention.

The use of the diagram shown in Fig. 8 is an effort to emphasize strongly the fact that the base circle is the root and seed of the involute, and is an attempt to ground our thinking in terms of base circles and center distances. These are the fundamentals, and they should not escape us. On the other hand, it is not recommended that the procedure followed in Fig. 15 be used as common practice. The "base-circle, center-distance" attitude of mind is most important in determining the standards. Once the best portion of the involute is determined, center distances may be standardized, determined from the diametral pitch employed, thus following present-day practice.

Two engaging involutes contact along their line of action, and the driver, if uniformly rotated, imparts uniform rotation to the driven. If, however, the involute length is so great as to extend beyond the point of tangency of base circle and line of action of the mating gear, the uniform rotation of the driven member ceases and the involutes are said to interfere. The point of tangency is called the interference point.

In Fig. 16 the two involutes I and F are assumed to have been contacting steadily along their lines of action, the driver I causing uniform rotation of F. When point J is reached all involute action ceases, since involute F cannot extend below the circle upon which it has been developed. The continued uniform rotation of A causes I to drive B, the contact of F being always at J. For purposes of illustration the involute length is determined by a 4-in. radius. The base circle radius is 2 in. With these radii it is plain that as A is rotated, a point at the 4-in. radius will move twice as far as a point at the 2-in. radius.

A tracing point carried on the line of action, after arriving at J, will be wound upon base circle B, its path thus bending inward and away from the straight line representing the line of action. If this tracing point is assumed to have traveled from J to K (which is the intersecting point of base circle B with circle C), it is apparent that a point in C will have moved twice this distance. If, then, a distance twice JK, indicated by NM, is laid off on circle C beginning at point N (which represents the end of involute I), it is found that M representing the extremity of this line lies outside the base circle B. To have moved in unison, J and N would have come together at K. Actually, when J has reached K, N has arrived at M. This means that as A is uniformly rotated, the rotation of B is gently accelerated.

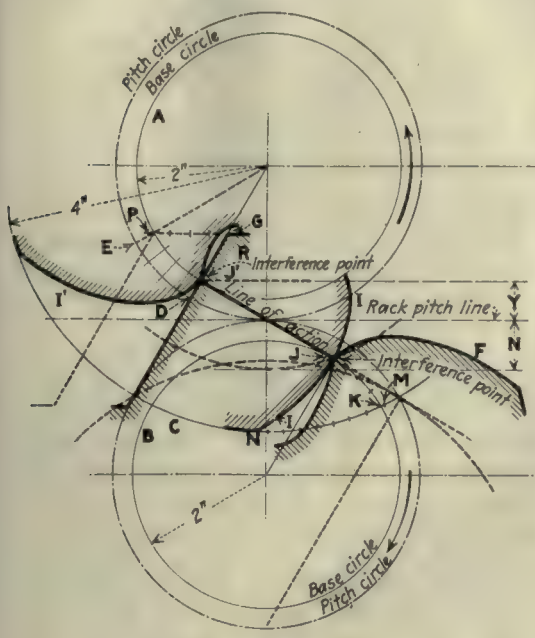


FIG. 16

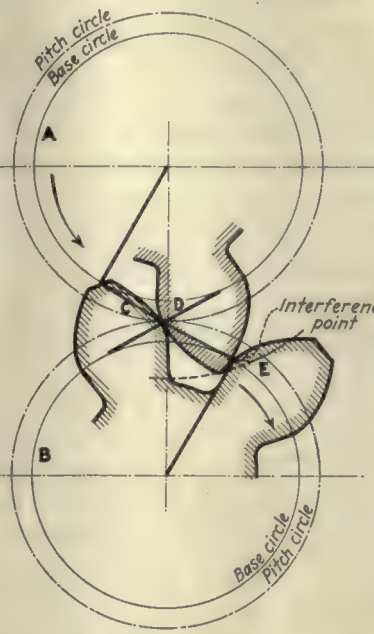


FIG. 17

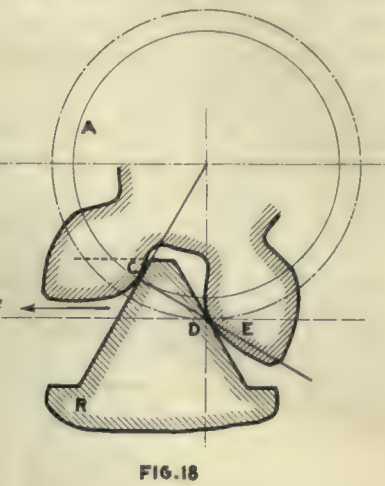


FIG. 18

FIG. 16. INTERFERENCE OF TEETH. FIG. 17. INTERLOCKING TEETH. FIG. 18. ACTION WITH A RACK

In this same figure a rack tooth R is shown engaging involute I'. If a point on base circle A moves from J' to P, a point on the pitch diameter moves distance DE, as does also any point on the rack pitch line. Laying off this distance on a line parallel to the rack pitch line and passing through the end of the rack tooth at G, the left-hand extremity is located outside the base circle at P. This again shows interference. To entirely avoid interference the rack tooth should be shortened to length Y when operating with I'. When I and F are operating together, the involute length should equal N. The difference in Y and N is appreciable, indicating the greater tendency of the rack tooth to interfere.

When involutes take the form of symmetrical teeth employed in the transmission of power, the presence of interference prevents operation. This is made plain by Figs. 17 and 18. The acceleration of the driven member B, Fig. 17 (as explained by Fig. 16), is prevented by positive contact of teeth C, D and E. Likewise in Fig. 18, the rack B driving A cannot accelerate the rotation of A by reason of the contact of teeth C, D and E. This assures that gears and racks with teeth extending beyond the interference point will positively lock, becoming inoperative.

The addendum of a gear tooth is known as that tooth length which extends above the pitch circle. The dedendum is the tooth length below the pitch circle and is equal to the addendum. The clearance represents extra

depth of cut to assure space between the bottoms of the teeth and the ends of the mating teeth. The sum of the addendum, the dedendum and the clearance equals the whole depth of tooth. The circle representing the outside diameter of the gear is sometimes called the addendum circle. Fig. 19 makes plain the application of the various terms.

The arc of action is that arc through which a gear tooth moves from the point at which it first contacts a mating tooth, to the point of which the contact ends. Fig. 20 indicates two gears in mesh. Contact in this diagram begins at the intersection of one addendum circle with the line of action (note points B and B'), and ceases at the intersection of the line of action with the addendum circle of the mating gear (note points A and A'). It is important that a pair of teeth shall remain in engagement until another pair can engage, thus taking up the load. If this does not occur, the gears operate with a bumpy, jerky motion, and are said to fail of continuous action.

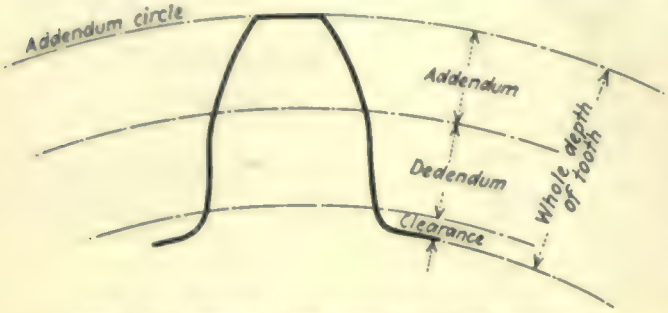


FIG. 19. TERMS APPLYING TO ONE TOOTH

The convenient term "normal pitch" has been used to define the distance from one side of a tooth to a corresponding side of the next tooth measured on the line of action. This obviously is the circular pitch of the gear measured on the *base* circle, since these corresponding sides are traced by points fixed in a cord unwound from the base circle. The normal pitch arc is established by a length on the base circle equal to the normal pitch. It is evident that the actual arc of action must be greater than the normal pitch arc to assure continuous action. In the case shown, the actual arc of action greatly exceeds the normal pitch arc. The maximum arc of action is obtained when the addendum circles pass through the interference points, as indicated by the dotted lines.

The slippage is an element which deserves careful investigation. It obviously should be reduced to a minimum approximating rolling action as nearly as possible. In Fig. 21, two involutes developed on base circles at center distance Z, are in contact at the pitch line. Beginning at the involute origin the base circles have been spaced in equal divisions as indicated by Nos. 1, 2, 3, 4, etc. If we still think of the cord with its tracing point, it is plain that when unwound from the arc No. 1, it has developed the involute length 1′. It is of great importance to note that although 7 exactly equals 1, the length of involute 7′ is several times greater than 1′. It is also plain that when these angles have moved to such position that lines L and N, representing the tracing line, lie in the line of action, length 1′ will begin to pass over length 7′. An angular movement equal to 1 of the base line divisions causes 7′ to pass completely over 1′. The difference in these two lengths evidences excessive sliding. From this it is evident that the extremely short length 1′ is responsible for a very considerable arc of movement. It is noteworthy that lengths 4′ contacting near the pitch line are identical, but due to the position they take, a slight slippage occurs. The straight line diagram shown in the lower portion of Fig. 21 furnishes a simple and convenient means of comparison of the percentage of slippage.

In Fig. 22 the same base circles and involutes are employed, but the center distance is increased an amount Y. The effect of this is to greatly increase the pressure angle and results, as reference to the lower diagram will show, in a great reduction in slippage. Although the total length of the involute is identical with Fig. 21, loss of the involute is utilized, having the effect of a shorter tooth.

Attention is called to the marked bend of the involute near the base circle. The straight length C laid off on a radial line passing through the origin of the involute, departs markedly from the involute. The same length C' laid off perpendicular to line B, deviates but little from the curve. It is plain that the farther the involute extends from the base circle the more nearly it approaches a straight line. The nearer two mating involutes approach a straight line, the less they slide upon each other as has been evidenced by the slippage diagram. The greatest curvature is near the base circle. Therefore that portion is most responsible for tooth slippage. It may be logically concluded that the active profiles of engaging tooth should be kept as far as practicable from the base circle.

Pressure Angles and Interchangeability

The pressure angle is of great importance in determining an interchangeable system. Together with the addendum it determines the possible range of involute action between the various members. It is common to make the addendum equal the reciprocal of the diametral pitch. For example, the addendum of an 8-pitch gear is made ⅛ in. As a starter it may be well to determine the necessary pressure angle to assure interchangeability of all members from 12 teeth to a rack when the addendum equals the reciprocal of the pitch.

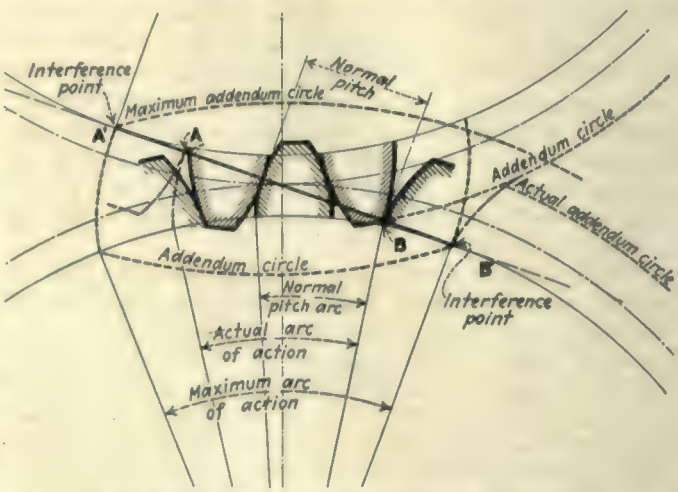


FIG. 20. TERMS USED WITH GEARING

The two extreme members, namely the 12-tooth pinion and the rack obviously present the limiting case. In Fig. 23 is shown a 12-tooth pinion of one diametral pitch. The problem is to find the pressure angle which shall fix the interference point in line AA'. Using a

right triangle, as shown, let the point *N* lie in line *AA'*. Shift triangle about, keeping *N* in *AA'* until side *T* passes through point *O*, and side *R* through *D*. Draw *CO* and *CD*. The angle *COD* is the desired pressure angle and equals 24 deg. 20 min. It may be mathematically checked by simple triangulation. In Fig. 24 a pair of 12-tooth pinions is observed to clear the interference points by a wide margin. Obviously a 24-deg.-4-min. pressure angle assures an interchangeable system.

One factor to be considered when determining the pressure angle is its effect on bearing loads. The example shown in Fig. 25 may serve to illustrate this. A pitch line force *EO* coming against the inclined surface of a gear tooth resolves itself into force *FO*, acting along the line of action, as shown. The amount of load-

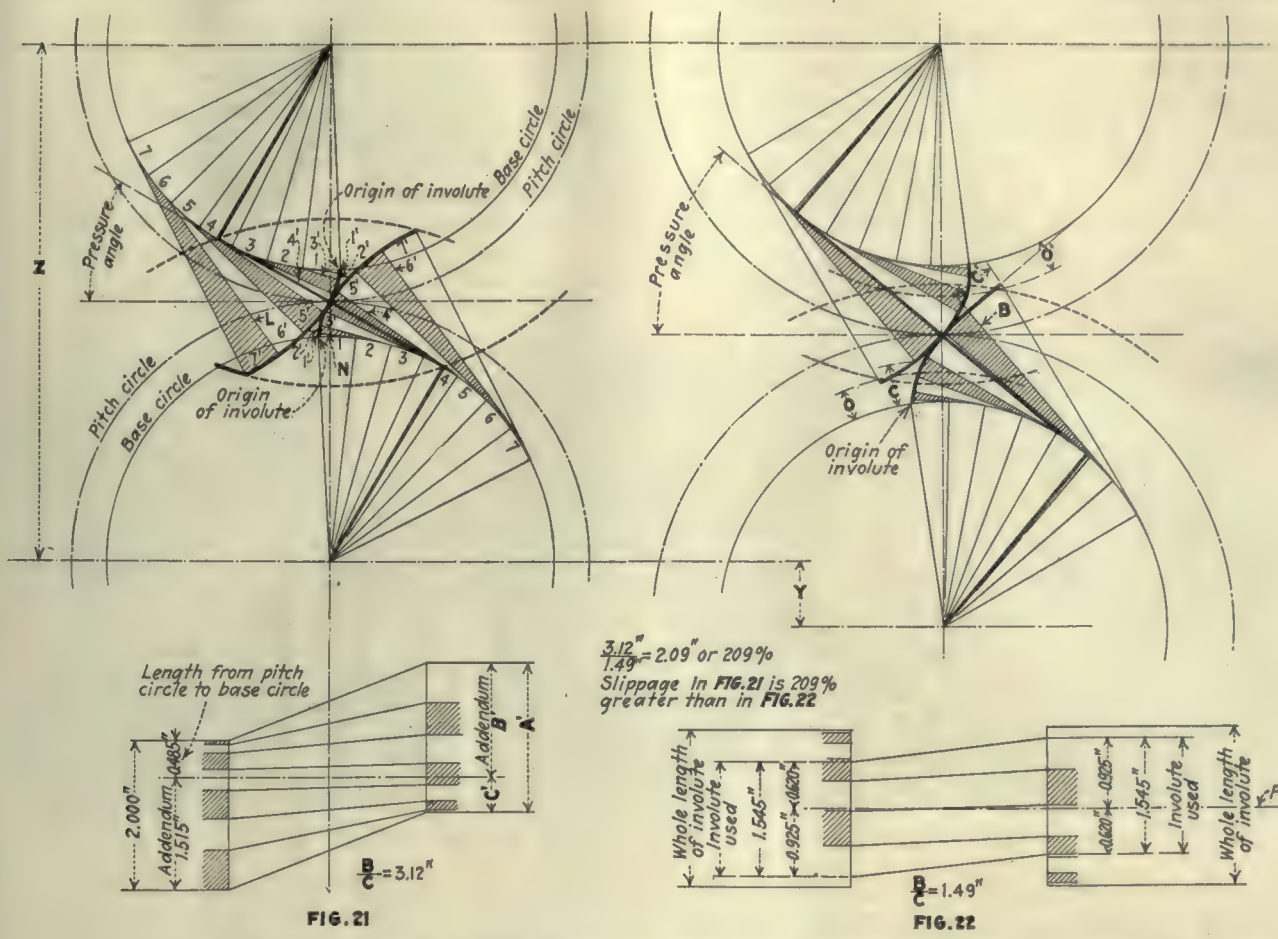


FIG. 21. EXCESSIVE TOOTH SLIPPAGE. FIG. 22. SLIPPAGE GREATLY REDUCED

increase by reason of the pressure angle is graphically indicated by *D*. It is apparent that the increase is in ratio of *EO* : *FO* of right triangle *OEF*, and is therefore proportional to the secant of the angle.

The table on the line cut gives the secants of several angles. The column on the right compares the load with 14½ deg. in terms of percentage.

In Fig. 26 is shown two 12-tooth pinions in mesh.

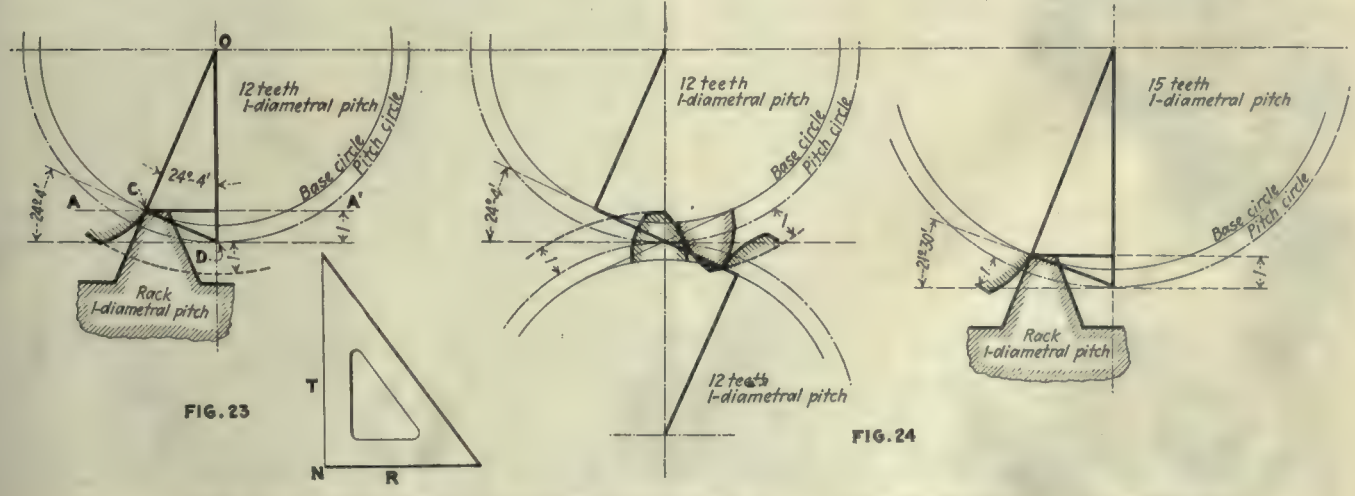


FIG. 23. FINDING THE PRESSURE ANGLE. FIG. 24. ACTION WITH GEARS AND RACK

The pressure angle is 24 deg. 4 min. Above is shown a rack engaging a pinion. In full lines the teeth of both pinion and rack are shown having an addendum of 0.2 in. The normal pitch is 2.858 in. and the excess engagement of the two pinions is 0.4 in. This indicates 14 per cent more travel than is actually necessary to effect continuous action. The rack and pinion as shown above have 25 per cent more than is required. If the addenda are made 1 in., as indicated by dotted lines, the excess action is considerably increased, as is indicated by these figures. It is to be noted that the teeth in both pinion and rack clear the interference point by a good margin when the addendum of both is 0.8 in.

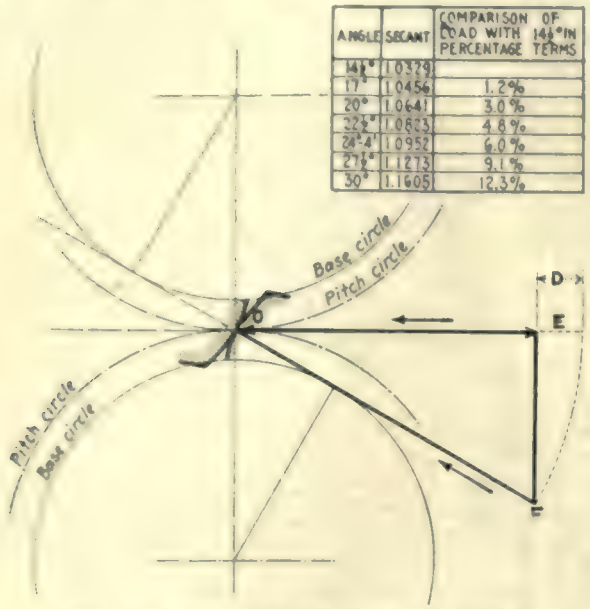


FIG. 25. INCREASE OF LOAD ON TEETH

When using a pressure angle of 24 deg. 4 min. the load on the bearings is 6 per cent more than when employing an angle of 14½ deg. This increase is little and may be considered negligible.

It appears from an investigation of this kind that a 24-deg. pressure angle with an 0.8-in. addendum may furnish a highly satisfactory interchangeable standard.

It is not believed that this matter can be easily and cheaply settled. Much experimental work should be carried on in a painstaking and unselfish fashion. Undoubtedly it would best be done in a place fitted up for research work, all experiments being made on the same devices in the same way, and careful record kept of results. In judging the all-around performance of gear teeth, the matters of noise, durability, strength and other lesser factors should influence our conclusions. We should make every effort to carry on the work to completion. Unquestionably the money cost of such work would be considerable, and this matter of finance must necessarily receive our attention.

This paper has dealt largely with an interchangeable standard: It is undoubtedly a matter of paramount importance. Special cases arise and have recently been much discussed. It is perhaps timely to direct attention to the fact that formulas assuring the very best pressure angle and tooth proportions for any specified

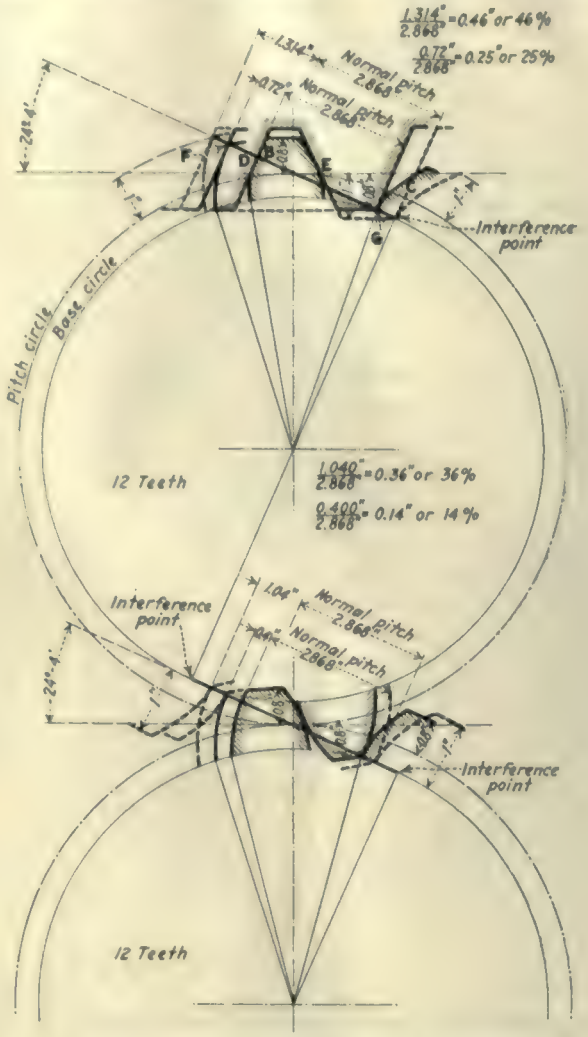


FIG. 26. WITH TWO 12-TOOTH PINIONS

pair or pairs of gears may be easily worked out. Possibly a secondary standard covering these special cases would be advisable and prove to be part of the work. There is nothing mysterious about these special cases, and further, they may all be handled by any of the commonly used processes of today, thus making the possibility of their production open to all.

In conclusion it is pointed out that a number of factors such as the arc of approach, arc of recess, tooth strength and extent of tooth surface, which are of importance, have not been touched upon; but time has not permitted their elaboration and they have been left for future consideration. An effort has been made to show the exact nature and the possibility of the involute in the hope that we may make the best use of this knowledge in our work of standardization.

Cylinders for the Mack Motor

Fixtures, Trams and Gages for Locating the Cylinder from the Bore—Inspection Methods Which Secure Results—Volume of Compression Chamber Tested by Liquid Gage

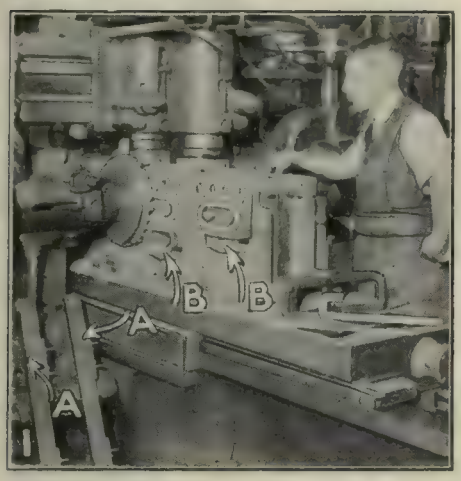
BY FRED H. COLVIN
Editor, *American Machinist*

THE Mack motor has its cylinders cast in pairs which are of the L-head type. The top, sides and bottom are milled in the first operation in the Ingersoll machine shown in Fig. 1. Figs. 1 and 2, show the construction of the miling fixtures which have many points of interest.

Great care is taken to maintain uniform cylinder wall thickness and so the cylinder block is located by the outside of the cylinder wall, using the trams and locating gages shown. The trams *AA*, Figs. 1 and 2, have dowels which fit into the holes shown in the fixture and locate the cylinders endwise. Each tram covers two pairs of cylinders. The castings are also carefully leveled with reference to the bore by means of the gages and the surface gage shown at *D*, Fig. 2. Means of leveling are provided by the bars *BB*, carrying hardened pins which support the cylinder block. It will be noted that the two cylinder blocks are not alike, the forward block having an oil pocket for the oiling system. Another view of the cylinder block is shown at *C*, Fig. 2.

Drilling the water cover holes and also two ½-in. holes in the base for future location points comes next and is followed by the rough-boring. Then comes the heat-treatment, or annealing for twelve hours at 800 to 900 deg. F. This relieves the stresses and is a practice that has much to commend it. After annealing, the top and bottom surfaces are finish-milled, and then the cylinders are finish-bored and reamed, leaving 0.002 in. for finish by rolling. The allowance for finish boring is from 0.020 to 0.025 inch.

The finish boring is shown in Fig. 3, a Foote-Burt machine being used. The cylinders are located from the milled base flange and the two bores, and are



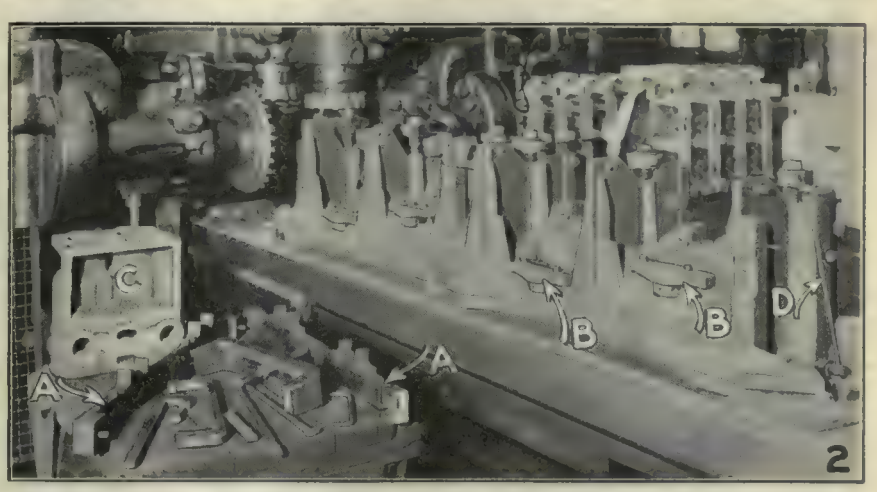
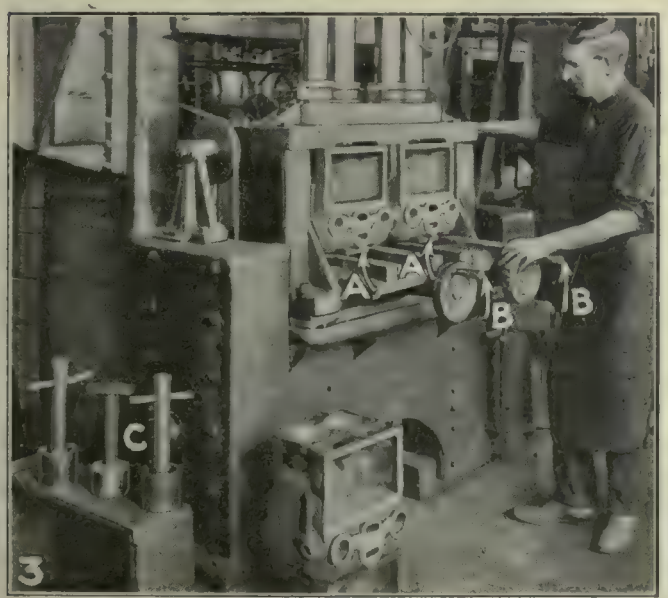


FIG. 1. THE FIRST MILLING OPERATION. FIG. 2. FIXTURES AND SETTING GAGES



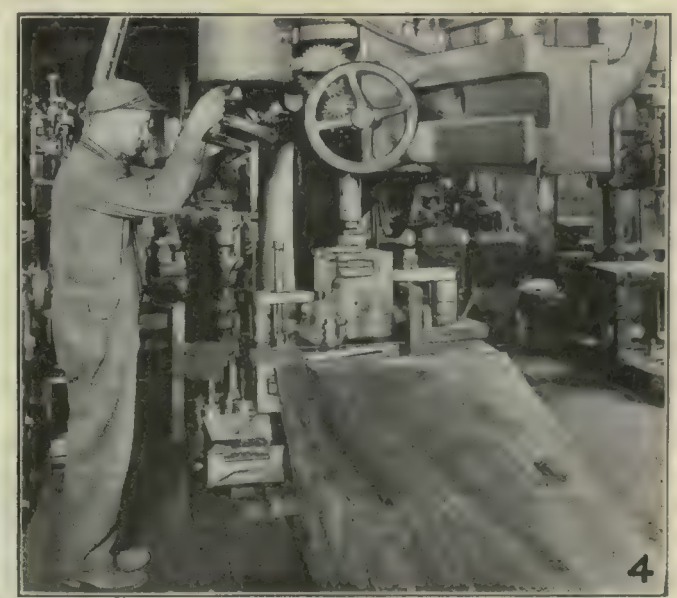


FIG. 3. FINISH-BORING THE CYLINDERS. FIG. 4. ROLLING THE CYLINDER BORES

held in position by the plates *AA*, which are operated by the handles *BB*. The gages are shown at *C*. The bores are chamfered at the bottom for connecting-rod clearance.

Boring valve pockets, drilling and tapping holes for studs and bolts and water testing for leaks come next and then the rolling or burnishing as shown in Fig. 4. It will be noted that one cylinder is burnished at a time and that the rollers are not quite straight with the body of the tool. This method has been found very satisfactory, tests at different points of the bore showing unexpected accuracy. As with other methods of finish, much depends upon the care with which the operation is handled.

Inspection is very thorough as it is realized how care at this point affects the life and satisfactory



FIG. 5. TWO OF THE INSPECTION TESTS

service of a motor. Squareness of the bore with the base is carefully checked as shown at *A*, Fig. 5. Here the gage fits one of the bores while the test is made with tissue paper on the opposite side of the block, as can be seen. While the squareness is tested in two directions, it is recognized, that the fore-and-aft squareness is by far the more important.

Lack of squareness in this direction has a disastrous effect on both bearings of the connecting rod, on the pistons and on the cylinder walls. It also wears the crank pin unevenly at the ends and affects the piston pin in a similar manner. Accuracy in this detail deserves more attention than it usually receives and it is therefore all the more interesting to note on that account as it adds greatly to the life of a motor and to its performance even before it requires overhauling. It pays big dividends to the user and reflects on the builder as well.

Details of this gage are shown in Fig. 6, which needs little explanation except to point out the contact points. There are four solid guiding points for each end of the cylinder and two spring plunger contacts above and below the fixed guides. In the end view, *A* and *B* are shown two of the solid guides and *C* and *D* the spring contacts 90 deg. apart. Neither of these is for measuring the bore but for holding the gage parallel in the bore.

Cylinder diameter is tested by the dial star gage shown at *B*, Fig. 5. This gage has three arms or prongs which make contact with the cylinder wall.

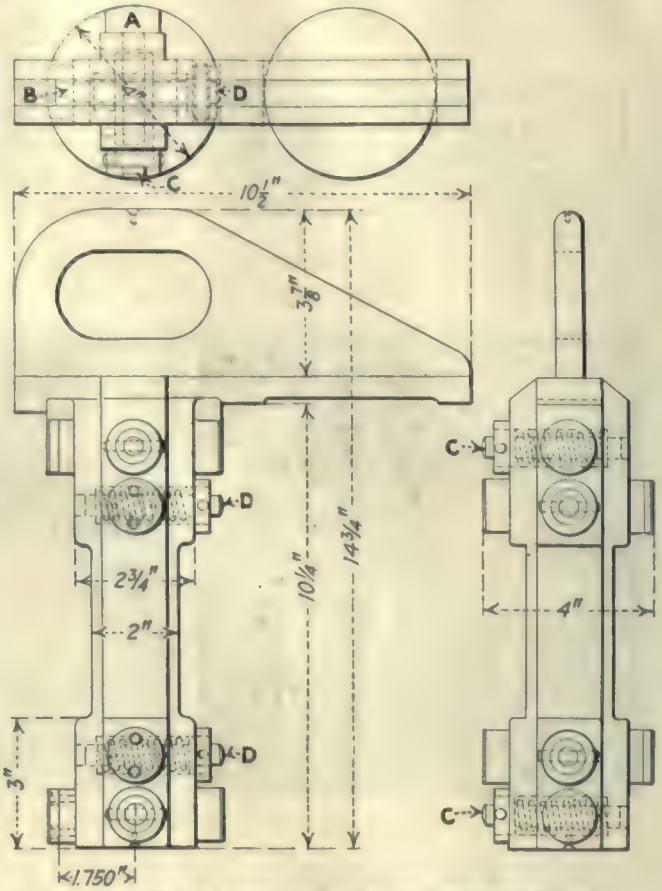


FIG. 6. DETAILS OF SQUARENESS GAGE

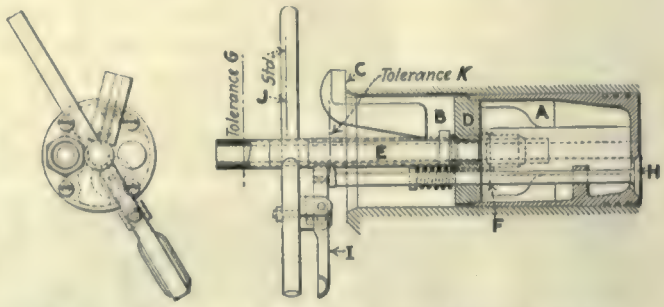
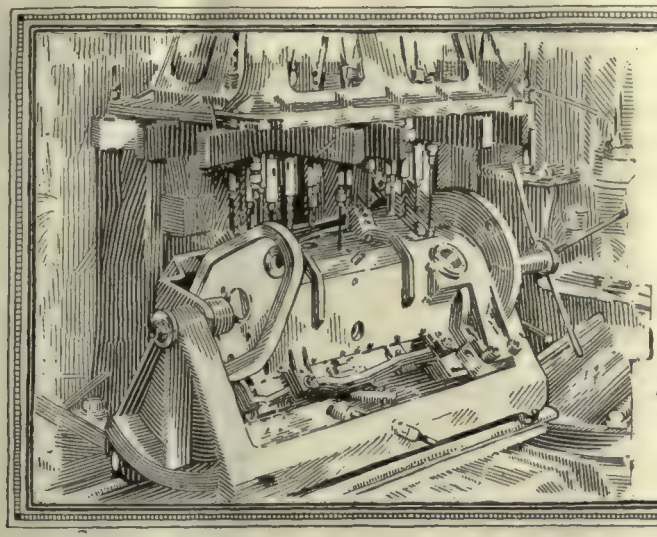


FIG. 7. GAGE FOR TESTING COMPRESSION SPACE

The cylinder is tested at different points of the bore and is held within very close limits.

A liquid test of the compression chamber is made by means of the gage shown in Fig. 7. The piston *A*, which is supported by the upper arm *B*, is slipped into the cylinder until the hook *C* contacts with the base flange. Passing through the top of the piston plate *D* are the tube *E* and the valve rod *F*.

After the gage is in place the tube and piston are filled with water to the upper tolerance mark *G*. Then the valve *H* is opened by means of the lever *I* and the compression space fills with water. This should lower the water to the level marked standard at *J*, the lower limit being marked "tolerance" at *K*. This makes an easy method of testing and has proved very satisfactory.



Tool Engineering

By
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Facing Tools for Turret Lathes—Cutting Action of Facing Tools—Counterbores, Shoulder Tools and Adjustable Cutter Heads—Adaptation of Standard Tools

CUTTER heads of various sorts are used for boring and facing, sometimes in combination with boring bars and at other times alone. Tools may be used for only one surface which is to be faced, or they may be utilized for turning, boring and facing a number of different diameters or shoulders. The shape of the work and the material to be cut influence the design to a great extent, particularly with respect to the form of the tools and their adjustments. If intended for boring only, the head may be single or multiple, according to the work which it has to do. A cutter head can often be used to advantage for rough boring large diameters when a great amount of stock is to be removed.

Cutting Action of Tools

We have already considered the position and shape of tools used for turning and boring, but the operation of facing has not been taken up. In turret-lathe work, facing operations are often attended with considerable "chatter," which may be due to a number of causes, such as back-lash in the spindle of the machine, loose gibbing, a worn feed screw, incorrect feeds used on the machine, improper methods of holding work, and position or shape of tool with respect to the work. The machine troubles can usually be easily remedied, but the position and shape of the tools used are both dependent on the design.

If a turret-lathe spindle is slightly loose in its bearings, there will be chatter in the facing operation, no matter what kind of tools are used. End play in the spindle, also, is likely to produce more or less chatter, but this trouble can be easily remedied by proper adjustment. A loose-fitting bearing may require re-babbitting before satisfactory results can be obtained; or, if taper bushings are used as spindle bearings, it may be necessary to take them up in order to remove all vibration. When the turret gibs are not set up snugly, chatter may develop due to a lift at these points, but the remedy for this condition is obvious. Oftentimes certain types of tools may appear to produce chatter and the tools will therefore be blamed, when in reality the cause lies in the various adjustments of the machine itself.

The matters of feeds and speeds also are important in their connection with the use of facing tools or cutter heads. The correct feeds and speeds can only be determined by experiment, as the quality of the material, the depth of the chip and the amount of surface which is being faced all govern the feed to some extent. A great many facing operations do not use machine feeds at all, the required power being applied entirely by hand. When cutter heads are used in combination with facing tools, the feeds may be used part way on the work, but the final finishing is done by hand pressure.

The amount of surface to be faced affects the design of tools strongly. On certain kinds of facing operations, too many teeth or cutter blades acting on the same surface will cause the tool to function improperly on account of the pressure required to force the tools into the work. Illustrations of this condition will be given later.

In considering the cutting action of a facing tool used in the turret lathe, we must pay attention to the position of the tool with respect to the center of the work. Fig. 310 shows several examples which illustrate these points. In the example *A* a facing tool *B* is shown on the center line of the work. A tool set in this way removes the metal without any shearing action, as the chip is removed on a line radial with the center of rotation of the work. In order to obtain a shearing action and make the cutting easier, the tool should be placed above center, as shown at *C*. The diagram at *D* illustrates the cutting action, and clearly shows the reason why it is so much easier when the tool is placed in this position. From these examples we determine a point of importance in connection with the design of facing tools; that is, that all tools of this nature should be placed ahead of center. If the tool is placed considerably below center a shearing action is also obtained, but the chip tends to crowd toward the center and would be likely to clog up tools after continued use.

In facing wide surfaces such as that shown in the example at *E* a flat tool *F* held in a holder *G* may be made to produce good results, providing it is set well above the center and held rigidly so that it will not chatter. It is much wiser to avoid broad cuts if possible, praticularly when cutting steel; and if a crossfeeding movement is available, it is better to use it rather than to make a wide facing tool like the one illustrated. With a single-point tool like that shown at *H* the stock can be removed quite rapidly by feeding in the direction shown

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by the arrow. Much depends upon the number of tools which are used for other operations on the work, and it is not always possible to obtain a single-point effect in facing.

By using a cutter head like that shown at *K*, wide

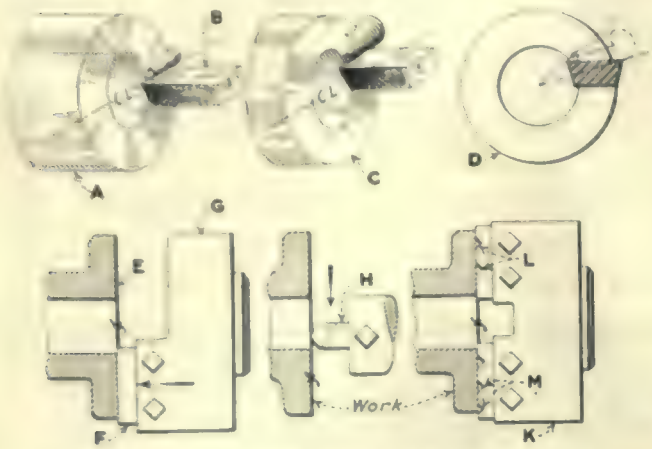


FIG. 310. CUTTING ACTION OF FACING TOOLS

surfaces can be faced successfully. It is a good idea to notch the cutters, as shown at *L* and *M*, making the notches in such a way that they will overlap each other and not produce a grooved surface on the work. It is better to use two cutters as in the example *K*, rather than a single cutter as shown at *F*, although the single cutter can be made to produce results when used with care. The double cutter, however, gives a balanced effect and will be found better in ordinary practice.

Counterbores and Shoulder Tools

Facing tools are often made in the form of a flat cutter like that shown at *A* in Fig. 311. They may be used in connection with a boring bar or separately, according to the requirements of the work. When a tool of this sort is used, it should not be ground radially, but each side should cut ahead of center an amount equal to half the thickness of the cutter. When made in this way, the cutting action is easier and the upkeep of the tool simpler. Very good results can be obtained by this design when the surfaces to be faced are not broad, but are like that shown. An end mill of the shell type is often used for a facing operation, as in the example shown at *B*. It is often possible to use a standard mill for the purpose, inserting a pilot bar *C* of suitable size and driving the mill by means of a collar *D* with a suitable key at *E*. Face mills used in this way should have teeth cut ahead of center. Many times it will be found profitable to grind away some of the cutting teeth in order to make the cutting action easier, if standard tools are used. The fewer the number of teeth, the easier the tool will cut; and the pressure required is not so great. The number of teeth in contact is a very important point in connection with face mills.

A very good illustration is shown at *F*, in which a special face mill *G* is used to form a large radius *H* in the bottom of a cast-iron bushing. In this particular example, the diameter of the cutter is 3.185 in. and the radius to be cut is ½ in. The writers designed this tool with eight teeth, but found on trial that it was almost impossible to force it into the work with sufficient pressure to make it cut. The tool was removed from the bar, and every alternate tooth was ground away so that it did not cut; after this another trial was made and the cutter was found to work satisfactorily. In analyzing this condition, it will be seen that the total surface covered by the eight teeth amounted to over 5½ in. A man would scarcely attempt to face a piece of work with a cutter 5½ in. wide, even if it were to be notched in eight places. Why then should it be considered practical to do the same thing with a face mill having an equal amount of contact?

These points are not usually considered by a tool designer, yet they are of great importance. The same mistake is frequently found in tools bought on the open market, as many of these have too many teeth, so that they do not cut freely. In automobile accessory stores it is possible to purchase valve-seating tools for facing off

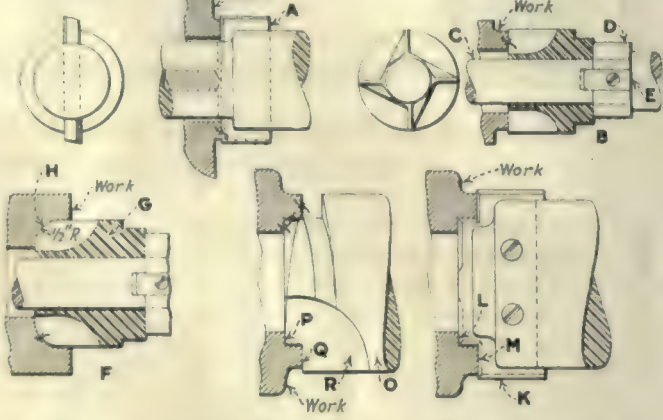


FIG. 311. COUNTERBORES AND SHOULDER TOOLS

the angular cast-iron surfaces on the cylinder blocks. The writers have never seen one of these tools properly made, as they usually have from twelve to sixteen teeth, and it is very nearly impossible to use pressure enough to make them cut on the valve seat.

In making up tools for facing two shoulders in a certain relation to each other when the two dimensions are important, the designer is confronted with the problem of preserving the two shoulder distances after the tool has been reground several times. A very common way of making a shoulder facing tool is shown at *K*, which is a flat-blade cutter for facing the shoulders *L* and *M*. The accuracy between these two shoulders must be preserved, which means that each time the cutter is reground the dimensions at these two points must be very carefully held to size. This makes an expensive grinding operation which can be avoided by using a different type of tool.

In the example *O*, the tool is circular in form and the shoulders *P* and *Q* are turned on the plug. Both of these shoulders are then faced off on a left-hand helix of the same lead for both shoulders. The tool is ground radially on the surface *R*, and as the shoulders *P* and *Q* are on parallel surfaces, the center distance is always preserved when grinding, without any difficulty. Tools of this nature will be found excellent when work of this kind is to be done.

Small Cutter Heads

When facing small diameters a cutter head is often made up with a bar, either piloted or otherwise, as a single unit. Occasionally the facing tools are inserted in a separate collar, which is pinned to the bar or driven by means of a key. Designs like those shown in Fig. 312 are often made with four flat-blade cutters having their cutting edges on center. The blades are

held in slots and fastened by some convenient method. This variety of facing head is really nothing more than a face mill with inserted blades. It will do good work, but has no particular advantages over the two- or three-blade variety. It takes considerably more pressure to

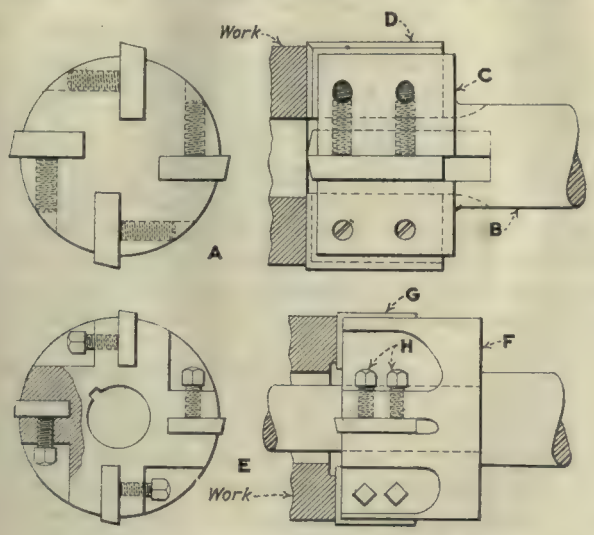


FIG. 312. SMALL PLAIN FACING HEADS

cut, but this is not usually objectionable on small diameters, as the total amount of surface faced is not great.

In the example *A* the bar *B* is enlarged at *C* to give support to the four cutters *D*. The latter are of the flat-blade type set in slots in the bar, and the cutters are finished all over so that they fit the slots accurately. They are held in place by headless setscrews, as indicated. These setscrews may be of the hollow-head type or have slotted heads for use with a screwdriver. There is no fine adjustment to the cutters on this type of head, and the blades must be ground in position in order that they may all cut equally. If this is not done, considerable trouble may be experienced in setting them. The example shows the blades on center, but it is better if they are arranged slightly ahead of center, as previously mentioned.

Another example, shown at *E*, is a head of somewhat similar type except that the member *F* is separate from the bar and the cutters *G* are short. The blades are held in place by means of two square-head setscrews *H*. The collar is milled away to allow ready access to the setscrews. This gives a very neat construction, and one which is inexpensive to manufacture. The blades in this example can be ground in the collar separate from the bar, if desired, but there is no fine adjustment for the blades. Both of these forms are in common use for facing work of small diameters.

There are various methods which can be used for

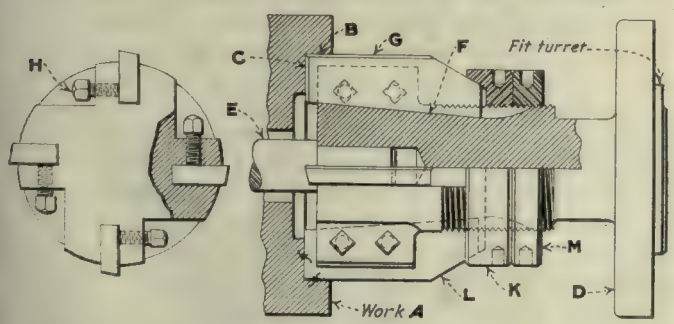


FIG. 313. FACING HEAD WITH ADJUSTING COLLARS

adjusting cutter blades in a facing head. It is always difficult, however, to adjust all four blades so that they cut equally, although very good results can be obtained by making adjustments on the machine and setting each blade out so that it strikes the surface which is to be finished. When using this method, it is necessary to make sure that the faced surface is perfectly true, as otherwise the cutter setting would be incorrect.

In the example shown in Fig. 313 the work *A* is to be cut out at *B* and faced at *C*. The body of the tool *D* is fitted to the turret, and it has a pilot *E* at the forward end in order to guide and steady it during the cutting. The body of the tool is slotted in four places, as shown at F, these slots being cut on a back taper. The tools

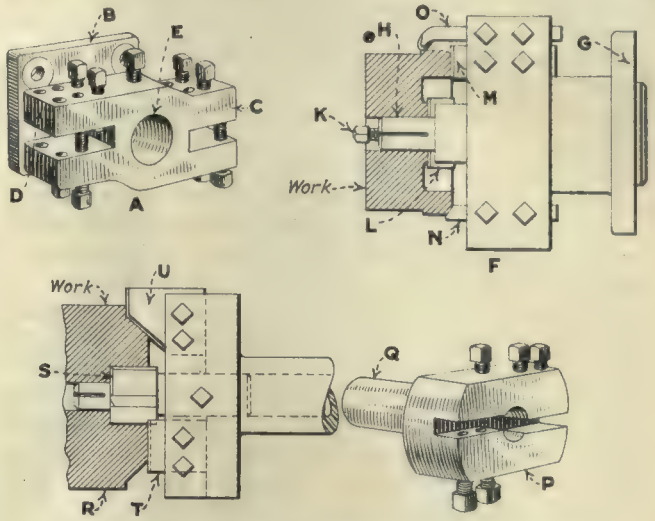


FIG. 314. STANDARD FORMS OF FACING TOOLS

G are flat and are held in place by setscrews *H*. The blades are hardened and ground all over, and are fitted accurately to the slots, so that they have a bearing on the tapered portion. The collar *K* is countersunk at an angle, so that it fits the bevel *L* on the ends of the cutters. This collar can be adjusted until it is in contact with all the blades, thus tending to hold them down and giving opportunity for end adjustment. A suitable locknut is provided at *M*. This type of tool is not in common use, yet there are certain cases where a design of this sort may be found convenient.

Care must be taken on any kind of a facing head that the overhang from the turret is not too great, unless proper support can be obtained by the use of a pilot. Not only must the body of the tool be well supported, but the cutter blades themselves must be held rigidly, and they should not project a great distance in front of the tool body. Various methods of adjustment will suggest themselves to the designer, and the examples given here represent some which have been used with success.

We wish to point out again the importance of placing tools for facing ahead of center, although several of the examples given here show them directly on center. It frequently happens that tool designers do not appreciate the value of the shearing cut, and they place the cutters on center when they could just as well be placed ahead of center and thus obtain a better cutting action. We emphasize this point because it is not always done, and the writers consider it of sufficient importance to mention it several times.

There are a number of standard forms of holders in which cutters can be placed for various kinds of facing

and turning operations. Several of these standard tools are shown in Fig. 314. In the example *A*, the body of the tool *B* is so arranged that it can be attached to the face of the turret. The extensions *C* and *D* are slotted and provided with a number of setscrew holes, as shown, so that one or more cutters can be placed in each side, according to the requirements of the work. A center hole is also provided at *E*, so that a pilot or a boring bar can be used in connection with the facing tools. Opportunities frequently occur in turret-lathe work when a tool of this sort will be found useful; and, as the device is substantially made, it will withstand the strains imposed upon it. It is particularly desirable to use a tool of this sort with a pilot or a piloted boring bar, except in cases when very light cuts are being made and it may be found unnecessary.

An example showing the application of the same tool is given at *F*. The tool body *G* is fitted to the turret, and a pilot *H* is provided. In the end of the pilot a setscrew *K* holds the flat blade cutter *L*, which is here used for facing a boss. The cutter blade *M* faces the flange, and a chamfering tool *N* breaks the corner. In addition, *O* is used for turning the outside diameter, and as all of the tools are used at the same time, the production obtained is exceptionally good.

Another type of tool which can be used for similar work is shown at *P*. It is provided with a shank *Q* which fits the turret of the machine. An application of this tool to a piece of work is shown at *R*. A piloted counterbore *S* is used to finish the pocket. A flat-blade cutter *T* faces the end of the hub, and a chamfering tool *U* cuts out the form and angle as indicated. The advantage of tools of this sort is that they are ready when wanted, and they can be quickly adapted to suit a given condition by the use of flat-blade cutters, boring tools, counterbores and the like. It is often possible to use holders of this kind for work which is to be made up rapidly, leaving very little time to design and build tools of a special nature that might otherwise be required.

British and International Engineering Standards

During the war and the subsequent extraordinary boom of 1919, British buyers at home and abroad at times bought materials and manufactured products based on other than British standard specifications. The whole complexion of the markets has now changed, according to a report from Trade Commissioner Hugh D. Butler, as the manufacturers in this country are looking for new contracts and offer prompt deliveries. Naturally, they are making every effort to procure all contracts let under British auspices, as in the case of the Greenwich power apparatus described later in this article. However, buyers for Indian railways, British Colonies, and British-controlled industries here and abroad, in addition to British sources, now have other European suppliers in the Belgians, Germans, and Swis, who are eager to supply machinery on British specifications in case their own specifications would not be accepted. Heretofore, the manufacturers of these countries have seldom, if ever, manufactured to British specifications. Many American manufacturers and producers of all lines of goods, in the past have been criticized in the markets of the world on account of the fact that they would not manufacture goods on other than American standards and to meet the varying demands of different markets. Of course, it is usually much more expensive for them to manufacture on the basis of other standards, but in somewhat less degree this is also the situation of the nationals of other countries.

A large American manufacturer who was about to make a tender on a contract which included a quantity of steel tubes, went to a tube manufacturer in the United States in order to get his cost for this specialty. British specifications were written into the proposal, and British standards call for quite elaborate tests. The American tube manufacturer in this case was not making these requirements his standard and prudently refused to bid. It is very easy to understand his position, as profitable orders have heretofore proved unprofitable on account of bids offered and accepted under such circumstances.

American manufacturers bidding on apparatus and supplies purchased by British engineers in the future will find that there will be few opportunities to bid unless they are in a position to estimate on the basis of British standard specifications. This will entail careful study of these specifications, and the methods of inspection and testing. In many instances, this study will have to be made in London, otherwise profitable business will not result where American bids are accepted.

Protection for British Manufacturers

Recently there has been a great deal written and spoken in Great Britain about the need for the protection of British markets against unfair foreign competition. The key industries and anti-dumping legislation just passed by Parliament, have been the concrete proposals behind which protectionist sentiment has rallied. In this connection, it is interesting to note that British engineering specifications give varying degrees of protection to British manufacturers depending on the extent to which other nationals have become prepared to meet the demands of these specifications. Of course, as each of the other manufacturing and buying countries has developed its own specifications and standards, British makers are also at a disadvantage when figuring on such proposals.

With the greater development of international trading has come the realization of the fact that international standards should be developed as soon as possible.

A step in this direction was taken last April when the secretaries of the Engineering Standards Associations of the United States, the United Kingdom, Holland, Switzerland Belgium, Norway, and Canada met unofficially in London to lay the foundation for international co-operation in the development of the standards of the future.

One of the purposes of a visit of American steel manufacturers in Great Britain in 1918 was to develop this subject. Also, the International Chamber of Commerce, at the London Congress of that body, proposed that its executive should "get in touch with the different national (standards) organizations with a view to co-ordinating and diffusing the results of their work."

There probably has been further development of international standards in the electrical industry than in any other branch of the engineering trades. The International Electrotechnical Commission was organized in 1906, and has since developed a number of definite international standards adhered to by 20 leading countries.

Compiled in the Industrial Machinery Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.

Practical Helical Spring Calculation

The Essentials of Spring Design—Analyzing Spring Troubles Mathematically—The High Cost of Poor Engineering—Helps for the Designer

By ALEX TAUB
Research Engineer, General Motors Corporation

FOR many years, "helical springs" have been the subject of several interesting and instructive articles, all of which are available for perusal and discussion. In carrying on this work to the extent of adding another article to the list, the object is not to improve upon or disagree with the work already done, but to simplify the mathematical calculations and to emphasize one popular and fast spreading evil, namely: The danger of leaving to the judgment of the spring-maker the predetermination of the working conditions of the spring.

In placing the responsibility for the characteristics of the spring upon the spring manufacturer, an engineer is staking the reputation of his product upon a guarantee that may prove solid but stands an equal chance of being flimsy.

Realizing that the public judges the merits of any car by the service it gives, nothing should be left undone to eliminate cause for complaint. A poor reputation, once gained, is a hard thing to overcome, and although the spring manufacturer may be conscientious to the last degree, his work consists of *manufacturing* springs to the data furnished him, and he therefore cannot be at all times the proper judge of the working conditions or the stress under which the car builders' spring must operate.

TABLE I — TABLE SHOWING COMPARISON OF SPRING CALCULATION, TEST OF ACTUAL SPRINGS, AND FIGURES TAKEN FROM A PROMINENT MAKER'S CHART

	Chart		Actual Spring	Calculated
1.	Deflection	0.1125	0.1125	0.1125
	Stress	47,200 lb. sq.in.	43,800 lb. sq.in.	43,350 lb. sq.in.
	Load	72½ lb.	68 lb.	66.9 lb.
2.	Deflection	0.156 in.	0.156 in.	0.156 in.
	Stress	51,560 lb. sq.in.	47,280 lb. sq.in.	46,810 lb. sq.in.
	Load	64.3 lb.	58 lb.	57.3 lb.
3.	Deflection	0.1356 in.	0.1356 in.	0.1356 in.
	Stress	41,400 lb. sq.in.	26,890 lb. sq.in.	27,890 lb. sq.in.
	Load	71½ lb.	66 lb.	66.8 lb.

Checking Spring-Maker's Figures

Recently the writer was asked to check the figures making up a spring chart that was published and distributed by a large manufacturer of springs. The figures incorporated in the chart were offered as a basis for calculation and selection of springs. Table I shows a chart of results of part of this check. In each instance a certain spring was taken from stock, the characteristics were taken from actual test of the spring, the dimensions were noted and calculations made with them as a basis. The same dimensions were then used to select characteristics from the spring chart. An examination of the table will prove my contention that spring makers' figures are not always dependable.

So much for a direct comparison. Now, place this spring chart in the hands of the average designer. He will naturally make his selections in all faith, trusting the springmaker's figures as being above suspicion. But it so happens that this particular spring chart has based its calculations on stressing of springs from 90,000 lb. per square inch to 120,000 lb. per square inch. Since 60,000 lb. per square inch is practically the limit for stress for any helical spring of regular spring stock, and further, since there are springs that should not be stressed over 40,000 lb. per square inch, it is quite obvious what must happen to springs selected promiscuously from such a chart.

The writer here wishes to offer full apologies to certain spring manufacturers that he has knowledge of, who do not come under the above category. There are some manufacturers who are to be congratulated on the quality of the springs they place on the market and the excellent service their factories render—due to their knowledge of their product.

It is, however, a doubtful practice under any condition to place yourself in the hands of your source of supply, accepting a product on which depends performance and reputation, without adequate consideration. Springs should be designed to function indefinitely; yet without knowledge of the stress, not even a rough estimate of its life can be made. The argument is advanced by engineers that should all possible dimensions be placed on the drawings, the spring manufacturers could furnish springs that were up to specifications as far as the inspection department could be capable of proving, but they might have been spoiled in heat-treating and yet have to be accepted by the buyer, since they were up to specifications.

But suppose that the safe working stress were placed on the drawing in the form of a note such as "This spring must be capable of withstanding a fiber stress of 50,000 lb. per square inch." Assuming that the working stress was 45,000 lb., this would give the engineer a margin of safety and still be lacking of hardship to the spring manufacturer. There can be no question as to extra charges for living up to this stress, since all that is required of him is to elimniate faulty heat-treating, which is absolutely his affair; also, he will wind springs without twisting the wire, which is strictly his business too. With these points taken care of, there con be no question as to springs being satisfactory to engineer, manufacturer and ultimate user.

Spring calculation, like all of the other engineering calculations, can be carried to the extreme. It can be made worthy of the attention of a mathematical professor or it can be arranged to suit the simple drafting room conditions. It is to be regretted that engineers generally "lean" to extremes. Their calculations must be based on minute derivations to satisfy themselves or calculation is entirely omitted. The writer has endeavored here to bring the practice of spring calculation down to the most practical basis, and in the event where "time is the essence," Table II and the charts (Figs. 1 and 2) will suffice, as they have been worked out with the formulas later referred to as a basis, and thoroughly checked. These charts are being used as a standardized method of obtaining spring data by several different engineering organizations, some of which are among the largest in the country.

In introducing spring calculation, I will place these data before you in such a manner as to make evident the advantage of their use and the disadvantage of their omis-

sion, by relating actual instances of spring troubles and their elimination.

Our first instance refers to a large engine manufacturing plant which received a complaint from their largest customer to the effect that an oil pump plunger

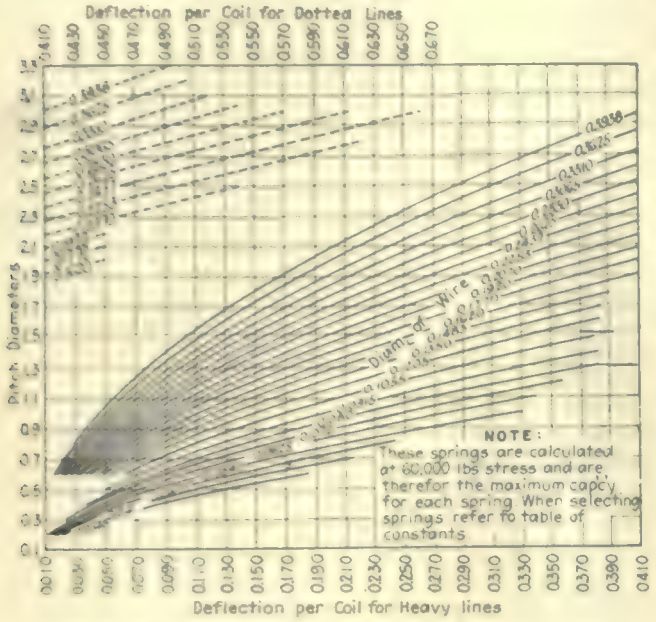


FIG. 1. MAIN CHART FOR SPRING CALCULATION

spring was giving a good deal of trouble, and that breakages amounting to 25,000 had up to that time been recorded. Investigation of this condition, which was made by the writer, brought to light the fact that the drawing from which the spring was made was void of all controlling data. Therefore, in order to define the trouble, it was necessary to procure a sample of the springs used and obtain the data direct.

The free length of the sample spring was 1.225 in.; the length at the maximum compression was found to be 0.725 in.; then obviously the spring was deflected a total of ½ in. There being four effective coils, the deflection per coil was 0.125 in. Other dimensions that it was necessary to obtain before proceeding with the investigation were: the outside diameter, which was found to be 1⅛ in.; and the diameter of the wire, which was 0.091 inch.

Then, with:

F = Deflection per coil.
S = Stress.
W = Load.
G = Torsional modulus elasticity (10,500,000).
D = Outside diameter of coil.
d = Diameter of wire.

Then:

$$W = \frac{F.G.(d)^4}{8(D-d)^3}$$

Transposing values, we have:

$$W = \frac{0.125 \times 10\frac{1}{2}m \times (0.091)^4}{8 \times (0.8125 - 0.091)^3} = 30 \text{ lb.}$$

Therefore, working load of spring = 30 lb.
Hence, stress is:

$$S = \frac{W(D-d)}{0.3927 \times (d)^3}$$

Transposing values, then stress equals:

$$S = \frac{30 \times (0.8125 - 0.091)}{0.3927 \times (0.091)^3} = 73{,}143 \text{ lb. per square inch}$$

Here was the seat of the trouble, since the spring was obviously over-stressed, regardless of function; and when the actual operating conditions are taken into consideration, this point becomes doubly apparent. The conditions were: operating in oil, actuating at every revolution of the camshaft as a valve spring; and since a spring of this actuation should not be stressed above 45,000 lb. per square inch, the reader will agree that the engineer guilty of omitting calculation of stress in this spring was responsible for all breakages. Ten minutes' calculation would have saved the cost of the springs, the labor of the assembling—which was probably several times more than the cost of the material—also the tie-up of cars for the period over which the pumps were out of commission; and last, but not least, the jeopardizing of the car manufacturers' reputation.

The reader will note the emphasis placed upon the spring working in oil. This might appear as an advantage, whereas actually such a condition can be a distinct disadvantage as acid and other foreign matter within oil speedily reduces the resiliency of springs. Hence, springs actuated with a high frequency, when made from steel wire and operating in oil, should of necessity be copper-plated.

To get back to the investigation, we have so far analyzed the cause of failure and have proved the source of the trouble. Now let us design a spring that will be minus the discrepancies that existed in the former spring. Since the faulty spring had a diameter of wire of 0.091 in. and under the conditions was stressed to 73,143 lb. per square inch, and since stress varies as

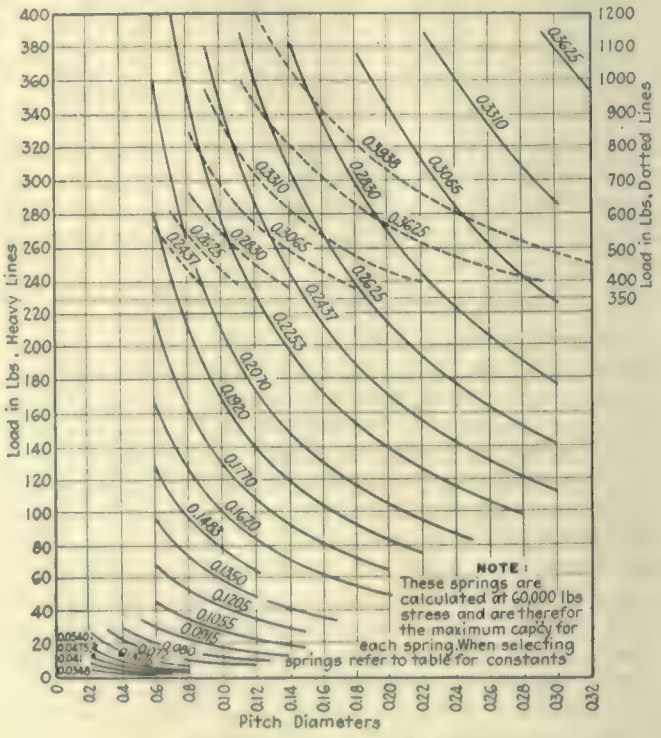


FIG. 2. LOAD CHART

the cube of the diameter of wire, a slight increase in the diameter of the wire should be sufficient. We will then increase the wire from 0.091 in. to 0.1055 in., and since in our particular instance we can increase our outside diameter slightly, we will assume the known dimensions of our spring to the 0.1055 in. diameter of

wire and $\frac{37}{32}$ in. outside diameter of coil with four and one half effective coils. The change from four effective coils to four and one half being made to insure sufficient length of spring a minimum deflection.

With a load of 30 lb., then stress is:

$$S = \frac{W(D-d)}{0.3927 \times d^3}$$

Transposing:

$$S = \frac{30 \times (0.844 - 0.1055)}{0.3927 \times (0.1055)^3} = 48{,}500 \text{ lb. per square inch.}$$

Although this is a fair stress, the load for a plunger pump is unnecessarily high.

Therefore:

If 48,500 = 30; then 45,000 = 28½ lb.

Hence, we will change the load to 28½ lb.; then stress equals 45,000 lb. per square inch. This latter being a fine working stress.

Then:

$$\text{Deflection per coil} = F = \frac{W(D-d)^3}{G \times d^4}$$

Transposing:

$$\frac{28.5 \times (0.844 - 0.1055)^3}{10\frac{1}{2}\ M \times (0.1055)^4} = 0.068 \text{ in. per coil.}$$

Then free length of spring equals:

Compressed length plus total deflection =

$$0.725 + (4\tfrac{1}{2} \times 0.068) = 1.032 \text{ in.}$$

Therefore, the specifications for an ideal spring for the above condition are as follows:

Diameter of wire	0.1055 in.
O.D.	$\frac{37}{32}$ in.
Number of effective coils	4½
Compressed length (When under load of 28½ lb.)	0.725 in.

In addition to the above specifications, the following note should be added: "This spring must be capable of withstanding *stress of 50,000 lb. per square inch.*" Sample springs were made to these specifications, tried out and found satisfactory.

Results of Poor Engineering

Having given an instance of the advantage of mathematically analyzing springs to determine fundamentals, we will illustrate the advantage of mathematical analysis of springs to determine upon the design of adjacent parts. It is quite often the case where the dimensions of spring aperture or cage have been arbitrarily determined upon that the working condition of the spring will be hopelessly complicated. An actual instance follows: It was desired to install a very simple plunger type of oil pump for a small engine, the pump being actuated by a cam and spring. The diameter of the plunger was arbitrarily set at $\frac{5}{8}$ in., necessitating a stroke of $\frac{1}{8}$ in. in order to obtain the required displacement. The housing containing this pump was designed for minimum weight, permitting a maximum outside diameter of $\frac{13}{32}$ in. for the spring.

The engine was built; the spring being considered a small detail, was just "wound up" and assembled in place. The result was a broken connecting rod, due to seizure of the wrist pin, brought about through breaking down of the lubricating system, and this latter was caused by breaking of the spring. Although several replacements were made, no better results were obtained. A spring with a maximum load of 10 lb. and a minimum load of 3 lb. was desired. The dimensions arbitrarily set in design but forced on the spring were as follows: Maximum $\frac{13}{32}$ in. outside diameter and minimum of $\frac{1}{32}$ in. inside diameter. The initial compressed length being set at 1 in. and the maximum compressed length being $\frac{5}{8}$ in. The spring used was made from wire of 0.040 in. diameter, $\frac{1}{32}$ in. inside diameter of coil and seven effective coils.

Hence, the stress was:

$$S = \frac{W \times (D-d)}{.3927 \times d^3}$$

Transposing:

$$S = \frac{10 \times (.344 + .040)}{.3927 \times (.40)^3} = 154{,}000 \text{ lb. per square inch.}$$

The cause of failure of the above spring is obvious and it can readily be seen that had the above calculation been made, this spring would not have been used. A wire of greater diameter was necessary. Now, let us take the largest diameter of wire that can be used without interfering with working conditions, this being 0.054 in. Then with $\frac{1}{32}$ in. inside diameter and 0.054 in. diameter of wire, the outside diameter will be 0.452 inch.

Another point that must be considered is the number of coils, and in this case it is necessary to obtain the maximum. Since the maximum compressed length has been arbitrarily fixed at $\frac{5}{8}$ in., the number of effective coils will be eight. Allowing one and one half coils for closed ends, the length of spring will be .513 in., giving approximately, 0.007 in. clearance between coils at minimum working length. This is certainly close enough; in fact, it is hardly practical.

The stress is:

$$S = \frac{W \times (D-d)}{.3927 \times (d)^3} =$$

Transposing:

$$S = \frac{10 \times .416}{.3927 \times (.054)^3} = 53{,}430 \text{ lb. per square inch.}$$

A stress of 53,430 lb. per square inch is surely high; but with the small diameter wire, this might pass, although we have approached the ragged edge of safety.

$$\text{Deflection per coil} = F. \quad F = \frac{8 \times W \times (D-d)^3}{D \times (d)^4}$$

$$\text{Transposing: } F = \frac{8 \times 10 \times (.416)^3}{10\frac{1}{2}\ m \times (.054)^4} = 0.0645 \text{ in.}$$

Free length = Maximum compressed length +

$8 \times 0.0645 = 0.5625 + 0.5160 = 1.0785$ in.

Total length of spring at initial compression has been arbitrarily set at 1 in. in design of adjacent parts. Then

$$\text{deflection per coil at initial position} = \frac{1.0785 - 1}{8} = .0098 \text{ in.}$$

$$\text{The initial load} = \frac{10 \times .0098}{.0645} = 1.52 \text{ lb.}$$

This is positively the best spring that could be fitted into the space alotted, but it is unsatisfactory as we know that it is highly stressed for a spring actuated at camshaft speed; also there is insfficient clearance between coils in maximum compressed position, and the spring has an initial load that is too light to overcome the inertia of the moving parts and body of oil to be raised.

Now let us revert to the original designing of the housing containing the plunger. From the foregoing,

it is obvious that the diameter of wire should be increased in order to obtain a better working stress; further, there will be an advantage gained in decreasing the stroke of the plunger by increasing the diameter slightly. This will permit of a greater deflection per coil at the initial position. It will also be advisable to make provision for a greater number of coils and additional clearance between coils at the maximum compressed position.

Assuming the diameter of the wire to be 0.0625 in. instead of 0.054 in., and as this will increase the outside diameter, provision should be made in the housing for so doing, and allowance should also be made for an increased size of plunger. Then assuming the size of the plunger to be $\frac{3}{4}$ in. in diameter, which will decrease the stroke to $\frac{5}{16}$ in., we have an inside diameter for the spring of $\frac{13}{16}$ inch.

Then:

$$S = \frac{W \times (D - d)}{0.3927 \times (d)^3}$$

Transposing:

$$\frac{10 \times (0.406 + 0.0625)}{0.3927 \times (0.0625)^3} = 48{,}500 \text{ lb. per square inch.}$$

$$\text{Deflection per coil} = F = \frac{8 \times W \times (D - d)^3}{G \times (d)^4}$$

Transposing:

$$\frac{8 \times 10 \times (0.468)^3}{10\frac{1}{2} \text{ m} \times (0.0625)^4} = 0.0512 \text{ in.}$$

Assuming the number of effective coils to be ten and the number of dead coils for closing to be two, clearance between coils to be $\frac{1}{16}$ in.; then the maximum compressed lenth =

$$10(0.0625 + \tfrac{1}{16}) + 2 \times 0.0625 = \tfrac{13}{16} \text{ in.}$$

Hence initial length:

Maximum compressed length + stroke of plunger

or: $\frac{13}{16} + \frac{5}{16} = 1\frac{3}{16}$ in.

Free length of spring =

Deflection per coil + Number of effective coils + Maximum compressed length or:

$$(0.0512 \times 10) + \tfrac{13}{16} = 1.418 \text{ in.}$$

And deflection per coil at initial compressed length =

$$\frac{1.418 - 1.2187}{10} = 0.01993 \text{ in.}$$

$$\text{Load at initial compressed position} = \frac{10 \times 0.0199}{0.0512} = 3.9 \text{ lb.}$$

Summing up the results, and also the changes made to accomplish them, we have: increased diameter of plunger, shortened stroke of pump, increased clearance around spring; and we have provided for a spring $\frac{3}{32}$ in. longer in maximum working length. Also, we have designed a spring with a better working stress, a practical working clearance between coils and a sufficient working tension in the initial position to adequately perform its function. Had proper consideration been given to the spring at the outset, many unhappy moments would have been spared.

Table II incorporates an actuation chart that gives recommendations for various safe stresses for different functions.

Use of Spring Chart

The spring charts, Figs. 1 and 2, were evolved with the idea of eliminating as much as possible of the labor attached to spring calculation and to surround the various points that create poor design in springs, thereby removing this source of trouble and yet permit of an intelligent and safe selection of springs. Springs included in these charts cover every size of wire under the Washburn & Moen gage, which is the gage used for spring steel wire. Further, these charts have been calculated for every pitch diameter in tenths, from two tenths up to three and two tenths. (0.2 to 3.2). Practically every possible spring has been calculated individually under the above formulas and all springs included in these charts are calculated on a basis of 60,000 lb. stress, which is safe for ordinary steel springs.

TABLE II.—TABLE SHOWING WORKING STRESSES FOR DIFFERENT CONDITIONS

Type	Actuation	Stress, Lb.
Valve spring	Continuous and sudden increase and decrease $\frac{1}{16}$ up to $\frac{1}{4}$ in. dia. wire	40,000–45,000
Plunger spring	Continuous and rapid increase and decrease $\frac{1}{16}$ up to $\frac{1}{16}$ in.	45,000–50,000
Retracting springs	Increasing and decreasing at long intervals, $\frac{1}{16}$ up to $\frac{1}{4}$ in.	50,000–55,000
Anti-Rattlers	Continuous pressure, stationary $\frac{1}{16}$ to $\frac{1}{16}$ in.	55,000–60,000
Anti-Rattlers	Continuous pressure, stationary $\frac{1}{16}$ to $\frac{1}{4}$ in.	50,000–55,000
Clutch spring	Increasing and decreasing at long intervals, $\frac{1}{16}$ up to $\frac{1}{16}$ in.	40,000–45,000
Clutch spring	Increasing and decreasing at long intervals, $\frac{1}{16}$ up to $\frac{1}{16}$ in.	45,000–50,000
Carburetor spring of music wire	Increasing and decreasing from "0" to No. 14 W.M., 0.0326 in.	60,000–70,000

Assuming that a spring capable of giving a maximum load of 50 lb. is desired to be used as a retracting spring. The actuating chart in the corner of the main chart (Fig. 1) shows that 60,000 lb. stress is O.K. for this type of spring. Therefore, from the load chart (Fig. 2) we find that the 50 lb. line intersects wire line 0.1205 in. (diameter of wire) at a point corresponding to 0.83 in. pitch diameter. If this diameter is too small and a greater pitch diameter is desired, we find that a 50-lb. line would intersect 0.1350 in. (diameter of wire) at 1.16 in. pitch diameter. Or if a still larger pitch diameter was desired, we find that the 50-lb. line intersects 0.1483 in. at 1.55 in. pitch diameter. However, if these pitch diameters are all too large, we find the chart does not show a spring for this load of smaller pitch diameter than 0.82 in., therefore, we could use a spring of 60-lb. maximum capacity which we find will be 0.1205 in. at 0.7 in. pitch diameter. However, we would only deflect this spring five-sixths of its total or charted deflection and the stress would be proportionately less, stress being:

$$\frac{60{,}000 \times 50}{60} = 50{,}000 \text{ lb. per square inch stress.}$$

It is well to state here that a wire of 0.1205 in. diameter wound at 0.7 in. pitch diameter, is an undesirable spring, as this small diameter is somewhat difficult to manufacture in this size wire. For this reason, where load cannot be selected direct from chart without reproportioning, dimensions should not be used unless necessary, as they will be found in every instance to form a costly spring, this point being one of the advantages of this chart.

The Factor of Efficiency

Especially does this appear true when efficiency is taken into consideration. If the safe load of this spring would be 60 lb., then when only used to 50 lb. this spring would not be used to its maximum ability and therefore would be only 84 per cent efficient. Now, assuming that for the 50 lb. spring the 0.83 in. pitch diameter and 0.1205 in. wire fitted our conditions, then turning to deflection chart we find that 0.83 in. pitch diameter intersects curve 0.1205 in. wire at 0.103 in.

deflection, for deflection per coil. However, this deflection is for the maximum load for this spring, which was 60 lb. Therefore, deflection per coil at 50 lb.:

$$F = \frac{50 \times 0.103}{60} = 0.086 \text{ in.}$$

Then total deflection = 0.086 in. times number of effective coils. We will assume that the number of effective coils is ten.—Thus the free length of spring can be readily obtained, which will be 0.086 × 10 = 0.86 in. Plus 10, times the diameter of the wire, since at least this much must be incorporated in the spring to obtain ten effective coils, this will give a total of 10 × 0.1205 in. plus total deflection which is 0.86 in. Thus we have a total of 2.065 inches. Now, if the ends of the springs are closed and ground, at least one and one-half diameters must be allowed for dead wire, which will bring the total to 2.246 inches.

Under the above conditions, the spring would be closed when under maximum load; that is, there would be no clearance between coils. As this is not practical, we must now add to the total the amount of clearance per coil times the number of coils. Assuming that $\frac{1}{16}$ in. per coil is to be allowed, which is ample, then we have as length of spring 2.246 in. plus 10 × $\frac{1}{16}$, which gives us a total free length of spring of 2.870 or $2\frac{7}{8}$ inches.

Then we have as spring data for a particular spring:

50 lb. load.
50,000 lb. stress (to be used as a retracting spring).
0.1205 in. diam. of wire.
0.830 in. pitch diam. of coils.
0.086 in. deflection per coil.
$2\frac{7}{8}$ in. free length of spring.

And a maximum compressed length of spring:

$2\frac{7}{8}$ in. minus total deflection, which equals
$1\frac{7}{8}$ inches.

These data are absolutely complete, giving the designer knowledge of every possible function and factor that is necessary in spring design. Where an open-end spring is to be used, one-half diameters should be allowed for dead metal, for at least this much will be ineffective. Where an extension spring is to be used, no allowance need be made.

It will be noted that the charts have a series of dotted curves in addition to full curves. The dotted curves as designated represent the heavy-duty wires for loads very seldom used. However, procedure for selecting springs will be similar to the procedure in selecting springs from full lines.

I desire to draw attention to the chart in the corners of the main charts that describe the actuation of the spring to be designed. In designing the valve spring, which requires the greatest attention, the stress to be used is 40,000 lb. Since the chart is calculated on the basis of 60,000 lb. stress, a spring must be selected that is 50 per cent or more greater than the load desired. In other words, if it is desired to select a valve spring capable of a maximum load of 80 lb., a designer will select a spring from chart for 80 plus 40, which is 50 per cent of the original, thereby obtaining 120 lb. Then proceed as above on chart. This will give a pitch diameter of 1.1 for a diameter wire 0.177 inches.

If a larger pitch diameter is desired, select from wherever the load line intersects the diameter wire line. For instance, it will be noted that 1.1 in. is a rather small diameter for this size of wire and it might be desirable to use a diameter of 1.3 in. As will be noted, this pitch diameter line intersects the 0.192-in. wire line at 130 lb. load. This would mean that if this spring was used for 80 lb. a greater factor of safety would be obtained and therefore a somewhat better spring. The greater the factor of safety, or, in other words, the smaller the stress of a valve spring, the greater the life of the spring and the greater speed and rough usage it will stand without breakage.

A similar ruling holds good for plunger springs, which, being of a smaller diameter, can be stressed somewhat higher. When selecting a plunger spring, a load 33 per cent or more greater should be selected, thus obtaining stress of 45,000 lb. In selecting a pitch diameter, it would be well to select such a one as would decrease this stress rather than increase it.

There is a further notation made in regard to clutch springs. These springs are generally of the heavy duty type and should be so constructed as to outlive any other portion of the clutch. This condition will be obtained if stress of 50,000 lb. is not exceeded, which means that when selecting clutch springs, a load 20 per cent greater than load desired should be chosen, thereby obtaining the necessary 50,000-lb. stress. In selecting pitch diameters, a smaller stress should be favored.

Modern Implements in Colombia

Small amounts of farm machinery are being successfully introduced into Colombia, according to a report received recently from vice consul Edmund B. Montgomery, Barranquilla, Colombia. Modern plows are in fairly general use in the region of the Cauca Valley, and a number of farm tractors are also being used. Due to difficulties of transportation and communication, information is not available as to the attitude taken by the farmers toward these tractors, nor as to their success in using them.

Colombia is essentially an agricultural country and the government is making every effort to develop the farming resources of the country. There is a tendency to increase the area of land under cultivation and on the whole the farmers are better off than they were in 1914. However, farming methods have always been primitive and farm labor is plentiful and seems to be increasing. These factors will undoubtedly tend to prevent the introduction of modern agricultural machinery on a large scale for some time to come.—*Commerce Reports.*



Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Taper Gages

By H. M. Funnell

When manufacturing component parts that have taper holes and taper shafts, it is important to have a system of gages arranged so that a quick check for accuracy of the gages can be obtained at any time.

The tapers considered in this article are the S.A.E. standard tapers 1, 1⅛, 1¼, 1⅜, 1½ and 1¾ in., maximum diameter, but the same system can be applied with variation to similar work.

The gage for the taper hole as shown at *A*, Fig. 1, is a taper plug made so that wear can be compensated for by regrinding the limit edges, also change in limits can be taken care of by the same means, whether the limits are increased or decreased by regrinding the taper or limit edges accordingly.

The conventional taper gage as shown at *B* is inflexible, and can be easily spoiled in the making by grinding a trifle small, as with a taper of 1½ in. per foot, the lateral movement is eight times the change in the diameter; that is, 0.0005 in. on the diameter would mean 0.004 in. on the face or end of the taper gage.

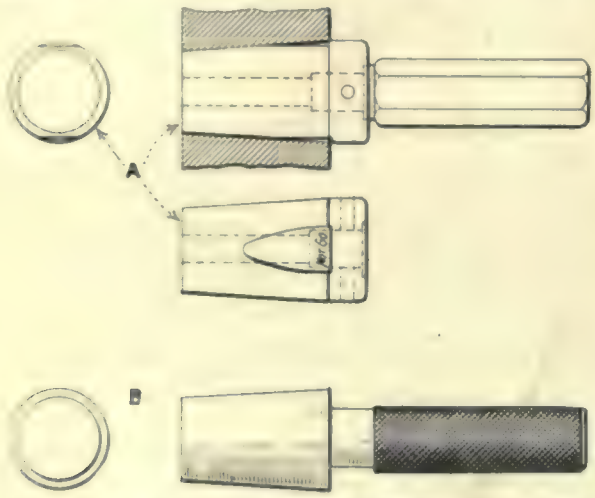


FIG. 1. IMPROVED AND CONVENTIONAL TAPER PLUG GAGES

Referring to *A* the body of the gage is simple to make and finish, because the accuracy is determined by making the lateral movement a function of the diameter, thus decreasing the error by one-eighth. Also, the final grinding of the limit faces is done on a surface grinding machine equipped with a fine feed, so that cuts of 0.00025 in. are easily obtained in the lateral direction of the gage.

The finishing operations of this gage are: (1) Grind the parallel diameter to maximum size ± 0.001 and square up the handle end at this setting so that this end can be used on the magnetic chuck of a surface grinding machine; (2) grind taper so that it coincides with the parallel surface approximately at the mill cuts; (3) grind limit edges to suit the master receiving gage; (4) insert handle and crosspin.

When using this gage a dark line is shown when the limit edge is out of the hole, but if it passes into the hole, no line is visible. This makes it much easier to use.

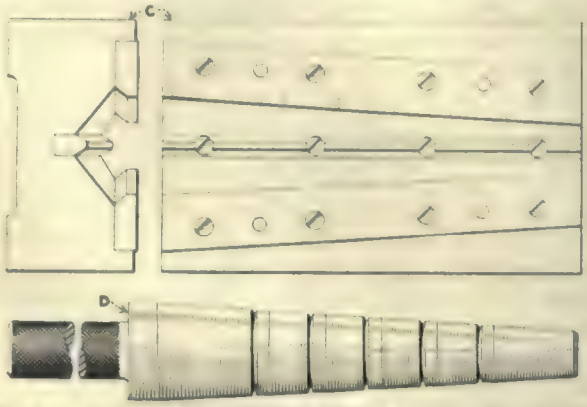


FIG. 2. MASTER RECEIVING GAGE, AND PLUG GAGE FOR CHECKING IT

The master receiving gage for the taper plug is shown at *C* in Fig. 2, and is a base of cast iron machined all over, with three hardened and ground steel inserts, and has lines etched on one of the inserts to which the high or low limit edge of the plug gage must correspond. This should be noted on the gage drawings to avoid any confusion.

The plug shown at *D* is the master plug for checking the receiving gage *C* and also for establishing the etched lines in the first place. This plug should have marked on it whether it is made to high or low limits. This plug is easily made and quickly checked. The short parallel diameters shown must be held closely to size, but this is easily controlled on the grinding machine. After the parallel diameters have been finished, they should be discolored by a weak solution of acid or copper. Then grind the taper, and the junction of the taper and the parallel surfaces will be the maximum diameter to the high or low limits according to which has been decided upon. The discoloring of the short surfaces helps to define the junction much more clearly. Should regrinding become necessary at any time, all the junction points will merely move up a little, but they will all be correct by simply grinding the taper.

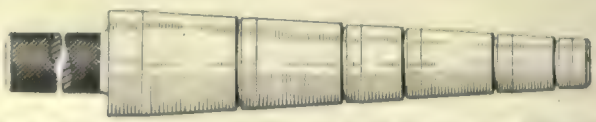


FIG. 3. MASTER PLUG GAGE FOR TOOLROOM AND INSPECTOR'S USE

The following gages should be made:

Two master receiving gages as at *C*, Fig. 2; one for the toolroom and one for the chief inspector's use.

One master gage as at *D;* this gage to control the two master receiving gages.

Two master gages similar to that shown in Fig. 3, with sizes suitable for working-ring gages; one for tool-room and one for inspector's use.

With this equipment any working gage, taper plug or taper ring can be checked quickly, and in case of doubt being thrown on the master, the checking of the master plug is easily done by micrometer or with a measuring machine and a sine bar.

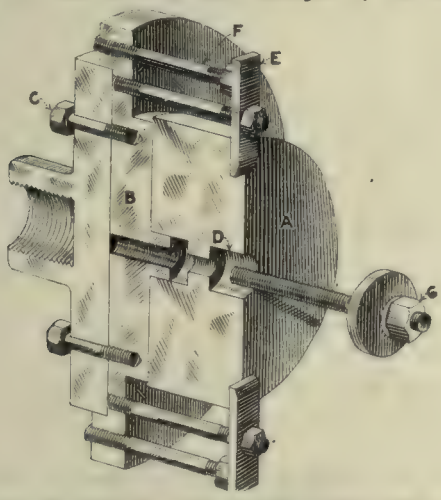
Lathe Fixture for Finishing Round Work All Over

By Charles Dorsch

Some cast-iron rollers were to be finished all over and counterbored from each side, as shown at *A* in the illustration, to receive bearings. As the finished pieces must run true, it would have been impracticable to hold them on an arbor in the usual way because of the small diameter of the central part of the hole and the difficulty of making the second counterbore in exact alignment with the first.

The pieces were first roughed out by holding them in a chuck and turning as far as the jaws would allow, the outer face and one counterbore being finished at this setting. The piece *B* was then fitted to the faceplate of the lathe and secured by the screws *C*. The hub *D* was turned to a close fit for the already finished counterbore.

The pieces were then wrung on the hub and fastened by means of the screws and clamps *E*, the screws *F*



JIG IN WHICH THE WORK WAS HELD

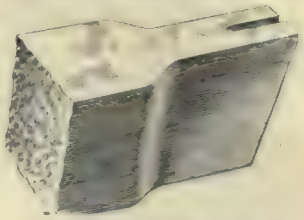
acting as heels, or blocks, for the clamps. After finishing the second counterbore and a portion of the exposed face, the screw *G* was passed through the bore into the hub *D*, which was tapped to receive it. The straps and bolts *E* and *F* were then removed from the faceplate and the machining completed. A very satisfactory job was obtained.

Easing the Pressure on a Cutting-Off Tool

By Clarence B. Coe

Every mechanic who uses a cutting-off or parting tool, knows what trouble they sometimes experience, especially in deep cuts, because of the tendency of the tool to dig in or tear the sides of the cut, often breaking the tool or distorting the work.

I find that a narrow groove ground in the edge, as shown in the illustration, will eliminate the trouble to a great extent and permit a faster speed and feed to be used, with less grinding. A groove about $\frac{3}{32}$ in. deep, gave the best results on a tool $\frac{1}{4}$ in. wide.



CUTTING-OFF TOOL DESIGNED TO REDUCE PRESSURE

My theory is that with a flat surface on the tool an extra heavy chip is a little wider than the cut itself, and the friction against the sides of the cut causes an extra strain on the tool and forces it still further into the metal until something gives away. With the groove in the tool, the chip removed is the same shape as the top of the tool. The groove in the chip will allow it to be compressed into the narrower cut before there is friction enough to cause extra strain on the tool.

Punch and Die Design

By Elam Whitney

Referring to the article on "Punch and Die Design," published on page 773, Vol. 55, of American Machinist, attention is called to the custom of designers showing the part after being formed, necessary information regarding the condition of the work previous to this operation being omitted. The writer has often been confused and put to unnecessary expense because of these omissions, especially on forming dies for work on which a previous forming operation had been performed. On these dies work clearance is often overlooked until after the punch and die have been hardened.

The large typewriter and adding machine companies for some years past have made it a practice to illustrate and dimension the blank size and various stages of forming and drawing operations on the part drawing, thus providing for this information being kept up-to-date when changes are made on the part. No part dimensions are given on the design of the punch and die, and allowances for shaving and trimming are called for on the part drawing.

Dimensions of work before bending and forming are computed as accurately as possible, reference being made to data accumulated in years of practice and having reference to size and quality of stock. Final corrections are made on the part drawing after completion of the punch and die and these seldom amount to more than 0.001 or 0.002 inch.

Micrometer Stop Attachment

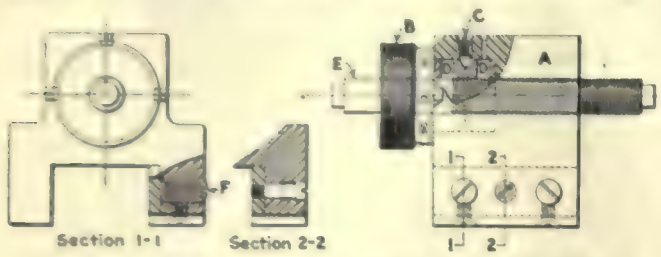
By J. J. Sherman

It is very difficult to do an accurate machining job on a machine not equipped with micrometer adjustment. The writer had a proposition of this kind put up to him some time ago, and to meet the need designed the attachment shown herewith. It will be seen that with slight modification this stop can be made adaptable to a number of different machines, lathes, planers, boring mills, etc.

The one shown is for a boring mill, and consists of a tool steel body *A* tapped for ten threads per inch and counterbored to receive the neck of the dial knob *B*. The cone point screw *C* fitting in the V-groove makes a snug, and at the same time a loose running, fit pos-

sible. The pins *D* act as a key in the keyway of stud *E* which slides in the hole through the knob. The dial is graduated to 100 parts which in combination with the 10-pitch screw gives direct reading in thousandths. A vernier could readily be added if thought desirable. Three zero lines are provided to make the device adaptable to any position.

The clamping plate *F* is held in place by the fillister head screw and is clamped by the headless setscrews



MICROMETER STOP FOR LATHE, PLANER, ETC.

G. The clamping plate may be made according to the design of the crossrail or ways on the machines to which the fixture is attached.

In operation, either end of the screw can be brought up against the head or carriage and the device clamped. Then the screw is backed off the required amount and the carriage brought to meet it. Or, if movement in the opposite direction is desired, the carriage is moved, keeping the screw against it by turning the knob.

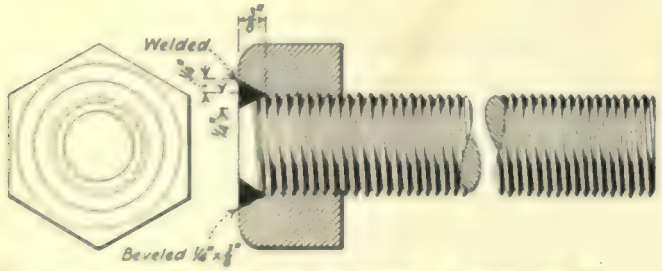
Making Bolts With Threads Clear to the Head

BY TOM MATEER

Recently we had to produce quite a large number of bolts 1½ in. in diameter and 9 in. long that had to be threaded right up to the head, and the job called for the screwing of these bolts up through a bed plate to make a water-tight fit between the bolt heads and the plate.

It was impossible with our dies to make a good job of these bolts without recessing them and also running them over with a die-nut. This all took time and the result did not look right.

I took bars of 1½-in. cold rolled stock, threaded them the full length, cut them off in suitable lengths for the bolts and beveled one end, as shown in the sketch. Standard 1½-in. hexagon nuts were countersunk to match, run on the threaded pieces until they were flush, and



HEADING A BOLT BY WELDING A NUT ON IT

welded in place. The welding took about three minutes each.

They were better looking bolts than were produced by the other method and cost only about half as much to produce, besides the saving in stock.

Formula Used in Milling Cutter Design

BY CARL H. BRIGGS

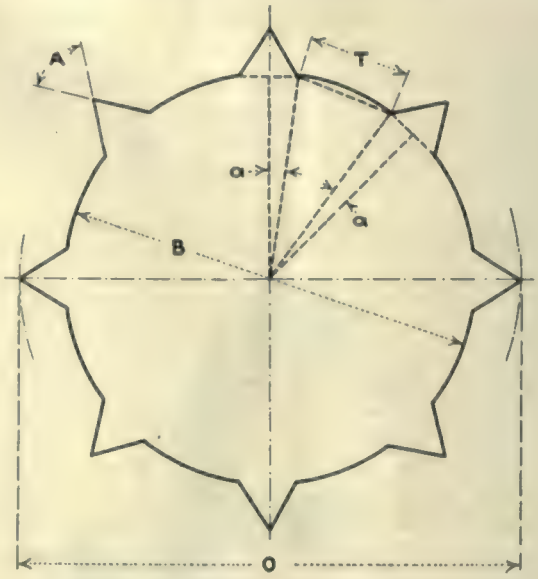
The accompanying illustration represents the cross-section of a serration broach used in broaching the V-shaped grooves in small metal rings. The teeth in these broaches are milled to the V-form with special form-milling cutters.

It will be apparent that the accuracy of the outside diameter *O* of the broach, depends largely on the accuracy of the dimension *T* of the milling cutter. This dimension may be readily computed by means of the following formula:

$$\sin.\left[\frac{180^\circ}{N} - a\right] B = T. \quad \text{(Where } N = \text{number of teeth)}$$

$$\therefore \text{And sine } a = \frac{\left(\tan \frac{A}{2}\right)\left(O - B\right)}{B} \text{ approximately.}$$

This formula has been used quite frequently by the writer in connection with broach design, but it will be quite apparent to the reader that it is capable



SECTION OF BROACH

of a more general application and for this reason should be of value to the readers of AMERICAN MACHINIST.

While the formula is close enough for ordinary practice, if absolute accuracy is desired, the sine of *a* should be found by the following formula:

$$\text{Sin } a = \frac{\left(\tan \frac{A}{2}\right)\left[(O - B) + \text{versin } a\right]}{B}$$

Tapping With a Bent Tap—Discussion

BY MILTON WRIGHT

On page 857, Vol. 55, of AMERICAN MACHINIST, there is an article by C. W. Frank describing a device for the continuous tapping of small nuts by means of a bent tap, and suitable mechanism for holding and rotating the nuts. It may interest your readers to know that such a device has been on the market for several years and that taps in all sizes up to ¾ in. are supplied by many of the larger tap and die manufacturers.

EDITORIALS

Save the Air Mail

IT IS ALMOST unbelievable that the Appropriations Committee of the House of Representatives of the great United States of America makes no provision for continuing the air mail service, but such is the case. The amount asked for is about 5 per cent of the cost of a battleship and is insignificant when its effect on a new and growing industry is considered.

Everyone with any semblance of vision knows that aviation has come to stay, but that it must be encouraged and developed. After less than four years the U. S. Air Mail is acknowledged to be the most successful air service in the world.

It is apparently up to the Senate to put the air mail budget back in the appropriation bill. For back it must go, in some way or other; unless we are ready to acknowledge to the world that we are willing to retard aircraft development.

Aircraft development has many possibilities as to adding another great industry to our list of mechanical achievements. Whether or not it will ever equal the automobile industry time alone will tell. But only those utterly devoid of vision can fail to believe that it will grow to large proportions. Whether this growth is rapid or unduly retarded depends largely upon continuing the air mail service.

Every citizen, business man or otherwise, who wants to see this country take its rightful place in aviation development, should leave no stone unturned to see that the air mail gets its appropriation without delay.

Write your Senator today.

What About the Second-Hand Market?

CHARLES F. KETTERING, the humorous genius of the automotive industry, administered several sugar-coated but extremely potent pills of thought to the diners at the annual function of the automotive engineers. He told them that there would be no second-hand car problem for the manufacturers to worry about, if they made their new cars better than the ones the owners are trying to trade in. If you will take time to investigate and analyze the question you will find that he is not far wrong.

Tighten up a few nuts on last year's flivver, take up the bearings, stick in a few new bushings and see if it won't run as well or better than a new one. No wonder there is a second-hand problem!

Can it be possible that the same shoe fits the machine tool builders or any other branch of the great machinery industry? Is the modern textile machinery so very different from that built five years ago—will it turn out better cloth more quickly and cheaply? Will the typewriter you bought last week give better letters than the one it replaced, unless the old one was worn out?

Mr. Kettering says that when an industry gets too big, advancement ceases because it costs too much to make changes. If he is right he has handed us a very disquieting thought. If not, somebody ought to take up the cudgels and prove him wrong.

The Brain Strike—A Menace to Progress

THE various and sundry kinds and classes of labor strikes are too common to need comment. The capital strike which has been incited by our bungling tax laws and which manifests itself in the investment of large incomes in tax-free securities, is also coming to be recognized by thoughtful people and even by a few of our legislators. But the brain strike, while it has gone on for years, has passed unnoticed.

Credit is due Harry L. Horning, a vice-president of the Society of Automotive Engineers, for calling attention to the menace to our continued progress which lies in allowing this brain strike to go on. He pointed out the fact that our antiquated and ponderous patent laws and overworked and inadequate patent office were seriously retarding the progress of inventive genius in the United States. Many an inventor has let valuable ideas remain undeveloped and unrevealed, because of the conviction that he would not get anything for the invention.

If necessity is the mother of invention, the hope of reward is usually the father. It is dangerous, therefore, to stand idly by and permit the continuance of a situation that wipes out the hope of reward.

Much depends on the brains of the country. A high standard of living for men who work with their hands has been set and no one wants to see that standard lowered. It cannot be maintained, however, if the workers hold back, and particularly if they are not given better tools and machinery to increase their individual capacity.

The brain strike must be settled and settled quickly by sane congressional action on the bills to help the patent office. You can do your part by writing to your representative.

Public Representation in Railroad Disputes

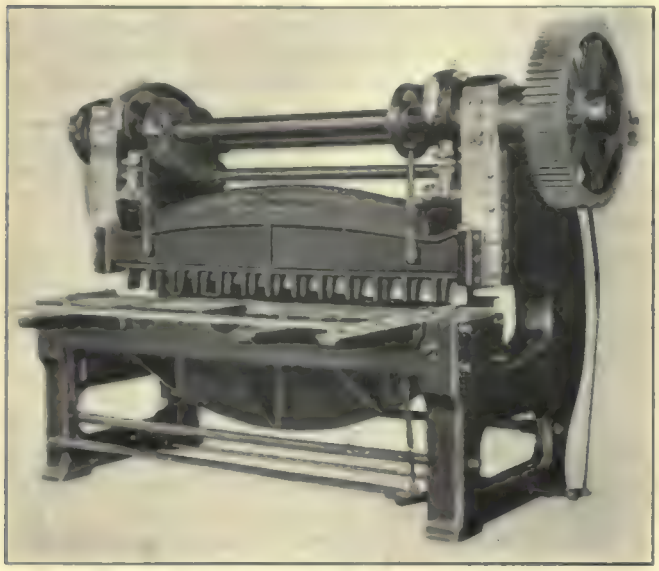
A NEWS item in this issue contains a recommendation by the railroad committee of the United States Chamber of Commerce which is worthy of careful consideration. It is suggested that a commissioner-general of transportation be appointed by the President, to represent the transportation interests of the country as a third party in the hearings before the Interstate Commerce Commission and the Railroad Labor Board. In the first case, as we understand it, he would uphold the transportation interests of the public as against the railroad executives and the shippers, and in the second case as against the railroad managers and the labor leaders.

Some people will look upon the suggestion as the first constructive one that has been put forward in years, others will see visionary radicalism and worse. At present it is only a suggestion and can but gain by constructive criticism. The idea of public representation in disputes before government commissions and boards has been gaining ground recently, but so far as we know this is the first concrete recommendation from a national body embodying it. The fate of the recommendation will be interesting.

Shop Equipment News

Streine Gap Shear

The Streine Tool and Manufacturing Co., New Bremen, Ohio, has recently placed on the market the power-driven shear shown in the accompanying illustration. The machine has a capacity for cutting ¾-in. and lighter annealed steel plates. The one shown has a shear blade 74 in. long, so that it is adapted to cutting plates 6 ft. in width. However, the machine can be furnished in any desired size.



STREINE GAP SHEAR

The housings are provided with gaps, so that long plates can be split. The machine is intended for use with a 15-hp. motor, the ratio of reduction of the gears being 16 to 1. The flywheel, which serves as a pulley, is 42 in. in diameter and weighs 1,260 lb. It ordinarily runs at a speed of 280 r.p.m., so as to give eighteen strokes per minute of the cutter bar.

One of the principal features of the machine is the design of the cutter bar or crosshead. The bar is of box-type construction, and is provided on the back with two deep-section longitudinal ribs and three cross-ribs, thus giving unusual strength and stiffness to the bar. This construction eliminates the necessity for truss rods, and keeps the cutter bar from deflecting under strain. Long bearings are provided for the crosshead in slides in the housings, taper gibs being provided so that adjustment may be made when necessary.

The cutter bar is connected to the eccentrics by means of adjustable links, so that the shearing knives may be either raised or lowered when required for such purposes as the splitting of long stock or shearing plates to the full length of the knives. The hold-down or clamp is automatically operated, and is equipped with compensating springs to take care of any unevenness or variation in the thickness of the metal.

The machine is fully equipped with front, side and back gages, the back gage being actuated through a screw and miter gears. The back gage is operated by means of a crank handle, and the gear shaft is made in two pieces and joined together by means of a sleeve. It is thus possible, by loosening the sleeve and re-setting the gears, to place the gage either parallel with or at an angle to the blades.

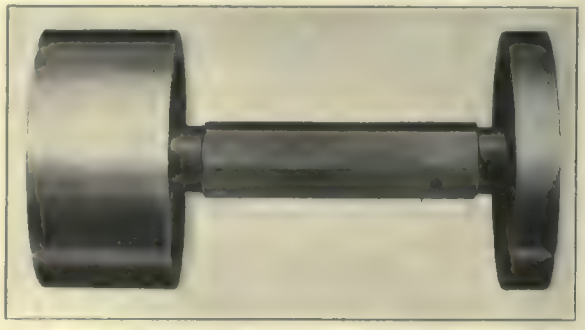
The housings are deeply ribbed and of heavy construction; and, while the shear bed is also heavily made, it can be adjusted to suit the requirements of the work. Graduations in sixteenths of an inch are marked from the edges of the shear blades to the ends of the front gage supports, thus enabling the operator to set the gages accurately.

The eccentrics are double keyed and shrunk onto the eccentric shaft, while the bearings of the eccentric shaft are split and can be readily adjusted or replaced. The gears used are made of semi-steel castings and the pinions of steel forgings. The clutch is made of forged steel, and is fitted with tool-steel pin and finger. The machine can be arranged for motor drive. With a 6-ft. shear blade, it requires a floor space of 84 x 120 in., and has an overall height of 88 in. It weighs approximately 18,500 lb., complete for shipment.

Pratt & Whitney Large "Trilock" Plug Gages

On page 325, Vol. 55, the "trilock" reversible plug gage made by the Pratt & Whitney Co., of Hartford, Conn., was described. The gage, shown in the accompanying illustration, is now manufactured in diameters of 2½ in. and larger. The wide "go" plug is lightened by a web and flange internal construction. The two disks are forced into the ring on a taper before grinding, and grip the central tube, holding the parts securely.

The reversible feature provides double the usual wearing surface. Three prongs on the handle are forced into three grooves in the bushing, providing a three-point, self-centering support without rock or shake. The washer at one end and the handle at the other bear on both the stay-tube and the disks, binding the assembled gagehead to the handle.

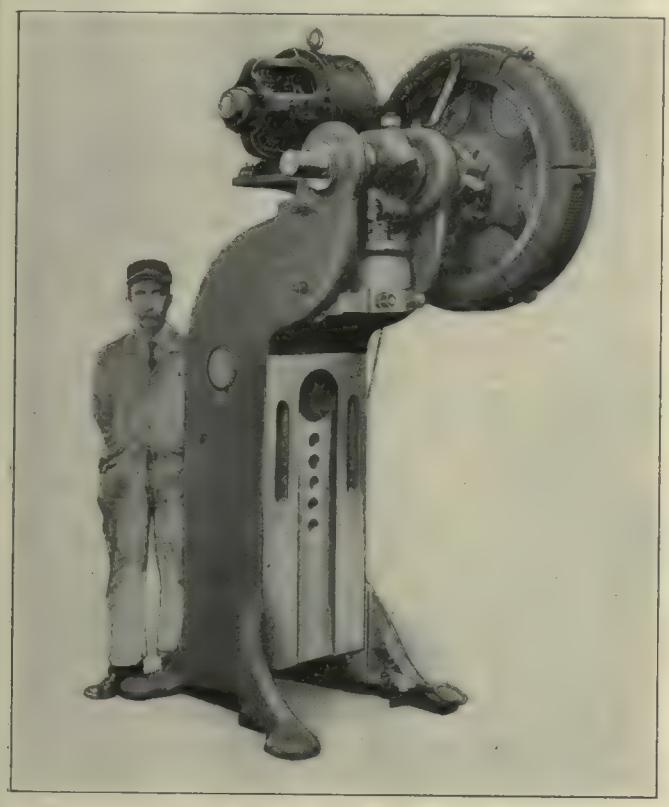


P. & W. "TRILOCK" PLUG GAGES

Reversible and renewable-end trilock gages can be supplied, either single- or double-ended, the threaded ones in all sizes above ½ in. and the plain cylindrical gages ⅝ in. and above.

Ferracute Horning Press

In the accompanying illustration is shown a special horning press recently built by the Ferracute Machine Co., of Bridgeton, N. J. The press is driven by an electric motor resting on a shelf bolted to a tablet cast in the frame. The motor shaft carries a raw-hide pinion that meshes with teeth cut in the periphery of the flywheel. This arrangement dispenses with belt connection, and has the additional advantage of placing the motor out of the way and economizing space. The wheel is not only entirely surrounded with a heavy guard, but has a wire mesh cast between the flywheel



FERRACUTE HORNING PRESS

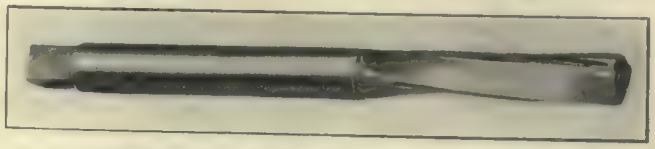
spokes, thereby preventing accidents to arms or hands when the wheel is in motion.

The horn-hole in the frame is 7½ in. in diameter, and 43 in. from the floor. The horizontal distance from the center of the ram to the front of the frame is 11 in. Guides are planed in this vertical front to enable an adjustable bed to be affixed at various heights and square with the bottom of the ram, the connections being made by means of large bolts and dowels. The wide variation in distance between the bed and ram, together with the facilities for horning and the unusual height of the press, provide for a greater latitude of work than is customary. The press shown is the fourth in a series of five sizes.

Bickford-Switzer "Cutwell" Reamer

The taper reamer shown in the accompanying illustration has recently been placed on the market by the Bickford-Switzer Co., Greenfield, Mass. The reamer has three right-hand helical flutes, the cutting lands being very rugged and milled with a hook or undercut. The reamer is so sharpened that two of the lands are relieved clear up to the cutting edge, while the third land is relieved for only about two-thirds of its width, leaving the remainder of a circular section to act as a steadyrest and prevent the right-hand helical flutes and the undercut from drawing the tool into the work.

The reamer can be best driven by power, as in a drill-



BICKFORD-SWITZER "CUTWELL" REAMER

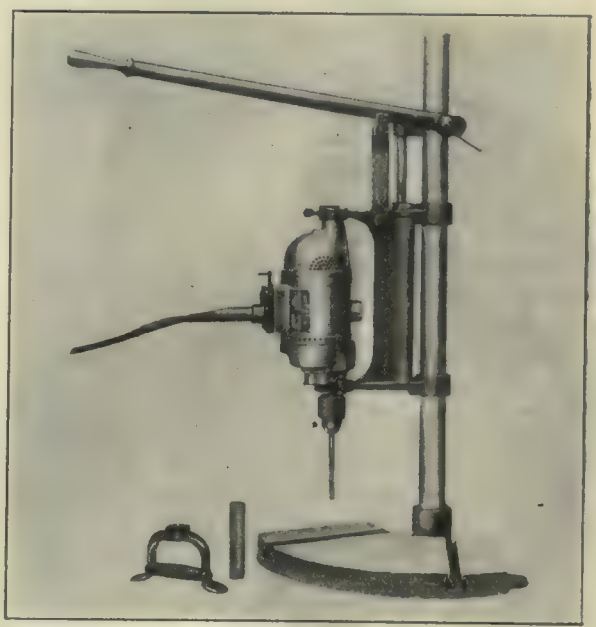
ing machine, and when used in steel, will shear the metal so that the chips look like steel wool. The tool is sold under the name "Cutwell." It is claimed for the reamer that it will not catch nor draw into the work, that it does not chatter, that it cuts as a drill does, and that it works best when driven by power.

The same principle is employed in a chucking or hand reamer for parallel-sided holes. In this case the reamer is made with three equally spaced and fully relieved cutting lands. Midway between two of these, is a narrow unrelieved land which acts as a steadyrest to keep the reamer from drawing in or chattering, and also serves in connection with one of the cutting edges, to furnish a place to measure the diameter of the reamer.

U. S. Electrical Tool Bench Drill Stand

In the accompanying illustration is shown a stand made by the United States Electrical Tool Co., Cincinnati, Ohio, and intended for the holding of portable electric drills, so as to adapt them to precision work. The drill may be easily clamped on the sliding head of the stand, and then fed to the work by means of a long hand lever. The height of the drill above the table may be adjusted by sliding the head on the vertical column. The base is provided with T-slots.

The stand is particularly adapted to use in automobile garages and repair shops. It is adapted to the holding of the ⅜- or ½-in. portable electric drils made by the concern. Its weight without the drill in place is 68 pounds.



U. S. ELECTRICAL TOOL DRILL STAND

ments are provided, in order to set the attachment quickly and accurately to the work to be engraved. The lower member of the attachment is directly over the center of the spindle and carries the former block, this block being a hardened piece of steel of the same shape as the engraved surface, except reversed. The arrangement controls also the vertical movement of the spindle.

The table is 10 in. wide, 30 in. long and 2 in. thick at its thinnest part. It is provided with three T-slots ⅝ in. in width. There is an oil groove at each edge so that oil or cutter lubricant can be drained into the pockets at the end. It is provided with a gib and with a locking screw to hold it in position.

On a bracket at the right side of the machine is mounted a copy holder. Its position is adjustable to compensate for changes in the reduction of motion in the pantograph. Special types of holders to suit the work at hand can be furnished.

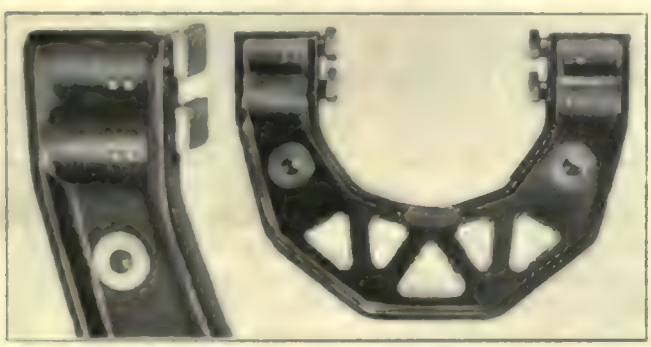
It is stated that when cutting steel a finishing cut is required in order to give a smooth surface. In cast iron, however, no finishing cut is necessary, provided that the tool is run to the full depth. In roughing, a cut ¼ in. in depth may be taken in cast iron, ⅛ in. in steel and ⅜ in. in brass. Letters can be quickly engraved in either the sunken or the relief style. It is stated that a letter 1½ in. high was sunk into cast iron at a single cut ⅜ in. deep in a total time of two minutes.

The machine is 48 in. in depth, its width overall is 60 in., and the height is 68 in. The approximate net weight of the belt-driven machine is 1,800 lb., while when boxed for shipment, the weight is 2,300 lb. The contents of the export box are 148 cu.ft. The weight of the motor-driven machine is, of course, increased by that of the electrical apparatus.

Pratt & Whitney "Trusform" Gages with Square Anvils

The "Trusform" gages made by the Pratt & Whitney Co., of Hartford, Conn., and previously described in AMERICAN MACHINIST on page 1144, Vol. 54, can be furnished with large square-head anvils, as shown in the accompanying illustration. The adjustment and locking device is the same as that previously described, two opposed headless setscrews in the frame pulling against each other.

Square anvils permit of working up to a shoulder, and give a larger wearing surface. This type of anvil is interchangeable with the round-head type, and new anvils may be substituted at any time.



SQUARE ANVILS ON P. & W. "TRUSFORM" GAGE

Greenfield "Hydroil" Internal Grinding Machine

The Greenfield Tap and Die Corporation, of Greenfield, Mass., has recently placed on the market the internal grinding machine shown in Fig. 1. High traverse speeds are employed on the machine. The wheel spindle is carried on a slide controlled by a feed-screw calibrated for feed increments of 0.00025 in. on the bore diameter of the work. The work table reciprocates upon ways at right-angles to the wheelslide ways, and carries a work head for holding and rotating the piece.

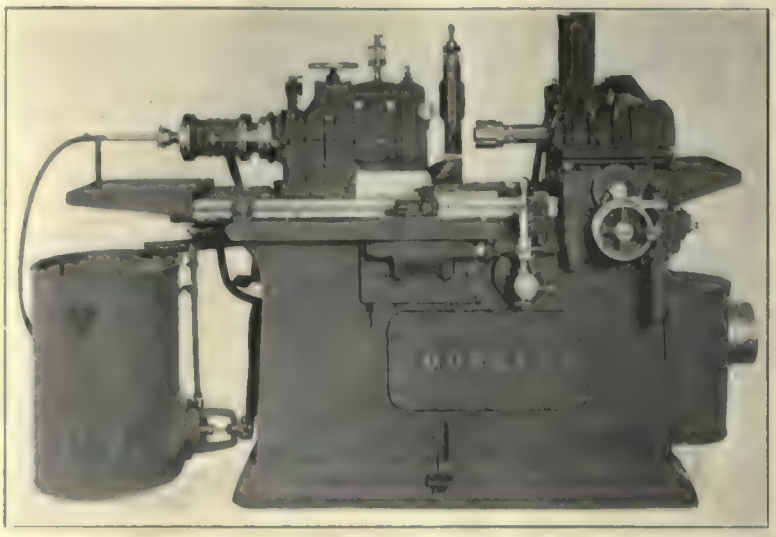


FIG. 1. GREENFIELD "HYDROIL" INTERNAL GRINDING MACHINE

The speed of the table traverse is controlled by the regulation of a sensitive throttle valve which admits oil under low pressure to a distributing valve, controlled by the limit stops of the table, and thence into either end of a double-acting cylinder, the piston of which is attached to a crosshead on the under side of the table. Great flexibility of table control is thus obtained. Table speeds from 2 to 36 ft. per minute are employed in the usual range of operation, while maximum speeds of 50 ft. per minute are possible. Special designs can provide for faster operation, should it be desired.

There are no definite stations of speed setting, as in mechanical drives, so that the most minute shading of speed is easily possible. The valve construction provides for shockless reversal, the cut-off and admission being so controlled as to give uniformly accelerated motion of the piston. The time required to accomplish a reversal is so small that with a 1½-in. stroke the table will reverse 320 times per minute without shock. A pressure-relief valve allows the table to stop without damage when overloaded. This feature also permits accurate positioning of the table for grinding against a shoulder. A screw-adjusted table stop locates the table position. By the combined use of reversing and locating stops, the table can be held to within 0.0005 in. limit on reversal, without sacrifice in operating speed.

The work is revolved toward the operator at the top, while the wheel turns away from the operator at the top. The diamond contacts on the back of the wheel throwing the dust down, instead of up into the air. Spindle bearing pressures are in the same direction whether the wheel is grinding or running free. This eliminates "hunting" in the bearings, and overcomes one source of "bell-mouth" grinding. Ball bearings are

generously employed throughout. The standard spindles provided with the machine are mounted upon ball bearings, having thrust adjustment so as to eliminate shake due to either axial or radial pressure.

A good commercial finish free from chatter is obtainable with these spindles. Where an exceptional mirror finish is desired, production rates are, of course, sacrificed to some extent, and special types of spindles can be furnished for this class of work. However, the high operating speeds show to advantage even on this class of work, and very fine finishing jobs are accomplished more rapidly than on slower moving machines. The chief merit of the machine lies in its ability to remove stock rapidly in roughing operations. For holes of 3-in. bore or greater, the machine is stated to remove at least 1 cu.in. of hardened steel per minute, floor to floor, assuming a reasonably fast-operating holding fixture.

For large bearing races having straight holes a special type of workhead is provided which chucks several races end to end, holding them endwise between a plunger operated by oil pressure and an iris-plate mechanism fashioned on the style of a camera shutter. A view of the head is shown in Fig. 2. The plunger ejects the load at the end of the operation when the iris is opened. By the use of loading pots, this fixture also grinds such work as piston rings. The production is high, it being stated that a single machine has ground 25,000 piston rings per 10-hr. day, a helper being employed to load the pots.

Rapid working is facilitated by the following points: The high speed of the table traverse allows the rapid

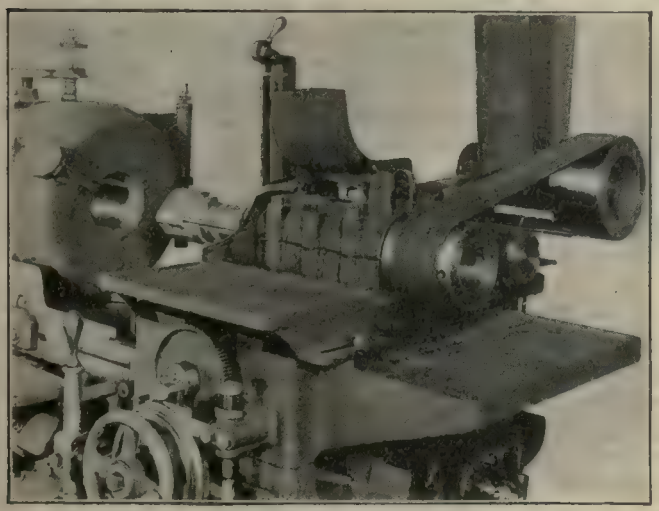


FIG. 2. CHUCKING ARRANGEMENT OF "HYDROIL" GRINDING MACHINE

exposure of the work surface to the wheel face, so that the wheel actually cuts away more material in a given time with less friction and heat losses than in slow-traverse operations. Rapid sizing is obtained, because the rapid application of relatively light cuts minimizes the springing away or gouging action of the wheel. A single hand lever controls all table motions. Pulling the lever toward the operator runs the table back to its station, where it remains while size plugs are being used. Another movement of the same lever brings the table up to the operating position, where it automatically continues to reciprocate between the working limit stops. A pedal is used to stop and start the work.

The heavy construction minimizes distortion and vibration, and allows accurate positioning in spindle feeding. The feed index mechanism is located by "feel" as well as by sight, allowing the operator to better watch his work. The diamond holder fixture swings out of the way, but can be quickly located at its previous position on the table by a single motion. A water supply is provided for cooling the diamond. Spindles are of the unit type, and can be exchanged very quickly and easily. The machine is self-contained, except for a portable water tank, made separate to provide for quick cleaning.

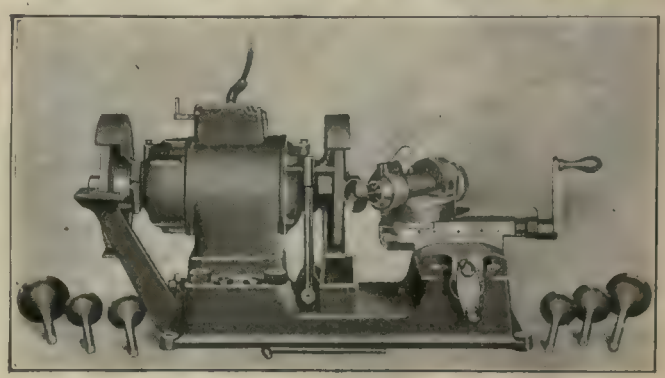
The machine is the design of R. L. Morgan, formerly principal owner of Churchill-Morgan-Crittsinger, of Worcester, Mass. This concern was recently purchased by the Greenfield Tap and Die Corporation, and forms a part of the machine tool division with which Mr. Morgan is connected.

Collins Valve-Facing and Tool-Grinding Machine

The machine shown in the accompanying illustration has recently been placed on the market by the Ford C. Close Co., Inc., 2 Rector St., New York, N. Y. The device is known as the Collins valve-facing and tool-grinding machine, and is intended for doing precision work in the surfacing of the valves and the valve seats of automotive engines.

A ¼-hp. motor carries a 6-in. grinding wheel at each end of the spindle. The motor can be furnished for either direct or alternating current, and operates at a speed of 3,450 r.p.m. The wheel at the left is intended especially for the grinding of cutting tools, and is provided with a tool rest. However, a buffing wheel may be mounted in this position if desired. The wheel at the right is used for facing the conical surfaces of the valves and for grinding the reamers used in cutting the valve seats. Both wheels are provided with hoods fastened to the frame.

The valve to be ground is mounted in a spring collet that grips the stem near the head of the valve, the remainder of the stem also being held in position so as to center and steady the work. The chuck is mounted on a swiveling base carried on a compound slide. It is thus possible to set the valve for the angle required, and hold it rigidly in position. By means of a transverse screw, the valve may be positioned for the proper depth of cut. By turning the crank on the feed screw, longitudinal motion may be given to the work, so as to move it back and forth across the face of the grinding wheel. The chuck is so geared to the feed screw that it is revolved when the screw is turned. The tool for grinding the valve seats in the cylinder block is mounted in the same position in the spring collet that the valve is placed, thus insuring that the same angle is obtained on both the cutter and the valve.



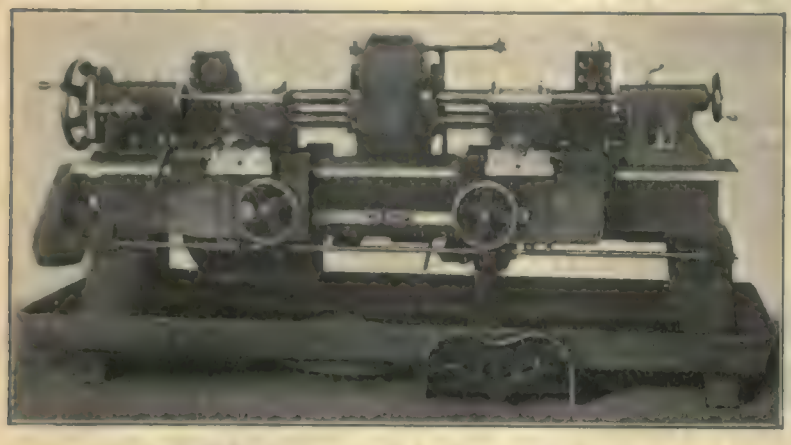
COLLINS VALVE AND TOOL-GRINDING MACHINE

Reed-Prentice Center-Driven Lathe

The center-driven lathe with the short head shown in the accompanying illustration, has recently been placed on the market by the Reed-Prentice Co., Worcester, Mass. This type of machine was originally designed for turning the rear axles of automobiles, but has proved itself of great value in other fields, particularly for turning both ends of mine-car axles. The only limitation is that the work cannot be turned at the center portion, this being the part which is gripped to provide the necessary torque.

The headstock, placed at the center of the machine, carries two chucks, one at each end of the spindle. The chucks are generally of the floating type, so that they will position themselves properly, relative to the outside diameter of the work when the jaws are tightened, at which point they are securely clamped against the shoulder on the main spindle. By this means, the work is positively driven and, being held rigidly, maintains the natural position of the shaft without any deflection due to springing under pressure.

The spindle itself is made of cast iron, has a large hole through its entire length and rotates in cast-iron journals, the driving gear being mounted directly on the spindle. In extreme cases where the shafts are particularly short, one of the chucks is omitted, thereby permitting the carriages to come closer to the headstock.



REED-PRENTICE CENTER-DRIVEN LATHE

The drive to the headstock spindle is from a motor of at least 7½-hp. rating mounted at the rear of the bed, and driving direct to the sprocket gear on the head spindle through silent chain. This assures the delivery of the full capacity of the motor to the spindle without any slippage. The motor is controlled by a treadle at the front of the machine which actuates a clutch, thereby releasing the gearing of the head without stopping and starting the motor.

The left-hand tailstock has an extra large spindle with two holes running through its entire length. One of the holes carries a standard center, while the other is a clearance hole through which the work is passed during the loading and unloading operation. By withdrawing the index plunger, which is shown at the front of the left tailstock, the spindle may be revolved, thereby bringing the clearance hole into proper alignment with the hole in the headstock spindle, at which position the work may be entered or withdrawn from the headstock.

After the work has been passed into the head, the index plunger is again released and the spindle rotated 180 deg., thus bringing the center into the proper position for guiding the work. The withdrawal of the index plunger is automatically actuated by the rotation of a large handwheel, due to the fact that there is a certain angle of free rotation in which the cam surface on the hub of the handwheel withdraws the plunger. By continuing to rotate the handwheel, the spindle will then pick up the motion, and finally bring the center or clearance hole into the desired position.

There is no axial adjustment to the left-hand spindle, this being taken care of by the longitudinal action of the spindle in the right-hand tailstock, which is similar to the standard engine-lathe tailstock. For long or short work, either tailstock may be unclamped from the bed and moved to the proper position. The arrangement of the tailstocks provides supports close to the cuts on the work. It eliminates excessive floor space, which would be necessary if the bed were of sufficient length to slide the tailstocks out of the way when loading or unloading.

The two carriages have their bridges off center, permitting close positioning to the headstock. The blocks are arranged to receive special magazine toolholders. Each carriage has a motion obtained by an eccentric and link by which the operator may feed the tools in to a pre-determined diameter, at which point the motion stops automatically.

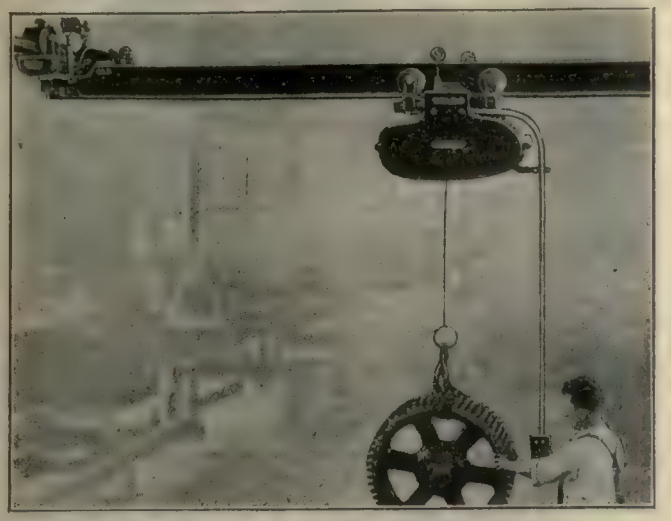
The longitudinal feed is then engaged, and after turning the desired length, a tripping mechanism automatically releases the link and cam action, which immediately allows the tools to recede from the finished work, so that they will not score it when they are returned to their starting position. Each carriage has its own automatic feed trip, although they are both driven by a single set of gearing at the extreme left of the machine. Both carriages and aprons feed toward the headstock and perform simultaneous operations on each end of the shaft.

A back-arm attachment has been incorporated for each carriage, so that the squaring of shoulders as well as grooving at the extreme ends of the shafts can be performed simultaneously with the turning operation. It is not, however, absolutely essential that the machine be equipped with this arrangement, as it is possible to cover a wide range of operations without it. The following arrangements, showing the flexibility of the machine, may be used. The machine may be fitted with front blocks for diameter turning and rear blocks for shouldering and taper turning, the rear blocks being brought into operation by hand after the diameter turning has been accomplished. The front blocks may be used for diameter turning and the back arm for shouldering, necking, chamfering, or grooving simultaneously with the turning of the front tools; or, auxiliary hand-operated blocks can be introduced at the rear for shaving the radius at the end of the cylindrical turning or when chamfering corners.

The machine is equipped with an oil pan, pump and piping. It will turn shafting up to 2⅞ in. in diameter. With a 9-ft. bed, the maximum distance between the centers is 72 in. The total length of the machine is 10 ft., and the total width 40½ in. With very slight modifications, it is possible to turn shafting up to 3⅜ in. in diameter.

Cleveland Electric or Hand-Power Crane

The Cleveland Crane and Engineering Co., Wickliffe, Ohio, has recently brought out the "one-hand" type of crane shown in the accompanying illustration. The



CLEVELAND ELECTRIC ONE-HAND CRANE

crane is equipped with an electric hoist having a push-button control at the bottom of a pipe carrying the handle. The operator thus controls with one hand the raising and lowering of the load, as well as the moving of it to any position desired, the other hand being free to steady the load.

The maker calls particular attention to the ease with which the crane can be caused to travel on the runway. All wheels carrying loads are equipped with ball bearings. It has a capacity up to 1 ton.

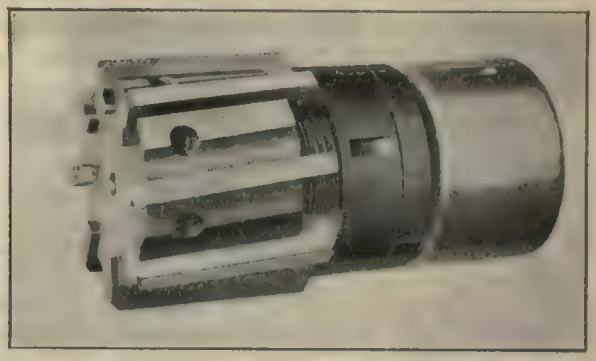
The outfit can be furnished in different lengths, the maximum permissible distance between the runways being 24 ft. The depth of the I-beam varies from 7 to 10 in., depending upon the distance between the runways. If desired, a slight overhang can be given at each end, thus permitting of a 26-ft. I-beam. The crane is particularly adapted to wire mills, machine shops, foundries and similar installations where a flexible unit is required. The crane can be equipped with a chain block suspended from a trolley for hand operation, instead of with the electric hoist.

Wetmore "Bull-Dog" Heavy-Duty Expanding Reamer

The Wetmore Reamer Co., 62 South 27th St., Milwaukee, Wis., has added to its line the heavy-duty expanding reamer shown herewith. The tool is known as the "bull-dog" reamer, and can be furnished with either six, eight or ten blades, according to the size of the reamer. The blades are of high-speed steel, and the body is made from a solid piece of heat-treated alloy steel guaranteed against breakage even under the most severe reaming tests.

The blades are set at a left-hand angle, which prevents digging-in while cutting and also minimizes chatter. It is said that this tool gives absolutely smooth holes and does not score while backing out after the cut. The front cutting edge of each blade is set on a 3-deg. angle, to give the proper rake for the most efficient working of the tool.

All threads are milled on centers to insure concentricity, and the blade seats are ground with the threads as the locating points. The alloy-steel cone nut and graduated adjusting screw make possible quick and accurate adjustment to a thousandth of an inch. A wrench with which all adjustments can be made is furnished with each reamer. A feature of the reamer is the tongue drive, which relieves the strain on the



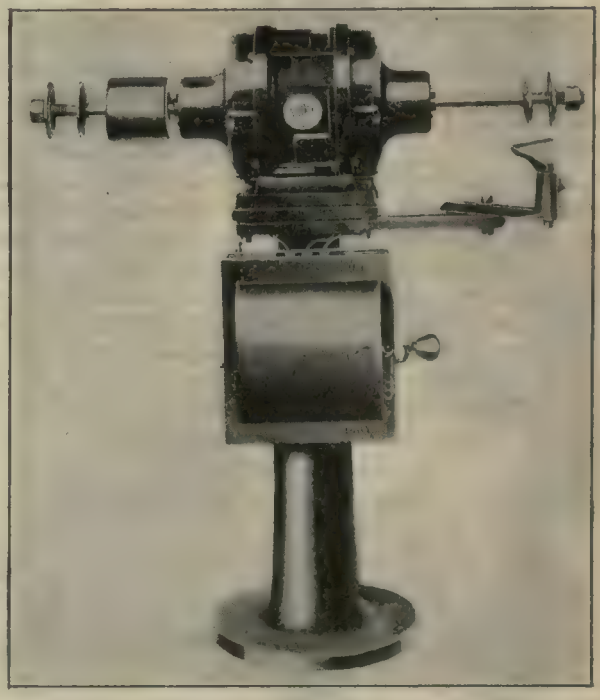
WETMORE "BULL-DOG" EXPANDING REAMER

coupling nut. The tool is intended for constant service on jobs where an accurate heavy-duty reamer is necessary.

Valley Buffer and Grinder

The Valley Electric Co., 3157 South Kingshighway, St. Louis, Mo., has recently placed on the market the floor type of buffer and grinder shown in the accompanying illustration. The motor is totally inclosed and dust proof. Ball bearings are used. The motor shaft is extended and threaded at both ends.

The motor is mounted on a heavy cast-iron pedestal. On the front of this pedestal is a safety switch completely wired to the buffer, so that it is only necessary for the electrician to connect the wires to the main terminals. A toolrest, guards and a driving pulley may be furnished. The pulley shown has a wide flat face, so that an air compressor utilizing a tight-and-loose



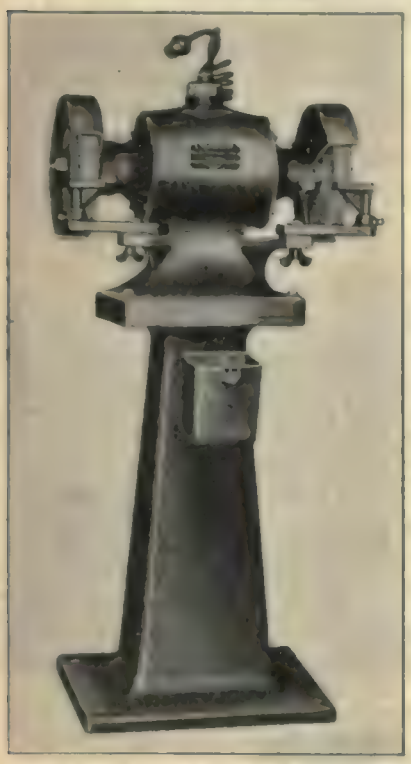
VALLEY BUFFER AND GRINDER

pulley or a small line shaft may be operated from the machine. The machine is particularly adapted to use in tire shops, machine shops and buffing and polishing rooms.

The motor can be furnished either single-phase or two or three-phase, to operate on 60-cycle current of either 110, 220 or 440 volts. It is made in horsepowers from ½ to 4, the speed being 1,800 r.p.m. The floor space required is 14 in. in diameter, and the shipping weight of the buffer and stand varies from 130 to 330 pounds.

"Standard" Bench and Floor Grinders

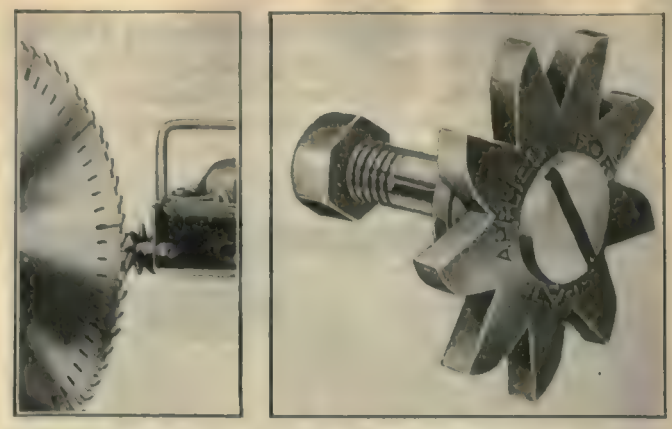
The accompanying illustration shows the ½-hp., alternating-current, electric grinder recently placed on the market by the Standard Electric Tool Co., Cincinnati, Ohio. The machine is fitted with double-row ball bearings, and the motor employed is manufactured by the Westinghouse Electric and Manufacturing Co., being equipped with this concern's latest type of circuit breaker. The machine is made in both the bench and floor types. It is intended for operation on alternating current, and can be furnished for either 110 or 220 volts, in single, two or three phases. The motor is powerful and quick to start. The wheels used are 8 in. in diameter, and have ¾-in. face and ⅝-in. hole. They extend in front of the body of the motor, which permits of grinding long and irregular castings and bars. The mechanical construction of the grinder is rigid throughout. The floor type is fitted with a water pot and both the bench and floor types have adjustable tool-rests. One coarse and one fine wheel are regularly furnished with the machine, the coarse wheel being suitable for castings and rough work and the fine one for tools and light work. A quick make-and-break switch is located on top of the motor within easy reach of the operator. A 10-ft. reinforced cord fitted with a plug is regularly furnished. The net weight of the bench machine is 110 lb., and of the floor machine 225 pounds.



"STANDARD" FLOOR GRINDER

Disston Saw-Tooth Chip Remover

A simple, positive, automatic device, intended for removing the chips from the teeth of metal saws, has just been placed on the market by Henry Disston & Sons, Inc., of Philadelphia, Pa. This chip remover consists of a special toothed wheel, made to fit any type of saw, and a stud to carry the wheel, as shown at the right of the accompanying illustration. It keeps the saw teeth and gullets entirely free from chips. Consequently, the saw will cut more easily and smoothly, and can be run faster and at a little heavier feed, because of the elimination of danger from the chips.



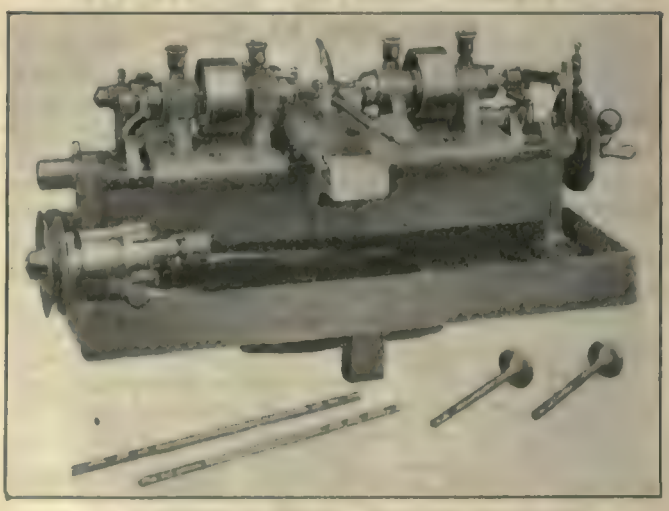
DISSTON SAW-TOOTH CHIP REMOVER

If chips from the cut are allowed to stick to the sides and points of the saw teeth, they score the work, and the result is a rough, uneven cut. Also, the teeth are likely to crack and break under the excessive strain imposed. These troubles are particularly noticeable when cutting soft stock, or in making cuts in unusually large pieces. The chip remover is particularly adapted to this work, being applied as shown at the left of the accompanying illustration.

Ogle Duplex Valve Milling Machine

The machine shown in the accompanying illustration is the Ogle duplex valve milling machine which has recently been placed on the market by the Dale Machinery Co., of 54 Lafayette St., New York, N. Y., and 547 Washington Blvd., Chicago, Ill. The machine is intended expressly for milling key-slots in automotive valve stems, although it can be used for cutting similar slots in other work up to the capacity of the machine.

The major working parts of the machine are the two heads, each having its own spindle and pulley and collet chuck for holding the end milling cutter. The machine is belt-driven, the two belts which operate the spindles running in opposite directions, so that right-hand mills can be used in both heads. A device is provided for holding the heads stationary while cutters are being changed or adjusted. The work is held in a



OGLE DUPLEX VALVE MILLING MACHINE

V-block, the clamp being operated by means of the screw at the right. The position of the V-block assures that the work is always held on center, regardless of the diameter of the piece.

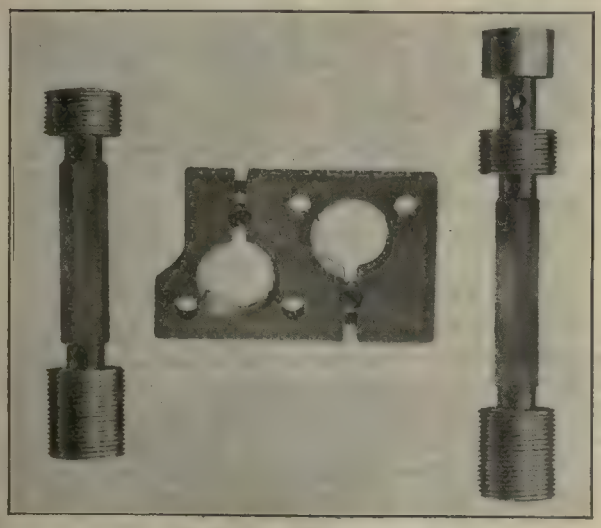
The cutters operate simultaneously, the heads being fed toward the center of the piece by the operation of the cams shown at the outside of each head on the main shaft. The feed is obtained through the ratchet at the right operated by mechanism at the rear of the machine. When the cutters are 0.005 in. apart, one automatically drops back, allowing the other to finish the cut. The worm mechanism at the rear operates a connecting rod, which connects to the rear of the slide and moves the work backward and forward across the machine in order to give length to the slot. The position of the crankpin can be adjusted to give any length of slot desired up to ½ inch.

The machine handles work up to ½ in. in diameter, and will mill slots up to ¼ in. in diameter and ½ in. long. Lubricant is supplied to the work by a self-priming pump, located at the left. The machine is heavily built. It occupies a bench space of 20 x 16 in.

Pratt & Whitney Spark Plug Gages

A set of limit gages for automotive spark-plug threads has recently been placed on the market by the Pratt & Whitney Co., of Hartford, Conn. It is made to S.A.E. standard limits and consists of a double-end limit plug gage of the "trilock" reversible-end type, a "go" and "no-go" templet in one unit, and a setting plug for the templet. The setting plug, shown at the right of the accompanying illustration, consists of two threaded members and one cylindrical plug for checking the root diameter.

The pitch diameters of the plugs are 0.841 and 0.843



P. & W. SPARK PLUG GAGES

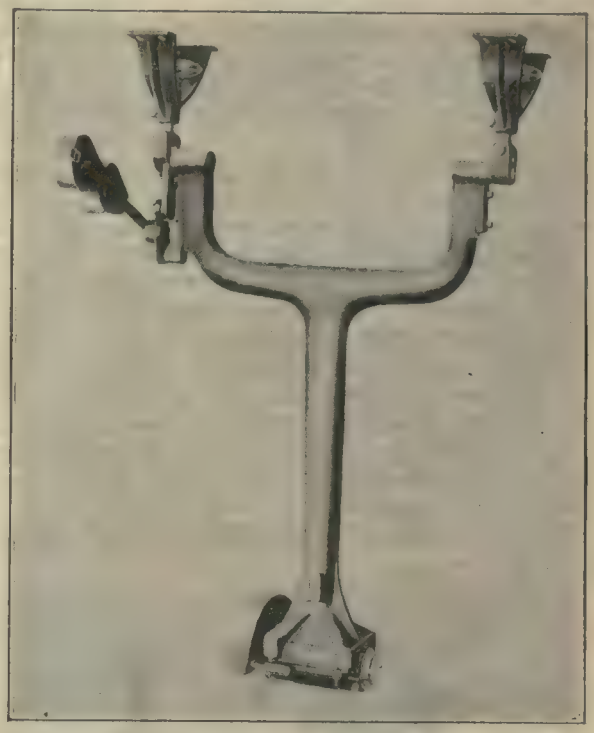
in., the tolerance for tapped holes thus being 0.002 in. The templet pitch diameters are 0.836 and 0.839 in., giving 0.003 in. tolerance for the threads on the body of the spark-plug. There is thus a neutral zone of 0.002 in. between the maximum spark plug and minimum hole sizes.

The gage for testing the holes is shown at the left, and is similar in construction to those described on page 324, Vol. 55, of AMERICAN MACHINIST. The reversible plug ends provide double the usual wearing surface.

The templet can be seen in the middle of the illustration. The taper screw permits very fine adjustment of pitch diameter, and when both the locking and the adjusting screws are tight, the threads of the adjusting screw form a dowel in both planes. The "go" and "no-go" ends are placed close together, for convenience in spinning on the work, and the unit is handled more readily than two separate templets. The "go" side of the templet is cut away for quick identification when using the gage for rapid inspection.

Oliver No. 36 Motor-On-Arbor Swing Cut-off Saw

The No. 36, motor-on-arbor, swinging-type, cut-off saw shown in the accompanying illustration has recently been placed on the market by the Oliver Machinery Co.,



OLIVER NO. 36 MOTOR-ON-ARBOR SWING SAW

Grand Rapids, Mich. The machine is made with three standard lengths of frame, 5 ft. 5 in., 7 ft. 5 in., and 9 ft. 5 in. The saw is fully protected by a guard, and the arbor is mounted on ball bearings.

The motor operates on three-phase, 60-cycle, 220- or 440-volt alternating current. It has 3 hp., and runs at a speed of 3,600 r.p.m. The saw carried is ordinarily 16 in. in diameter. The chief advantage in mounting the motor on the arbor is the elimination of belts, pulleys and countershafts. In this way, the over-all efficiency of the mechanism is increased. Due to the fact that there are no moving parts except the saw exposed, the safety of the operator is greatly increased.

The motor is started and stopped by means of a push button placed directly above the motor where it may be conveniently reached. A counterbalance is fastened to one of the standards. It consists of a weight and a lever so mounted as to enable easy swinging of the saw while cutting.

The device can be furnished with the motor mounted on top of the swinging bracket and belted to the saw arbor. Also, it can be furnished for drive from a

countershaft. With this latter arrangement, larger sizes of saws can be used. When sawing planks 12 in. wide, a saw 16 in. in diameter will cut up to 4½ in. thick, the 18-in. saw up to 6 in. thick, and the 24-in. saw up to 9 in. thick.

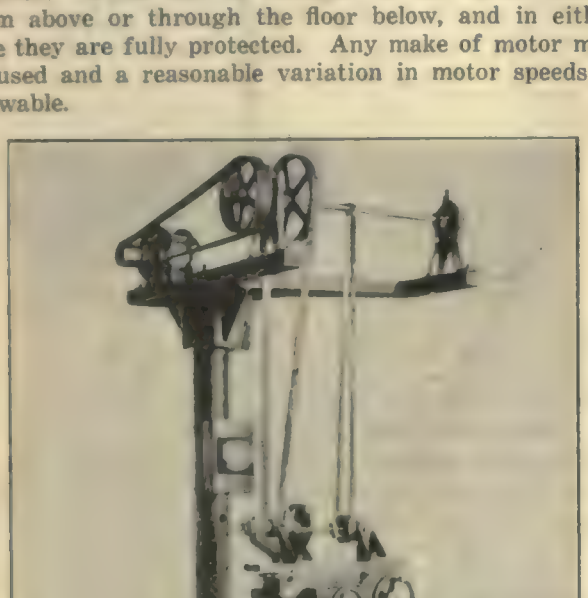
Motor Drive for Grand Rapids Grinding Machine

The illustration shows an arrangement recently perfected by the Grand Rapids Grinding Machine Co., Grand Rapids, Mich., whereby motor drive can be applied to the No. 1 universal grinding machine made by the concern and described in the AMERICAN MACHINIST on page 387, Vol. 47.

The stand consists of a cast-iron base, into which is screwed an upright section of heavy iron pipe, carrying at its top a table casting to which are bolted the motor and countershaft. The grinding machine is bolted to the base casting, so that the stand and machine form a complete self-contained unit. The arrangement insures alignment of the countershaft and machine.

The pipe which forms the upright stands directly back of the machine, where it cannot interfere with the operator's movements. The machine and stand occupy little more floor space than a belt-driven machine. The motor and countershaft are offset to different sides, so that balance is obtained for the entire table on the upright.

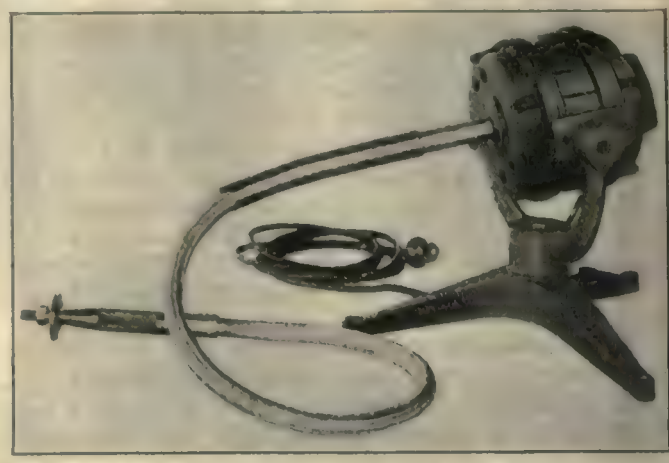
The starting switch is located on the column, directly back of the machine and within easy reach of the operator. Wiring from the motor to the switch can be carried down through the column so that no wires are exposed. Wires can be brought to the motor either from above or through the floor below, and in either case they are fully protected. Any make of motor may be used and a reasonable variation in motor speeds is allowable.



INDIVIDUAL MOTOR DRIVE FOR GRAND RAPIDS GRINDING MACHINE

Valley Flexible-Shaft Grinder

The flexible-shaft grinder and buffer shown in the accompanying illustration has recently been placed on the market by the Valley Electric Co., 3157 South Kingshighway, St. Louis, Mo. A ¼-hp. ball-bearing motor is used to drive the wheel. It is mounted in trunnions in a fork that is carried on ball bearings, so that the motor can be freely swiveled in any direction. The flexible shaft permits of moving the wheel to any position desired. Due to the universal motion of the motor the shaft is made rather short, and is thus able to operate most of the time with but slight bending. Consequently, wear in the shaft is reduced, giving longer life to the outfit. Different types of abrasive wheels may be employed. It is not necessary to change the position of the piece to grind it.



VALLEY FLEXIBLE SHAFT GRINDER

The device is furnished with a flexible electrical cord and attachment plug, and may be run from the ordinary lighting circuit. It is made in both ¼ and ½ hp. sizes to operate on either 110 or 220-volt alternating current of 60 cycles and one- or three-phase. As a direct-current machine, it can be furnished to operate on 110 or 220 volts. The bench space required is 14 in. square. Its weight varies from 60 to 80 lb., depending on the power, and the shipping weight from 80 to 100 pounds.

Tractor Contest in Brazil

The second annual tractor demonstration and contest was held at Santa Cruz under the auspices of the Brazilian Ministry of Agriculture on Oct. 3 to 7, inclusive. A report submitted by assistant trade commissioner W. E. Embry states that of the seven tractors entered, five were of American manufacture, and the three first places were taken by American machines. The other two tractors were of German make—one a W. D. Large and the other a W. D. Tank. One small French tractor was on the grounds but failed to take part in any demonstration.

The ground on which the trials were held was selected by lot. Work was carried on under difficult conditions as the lots were covered with matted crawling vegetation of various descriptions which was very difficult to cultivate by any method. In spite of this handicap, the American tractors without exception did excellent work and won the undivided approval of the various judges. The German tractor, W. D. Large, although a large powerful machine of approximately 80 horsepower failed to show up to advantage.



NEWS SECTION

Business Paper Editors Meet the Secretary of Commerce

The National Conference of Business Paper Editors met in Washington on Monday, Jan. 23, for the usual monthly dinner conference with Secretary Hoover. After luncheon the editors were addressed by George Otis Smith, director of the United States Geological Survey, on the work of the Department of the Interior. At 3:15 p.m. they adjourned to the council room of the Chamber of Commerce of the United States and discussed the national problems of railroads, tariff, soldier bonus and the "hardwood" decision with President Defrees, Vice-president Goodwin and the staff of the chamber.

At dinner Mr. Hoover discussed the various economic problems facing the country and answered numerous questions fired at him by the editors.

Iron Production in South Shows Improvement

Official figures on iron ore production in Alabama during 1921, according to advices received by headquarters of the Southern Metal Trades Association in Atlanta, show total production during the year of less than one-half the 1920 record. The state produced in 1921 2,927,010 tons, as compared with 5,891,011 tons in 1920. Average value in 1920 was $2.88 per ton, and in 1921 was $2.15 per ton. While Alabama is by far the largest iron ore producing state in the South, other states also produce to some extent.

The association also has been advised of official pig iron production in Alabama in 1921, the total being 1,190,888 tons, as compared with 2,392,000 tons in 1920. The slump in pig iron production continued from January to July, a steady decline being shown each month. At that time production began to climb and in December had reached 117,886 tons, which is the official figure for the last month of the year. July production, the lowest monthly record of several years, was 66,573 tons, the recovery since then as compared to the low point being about 75 per cent. There were five furnaces in blast in July, 1921, and 13 in blast Jan. 1, 1922. The outlook portends close to a normal year in pig iron production during 1922.

In other states of the Southeast pig iron production during 1921 was almost negligible for the industry did not experience the rapid recovery the last four or five months of the year, as did the Alabama district. The outlook for 1922, however, is fair.

Safety Council Census

The National Safety Council is now taking a census which when completed will reveal how many safety workers there are in the machinery industry and where they are located. This census will include all persons engaged in safety and industrial health activities in all industries, and those who are doing public safety work as well. The results of the census will show how the machinery industry compares with the other industries in respect to the number of persons it has engaged in safety and health work.

The census includes not only members and employees of members of the National Safety Council, but all persons engaged in safety and industrial health activities, regardless of whether they are connected with the council in any way or not.

Every reader who is professionally engaged in industrial or public accident prevention or industrial health work, whether he is devoting all or only part of his time to accident prevention, is urged to assist in the taking of this census by sending to the National Safety Council, 168 North Michigan Ave., Chicago, his name and the other details of his position.

Freight Cars Needed

Improved demand for railroad equipment in 1922 is confidently expected by W. H. Woodin, president of the American Car and Foundry Co., New York. Mr. Woodin's survey of conditions indicates that approximately half of the freight cars on American railroads need repairs. New freight cars ordered during the first ten months of 1921 amounted to only 13,227, against 105,669 in the whole of 1920. For the twenty-year period ended Dec. 31, 1920, the total of new freight cars ordered amounted to 3,204,258, the yearly average being 160,000.

Strike Losses for 1920

A report recently issued by the Government reveals the astounding fact that strikes and labor walk-outs during the year 1920 cost the workers who participated in them the sum of $4,000,000,000. This amount would run the Federal Government for a year.

This stupendous amount represents a total loss of cold cash through idleness, an amount which might have been earned, spent on families and homes and put into circulation.

It brings us to a very pointed question—"Does it pay?"

Aerial Transportation Company Organized

According to a recent issue of the *Dayton Journal* a company of Dayton, Ohio, men are planning the inauguration of an airplane passenger service between Dayton, Cincinnati and Detroit, using four metal ships. W. A. Johnson, head of this company (the Johnson Airplane and Supply Co.) is credited as saying that capital for the company will amount to approximately $250,000. Each ship will carry five or six passengers, and the rates of fare will be slightly higher than the current railroad fare. Traveling time by air between Detroit and Dayton is about two hours, while it takes six hours to make the trip by rail. Cincinnati is just a short jump from Dayton, less than an hour being required to make the trip.

As soon as arrangements have been completed the company will begin operations.

Ordnance Dept. Would Co-operate with Industry

The Federated American Engineering Societies has referred to the American Society of Mechanical Engineers a statement from the Ordnance Department of the Army to the effect that it will welcome suggestions as to closer co-operation between the department and manufacturers of mechanical equipment. The Ordnance Department is determined to do everything within its power to make its designs practical.

The Ordnance Department thoroughly recognizes the fact that in a great emergency, such as the last war, it is practically dependent upon the industry of the country to procure the munitions which it is required by law to furnish the Army. To this end, it believed that there should be the greatest possible co-operation and interchange of views at all times between the department and those branches of industry which would be called upon to manufacture the more or less complicated forms of munitions. The department therefore, earnestly desires to find means by which its designs may be submitted for criticism and suggestion not only in regard to the basic principles involved, but as regards rapid and economical production to the end that such modifications may be incorporated in the drawings to do away with as much of the difficulty of production as can be eliminated without impairing the necessary functioning of the device.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

As a delegate to the National Agricultural Conference I spent the better part of last week in Washington. The experience was interesting, for although it has been wittily said that the gathering did not include many farmers from the rural districts, the leaders of the farmers' organizations were there in force and did not hesitate to express themselves.

It is, in fact, probable that the "dirt" farmer, to use the current political slang, was represented more effectively than if he had been present in person, for those who spoke for him were used to speaking and thoroughly familiar with parliamentary law and procedure.

In his opening address President Harding showed a sympathetic appreciation of the farmer's predicament and needs, but when he departed from the printed copy of his speech to take an extemporaneous fling at the agricultural "bloc" it was instantly apparent that many if not a majority of his audience were supporters of the "bloc" of whose activities he disapproved.

On the same afternoon William Jennings Bryan, who was in the audience but not among the speakers on the program, was called to the platform and heartily applauded for a speech in which he commended the Agricultural "bloc." It was, he said, only different from the ever present Wall Street "bloc" and the business "bloc" in that it worked openly and not in secret. He told his hearers that they had Congress "scared" and that they could get what they were entitled to if they insisted upon it. By Thursday afternoon the feeling had risen so high that the "insurgents" were able to pass a resolution commending the President and the Secretary of Agriculture for calling the conference, but also commending and approving "the action of those members of the House and Senate comprising the Agricultural bloc who, regardless of party, so early saw the emergency and have so consistently supported a constructive program for the improvement of agriculture and the betterment of rural life."

Concurrently there was to be heard much talk of a farmers' party with Senator Kenyon, of Iowa, as its presidential candidate. In considering the suggestion allowance should be made for the heated imagination of excited men, although analogous conditions have often brought new parties into being.

The story is included because the political developments of the near future seem likely to have a profound effect upon business. In the last analysis nearly every one of the innumerable proposals made for the betterment of the farmer's condition contemplate the use of government credit or money. They range from a demand that U. S. Treasury notes or greenbacks shall be issued against farmers' obligations or agricultural products, to a scheme which calls for a practically unlimited bond issue for the purchase of everything produced on the farm at not less than cost. Some of them are practicable; others are chimerical. In the former class may be included a plea for the continuance of the War Finance Corporation, or its equivalent, and a plan for supplying crop insurance to those who are willing to pay for it.

But even the most meritorious call for the use of huge sums of money that can only be got by borrowing. The same statement is true of the bonus bill which Congress seems determined to pass in spite of Mr. Mellon's warning. Mr. Bryan is right in saying that Congress is scared and it is not to be expected that it will refuse to deal as liberally with the farmers as with the soldiers.

Those who would be wise will therefore prepare themselves for a flood of new government bonds and an increase in taxation in the near future. The first effect will be an advance in interest rates in anticipation of which the outstanding Liberty issues have declined slightly during the week. Other bonds are also somewhat lower.

But the statement of the Federal Reserve Banks shows a reserve ratio of 77.2 per cent as compared with 76 per cent a week ago and a gain of nearly $6,000,000 in the gold on hand. With such reserves it is unlikely that government borrowing will tighten the money market much for the funds borrowed will be kept with the banks until they are disbursed and spent, when the secondary effect will be felt. It will be credit expansion, inflation and higher prices in the order named, just as they came during the war when the government was borrowing and spending so largely. There is no economic sequence that can be more certainly predicted. After it may come the deluge but with that we need not concern ourselves at once, though the farsighted man will do well to secure a reservation in the nearest ark when the flood commences to rise.

The commercial developments of the week are not significant. Cotton has shown a declining tendency which is variously explained. Fundamentally it seems to be due to a feeling that an increased rather than a decreased acreage will be planted this year. It is too early for definite information on the subject. The demand for cotton goods is somewhat slacker.

The action of the American Woolen Co. in putting lower prices on many heavy weight lines at their opening last Monday is significant in view of the steady climb in the price of raw wool, and President Wood's declaration that there will be no more wage reductions. By some it is regarded as evidence that a shrewd and farsighted manufacturer does not believe that the public is yet willing to pay higher prices for finished products.

It seems questionable whether under the circumstances raw wool can hold its advance, much of which may be due to speculation engendered by the tariff talk. Dealers were delighted with the woolen company's prices, and sales, especially of women's wear, were so heavy that last year's record, when all offerings were sold in a week, may be surpassed. Silk and rubber, which were advancing until recently, have both declined sharply. Rubber has dropped nearly five cents a pound in London. The financial embarrassment of some large dealers is said to be the cause of the decline but the fact is that all the efforts made to control the price of an excessive supply seem to have failed.

Raw sugar has advanced to 2¼ cost and freight, ex-duty. Futures sympathized, but have reacted slightly. Granulated is up to 5.10, with the refiners apparently oversold. Sugar is still cheap. The American consumption in 1921 was 90 lb. per capita, an increase of nearly 3 lb. over 1920 and of 16 lb. over 1918. On the Stock Exchange sugar shares have been active and strong, especially those of the producing companies. Coffee has been dull but steady. The Brazilian government is not apparently disposed to be aggressive in asserting its admitted control of the market.

Copper is slightly lower and the steel industry is still hopefully waiting for the long promised activity. The railroads are, however, buying a little more freely and their traffic is improving for car loadings have increased each week since New Year's. Incidentally, the Agricultural Conference was unanimous in demanding lower freight rates. Petroleum is unsettled and lower prices in the mid-continent field seems probable. Hoover says a coal miner's strike April 1 appears to be inevitable. He advices consumers to secure their requirements in advance, but it is well to remember that inevitable strikes are often averted.

The stock market is dull and somewhat reactionary, but not in any sense weak. The steel merger so much talked of appears to have struck a snag. In Europe much is hoped of the conference to be held in March at Genoa and people are waiting until it convenes. After it adjourns they will probably be waiting for something else.

All over the world there is a disposition to rely on conferences and legislation and bond issues to remedy conditions that would probably yield to hard work inspired by faith in the belief that the Lord helps him who helps himself. This faith is the supreme need of the present hour.

Metric Referendum

Whether or not the Chamber of Commerce of the United States will conduct a metric system referendum will be determined at the meeting of the national council of the Chamber which will be held in Washington, Feb. 8 and 9. The council is made up of one representative each from 1,400 business organizations.

A Business Man's Impressions of Germany

Absolute Demoralization of People—Growing Hatred of Foreigners—Scheme To Get Out of Indemnity—Government Not Popular

By AN AMERICAN CORRESPONDENT

When I was in Munich during April, May and June of last year, the mark stood between 55 and 65 to the dollar and things were moving along fine. The people were courteous and obliging, and as everyone was working and showed plainly that they wanted to work, I concluded that Germany would very soon drag herself through the mire and once again assume her old position in world affairs. From that time on business continued to improve until there was not one single man out of work and orders were piled so high in advance that there was no hope of ever catching up with the demand.

The mark continued to fall slowly on the exchange until it stood around 140 to the dollar on Oct. 15. About this time I left for Paris, but on the day we crossed the frontier the mark took one mad drop of 45 to 195 points and when we arrived in Nürnberg, every German's face was white and the people seemed almost paralyzed. All the papers issued special bulletins on the "Catastrophe of the Mark."

The hotel at Nürnberg which just three days previously had urged me to come and offered the same old rooms at 120 marks per day, at once repudiated this agreement and demanded 300 marks. The proprietor finally compromised on 220 marks per day, saying that he would be compelled to advance the rate to 500 the following week.

At once the German government threw overboard all its foreign bills of exchange and rallied the mark back to 150. Then it began to slide again and finally hit 310, came back to 240, and closed on Nov. 22 at 280.

The Buying Craze

As a result of this great depreciation in the mark, a very curious condition prevailed. To begin with, the rise in prices has not kept pace with the fall of the mark, so that although almost everything has doubled in price within the last five weeks, living is even cheaper now than last summer for people with currency that has a good exchange value. Last summer it cost me an average of $4 a day to live here with the mark at 60; it now costs me only about $3 per day at present rates, regardless of the fact that I am paying double the number of marks for everything. A most curious result of this drop in the value of the mark is the apparent panic of the German populace. The people are rushing to buy any old thing they happen to see, simply to get rid of their paper marks and to get something which might be of some real value. The shops are stampeded. Lines have formed on the sidewalks and in front of places that sell woolens and shoes, sugar and foodstuffs, and it has been necessary for the police to regulate the crowd.

The shopkeepers have taken advantage of this rush to raise prices hour by hour, so that the panic increases. The newspapers continue to fan the flame so that it is hard to say just what will really happen. The shopkeepers in order to blind the people to the fact that they are really holding back goods for higher prices, are saying that the foreigners have been attracted to the country by the low mark, and are swarming into Germany and buying up all the available goods and food supplies. The result is that a movement is under way to prevent foreigners from buying at all, or only upon the payment of a price anywhere from 30 to 100 per cent advance over the regular market price. Where we were once received with open arms and a smile, we are now either ignored altogether, refused, insulted, and in some cases actually thrown out of the shops. I am told by one of my business acquaintances here that he has been compelled to adopt this rule because his employees demand it. The Germans themselves are literally buying their heads off.

A Morale Collapse

Whereas universal courtesy toward foreigners, and particularly toward Americans, was evident last summer, today there seems to be nothing but antagonism, discourtesy, rudeness, open resentment and threat. Walking on the streets you will notice people, hearing that you speak in a foreign tongue, turn and call after you; some even shake their fists and threaten. They will tell you that as long as you are in Germany, you must speak German. Hotels will charge you double rates, will make written agreements with you and agree to reserve rooms for you, and then when you arrive they will shunt you to some inferior room and will repudiate their written agreement, refusing to give any decent reason but simply saying that they will not acknowledge any responsibility.

Manufacturers and tradesmen who have made written agreements, either repudiate them altogether or endeavor to hold you up for higher prices, saying that they cannot be held for any contracts they have made.

It is very apparent to me and to all other students of these situations, that the German people have suffered a mental collapse, and I now have serious doubts as to their ability to come back as I thought they would a year ago. I am inclined to believe that the drop in the mark is due somewhat to "political manipulation" and that after the storm has cleared, it will come back again to where it was in June of last year, although there are some very influential persons here who believe that it will sell as low as 500 to 600 within a month or so. There are some who think that this prediction comes from governmental sources.

One thing is positive and that is that Germany is doing everything within her power to get out of the French indemnity payment, and I believe she is willing to go bankrupt in order to bring this about. A very significant remark was dropped to me by one of the great German officials. When I mentioned the system of permitting individual tradesmen to raise prices, and said that the German government could remedy the situation by imposing a tax on goods taken out of the country by foreigners, this tax to go into a general fund of the country, he replied with a significant wink, "And to France."

Now I am convinced that this is exactly the situation; that if the government did raise such a fund by taxation, it would have to go for repatriation, and the Germans would lose the total amount. The government pretends not to know anything about the individual merchant and his price raising schemes.

The Germans themselves say that their government is no good. They ask you how a government made up of harness-makers, cobblers and others of the like, can be good; and they still believe that the worst king or military ruler had a better system than the present government.

Another Revolution Imminent

It is freely predicted over here that revolution will occur again in Germany within six months, but although there is a great under-current of rumor, there has been no outside overt act so far. The collapse is bound to come and when it does no one knows just what will happen.

Never in all my life, anywhere on earth, have I seen the spending of money, eating, drinking and general joyfulness that I can witness any afternoon in the "tea room" of my hotel. You see frowsy-headed women of the most vulgar appearance occupying the most expensive seats at the opera, in the restaurants, and buying the best of clothes in the shops.

The Germans today believe that it would be a crying shame to permit an American to buy the product of their brains for so little as the German mark value means when measured in American money. They believe that Wilson betrayed them and made Germany poor, and they intend to take it out of every individual American who passes their way.

The system of taxation is changed to suit the occasion. The police have positively refused to give me any information concerning their actual schedule of charges, saying it is their affair and none of my business. Upon the advice of the German ambassador in Berlin, I had the city of Nürnberg issue me a permit to visit Munich and paid for this paper which contained the state seal. When I arrived in that city, the police repudiated the permit, saying that Nürnberg had no right at all to issue it, as Munich being the capital did as she liked and no other place had a similar right. It cost me 150 marks to remain a few days and upon the payment of an additional 150 marks I was allowed to stay a month; this price was later raised to 740 marks and finally compromised for 500 marks. Later they refused to extend my permit at all, telling me there were too many foreigners in the city and that I had better "beat it."

The Trend of Business Improvement—Plants Resuming

The E. G. Budd Manufacturing Co., 25th St. and Hunting Park Ave., Philadelphia, Pa., manufacturer of steel automobile bodies, added about 500 men to its working force last month. The plant is now operating at about 80 per cent of normal, with a number of departments working on full time and a few on an overtime schedule.

The Laconia Car Co., Boston, Mass., with plant at Laconia, N. H., is arranging for increased production from 32 to 40 complete freight cars in the repair departments at the works. Present contracts on hand cover 1,000 cars for the Boston & Maine Railroad, and 500 cars for the Maine Central Railroad, and insure continuous operation well into next November.

The Fisher Body Co., Cleveland, Ohio, manufacturer of automobile bodies, is operating its local plant on a day and night schedule, with three 8-hour working shifts. About 2,000 employees have recently been added to the force.

The New York, New Haven & Hartford Railroad Co. has resumed operations at its locomotive repair shops at New Haven, Conn., following a shut down since Dec. 24. The works will give employment to about 2,000 men.

The Art Metal Works, Newark, N. J., has adopted a full time production schedule at its plant.

The John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wires, cables, etc., is arranging for immediate operations in a new building now being completed at the plant.

The Rodney Hunt Machine Co., Orange, Mass., is increasing the working hours in a number of departments at its plant.

The Chicago, Rock Island & Pacific Railroad Co., Chicago, Ill., is increasing the working force at its shops at Chickasha, Okla. The plant is now operating under a 5-day week schedule.

The Loch & Battista Manufacturing Co., Berwick, Pa., manufacturer of patented flush tanks, etc., is arranging for immediate increase in manufacture with a schedule of about 1,500 tanks a month. Additions will be made to the working force, and three shifts operated.

The American Steel and Wire Co., Worcester, Mass., is operating the cable department at its South Works at full capacity with day and night shifts. Other branches of the plant are working on a 10-hour day basis, including Saturday mornings. The plant is now giving employment to about 5,000 workers. An increase of from 15 to 20 per cent in manufacture as compared with 1921 operations has been arranged.

The Bessemer Motor Truck Co., Grove City, Pa., is arranging for the immediate removal of its works to its new plant, recently completed, at Holmesburg, near Philadelphia, where an increased working force will be employed for the manufacture of motor trucks, parts, etc. The new plant will have a rated capacity of close to 3,000 complete trucks a year.

The Lapointe Machine Tool Co., Hudson, Mass., is increasing the working force at its plant.

The Reeves Manufacturing Co., Dover, Ohio, manufacturer of iron and steel products, has resumed operations in a number of departments at its plant, which have been idle for several weeks past.

The American Car and Foundry Co., 165 Broadway, New York, N. Y., has taken orders for 500 steel hopper cars and 500 box cars from the Lackawanna Railroad; also for 1,000 freight cars from the Union Pacific Railroad; and 500 freight cars from the Illinois Central Railroad. The work will be distributed among the different plants of the company. The company is operating at close to normal at its Pennsylvania works. It is said that recent orders will increase the working forces by about 1,000 men.

U. S. Chamber Votes on Tariff Principles

The results of Referendum No. 37, conducted by the Chamber of Commerce of the U. S., to get the consensus of opinion of its members, have just been announced. The referendum covered a variety of tariff principles and was the means of bringing out some valuable information on how the manufacturers and the general business world stood.

The principles voted on were as follows:

(1) The committee recommends legislation permitting, in the event of changes of economic factors, adjustment of tariff rates by administrative authorities within limits prescribed by Congress for the purpose of maintaining a consistent tariff policy. In favor, 1,588; opposed, 384. Chamber committed.

(2) The committee recommends creation of a Tariff Adjustment Board to administer adjustable rates. In favor, 1,379½; opposed, 481½. Chamber committed.

(3) The committee recommends that there should be reasonable protection for American industries subject to destructive competition from abroad and of benefit to any considerable section of the country. In favor, 1,840½; opposed, 27½. Chamber committed.

(4) The committee recommends that the anti-dumping legislation of May, 1921, should be maintained in principle. In favor, 1,846½; opposed, 37½. Chamber committed.

(5) The committee recommends that the principle of maintenance and encouragement of our export trade should be observed in tariff legislation so far as consistent with reasonable protection for American industries of benefit to any considerable section of the country and subject to destructive competition from abroad. In favor, 1,793½; opposed, 59½. Chamber committed.

(6) The committee recommends that tariff legislation should be framed and administered with a view to meeting discriminations, direct or indirect, by other countries against American trade. In favor, 1,868; opposed, 26. Chamber committed.

(7) The committee recommends that the present system of valuation for levy of ad valorem duties should be maintained. (Votes in opposition to this recommendation will be interpreted as in favor of "American valuation.") In favor, 979; opposed, 833. Chamber has no attitude.

(8) Do you favor postponement of general tariff revision until conditions in international trade and finance are sufficiently stabilized to form a basis for legislation possessing permanent value? In favor, 734; opposed, 1,110. Chamber has no attitude.

How Some of the Cincinnati Shops Are Getting Ready for Business

The Cincinnati Bickford Tool Company

The Cincinnati Bickford Tool Company is following a practice of weeding out such machines as are a little below standard, either through severe service or because of the better performance of later models. It is constantly experimenting with various designs so as to know the effect of the changes on performance.

The economical drilling of holes is an obsession with H. M. Norris and D. C. Klausmeyer, officials of the company, who have devoted many years to a study of this problem, and who are just as enthusiastic in the development of new things as they were in the many years gone by. There is no guessing in their work; all things are cold facts relating to deflection, torsion, power, speeds, etc.

The G. A. Gray Company

The G. A. Gray Co. in addition to bringing out its new planer, recently described in these pages, is getting ready for business in several other ways. It is replacing all of the larger planers with the maximum service type. While some of the machines thrown out are of recent installation, it is felt that the greatly increased production possible with the new planers more than justifies the expense of the change.

The Gray Co. is also keeping alive the insurance policies for all its men who, through no fault of their own, are now out of employment. This is one of the things which cannot fail to help in cementing the bond of good feeling more closely.

The King Machine Tool Company

One of the notably optimistic concerns is the King Machine Tool Company. It enlarged the shop last year to about double its original size, and while the changes are not entirely completed as yet, they are assuming shape and the new shop will have many advantages. The office is also new and is plain, neat and substantial in every way.

The shop is running about half force, which is a large percentage in these times, and is building both for shipment and for stock. The railroads are buying a few boring mills and some of the orders have found their way into the King shop.

All new machines in the plant are motor-driven, but it has not seemed advisable to change over the whole equipment. Vice-president E. A. Muller has not forgotten his steam-power transmission experience and it stood him in good stead in rearranging the plant. The power plant is unusually quiet and efficient with its Uniflow steam engines as the prime movers.

The shop layout has several interesting features all of which make for simplicity, ease of handling work and comfort of the men. The lack of red tape in the shop routine is noticeable.

"A. S. M. E. News"

The American Society of Mechanical Engineers has begun the publication of a semi-monthly bulletin which has been called the "A. S. M. E. News." It will carry information regarding the activities of the society, its local sections and professional divisions.

Business Conditions in England

By OUR LONDON CORRESPONDENT

People in control of trade and industry in Great Britain remain hopeful, realizing that no marked improvement can be expected until taxation is reduced and foreign markets are restored. They are slowly recognizing that politics and policies have an important bearing on ordinary business. Despite the depressed conditions everyone at least appears to be cheerful; but the fatalism from which in the past this feeling was in part derived, is giving way to real concern for the future, and engineering traders have frankly been looking forward to Cannes for international adjustments and agreements, without which Great Britain will have extreme difficulty in maintaining her position. As far as it has gone, the Washington conference has certainly been ameliorative in effect; the only regret is that agreements of a wider scope could not have been effected. We have been hearing from France of international corporations to help in restoration and reconstruction on the European continent. The capital suggested, twenty million pounds, is itself a criticism of the scheme. Too much hope has not been based on these rumors, for it is apparent that no permanent improvement can be effected until the German reparations problem is tackled again, and solved according to a workable plan; and further, that a much wider trading system must be possible in connection with Russia. Germany and Russia together figured largely in the overseas trading of Great Britain before the war. Either they must come back, or equivalent markets must be found elsewhere. The latest return gives 1,885,300 persons on the live registers of the employment exchanges in the United Kingdom, the increase marking the decline of the seasonal Christmas employment.

Finances Are Steady

Great Britain's financial year closes at the beginning of April rather than with the calendar year, but the figures of revenue and expenditure for the nine months ending with December form a rough indication as to how the budget will work out. For these nine months of 1921, taxation brought in £676,831,000, a decrease, as compared with the previous year, of nearly £212,000,000. On the other hand, the total expenditure was nearly £740,000,000, or about £100,000,000 less than the figures for the corresponding period of 1920. There has been a definite tendency to conclude that the figures given imply a deficit on the budget when finally made up. This, while not impossible, is by no means certain, for it has been shown that about three-fifths of the revenue estimated has been received, and this is not far behind the usual proportion, while the expenditure is, on similar reasoning, actually lower than usual. The chief difference, as compared with a year ago, is in the reduced excess profits duty. But this was budgeted for and the other principal item, namely, miscellaneous receipts, is also not greatly below estimate.

While dealing with figures, bankers' clearings, though not altogether connected, may be mentioned. The total amounts to £34,930,559,000, or about £4,000,000,000 less than 1920.

Much is being made of the government committee's efforts to economize by reducing expenditures, and pressure is being exerted in order that the interim report, circulated among ministers concerned a short while ago, shall be published. At present the air is full of rumors. One specially persistent is to the effect that a cut of £20,000,000 is to be made in the expenditure on education, the effect of this being to rouse the opposition of the primary school teaching profession and still further extend the movement to make people of this class privileged persons.

Great Britain's liabilities have been discussed by the Chancellor of the Exchequer, who has mentioned that 520 million pounds yearly is required to pay for pensions and national debt services. Very little in the way of reduction of debt has been accomplished. Of the total debt, which is about £7,700,000,000, more than £5,307,000,000 is funded, £1,100,000,000 is owed to the United States and the rest is in the form of a floating debt. During the next nine years in one way or another about £1,674,000,000 will fall due for re-payment; it is felt that the policy of re-borrowing cannot be safely continued for very long.

Government Aiding Exports

The government export credits scheme has lately been of service to the engineering industry, one of the leading electrical engineering companies having received help in the equipment of works in South Africa, which could not undertake to pay for some twelve months. The section concerned with the Overseas Trade Department dealt with the proposal, and in a fortnight settled the matter. This has encouraged other firms to make application and more than half a dozen schemes of engineering interest are now under consideration, two of them relating to constructional steel work on the continent of Europe and in Canada. Electrical people have been among the best employed of engineers during the slump, but of late a decline has been experienced. Part of this, however, is thought to be due to the fact that the commissioners who are considering the electrical supply of the country have not yet finished their work, which is expected to exercise a marked effect on the manufacturing industry.

The rates charged for the transport of materials on the railways have long been held to constitute a handicap to trade improvement; in particular, the Federation of British Industries has exerted itself, and lately some reductions have been effected in charges for iron ore, limestone, etc., fuels, including coal and coke, etc. But the lowering of rates is not thought to be sufficient to stimulate trade in the industries concerned. In any case it has been urged that reductions should be general and not confined to the materials indicated. It is probable that before long every industry will make a demand on the railway rates tribunal for a definite proportionate reduction.

The machine tool industry was enlivened somewhat during the past month by the receipt of a few orders, though their effect in the shops can only be described as negligible. A trade revival is not expected in this direction for another six months, though some inquiries suggest that export conditions may improve before long. While prices may be adjusted in special circumstances, some firms have made a definite cut, in one case of 25 per cent, the purpose being to bring in ready money. Nobody doubts that the machine tool industry has been and is passing through a period of great stress, but financial failures so far have been few in number. One of the most interesting items of news is the announcement that Dean, Smith & Grace, Ltd., Keighley, has seceded from Associated British Machine Tool Makers, Ltd. This was the last of the twelve firms to enter and, opponents of the scheme will say, the first to leave. A period like this is indeed a testing time for an organization, the constituents of which bond themselves not to proceed outside certain limits.

Profits Shrinking

The members of the iron and steel industry seem to be more hopeful, and it is thought that in price British producers can now compete with continental.

The profits, or otherwise, of one or two engineering concerns may be mentioned. Taking first Agricultural and General Engineers, Ltd., which has an issued capital of more than three million pounds and holds most of the shares in about a dozen separate engineering concerns; here it has been decided not to pay any interim dividend on the first and second cumulative preference shares. The directors have mentioned signs of improvement in trade. Cubitt's Engineering Co. shows a loss up to June last of £79,358. This company is not yet three years old, and in the first year showed a net profit of £13,340. Alldays & Onions, Ltd., Birmingham, manufacturer of motor cars, motorcycles, compressed air hammers, furnaces, blacksmiths' equipment and some small tools, reports a loss on the year to July last of £108,300. The profits having fallen the previous year to £7,110, various changes were made in personnel, and the business was reorganized, only to lead to the heavy loss noted. Previously the company had been in the habit of paying about 10 per cent. The Coventry Chain Co. reports a profit of £35,546 as compared with £49,477 the previous year. The subsidiary company, known as the Coventry Repetition Co., manufacturer of screws, pins, etc., showed a loss in the last report of £38,000. Brett's Patent Lifter Co. shows a profit for the year ending with October last of £8,195. S. Smith & Sons, manufacturer of motor accessories, shows a loss for the year ending with last July of £295,437, against a net profit on the previous year of £98,337, a debit balance of £203,985 being carried forward. The loss is in part due to the writing down of stocks and investments and to expenses in connection with a debenture issue.

Councillors of the U. S. Chamber of Commerce to Meet

A meeting of the more than 1,400 councillors of the United States Chamber of Commerce will be held in Washington on Feb. 8 and 9. At that time there will be a discussion of the proposition of making compulsory the adoption of the metric system in the United States, and also a discussion of the railroad situation and consideration of the following recommendation which is put forward by the railroad committee of the chamber:

"It is the sense of this committee that there should be some governmental agency adequately equipped having appropriate jurisdiction and the duty to promote, sustain and develop the transportation facilities of the country in the light of the public interest before committees of Congress and before the various governmental agencies now in existence or hereafter created that have power of action or decision in respect to any matters affecting transportation."

Pursuant to this principle the committee presents the following recommendations:

(1) That the Chamber of Commerce urge Congress to enact appropriate legislation authorizing the President to appoint and prescribe the compensation of a special administrative officer with the title of Commissioner General of Transportation.

(2) The commissioner should hold office subject to the will of the President, and upon the occurrence of a vacancy in the office the President should appoint and prescribe the compensation of a successor.

(3) The commissioner should be selected because of his familiarity and experience with transportation conditions, problems and necessities, and should keep himself informed of the transportation needs of the country and make such recommendations to all governmental agencies charged with the regulation of interstate transportation as he may find will be for the public interest and will tend to co-ordinate the administration of the laws respecting interstate transportation by land, water and air for the promotion and development of a national system of rail, water, highway and aerial transportation, and will make possible the articulation and economical use of all transportation facilities including tracks, highways, terminals, transfer facilities, docks and landing places. The commissioner should make an annual report of these matters to the President for transmission to Congress.

(4) The commissioner should not be permitted to engage in any other business, vocation or employment during his term of office, nor to be eligible for any elective office within two (2) years after he ceases to be commissioner.

(5) The commissioner should ascertain and report to the President from time to time for transmission to Congress each and all conflicting or inharmonious functions and rulings of any one or more boards, commissions, bureaus or other governmental agencies with respect to interstate transportation as related to the functions and rulings of any or all other such agencies that cannot be so reconciled by administrative practices as to promote the general development of a co-ordinated system of interstate transportation; such report to be accompanied by recommendations of the commissioner designed to correct and remove such inharmonious provisions and practices.

(6) The commissioner should render all possible assistance to the Interstate Commerce Commission in facilitating and advancing the consolidation of railroads into a limited number of competing systems as authorized in the Transportation Act, 1920.

(7) The commissioner should be notified of all hearings before any board, commission, bureau or other governmental agency now existing or hereafter created with respect to transportation, rates, fares, regulations, terminal charges, wages, working conditions or other subject matter affecting interstate transportation; and should be entitled to be heard in person or by representative at all such hearings and to produce evidence that will tend towards a result that will promote and facilitate the continuous development of an interstate transportation system that will be adequate and efficient to meet the transportation needs of the country.

(8) The commissioner should be authorized to call upon any department or bureau of the Government for any information as to interstate transportation matters that may be needed by him in the performance of his duties; and such departments and bureaus should be required to furnish such information on his request.

(9) The commissioner should be authorized to grant federal charters to corporations proposing to engage in interstate transportation by land, water or air, and upon application therefor, to convert state corporations so engaged into federal corporations so that by such conversion the existing corporation shall not close or interrupt its business as a common carrier, nor shall any of its existing obligations to others nor any existing obligations of others to it be in any manner prejudiced or impaired, but it shall continue as a corporation with the same officers and directors until other directors shall have been chosen under the federal charter and the same property assets and business as before its conversion, save only that jurisdiction over it as a corporation shall be vested in the Government of the United States.

(10) The Congress should make adequate appropriations for carrying out the foregoing provisions until such time as receipts from charter license fees to be authorized by Congress are sufficient for this purpose.

The committee on railroads includes: George A. Post, chairman; Walter S. Dickey, F. C. Dillard, Emory R. Johnson, Charles E. Lee, Thomas C. Powell, Wilmer W. Salmon, George W. Simmons, Alexander W. Smith, Harry A. Wheeler.

Distribution of Machinists Compared to 1910

Figures just made public by the Bureau of the Census show at the time the 1920 census was taken there were 6,489 machinists and toolmakers in San Francisco, as compared with 2,982 in 1910. Figures for other localities are as follows: St. Louis, 8,771 in 1920, 5,149 in 1910; Newark, N. J., 7,862 in 1920, 3,982 in 1910; New Orleans, 2,079 in 1920, 1,104 in 1910; Seattle, 3,548 in 1920, 1,437 in 1910; in the state of Colorado, 5,032 in 1920, 3,661 in 1910.

Washington Notes

By Paul Wooton
Washington Correspondent

Reference to the Transportation Act itself is all that is necessary to refute the claims that the administration has gone over the head of the Railroad Labor Board in its conferences with representatives of the railroad executives and of the railroad brotherhoods. The law provides machinery to bring employer and employee together. The labor board was intended to take care of only those questions on which the railroad management and the employees could not reach an agreement. Since the local machinery provided in the Act never has functioned, the administration has seen no impropriety in attempting to start it working and relieve the over-worked labor board of as many cases as possible. That the administration's efforts in that regard have been successful may be judged by the fact that agreements already have been reached for regional conferences.

It is of the utmost importance to the efficient and economical conduct of rail transportation that the management have the hearty co-operation of the men in the train service particularly. With these employees working earnestly to make the best possible showing, very material savings can be made in operating expenses. For this reason there is an argument against cutting the salary of the engineers, conductors, firemen and brakemen—the employees making up the four brotherhoods—when a 10 per cent cut in their wages would mean only 1.2 per cent reduction in operating expenses and probably would make it impossible to imbue these men with the *esprit de corps* so necessary to insure maximum efficiency. In that connection it also is pointed out that conductors and engineers have had relatively small increases in pay since 1914 as compared with the increases allowed other employees. It also is contended that men in the train service and certain other classes of railway employees have a narrow calling in that their skill cannot be applied in other lines of endeavor. For this reason, it is argued, they should have a higher relative wage than those engaged in a type of railroad work where the training and experience can be applied in comparable lines in other industries.

While one swallow may not insure the immediate approach of more propitious weather, there are at least two harbingers of an approaching revival in business. One is the activity of banking houses in their search for investments, and the other is the status of railroad supplies and materials. While it may be said that the banks at this time will be interested only in gilt-edge securities, the rapid increase in idle capital indicates that these investors very shortly will "go into business."

Since the railroads are the purchasers of some 20 per cent of the country's manufactured commodities, it is of significance to know that they are now at the end of their stocks.

With some unemployment prevailing, sight frequently is lost of the other portion of the picture. Eighty-five per cent of the people in the United States are at work and are being paid at a relatively higher level than at any time in twenty-five years.

Timken Bearing Co. Wins Patent Suit

The right of the Timken Rolling Bearing Co. to English patents on the machinery invented by John F. Flaherty, while in the employ of the company, was upheld in a decision handed down by Judge Krichbaum, at Canton, Ohio, on Jan. 13.

Flaherty was employed by the company for several years with title of master mechanic. It was agreed that his principal duty was the improvement and development of machinery used by the company in the manufacture of roller bearings. All of these were assigned to the company with the exception of the British patent rights on one machine, which Flaherty retained in his own name and sought to transfer to the Standard Parts Co., a competitor of the Timken concern. The Timken company filed suit to compel him to turn over the patent.

The court found that Flaherty had voluntarily turned over his patents on his other inventions to his employers and had willingly performed all the things necessary to establish the patent rights in the firm. It was decided from correspondence signed by Flaherty that he considered himself to be acting as an agent for the company and the court held that creation of the inventions was part of the work for which he was employed on a salary.

A. B. Hiler Dead

A. B. Hiler, well known as the New York representative of the Jones & Lamson Co., died Jan. 28. He was born in Rockaway, N. J., in 1874, and one of his early mechanical experiences was in the old Liberty bicycle factory at Rockaway.

Later he went to Orange, N. J., entering the employ of Thomas A. Edison in the screw machine department, where he soon rose to be foreman. He left there about 15 years ago to join the Jones & Lamson Company.

Combustion Corporation Opens Branch Offices

Mutually satisfactory arrangements have been made between the Combustion Engineering Corporation and the George J. Hagan Co., of Pittsburgh, Pa., whereby the latter company discontinues representation of the Combustion Engineering Corporation.

The Combustion Engineering Corporation has opened its own office in the First National Bank Building in Pittsburgh, Pa., and will soon open an office in Cleveland, Ohio, both of which will be in charge of W. C. Stripe, former manager of the Philadelphia office.

The George J. Hagan Co., will retain the exclusive agency for the type "H" stoker, formerly known as the American stoker, for use in Hagan furnaces.

Feiker Resigns as Assistant to Hoover

F. M. Feiker, vice-president of the McGraw-Hill Publishing Co., who for the past eight months has been assisting Secretary of Commerce Herbert Hoover in the reorganization of the Department of Commerce, has resigned. Mr. Feiker has not, however, completely severed his relations with the Secretary or the department. He has been appointed a special agent of the Bureau of Foreign and Domestic Commerce, to continue, in a consulting capacity.

Last May, Mr. Feiker was given leave of absence from the McGraw-Hill Company to join the Department of Commerce as a special Administrative Assistant of Secretary Hoover.

Howard D. Lewis Dead

Howard D. Lewis, secretary of the Fitchburg Machine Works, Fitchburg, Mass., died on Jan. 26. Before becoming connected with the Fitchburg Machine Works, he was associated with the Allied Machinery Company of America in this country and in Europe, and before that with the Fairbanks Co.

Trade in Iron and Steel for November

Starting with September, when the turning point was witnessed, exports of iron and steel from the United States gradually worked toward a higher level, reaching a total in November of 122,835 long tons, 20,303 tons in excess of October's figure, says the iron and steel division of the Department of Commerce. It is necessary to go back as far as May, when 138,106 tons were sent abroad, to find a better record than this.

Improvement over October's export showing is seen in the majority of items, marked gains having been made in steel sheets, rails, and tin plates, which more than accounted for the resulting total gain. Slight losses were experienced in wrought pipe, steel plates, barbed wire, pig iron, hoops and bands and railroad spikes.

Japan takes first place as a buyer of American iron and steel in November, with a total of 54,611 tons, over 31,000 tons of which were black sheets, the remainder comprising large takings of tin plates, rails, wrought pipe, structural steel, wire nails, plain wire, wire rods and steel plates.

Canada's share in November's exports of iron and steel amounted to 31,259 tons, which, together with Japan's total, represented 70 per cent of the month's exports to all countries. Exports to Canada comprised every item shown in the table excepting cut nails, its principal receipts consisting of steel plates, structural steel, rails, black sheets, barbed wire, billets, steel bars, tin plates, galvanized sheets, wire rods, plain wire, and pig iron, in the order named. It is noted that 7 of the 16 foreign markets listed in the table belong to the Latin American group, their receipts comprising a great variety of products, with wrought pipe, rails, structural steel, steel bars, and black sheets predominating. Of the remaining countries in the table, the principal takings of each were: China—steel bars, rails, and black sheets; Philippine Islands—rails and black sheets; British India—structural steel, wrought pipe, and black sheets; the United Kingdom—steel plates and wrought pipe; Australia—rails (1,100 tons); Hongkong—tin plates, steel bars, and wire rods; and Kwantung Leased Territory—galvanized sheets and wire nails.

December Exports of Metal-Working Machinery

Metal-working machinery was exported during December in slightly greater volume than in November. While the increase in this movement was small, an analysis of the figures shows the encouraging sign that exports are continuing to a long list of countries. The volume of business has been greatly reduced with all the countries on the list, but the fact that a certain amount of business is being maintained throughout the world is thought to indicate that no other country is making decided headway in its competitive efforts against American metal-working machinery. The detailed figures for December, which are those of the Bureau of Foreign and Domestic Commerce, are as follows:

	Dec., 1920	Dec., 1921
Metal-working machinery:		
Lathes	$629,594	$12,001
Other machine tools	1,264,939	219,708
Sharpening and grinding machines	314,293	63,088
All other	1,557,881	370,036
Total metal-working machinery	$3,766,707	$772,833
Exported to:		
Belgium	$218,945	$2,218
France	375,504	34,579
Italy	33,748	4,932
Norway	15,909	899
Spain	70,716	12,134
Sweden	24,673	3,869
United Kingdom	899,789	164,587
Canada	254,622	72,104
Mexico	150,604	22,652
Cuba	147,402	27,834
Brazil	59,253	44,769
Chile	121,250	3,552
China	54,715	14,590
British India	91,284	55,310
Japan	385,351	99,574
Australia	175,985	18,253
Netherlands	.....	5,171
Argentina	.....	10,370
Dutch East Indies	.....	4,390
Other countries	686,957	171,046

Imports of machine tools continue negligible. The value of those imported during December was $16,760.

Dean Cooley to Spread Gospel of Engineers

President Mortimer E. Cooley, of the Federated American Engineering Societies, will leave Ann Arbor, Mich., on Feb. 5 for a flying trip through the South and Middlewest. He will visit the leading cities, making about twenty speeches during the trip, which has been planned to further the organization of the federation and explain the mission of the engineer.

Among the places already listed on the president's schedule are: Kansas City, Lawrence and Topeka, in Kansas; Oklahoma City and Norman, in Oklahoma; Dallas, Austin and Houston, in Texas; New Orleans, La.; Montgomery and Muscle Shoals, in Alabama; Atlanta and Athens, in Georgia; Nashville, Tenn.; Louisville and Lexington, in Kentucky. He is expected to arrive in Chicago, March 10, the end of the trip.

Screw Thread Bill Passes House

Despite several sarcastic references, by Rep. Walsh of Massachusetts, to the National Screw Thread Commission, and to Secretary Hoover, the House passed the bill extending the life of the commission for five years. The bill is now in the hands of the Senate Committee on Manufactures and probably will be reported out with a recommendation that it be passed without further public hearings.

Representative Walsh stated that when the commission was created "it was not even dreamed that it would take any considerable time to complete its work." "When the term of the Commission was extended before," Mr. Walsh said, "it was done on the understanding that the work was to be concluded speedily. I should like to have somebody besides the distinguished and eminent gentleman (Mr. Hoover) who appeared before the committee, give some good reason why any such extension should be granted to a commission which was organized during the war, and which we were told would be able to wind up and standardize most of the matters with which it was dealing. Why not appoint the commission for life?"

Representative Tilson, of Connecticut, explained the success which had followed the commission's work on the standardization of screw threads, and told the House that there is further need of standardizing special threads, such as those used on pipes and on electric fixtures. He also explained that the commission proposes to continue its work so as to include the matter of standardizing the material of which screws are made and to take up wire sizes. Mr. Tilson also explained that the commission serves without pay; that it has no clerical personnel and that it does not incur printing expense. He told how the members of the commission had made a trip to Europe at their own expense to confer with the standards commissions of England and France. He said that there is hope that within the next five years international standards governing screw threads may be adopted. "This commission is unique," said Representative Tilson, "in that it never has cost the government a cent. It is not contemplated that it will cost anything, yet is doing a work which the manufacturers of the country and the engineering profession agree is one of the most important that is now being done by any commission appointed by Congress."

The Federated American Engineering Societies has urged Senator La Follette, the chairman of the Committee on Manufactures, to report out the National Screw Thread Commission bill without further hearings. It is believed that nothing can be added to the information developed by the House committee and during the discussion of the bill on the floor of the House. The advantages to the engineering professions of the work done by the Commission was pointed out and prompt action on the bill urged.

Work Continues

Sub-committees to consider tap and tap drill sizes and boltheads, nuts and wrenches were named by the National Screw Thread Commission at a meeting held at the Bureau of Standards on Jan. 17. The meeting was devoted almost entirely to the discussion of tap drill sizes and tolerances and to the standardization of boltheads, nuts, and wrench dimensions. These two subjects were assigned to the sub-committees which will rush the work on their reports in order that they may be submitted at the next meeting of the commission which will be held prior to Mar. 1. Wire sizes also will be discussed at that meeting. The personnel of the sub-committees is as follows. Tap and tapdrill sizes, E. C. Peck, R. E. Flanders and Earl Buckingham; boltheads, nuts and wrenches, F. O. Wells, Commander J. M. Ferguson and E. H. Ehrman.

A. S. M. E. to Revise Its Constitution

As the outcome of about two years' discussion of the leading policies of the American Society of Mechanical Engineers, it is highly probably that the year 1922 will see the adoption of an entire revision of the constitution under which all the work of the organization is carried on. The proposed constitution will be shortened to about one-fourth of its present length, and will contain principles only. All details will be transferred to the by-laws. Other important recommendations concern a raising of the standards of membership and a rearrangement of the governing body to secure better professional representation.

Two big meetings of the society will be held during the year, and there will be about two-hundred meetings of local sections. The general meetings will be held at Atlanta, Ga., in May, and in New York in December. The meetings of the local sections will be held in the fifty-one centers throughout the country, in which the society conducts a local organization.

Business Items

The New England Blower Co., 27 Charter Oak Pl., Hartford, Conn., has been incorporated under the laws of the State of Connecticut, to manufacture blowers, sheet metal products, etc. Ivor Miller, 80 Heath St., Hartford, is the president; Christian B. White, treasurer; John A. Magnuson, secretary.

The Waterbury Manufacturing Co., 236 Grand St., Waterbury, Conn., manufacturer of brass goods, recently bought a factory building on College St., Middletown, Conn., from W. E. Schroud. It is planned to manufacture sheet brass goods in the building.

The Mann Edge Tool Co., Water St., Lewistown, Pa., at the annual meeting of stockholders, elected the following officers: President, John Stephens, Jr.; vice-president, J. A. Muthersbaugh; secretary, H. R. Manbeck; treasurer, S. B. Weber. Directors include officers and A. R. Hayes, J. S. Green, Calvin Green, J. M. Selheimer, W. W. Cunningham, all of Lewistown, Sidney D. Furst and Charles Lunn of Lock Haven, and J. A. Knight of Williamsport.

Papers were filed recently with the Secretary of State of Indiana, by the Riess Manufacturing Co., of Indianapolis, for the purpose of manufacturing and selling all kinds of machines, tools, etc. The company was organized by Frank Reiss, A. M. Stewart and Henry P. Ross, and is capitalized at $75,000.

The Stewart-Burgan Co. has been incorporated at Toledo, Ohio, with a capital of $25,000 to manufacture and sell machinery and tools. The incorporators are A. M. Stewart, 2159 Scottwood Ave, J. H. Burgan, F. H. Schroeder, C. B. Halsted and C. T. Lambert, all of Cleveland.

The Detroit Marine Aero Engine Co. has been incorporated in that city with Garfield A. Wood as president. The company will manufacture, buy, sell and repair airplane and marine motors. Other officers named are: A. A. Schantz, vice-president; J. L. Barret, secretary-treasurer; W. C. Rands, Carl Fischer, J. A. Allison and O. F. Barthel, directors.

The Dayton Malleable Iron Co. has purchased the Canton, Ohio, plant of the Timken-Detroit Axle Co. Extensive alterations in plant and equipment will be made as the new owners will operate a railroad specialty shop. The Timken concern will continue to manufacture its product in the Detroit factory.

The Victor Screw Works, Inc. has consolidated with the Peninsular Milled Screw Co. Both companies are situated in Detroit, Mich., and will occupy a new plant at Hancock and Lawton Sts. The new organization will be known as the Victor-Peninsular Co.

Canada Foundries and Forgings, Ltd., has opened an office at 186 Bay St., Toronto, Canada. Tim W. Rogers is in charge of this branch.

Curtis & Marble, Worcester, Mass., manufacturers of textile machinery, report good business. The plant is running full time with a full complement of workmen.

The Atlas Die Casting Co., Worcester, Mass., is working on a full-time basis. The toolroom is in operation every evening until ten o'clock.

Sleeper & Hartley, Inc., Worcester, Mass., reports full-time operations. Orders have been received for standard and special machinery.

The Direct Steel Process Co. of San Jose, Cal., is contemplating building a steel plant in the vicinity of San Francisco. W. O. Bardee, vice-president of the company, has conferred with the Chamber of Commerce in that city regarding the matter.

The International Purchasing and Engineering Co., Detroit, Mich., announces a reduction of 15 per cent in the price of Dresser electric driven machines. The reduction will be permanent for 1922.

The Murphy Valve Co. has opened offices in the Majestic Bldg., Columbus, Ohio. The company will market a valve, the recent invention of D. R. Murphy, of Newark, Ohio, who is head of the company.

Ohio Alloys Company, backed by New York and Chicago capitalists, has purchased a plant at Fortoria, Ohio, and will remodel it to manufacture metal alloys. It is expected that the changes can be made, machinery installed and the plant ready for production by Mar. 1. The new concern will be in charge of H. J. Hayden.

The Portage Iron and Wire Co., Akron, Ohio, at its annual meeting

last week, elected J. A. Bachmann president, John Kraker vice-president, J. J. Whitelaw treasurer, and J. A. Bachmann, Jr., secretary. The new board of directors is made up of John P. Lind, A. Vollbracht, Walton Gruner, W. F. Ridge and John A. Greissing.

The Nilco Lamp Works, St. Marys, Pa., has acquired the St. Marys plant of the General Electric Co. Arrangements are being made for immediate operations. The Nilco Company also operates a plant at Emporium, Pa. B. G. Erkskine is president and J. C. Wortman, vice-president.

Reorganization of the Central Steel Co., Massillon, Ohio, has been completed and operations in the combined plants will be started soon. Officers elected are: R. E. Bebb, president; F. T. Griffith, vice-president and general manager; C. E. Stuart, secretary-treasurer. Vice-presidents in charge of departments are: C. C. Chase, Jr., sheet; Harry Baugle, strip; Ben Fairless, operations; Myron Phillips, production; J. M. Schlendorf, sales. The Central Steel Co. is a combination of the Massillon Rolling Mills, National Pressed Steel Co. and the old Central Steel Co.

Personals

WILLIAM K. SINGLETON, for the past seven and a half years manager of sales for the Carnahan Tinplate and Sheet Co., Canton, Ohio, has severed his connection with that company and has taken up his new duties with the tin plate plant of the American Steel Company, at Pittsburg.

R. B. PERRY, who for the past six years has been connected with the Allen Motor Company, has resigned as director of sales and service to join the Atlas Brass Foundry Co., of Youngstown, Ohio, in the capacity of general sales manager.

FREDERICK W. ANDREWS, former purchasing agent of the United States Hoffman Machinery Co., of Syracuse, N. Y. has entered the automobile business, forming the firm of Oswald & Andrews with a $25,000 capital. Charles Oswald, formerly with the Stowell Motor Car Co., and Harry H. Skerritt are the other directors of the company.

O. W. HOWARD, of the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has been transferred from Springfield to the New York office of the company.

J. A. FORSITHE, general sales manager of the Gilbert & Barker Manufacturing Co., Springfield, Mass., recently received a five years' service pin from the company.

K. S. EDWARDS, of the Pacific Coast Sales Department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has been transferred to the home office where he will assume supervision of all retail sales activities of the company, and in addition will assist general sales manager J. A. Forsithe in the Eastern field. C. O. Chauncey, will assist Mr. Edwards in his new work.

S. M. ARCHER, has been appointed superintendent of the bank lock department of the Yale & Towne Manufacturing Co., Stamford, Conn., succeeding R. C. Lewis, who has retired.

R. C. LEWIS, superintendent of the bank lock department of the Yale & Towne Manufacturing Co., Stamford, Conn., has retired after thirty-five years of service with the company. Mr. Lewis will, however, remain in the company's service in a consulting capacity.

W. H. SWINK, formerly supervisor of inspection with Supreme Motors Co., of Warren, Ohio, is now employed in a similar capacity with the White Motor Co. in Cleveland, Ohio.

ARTHUR J. PROCTOR, efficiency engineer with the Champion Ignition Co., of Flint, Mich., sailed on Jan. 19 for Liverpool, England, where he will spend some time on a special errand for the company.

MRS. MATILDA S. DILL, widow of the late president of the T. C. Dill Machine Co., of Philadelphia, Pa., has been elected president of the company. Her daughter, Mrs. Matilda Dill Moore, has been secretary of the organization for several years.

A. M. BREWSTER, president of the Atlas Die Casting Co., Worcester, Mass., addressed the local section of the A. S. M. E. in that city on January 24. His subject was "Die Castings."

T. H. HAYS has been appointed manager of the Indianapolis office of the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa.

A. E. HITCHNER has been appointed manager of the industrial department of the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa.

ALLAN A. RYAN has resigned as chairman and director of the Stutz Motor Car Co., and has been elected chairman of the newly organized Frontenac Motor Co., capitalized at $1,000,000. Mr. Ryan is now in Europe.

S. H. FARKAS has resigned as vice-president and director of the Exeter Machine Works, Inc., of West Pittston, Pa.

WILLIAM J. CLEARY has been appointed assistant general sales manager of the Sharon Pressed Steel Co., of Sharon, Pa. He will be located in the Dime Bank Bldg., Detroit, Mich.

GEORGE W. MCCANDLESS, treasurer of the McConway-Torley Co., and also of the Valley Steel Products Co., both of Pittsburgh, Pa., has been appointed Director of Public Safety in that city.

Obituary

J. T. SLINGSBY, president of the Aborn Steel Company, New York, was accidently killed by a shot from a revolver on Jan. 22. Mr. Slingsby kept the pistol in the tool pocket of his automobile and when he reached in to get a wrench, the gun was discharged and the bullet entered his head. He died two hours later in a hospital. Mr. Slingsby was forty years old and was widely known in steel manufacturing circles.

ROBERT M. KEATING, inventor of the Keating bicycle, and head of the Robert M. Keating Co., manufacturer of the Keating flush valve, Springfield, Mass., died in his home in that city on Jan. 19. He was fifty-eight years old.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A Belgian citizen residing in London, who is now in the United States, desires to secure an agency for the sale in England of iron and steel and textiles. Reference No. 516.

An industrial establishment in Belgium wishes to secure an agency for the sale of machine tools for wood working and metal working, small tools, and factory supplies. Quotations shoud be given c.i.f. Antwerp or Ghent. Catalogs in French are requested. Reference No. 502.

Quotations are desired by a manufacturing firm in Canada on large quantities of steel, sheet metal, malleable castings, and plows. Reference No. 495.

The purchase is desired by a firm in Canada of 100 tons of dead soft steel. Quotations should be given f.o.b. Pittsburgh, Pa., or New York City. Cash to be paid. Reference No. 518.

The purchase is desired by a merchant in Spain of general hardware and steel wire. Correspondence should be in Spanish. Catalogues and price lists are requested. Reference No. 623.

An agency on commission is desired by a firm in India for the sale of hardware, knitting machinery, sewing machines, automobiles, bicycles, typewriters and accessories. Quotations should be given c.i.f. Karachi or Bombay. Payment to be arranged through banks by confirmed letter of credit. Reference No. 626.

A commercial agency firm in Natal, South Africa, desires to secure the exclusive representation of firms for the sale of corrugated galvanized iron, bolts and nuts, wire nails, steel plates, bar iron and steel, packings and sheetings, tools such as shovels, picks, wrenches, and spanners; twist drills, lubricators, air and water valves, piping and pipe fittings, rails and fittings, cotton waste, leather and balata belting, and brush wire. Reference No. 628.

Representatives of manufacturing firms in Canada desire to purchase direct from manufacturers, steel sheets, gages 28 to 18. Quotations should be given f.o.b. destination. Cash to be paid. Shipment should be made by railroad. Reference No. 633.

There is required for the building of a railway in Mexico 4,400 tons of 56-lb. rails for standard gage track, with fastenings, either continuous joints or angle bars, and 15 switches complete. Should be given f.o.b. shipping point, or c.i.f. El Paso, Tex. Cash to be paid. Reference No. 637.

The commercial representative of firms in India desires to be placed in touch with manufacturers of cotton-mill plants; 1 plating machine, 1 bundle press, 1 machine of 50 drums; 3 sizing, 1 finishing machine, 1 calender machine, 250 dobbies, and fittings for sizing and mixing machine. Reference No. 640.

An importing firm in Sweden desires to secure an agency for the sale of iron and steel goods and hardware. Quotations should be given c.i.f. Harnosand or Stockholm. Reference No. 652.

An American commercial agent desires to secure representation in the Orient, where he already has an organization, of firms dealing in machinery, mechanical supplies, electrical equipment, hardware, etc. Reference No. 668.

Forthcoming Meetings

American Boiler Manufacturers' Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3, Engineering Societies Building. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Furnace, Resistance, Electric, Automatic
General Electric Co., Schenectady, N. Y.
"American Machinist," Sept. 8, 1921.



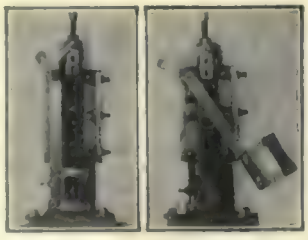
This furnace is designed primarily for operation at 1,800 deg. F. although it can be safely operated at 2,000 deg. F. The complete equipment consists of the furnace, transformer, automatic control panel and a temperature-control instrument, which is mounted on the sub-base of the panel. The furnace consists of a large sheet-steel casing, lined with insulating material, and having a semi-cylindrical chamber. The heating element consists of a continuous strip of resistor ribbon formed into arches, or a succession of semi-circular turns conforming to the arch of the furnace.

Relay, Voltage-Drop, D. C.
General Electric Co., Schenectady, N. Y.
"American Machinist," Sept. 8, 1921.



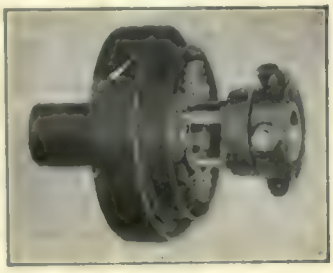
The relay is used in a system of control for direct-current motors, for either reversing or non-reversing applications. It combines time and current limits, allowing high torque where necessary, and minimizing current peaks on light loads. The relay, which controls the accelerating contractors, is operated by the voltage drop across the motor's starting resistor. It has two independent magnetic circuits, the upper one energized by a calibrating coil and the lower one by an assisting coil. The voltage at which the armature will close the contacts may be adjusted. The relay possesses a small, adjustable time lag in the releasing of the armature after the assisting coil is shorted.

Guard, Power-Press, Safety
Woodward & Wolf, 213 Rosemont Ave., Trenton, N. J.
"American Machinist," Sept. 8, 1921.



The device is intended for attachment to small foot-actuated presses. At the beginning of the stroke, the guard is well out of the way. When the press begins its downward stroke, the guard is said to swing well across the danger zone in only ⅛-in. movement of the punch or upper die. The view on the left shows the guard in a position in front of the die, while on the right it is at the limit of its stroke, the punch being at the bottom of its travel.

Clutch and Cut-off Coupling, Ball-Bearing
Hilliard Clutch and Machinery Co., Elmira, N. Y.
"American Machinist," Sept. 8, 1921.



The use of the ball-bearings is to permit of high speeds, even up to 2,000 r.p.m. The ball bearing sleeves are said to insure that the sleeve member is kept in proper alignment with the other member. The bearing caps are fitted with felt washers to exclude dust and retain the lubricant. Fafnir ball bearings are also used in the high-speed friction cut-off couplings, for use in connection with high-speed gas engines and for driving centrifugal pumps, blowers and air-compressors. The cut-off couplings are made for shafts 1 7/16 to 3 15/16 in. in diameter.

Crane, Portable, Garage
Kimball's Garage, 139 Ashmun St., New Haven, Conn.
"American Machinist," Sept. 8, 1921.



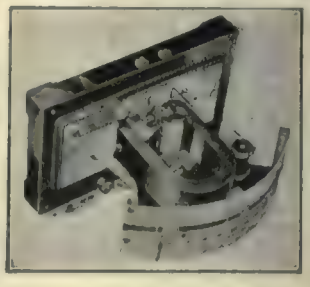
The crane is for use in garages or upon the road, for lifting all or part of a wrecked or dismantled car. The legs are of standard wrought-iron pipe, fitting into welded steel brackets attached to the ends of the crossbeam, and they may be of any length desired. The crossbeam is a standard I-section, either 4 or 6 in. in depth. The hoisting apparatus consists of a winding drum and wormwheel cast in one piece and of a worm and crank handle, supported by a bracket on one of the legs. The movable yoke encircling the beam is so shaped that it grips the beam firmly when the load is applied. The apparatus may be quickly disassembled.

Compass and Divider, Combination, "Cyma"
Edgar Bourquin, 1347 Main St., Waltham, Mass.
"American Machinist," Sept. 8, 1921.



Two divider points, a lead and a pen, are included in the construction of the instrument. Any of the four tools can be brought into play, thumbnuts being provided to lock the legs in the position desired. The divider points are claimed to be strong enough for inscribing on metal. The joints and fulcrums are firm fits and can be rigidly locked. The illustration shows also a combination ruling pen and pencil point, and a single ruling pen.

Pyrometer, Compensated
Brown Instrument Co., Philadelphia, Pa.
"American Machinist," Sept. 8, 1921.



This thermo-electric pyrometer is automatically compensated in the instrument itself for changes in cold-junction temperature. It includes means for setting the pointers to zero. No cold well in the ground nor compensating box is necessary. After mounting the instrument, the pointer is set by the zero adjuster to correspond with the index on the scale. When the temperature surrounding the instrument rises, the index automatically rises. Recording instruments can be equipped with this automatic compensation and with means for setting the pointer to zero.

Base Block, Vernier Height Gage
Art Tool Co., 16 Montgomery St., Bridgeport, Conn.
"American Machinist," Sept. 8, 1921.



This base block is intended to hold vernier calipers or height gages in an upright position when using them for laying out or testing work upon a bench plate. The block is made of carbon steel and ground and finished all over. A groove passing lengthwise through the upper side of the block takes the jaw of a standard height gage. A flat-sided taper key, locked by means of a headless screw on the under face of the block is used to obtain a firm grip upon the gage without danger of marring it.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Birmingham—C. T. Lehman, 2300 Ave. A., C. C. Penny, Purch. Agt.—One eye bolt machine of type and capacity similar to Williams & White No. 2 eye bender, arranged for motor drive.

One slow speed bulldozer of size and capacity similar to W. & W. Machine No. 29-U, or Ajax machine No. 10, arranged for motor drive.

One 30 in. hot saw and burring machine, similar to Ajax No. 3, complete and arranged for motor drive, current available 3 phase, 60 cycle, 220 volt (all used).

Ala., Pyriton—J. Boyd, Route 2—mica grinding machinery and equipment.

Conn., Bridgeport—The Park Ave. Garage, 1608 Park Ave., A. Levine, Purch. Agt.—chain hoist block about ½ ton capacity.

Del., Wilmington—The Wilmington Sugar Refining Co., Du Pont Bldg.—machinery for proposed sugar refinery.

Ga., Brunswick—The Brunswick Cross Arm Co. Box 167—one cross arm boring machine, one high speed band resaw, fast feed matcher and file room equipment.

Ill., Chicago—The Acme Wood Working Co., 1320 Rawson St.—one Pringle Brodie variety lathe.

Ill., Chicago—B. A. Futter, 7871 Glenwood Ave.—small bench punch press, 1¼ in. stroke, 6 in. base die between ram and bed, also automatic wire forming machines.

Ill., Chicago—The Natl. Stamping & Electric Wks., 424 South Clinton St.—one 36 in. power square shear.

Ill., Chicago—The B. H. Stafford Furniture Co., 218 South Wabash Ave—cabinet benches and 250-165 degree sprinkler heads.

Ill., Chicago — V. Thrane, Room 1750, McCormick Bldg.—one No. 25 double anvil type Diamond hog, capacity 5 to 8 cords per hour (used); Williams varnish scrap schredder; Williams-Miller special size No. 12 pulverizer known under old name as Miller special "G" size.

Ill., Chicago—The Underwriters Laboratories, 207 East Ohio St., A. Peterson, Purch. Agt.—one 2, 2½ or 3 ft. radial drill press. Machine that can be readily adapted to the drive will be considered (2½ ft. preferred, good make).

Ill., Sycamore—E. J. Morgan—pipe machine, 4 to 6 in., Beaver or other.

Ill., Toulon—The Bd. Educ., J. A. Nowlan, Secy.—domestic science and manual training equipment for proposed Township High School.

Ill., Winnetka—F. W. Hubsch, 1072 Spruce St.—one 8 ft. steel cornice brake.

Kan., Baldwin—W. Hey—truck, tractor, lathe and welding equipment.

Ky., Lexington—The Amer. Metallic Packing Co.—modern ice machine, 15 to 20 ton capacity.

La., New Orleans — The Estate R. G. Holzer, 317 Burgunay St., sheet metal work, etc., J. E. V. Holzer, Asst. Mgr.—crankshaft grinding machine for use in automobile department (new or used), 8 ft. 6 in. to 10 ft. 6 in. power cornice press brake, bending capacity 1/8 or 10 gage (slightly used).

La., New Orleans — The Orleans Steel Products Co., Inc., 1021-25 Bienville St.—crankshaft power grinding machine or crankshaft grinder attachment to be fastened to lathe (used). Wants catalogs for power machines, also attachments for doing crankshaft work for automobiles, etc.

Mass., Enfield—J. E. Hess, P. O. Box 144—one small lathe (used).

Md., Baltimore—The Purchasing Dept. of the Western Maryland R.R., Morris Bldg.—machine tools for rail reclaiming plant.

Md., Baltimore — S. T. Williams, 223 North Calvert St.—one piece shafting, 11-13 ft. long, 3 7/16 in.; one 30 x 8 in. split pulley; 3 post hangers, 3 set collars, one clutch and sleeve, all for 3 7/16 in. or near this; one 150 hp. Corliss or similar engine and two 100-125 hp. boilers.

Mich., Detroit — The Bd. Educ., 1354 Bway. Ave., A. Gadd, Bus. Mgr.—drill, brest drill, grinders and emery wheel dressers.

Mich., Detroit—The Dept. of Purchases and Supplies, 710 Marquette Bldg., G. J. Finn, Comr.—one earth boring and pole setting machine.

Mich., Detroit—The Eagle Bottling Wks., 4140 Antoine St.—bottling and capping machinery.

Mich., Detroit—H. A. Meier, 2153 Bellevue Ave.—one motor driven air compressor, 6 x 8, one traveling crane, 35 ft. span, one Ohio grinder, one 3 ton electric hoist and one planer, 42 in. x 14 ft.

Mich., Grand Rapids—The Grand Rapids Metal Products Co., 1530 Monroe Ave., N. W.—two spindle drill press and a No. 2 Warner & Swasey screw machine.

Mich., Lansing—The Robinson Drug Co., 107 North Washington St.—equipment for small ice cream manufacturing plant (used).

Mo., Joplin—The Conqueror Trust Co., 120 West 4th St., J. G. Starr, Vice-Pres.—tools, lathes, etc., for garage and machine shop.

Mo., Monett—Butler & McCormick, 3rd St.—garage tools, vise, bits and gasoline torch.

Mo., Monett—Lawler & McKinney, P. O. Box 311—gasoline boring machine.

Mo., Webb City—The Webb City Stone Co., 29 South Main St., or P. O. Box 505, C. Stupp, Mgr.—one 18 or 20 in. stone crusher and one double drum hoist and cable.

N. Y., New York—The National Railways of Mexico, Woolworth Building—list of 120 machine tools for their railroad shops in Mexico. The list includes different sizes and makes of lathes, shears, drills, grinders and rolls.

N. Y., Rochester—S. Snyder, 531 Lyell Ave.—electric trucks for factory use (new or used).

N. Y., Worcester—H. Mooney—equipment for garage, including taps and dies, adjustable reamers, battery charging outfit, lathe, air compressor and tank, vise, small air drill (new or used).

N. C., Wilson—Hackney Bros., Inc., T. J. Hackney, Purch. Agt.—complete woodworking machinery.

O., Cincinnati—Norton Broadway Mchy. Co., 236 Bway., C. H Norton, Purch. Agt.—six small quick change gear lathes; planer grinder; No. 4 and No. 5 inclinable press to weigh from 4,000 to 5,000, also two smaller inclinable presses.

O., Cleveland—J. C. Heintz & Co., 1319 Main Ave. — small engine lathe (new or used).

O., Cleveland—The Sandusky Cement Co., 626 Engineers Bldg., c/o F. G. Herman—three overhead traveling cranes, 80 ft. span, 10 ton capacity.

O., Findlay—The Visible Pump Co., S. B. Rohrer, Genl. Mgr.—machinery for large machine shop including lathes, drill, presses, grinders, etc.

O., Toledo—The Natl. Supply Co., Clair and Washington Sts.—two 5 ton traveling cranes.

Okla., Nowata—The Nowata Star, J. G. Norton, Mgr.—machinery for proposed newspaper plant on Main St.

Okla., Okmulgee — The Okmulgee Machine Shop, 2nd and Alabama Sts.—one large 16 ft. lathe and 1 small lathe, also forge or foundry equipment.

Pa., Braddock — The Bd. Educ.—lathes and equipment for vocational department of high school.

Pa., Braddock—Zamore & Kurfeerst, 905 Braddock Ave.—steel brake (used).

Pa., Charleroi—The Charleroi Iron Wks.—one keyseater.

Pa., Norristown — The Hatchinson Mfg. Co., Inc., manufacturers of woodworking equipment — additional boring machines, lathes, etc.

Pa., Oil City—The Bd. Educ.—equipment for vocational department of new high school.

Pa., Phila. — The Blum Mfg. Co., 1020 Market St., J. Blum, Pres.—paper box cutting machine.

Pa., Phila.—B. Ettleman, 5617 Kingsessing Ave.—pneumatic riveting hammer, air drill, sealing tools, etc.

Pa., Phila.—E. J. McAleer & Co., 1422 North 8th St., manufacturer of tinware—additional power presses and other machinery.

Pa., Phila.—The S. & M. Dye Wks., 3419 Richmond St.—additional weaving, spinning and drying machines for new addition to factory.

Pa., Phila.—The School District of Phila., 19 and Chestnut Sts., M. L. Savage, Supt. of Supplies—Bids will be received until Feb. 9 for a quantity of machinery for manual training, metal and woodworking shops.

Pa., Phila.—The J. M. White Co., 1116 Olive St., J. M. White, Pres.—automatic wire braiding machines and general machinery for wire braiding plant.

Pa., Pittsburgh—The Findlays Tire Shop, 4712 Baum Blvd.—band saw and electric drill.

Pa., Pittsburgh—The National Tube Co., Frick Bldg.—one 15 ton overhead crane for Christy Park Wks. at McKeesport.

Pa., Pittsburgh—The Pittsburgh School of Automobile Engineering, 237 Collins Ave.—lathes, drill presses and garage equipment (used).

Pa., Pittsburgh—C. J. Seyler, 525 Aspin St.—machinery for machine shop (used).

Tenn., Knoxville—The Appalachian Marble Co., Middlebrook Park—20 in. power feed drill press; 6 x 6 power hack saw; 18 in. x 8 ft. engine lathe with countershaft; 16 x 16 back geared crank shaper.

The Weekly Price Guide

This Week's Market

Structural shapes quoted at $1.50 per 100 lb., Pittsburgh, in lots of 20 tons or more; smaller tonnages at $1.60. Plates and bars continue at $1.50. Pig iron, Eastern Pa. No. 2X, is quoted at $22.26 as against $20.76 per gross ton last week.

Metals in New York warehouses report demand for copper slight; tin quoted at 32c. as against 33c.; zinc at 5⅜c. as compared with 5¼c. per lb. last week, and lead prices firm but demand small. Babbitt metal (best grade) is quoted at 31c. (500 lb. lots) in New York and at 41c. per lb. in Cleveland.

Sal soda down 50c. per 100 lb. in Cleveland and linseed oil up 2c. in New York and 4c. per gal. in Cleveland. Rise in linseed oil attributed to increase in cost of flaxseed.

Substantial price reductions on abrasive materials quoted in New York and on shop supplies in the Cleveland market. Chicago prices firm throughout the week.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.10	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1¼	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1¼	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅝	8.50		12@13
⅜	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			32.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.97½; New York			5.37½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	10.65	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.25
Babbitt metal (best grade)	31.00	41.00	36.00
Babbitt metal (commercial)	16.00	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.25	11.00	11.00
Copper, heavy, and wire	11.00	10.50	10.00
Copper, light, and bottoms	9.00	9.00	8.75
Lead, heavy	4.00	3.50	3.50
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.00	6.00	6.50
Brass, light	4.50	4.25	5.00
No. 1 yellow brass turnings	5.75	5.00	5.75
Zinc	3.00	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	2.50	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.77	.80	.80
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$2.75@$2.90	
Coke, prompt foundry, Connellsville	per net ton	3.75@ 4.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60–5%	60–10%	60-10-10%
1¼ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.43
Cone heads, ditto (net)	3.60	3.35	3.53
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads. *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	60–10%
Medium grade	45%	40–10–2½%	50%
Heavy grade	40%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Tenn., Johnson City—The Doe River Sand Co., 208 East Main St., R. N. Campbell, Pres.—Six 1 to 3 yd. dump cars, side or end dump; small hoisting outfit; rotary screens; one-half mile 16 to 20 lb. relaying rail.

Tenn., Knoxville — J. G. Duncan Co., Jackson and Central Sts., machinery manufacturer—screw cutting back geared iron lathe, 9-14 in. swing by 3-6 ft. long (used); splint machine to cut splints out of wood for making cheap splint bottom chairs.

Tenn., Knoxville—The Knoxville Cement Products Co., H. A. Awrin, Secy.—brick and block machines also sewer pipe forms.

Tenn., Knoxville—The White Oak Corp., H. T. Spencer, Pres.—catalogues containing dies, stamping and soldering equipment; would like to correspond with those in a position to manufacture light articles of tin.

Tenn., Mountain City—J. T. Ray—complete machinery, etc. for the manufacture of candy.

Tex., Eagle Pass—The Eagle Pass Oil & Gas Co., L. D. Brooks, Pres.—all kinds of standard and rotary drilling machinery and supplies.

Tex., Houston—The Texas Tinners Supply Co., Nance and Grayson Sts., sheet metals and sheet metal products, W. D. Rogers, Purch. Agt. — tinners squaring shears, tinners forming rolls, all kinds of tin shop tools and supplies, also 4 and 5 in. copper can screws.

Va., Lynchburg—The Lynchburg Paint & Color Corp.—complete machinery for the manufacture of paint, including mixers, etc.

Va., Richmond—W. E. Carter, 500 South Lombardy St.—gasoline crane.

W. Va., Logan—Guyan Machine Shops, B. Shell, Mgr.—one 16 in. or 14 in. turret lathe for finishing brass bushings, also adjustable reamers for same; balancing rolls for balancing armatures; wheel lathe for turning steel wheels up to 36 in. diameter, gage 32 to 48 in.; cold saw, 6 in. or 8 in. capacity; wheel press, 200 to 250 ton; slitting shear and punch for ½ in. plate.

Wis., Chilton — The Chilton Tackle Co., c/o O. J. Boettcher—machinery for the manufacture of hoisting tackles.

Wis., Cudahy—Polasek Bros., 625 Carpenter Ave.—additional sawing machines, including band saw.

Wis., Green Bay—The Badger Show Case Wks., 133 North Pearl St. — additional woodworking machinery.

Wis., Green Bay — The Hagemeister Products Co., Manitowoc Bldg., G. Schober, Secy.—dairy machinery, refrigerating machinery and ice machine for proposed ice cream plant at Marinette.

Wis., Kenosha — The Anderson - Jensen Co., 765 Howland Ave., T. W. Anderson, Pres.—special machinery for the manufacture of plumbing supplies.

Wis., Manitowoc — The Hamacheck-Bleser Co., 11th and Franklin Sts.—repair machinery for garage on Franklin St.

Wis., Milwaukee—The American Granite Wks., 15th and Cleveland Aves.—monument cutting machinery.

Wis., Milwaukee—Byrne Bros. Co., 3112 Burleigh St.—gasoline storage tank and pump.

Wis., Portage—The Hyland Garage Co., J. B. Jackman, Purch. Agt.—auto repair machinery, including a drill press.

Wis., Prairie-du-Chien—The Prairie-du-Chien Woolen Mill Co., F. H. Poebler, Pres.—special and new machinery including 2 sets carding machines for proposed woolen mill.

Wis., Wauwatosa — E. Gissinger, 137 State St.—brake, beader and shear for sheet metal work.

Wis., Wauwatosa—R. Mueller, P. O. Box 515—rip and cross cut saw, universal table.

Wis., Wauwatosa—Whipp & Goebel, 67 Vine St., J. Goebel, Purch. Agt.—one folder.

Wis., Wisconsin Rapids — The Grand Rapids Canning Co., H. Dorn, Purch. Agt. —sorting machinery, hullers and conveyors.

Metal Working Shops

Cal., San Francisco—A. Livenais, 1625 Pacific Ave., has awarded the contract for the construction of a 1 story automobile repair shop on Pacific Ave. near Larkin St. Estimated cost, $12,000. Noted Jan. 19.

Conn., Bridgeport—The Southern New England Telephone Co., 114 Court St., New Haven, plans to construct a garage and warehouse on Beechwood St. and Colorado Ave., here.

Conn., Hartford—Dragat & Traubman, 340 Windsor Ave., are having revised plans prepared for the construction of a 3 story, 95 x 100 ft. garage on Windsor Ave. Estimated cost, $100,000. G. A. Zunner, 182 High St., Archt. Noted Sept. 15.

Conn., Hartford—J. Reibert, Mountain Rd., West Hartford, is receiving bids for the construction of a 1 story 52 x 220 ft. garage on Park St. Estimated cost, $50,000. G. H. Matthews, 48 Campfield Ave., Archt.

Conn., Waterbury—F. F. Kirschner, 24 Piedmont St., has awarded the contract for the construction of a 2 story, 60 x 125 ft. garage, sales and service station on South Main St.

Ill., Freeport—The Woodmanse Mfg. Co., 10 Galena St., plans to build a 2 story factory for the manufacture of windmills. Estimated cost, $30,000. A. Steenrod, Secy. Architect not selected.

Ill., Rockford — G. C. Brown and W. C. Gridley, 1826 Hoffman Blvd., will soon award the contract for the construction of a 1 story, 60 x 145 ft. garage, a 35 x 60 ft. repair shop and a 20 x 30 ft. boiler plant on Auburn Ave. Estimated cost, $75,000. C. E. Wolfley, 610 Stewart Bldg., Archt. Noted Dec. 22.

Ind., Indianapolis—W. H. Barrere, Jr., and D. Miller, c/o City Trust Co., are representing local business men, who are having plans prepared for the construction of a 5 story, 135 x 195 ft. garage and auto storage building on Illinois St. Estimated cost, $700,000. Bass, Knowlton & Co., 801 Hume-Mansur Bldg., Archts.

Md., Bridewell (Jessups P. O.)—The Maryland House of Correction, Union Trust Bldg., Baltimore, has awarded the contract for the construction of a 2 story, 45 x 144 ft. work shop, here. Estimated cost, $46,660. Noted Jan. 19.

Minn., Duluth—Jacobson Bros., 410 Columbia Bldg., will receive bids until Feb. 15 for the construction of a 1 story, 75 x 140 ft. garage on East Superior St. Estimated cost, $100,000. Halstead & Sullivan 409 Palladio Bldg., Archts. and Engrs.

Mo., Joplin—The Conqueror Trust Co., 120 West 4th St., plans to build a garage and machine shop on Wall St. Estimated cost, $25,000. J. G. Starr, Vice-Pres. C. Sudhoelter & Co., 715 Joplin St., Archts.

Mo., St. Louis—W. F. Parks, Frisco Bldg., is having plans prepared for the construction of a 3 story, 98 x 180 ft. garage on North Euclid Ave. Estimated cost, $50,000. W. H. Mills, Chemical Bldg., Archt.

Mo., St. Louis—Scruggs, Vandervoort & Barney Dry Goods Co., 9th and Olive Sts., will soon award the contract for the construction of a 4 story, 102 x 160 ft. garage on St. Charles St. Estimated cost, $350,000. M. L. Wilkinson, pres. Private plans.

N. J., Camden—S. V. Reeves Stove Co., 22nd and Haynes Sts., will build a 2 story, 40 x 40 ft. foundry. Estimated cost, $7,500.

Pa., Beaver Falls—The Keystone Driller Co., 8th Ave., manufacturers of well drilling machinery and pumps, will build 1 story, 60 x 110 ft., 20 x 201 ft., 80 x 100 ft and 80 x 80 ft. factory additions. Estimated cost, $200,000.

Pa., Phila.—The Kolb Baking Co., 10th and Reed Sts., is receiving bids for the construction of a 1 story, 124 x 260 ft. garage on Broad and Greene Sts. Estimated cost $60,000. H. B. Weldon, 10 South 18th St., Archt.

Pa., Phila.—E. J. McAleer & Co., 1422 North 8th St., has awarded the contract for the construction of a 2 story, 40 x 60 ft. tinware factory on North 8th St. Estimated cost, $5,000.

Pa., Pittsburgh—The Greenwood Constr. Co., Terminal Bldg., S. S., (assemblers of refrigerating equipment), has awarded the contract for the construction of a 1 story, 62 x 86 x 120 x 166 ft. shop and a 2 story, 58 x 80 ft. office, on Carson and 24th Sts. Estimated cost, $80,000.

Wis., Kenosha — The Anderson - Jensen Co., 765 Howland Ave., will build a 1 story, 40 x 56 ft. foundry and machine shop on Norman St. Estimated cost, $10,000. T. W. Anderson, Pres. Private plans.

Wis., Manitowoc—The Hamacheck-Bleser Co., 11th and Franklin Sts., is having plans prepared for the construction of a 1 story, 50 x 139 ft. garage on Franklin St. Estimated cost, $50,000. Smith & Reynolds, Dempsey Bldg., Archts.

Wis., Milwaukee—Byrne Bros. Co., 3112 Burleigh St., will build a 2 story, 32 x 60 ft. garage on Hubbard St. Estimated cost, $40,000.

Wis., Milwaukee — A. Kaufman, 1325 Vliet St., is having plans prepared for the construction of a 1 and 2 story, 52 x 160 ft. garage on 7th and Walnut Sts. Estimated cost, $40,000. R. B. Williamson, Bway. Bldg., Archt.

General Manufacturing

Del., Wilmington—The Wilmington Sugar Refining Co., DuPont Bldg., is having plans prepared for the construction of a 5 story, 125 x 150 ft. sugar refinery (1st unit). Estimated cost, $800,000. Total cost, $1,500,000. W. J. Wayte, Grand Central Palace, New York, Archt. and Engr.

Mo., Joplin — The Spotless Cleaners & Dyers, 106 Main St., plans to build a cleaning plant. Estimated cost, $10,000. Architect not selected.

Mo., Webb City—The Rock Hill Paint & Cloth Co. plans to build a paint factory on Allen St. Estimated cost, $50,000. R. Porter, Secy. Architect not selected.

Okla., Nowata—R. A. Swartz, Archt., Miami, Okla., will receive bids until Feb. 10 for the construction of a 1 story, 50 x 120 ft. newspaper plant on Main St., for the Nowata Star. Estimated cost, $13,000. J. G. Norton, Mgr.

Pa., Norristown — The Hutchinson Mfg. Co., manufacturer of woodworking machinery, will build a 60 x 160 ft. factory. G. L. Dannehower, Pres.

Pa., Williamsport—H. A. Moore, 114 Elm St., Milton, has purchased a site on Franklin Ave. and 4th St., here, and plans to construct a 2 story, 50 x 120 ft. building supply shop, warehouse and power plant. Estimated cost, $50,000.

Wash., Seattle—The General Petroleum Corp. of California, White Bldg., plans improvements to its oil station and terminal on Harbor Island, including two 55,000 bbl. steel tanks for fuel oil, two 10,000 bbl. steel tanks for gasoline, also a number of smaller tanks. Cost to exceed $100,000.

Wis., Milwaukee—I. Braun, 737 32nd St., has awarded the contract for the construction of a 2 story, 25 x 80 ft. bakery on Center St. Estimated cost, $40,000.

Wis., Milwaukee—The Harsh - Chapline Shoe Co., 694 Hanover St., has awarded the contract for the construction of a 2 story, 30 x 110 ft. and a 7 story, 78 x 160 ft. factory on Reed St. Estimated cost, $175,000. Noted Jan. 6.

Wis., Milwaukee — Lockwood Green & Co., Archts., 38 South Dearborn St., Chicago, are revising plans and will receive bids about February for the construction of a 3 story, 260 x 315 ft. tannery at 658 Commerce St., here, for the Amer. Hide & Leather Co., 1320 Elston St., Chicago. Estimated cost, $500,000.

Wis., Milwaukee — Marks Bros., Dye Wks., 1107 Wells St., is having plans prepared for the construction of a 2 story, 32 x 45 ft. dye works on North Ave. Estimated cost, $25,000. G. Zagel, 144 Oneida St., Archt.

Wis., Milwaukee — The Phoenix Knitting Wks., 208 Bway., is receiving bids for the construction of a 6 or 7 story, 120 x 180 ft. dye plant on Milwaukee and Buffalo Sts. Estimated cost, $350,000. Lockwood Greene & Co., 38 South Dearborn St., Chicago, Engrs. Noted Jan. 26.

Wis., Sheboygan — Verhulst Bros. Co., Erie Ave., will build a 2 story, 48 x 70 ft. woodworking plant on Calumet St. Estimated cost, $45,000.

Wis., Sturgeon Bay—The Sturgeon Bay Fruit Co. plans to build a 2 story, 100 x 300 ft. canning factory. Estimated cost, $100,000. Architect not selected.

Ont., Collingwood—The Gourlay Shoe Co. has taken over an old factory and plans to equip same for its own use. Estimated cost, $25,000.

Ont., Kincardine—D. F. E. Coombe Furniture Co. is having plans prepared for the construction of a 2 story furniture factory. Estimated cost, $30,000. Private plans. Noted Dec. 1.

Ont., London—B. F. Brighton, 479 Emery St., plans to build an addition to his bakery. Estimated cost, $25,000.

Ont., Listowel — A. Malcolm Furniture Co. plans to build an addition to its dry kilns. Estimated cost, $15,000.

Ont., Petrolea.—The Canadian Oil Co. is having plans prepared for the construction of an oil filtration plant. Estimated cost, $30,000. C. A. Hale, Mgr. Private plans.

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You Are Probably Entitled to Amortization

Operation Under Priority Indicates Business Was Essential—The Existence of Over-Expansion and Taxation on Excess Profits Are Most Convincing Evidence

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THE tremendous over-expansion in buildings, machinery and equipment in the years 1917 and 1918 among taxpayers who engaged in the production of articles contributive to the prosecution of the war and the attendant high taxes paid are responsible today for the vitally needed relief by amortization prescribed in the law and interpreted by the regulations. The importance and seriousness of the situation have become more and more apparent as a position more consistent with a stable post-war condition is approached.

The question arising almost at the outset in the minds of the taxpayers is, "Who is entitled to Amortization?" In other words, without giving consideration to the existence of over-expanded facilities and excess profits taxes, the taxpayer hesitates and often entertains a doubt as to whether amortization can apply in his case, solely because his operations, intensive though they were, did not occur in connection with direct government contracts. Often the taxpayer construes the application of amortization as applying to merely specific items purchased or installed for some particular government work. This is an erroneous idea entertained by many as is illustrated by the following excerpts from letters which have been received on this subject from two specific sources.

"We have understood that we have no chance for claim; while we did not do any direct war work, our lathes were used on that work. The building we are in was purchased in October, 1917, and some of our machinery was purchased within the period covered by amortization. We shall be glad if you will advise us."

Again another taxpayer writes as follows:

"We do not think we have a claim for amortization because we continued to manufacture just our regular product throughout the war period. While we purchased a lot of additional equipment, it was only to increase our capacity and there are few if any special machines that cannot now be used, provided we have the volume."

Reference to the Revenue Act of 1918 makes it clear that the differentiation between those industries to which amortization shall or shall not apply is as between essentials and non-essentials. The fact that any industry was allowed to operate under priority is evidence sufficient of its essential character. The existence of over-expansion together with taxation in the excess profits brackets is most convincing evidence that relief by amortization is available.

The excerpts from letters presented and the actual experience in many other instances show that there exists only a hazy conception of what should constitute the amortizable costs. These costs are essentially the increase in permanent assets from April 6, 1917, to Dec. 31, 1918, plus any 1919 charges which were irrevocably committed for in 1918.

Many taxpayers who have problems covered by other phases of the tax law think that these problems are paramount, overlooking entirely the amortization phase, when in reality amortization is the most important and as such stands alone, affecting but not affected by any other tax problems for its determination must be made before consideration to certain other tax problems can be given. This being the case there is not the slightest reason why a claim for amortization should not be filed, wherever it exists. As a matter of fact it is vitally important that the amortization phase of the tax law be given first consideration.

As the relief by amortization constitutes a reduction in the taxes of 1918 and 1919 but 1918 for the most part, as this was the year of greatest earnings and highest taxes, it is necessary first of all that over-expansion in the nature of additions to buildings, machinery and equipment actually exist and stand in the records today as "increase in permanent assets."

Second, it is necessary that the over-expanded industry should have been taxed in the excess profits brackets (30, 65 or 80 per cent) in the year 1918 or (20 and 40 per cent) in 1919, in order that relief by amortization which is in reality special depreciation, shall constitute a relief greater than ordinary depreciation which is the minimum deduction from gross income in computing taxes.

These two requisites existing, the determination of the justifiable amortization allowance remains only to be made in accordance with the regulations and standards of the amortization section in order to secure examination, approval and credit against any taxes due and unpaid, or refund.

The existence of these essential factors is not by any means a criterion. In other words, the absence of the excess profits bracket in the taxation for 1918, with, however, a material increase in permanent assets, does not indicate necessarily that the particular industry is not in reality subject to amortization. It may be that in accounting a policy of liberal expensing of capital charges has been followed which when corrected, as it surely will be by the government auditor, will develop the fact that the particular tax should have been at an excess profits rate. Ignorance during this most intensive war period led taxpayers in many cases to amortize by improper expensing. Amortization is, therefore, the compensation for assessments arising from this source, thus stabilizing the economic and operative situation by removing from the taxpayer the burden of over-expansion which really existed, whether accounted for in a

manner consistent with modern accounting principles originally or subsequently arranged to conform to these principles.

At the signing of the armistice and with the multitude of cancellations attendant upon it, the over-expansion became in some cases alarmingly apparent at once. The general ignorance of the existence of relief by amortization as prescribed in the law or the scanty knowledge of its application, if existence were known, accounted for the inaction of many taxpayers in claiming their relief even though the need grew more urgent day by day. Inadequate claims, also, were filed by those whose imperfect knowledge of the law and regulations operated to the taxpayer's detriment. This procedure, was not confined to taxpayers alone, but was also followed by incompetent tax advisers acting in their interests.

The claims as a whole, particularly in the early days, were set up in a most incomplete manner, one which could not but secure disallowance at the hands of the examiner because of its lack of conformity to the requirements as prescribed in the regulations.

Many taxpayers after a slight decline in the early part of 1919 found their production demand soaring to greater heights than ever, which continued well into 1920. This was true particularly of the automotive industry.

For this additional production the taxpayer was obliged to expand further. The need for amortization in these cases was not, therefore, felt until the latter part of 1920 and early part of 1921 during which time the decline which was destined to come, arrived and progressed in a most precipitous manner.

War was declared on April 6, 1917. The armistice was signed Nov. 11, 1918, and the war ended formally March 3, 1921. With these dates clearly in mind together with the effects resultant of the war, it is obvious that in the cases of particular industries, a further expansion after Nov. 11, 1918, could only be considered of distinctly abnormal nature, even as the demand for production of 1917 and 1918 was intensely abnormal. The 1919 and 1920 production was due entirely to the war time momentum, depleted commercial inventories, and the justifiable hesitancy on the part of all industry to recognize that the whole period was non-representative and that the inevitable decline to a stable position must come even though little could be done to relieve the situation in those particular cases where abnormal post-war expansion was required. Unfamiliar with the probable results and without regard for economic law and precedent because of the urgent need for production in the shortest space of time and with no time for retro- or introspection, the manufacturing industries were obliged to expand materially to meet a recognized greatly increased productive demand. Relief for this situation by amortization, is specifically afforded, thus compensating in a measure for the enforced plant expansion. Had there been sufficient time for the industries to investigate and analyze the subsequent tremendous demand of 1919 and part of 1920 they would have learned by plotting the projection of their accumulative production curve over a representative period of years, that the 1918 production figure could not possibly under normally prevailing conditions be reached for several years to come. A realization of the inevitable results might or might not have reduced the portion of over-expansion for which no relief is provided in the Revenue Act of 1918, depending on the volume and intensity of productive demand and the general outlook. The latter proved of little value as a guide owing to the sharpness of the break when the decline came.

Unfamiliar also with results attendant upon the situation recently experienced because the resultant effect had not yet appeared, and in no position to prevent it, some industries, particularly the automotive, expanded further because of the fact that it was inadvisable seemingly to do otherwise. The projected accumulated production curve showed in the face of all the facts, that 1918 production could not possibly, judging by sound precedent, be expected for some years and indicated beforehand the increased differential between investment and production, all this with a dollar value decreasing rapidly up to 1919 and increasing thereafter at a relatively rapid rate. This in itself definitely establishes amortization to a considerable extent and also the amount of post-war expenditure which could never be reflected in production owing to the difference between the replacement and actual cost; in other words 100 per cent loss to the taxpayer.

This resultant effect of the war upon industry rendered the need for amortization to those who were forced to expand subsequent to the signing of the armistice, more vital than the need for amortization to those whose expansion ceased with the signing of the armistice. In fact, the degree of over-expansion subsequent to the signing of the armistice has been the deciding factor against the corporate life of many industries. The reduction in value of amortization as a relief from over-expansion is evident when it is considered that an industry expanded a given amount in 1917 and 1918 receives a 50 per cent relief and another with like over-expansion in 1917 and 1918 but an enforced additional like amount in 1919 and 1920 receives 50 per cent, to be sure, of the 1917 and 1918 over-expansion, but which applied to the total over-expansion constitutes a relief of but 25 per cent.

Both the uncertainty of the future with respect to demand and the possible change in character of production are proof sufficient of the absolute necessity of reconcentrating to the maximum degree.

This frenzied condition of 1919 and 1920, no less frenzied, however, than that of 1917 and 1918, constitutes in itself, then, merely the last half of the whole war period. Statistics in general of this period, therefore, can constitute no criterion by which to judge value in use of a plant in the going business of the taxpayer, for the intensive demand is gone. The need for the over-expansion as expressed in buildings, machinery and equipment is gone and indeed all of the over-expansion has either been disposed of at very low figures, or destroyed, or is subject to disposal when it can be marketed at all, but which probably will be scrapped, or if retained, will have no possibility of economic value.

Adjust Plant Facilities Without Sentiment

These facts are presented to convey to the taxpayer's mind the absolute necessity of co-operating with himself to re-adjust his plant facilities without sentiment to the reasonable limit. The taxpayer, who has been obliged to over-expand, is sure of the amortization allowance. The future he knows nothing about except that which can be gleaned from past operative facts and these facts surely do not indicate anything which could and would not be accomplished by reconcentration.

In fact the reorganization of facilities so far as is possible, is consistent with the economic law relative to production and investment and must sooner or later be

obeyed or the natural penalty will be paid. The delay in reconcentration due to basing of plans on hopes of the future is absolutely unsound and should be eliminated from all consideration of amortization. Under the regulations amortization is divided into two distinct classes, the first known as Class I, dealing entirely with buildings, machinery and equipment which have been already discarded or will be at a known date previous to March 3, 1924. The second, or Class II, deals with buildings, machinery and equipment which have and will undoubtedly continue to have a certain value in use to the taxpayer in his going business.

Class I amortization applies particularly to those who departed from their production of a standard product, took over essential work or intensified production of standard material and prepared for the same by the erection of buildings and the installation of machinery and equipment, most or all of which has no value in use to the company in its going business and is therefore discarded and amortized under Class I.

Class II amortization covers buildings, machinery and equipment which have a certain value in use to the taxpayer in his going business and probably, within reason, will continue to have.

The residual value, of course, under Class I consists of either salvage or scrap values. The scrap or salvage values during the war period were abnormally high even as all constructive material costs were high. With the end of the war these values are fast approaching the normal so that claims presented today or later under Class I or Class II, because of the position of the useful value, cannot but secure the maximum degree of amortization allowance. The fact that no market exists today for many manufactured articles must be recognized and the advisability of scrapping carefully considered in view of the indeterminate time factor relative to disposal by sale or value in use, with the attendant deterioration, possibility of changed nature of product and the ability to buy machinery more suited for the particular requirements at a greatly reduced cost.

In the taking of amortization under Class I or that of discarded equipment, the procedure is divided into two distinct divisions. The first naturally covers buildings, machinery and equipment which actually have been discarded. The second is created by the understanding of amortization by the taxpayer together with the reasonable attitude of the department and the important part which reconcentration can and must play for his best interests.

In developing a plant during 1917 and 1918 to meet the abnormally intensive demand for war requirements the identity of the pre-war reasonably efficient plant was lost in the effort to turn out a greatly increased production even though this production was not by any means consistent with the investment.

In order to reconcentrate, therefore, it must be first taken into consideration that the pre-war efficient plant, because of the destruction of its identity cannot again be reproduced without entailing a prohibitive expenditure. Reconcentration must be effected regardless of sentiment in order to bring the investment and production relation into a position as economic as possible.

In so doing many buildings and pieces of machinery and equipment are discarded. By discarding is not meant the dismantling and removal for this again would entail a cost which would obviously be unfair to the taxpayer. The attitude of the department has been most equitable along these lines, allowing the taxpayer to discard, notifying the commissioner of the fact and filing with him a suitable affidavit to this effect and agreeing not to again use discarded items before first reporting them to the commissioner, at which time the relief originally allowed by the government would be restored, at least to the extent of percentage of the replacement value.

Restoration of Amortized Facilities

It is obvious that re-adjustment at the present time cannot but operate for the best interests of the taxpayer, for with maximum relief allowed and the reconcentrated plant having increased production because of demand up to 100 per cent, it is apparent that this plant will be operated 100 per cent capacity and at the greatest efficiency before the idea of restoring the amortized facilities would be entertained. The restoration of facilities is nothing more nor less than the provision of additional facilities if the amortized ones did not exist, which surely would be accomplished through the regular channels of amortization and construction in any event. The distinct advantage of the restoration of amortized facilities lies in the fact that they can be operated at once whereas construction of additional buildings and the purchase and installation of machinery and equipment require a considerable length of time.

The consideration of Class II amortization involves many interesting factors which do not present themselves at all upon reading the regulations. Statistics show that in the major portion of manufacturing industries the production for 1921 at least has been less than that of 1916. In many cases the average of 1919, 1920 and 1921 has been less than that of 1916. It has been shown that the war period was essentially 1917, 1918, 1919 and 1920, the distinctly abnormal condition due to the war prevailing in many cases, well into 1920. The unknown factors relative to the years to come, during which production will continue on its course, tend to reduce the actual effective relief by amortization owing to the very uncertainty of things.

It is a fact that the declines after all great wars such as the Napoleonic and Civil wars have been marked and a long period of low prices and high dollar value, relatively speaking, experienced. With the war period of four years' duration, so far as its effect on the United States is concerned, the fact remains that the decline is now being made over a shorter period and at a more rapid rate than in the case of the great wars mentioned.

It is clear beyond question that with the post-war production less than in 1916, the investment representative of increased capacity is not reflected in production which is therefore proof sufficient of maximum amortization. In other words, the increased investment of the war period, amortizable or non-amortizable as distinguished between investment of 1917 and 1918 and the period 1919 and 1920, represents a financial burden which has no economic value, or value in use, beyond the reasonable salvage value with due consideration for the replacement value, of which value the recent rapid return toward the normal has demanded recognition in the consideration of amortization.

In the consideration of amortization from a Class II or "useful value" standpoint many cases come under observation which have to deal with plants which were entirely adequate before the entry of this country into the war but which expanded tremendously to meet the intensive demand. With the cessation of hostilities and the return to peace-time operations, the pre-war plant

is again entirely adequate for all possible demand for production. This fact can be easily proved as can the existence of no greater volume of business now than previous to the war; nor can this volume be increased materially, for the need cannot exist. This applies particularly to shipbuilding and machine tool industries.

The return to the pre-war plant basis has been rendered physically, mechanically and practically impossible owing to the prohibitive cost of so doing. This inability to return to the pre-war arrangement which was entirely adequate and with no possible present demand for expansion, has made it necessary to retain certain items and amortize them under classification No. 2 or "value in use."

It is clear that 100 per cent value in use cannot be greater than the replacement value and can, therefore, only apply to the portion of the actual cost equal to the replacement value. This factor of replacement value cannot, therefore, be disregarded with the differential between it and the actual so apparent today. It is the return toward normal, which dates really in many cases from the latter part of 1920, the 1921 operative results having been generally less than those of 1916, and the decline in prices which have made it imperative to take the replacement value into consideration.

Replacement and Salvage Values

Operative facts since the war prove generally that in the determination of amortization under both classes the salvage values must be taken. This is distinctly provided for in the regulations which state specifically that in no case can the useful value be taken as less than the salvage value. The present day conditions, however, being nearer a stable post-war condition, have automatically demanded recognition of the replacement value, whether considered by reducing the actual to replacement cost before applying salvage values, or by adjustment of salvage values consistent with the facts to arrive at the same objective.

The application of reduction factor, however, to the actual cost to arrive at the replacement figure is in some cases difficult and open to question. This can be compensated for in the establishment of salvage values which, expressed in terms of replacement values, can be determined with reasonable accuracy. It is apparent that the salvage value expressed as a percentage of the actual cost is essentially a considerably greater percentage of the replacement cost, this increment increasing up to that time when prices shall have stabilized and the effective dollar value become uniform over a representative period of time.

The regulations interpreting the revenue act of 1918 cover various prescriptions which must be observed and phases of the situation which must be considered in the preparation of a report substantiating an amortization deduction.

It is most important to note that amortization is entirely divorced not only from any and all other tax problems but in its computation, "all allowances made to a taxpayer by a contracting department of the government or by any other contractor for amortization or fall in value of property, whether such allowance were made as a part of the price of the product or in settlement of claims arising out of the cancellation or termination of contracts, shall be included in gross income. In the computation of taxes all payments arising out of the settlement of such claims shall be included in the accrued income of the taxable year in which such cancellation or termination (whether formal or informal) occurred. The amount of amortization to be allowed as a deduction from gross income for the purpose of the tax shall be computed in accordance with the provision of Articles 181-189, pursuant to which the deduction must be made, and not upon the basis of any amounts contractually or otherwise determined." The foregoing quotation from Article 181, Regulations 45, makes it very clear that the existence of contracts with allowances for amortization or fall in value of the property does not in any way affect the claim for amortization of war facilities to be allowed as a deduction from gross income in the computation of the tax.

Too much credit cannot be given the corps of engineers of the amortization section in Washington, who in their examinations in the field have solved the various problems relative to interpretation of the regulations, consistent with the date of examination, in a most material and satisfactory way. These interpretations became absolutely necessary owing to the fact that literal interpretations of the regulations, in some respects, could not at the time of examination be strictly adhered to.

It was early recognized that, whereas the Regulations state: "In the case of property not included under Class I the value shall be the estimated value to the taxpayer in terms of its actual use or employment in his going business; such value to be not less than the sale or salvage value of the property," and "In the determination by engineers of the Bureau of Internal Revenue, of the proper amortization allowance, the estimated value to the taxpayer of the property in terms of its actual use or employment in his going business shall be as of the time of such termination," and "In the final determination, the amount of the amortization allowance will be ascertained upon the basis of stable post-war conditions under regulations to be promulgated when these conditions become apparent."

Yet in the case of many claims reviewed and examined in the field in 1919 and the first part of 1920, which was a part of the war period, with the prevailing abnormal and non-representative conditions and productive facts, the amortization allowance could not be determined as of the day of examination because the war and its effect was not then over. A well recognized state of abnormality existed so that in no way could the reasonable deduction for amortization be determined from a comparison of data which were known to be distorted by the war conditions and, therefore, non-representative. Amortization is based on the relation of the value in use to the taxpayer, of the amortizable costs in his going business, not the value in use of the amortizable costs during an abnormal period in his abnormally expanded business. The relation of value in use in his going business to the going business pre-war capacity plus the expanded capacity on a uniformly comparable basis determines the amortization allowance.

It is, therefore, apparent that the year 1921 was in reality the first post-war year. With the useful value below the salvage in the majority of cases today they should be settled on the salvage value basis with due consideration to the replacement value. This basis for some time to come cannot but represent an additional burden which reflects itself seriously in consideration of the keen competition prevailing.

The only real difference between Class I and Class II, which in fact automatically becomes Class I by virtue of the position of the useful value, is that in the case of a

straight Class I property the amortization is arrived at by applying the salvage value percentage to the bare cost of amortizable items and 100 per cent amortization to the contingent costs; whereas in the case of Class II amortization because of the low position of the useful value relative to the salvage value, the salvage value percentage adopted in lieu of value in use is applied to the total cost of any particular item.

It is probably true that whether the recession toward normal came immediately after the signing of the armistice or toward the end of 1920 its coming was inevitable and undoubtedly has carried below the normal.

The abnormally high non-representative productive figures of one and one-half years after the signing of the armistice which prevailed in some lines of industry, particularly the automotive, cannot alone be taken as any criterion.

The real factors which enter into the determination of value in use are the high figures of 1919 and one-half of 1920, the low figures of several more years which can be closely figured by hypothesis and the time factor over which the high and low range of production obtains.

The time fatcor of the low range will predominate in most cases which, according to the extent of predominance, lowers the point of reasonable useful value below the mean between the high and low, to that which will not exceed the salvage value point particularly when due consideration is given to replacement cost.

The regulations provide that the examination up to the present time is a strictly tentative one, which experience has shown is well fitted for the very contingency that has arisen. It has allowed the taxpayer to secure a portion of the amortization due him as a relief from his over-expansion and left the balance as a factor of safety to taxpayer and government alike, the final determination, after sufficient lapse of time to promote reasonable stability, to determine the exact balance due.

As a matter of fact already the tentative allowances made are found to be in many cases no greater than the definitely established difference between cost and replacement value which leaves a balance equal to the difference between value in use and the replacement value.

Situation at the Beginning of 1922

The status of amortization among the taxpayers at the beginning of the year 1922 is well worth a brief review. The lapse of time since the signing of the armistice, together with the known character of the war period operations up to March 1, 1921, has automatically determined to a great degree the standpoint from which any report substantiating amortization must be viewed.

The lack of positive representative data up to 1921 obviously and irrefutably has operated against the taxpayer whose claim was filed in 1919 and some in 1920.

With the sluggish return from a productive point below normal to the normal it is clear that generally speaking a normal salvage value basis must be used in determining the amortization deduction. The salvage values which naturally followed the frenzied trend of 1917, 1918, 1919 and part of 1920 have reached a subnormal point, but a point which, if applied to the replacement value, will represent a more equitable salvage value with respect to normal.

The recognition of these facts indicates clearly that claims figured in 1919 particularly and many in 1920 have not been equitably settled because of the lack of positive stable data on a basis fair to the taxpayer. There may be remote cases where the reverse is true. If so the reopening of the case will reveal the excess allowance. In the great majority, however, the facts will prove a balance due the taxpayer.

Reopened cases of course constitute redeterminations and are subject to delay sufficient to allow original determinations to be made by the department.

The above illustrates the meaning of the part of Section 214 of the Revenue Act of 1918 which states that the commissioner may and at the request of the taxpayer shall re-examine the return.

The ultra-conservative attitude of the department in handling claims, up to the present, unquestionably due to the lack of positive data, operates naturally against the necessity for reopening on the part of the government. The same factor, however, clearly establishes the advisability of reopening on the part of the taxpayer whenever the productive facts over representative post-war period warrant and they absolutely warrant today and will for some time to come, according to all indications.

There are many taxpayers who have filed an original claim examination of which, however, has not been reached by the examiners. These original claims either wholly or partly unsubstantiated, are not in a form acceptable to the department. It is most advisable then that all taxpayers who have filed claims and have not been examined, should attend to the substantiation at once so that entire or substantial disallowance may be avoided and a re-examination made necessary at a considerable later date. The disturbing feature of a situation like this is that any assessments made must be paid and the amortization ultimately allowed recovered subsequently as a refund. On the other hand with the claim properly substantiated at the time of the engineer's visit, the claim can be approved and credit used against any possible assessment accruing from the complete tax examination at that time. The vital importance of this feature is most obvious.

The foregoing consideration of amortization, based largely upon experience, answers in a reasonable and brief manner the many questions which naturally arise in the mind of the taxpayer. The practical nature of the consideration places it in a more pertinent position, so far as the taxpayer is concerned, than any theoretical or hypothetical discussion or deduction.



The Expanding Markets for Machinery

Volume of Exports to Europe—Value of Machinery Exports to Latin America—Importance of Japan as a Market—Opportunities in Other Countries

By W. H. RASTALL
Chief, Industrial Machinery Division, Department of Commerce

IN PREVIOUS articles, attention has been called to the changes that have developed recently in the foreign demand for American machinery. The flow toward Europe represents a smaller percentage than formerly while the demand in certain other countries is rising rapidly. The chart, Fig. 1, was published in

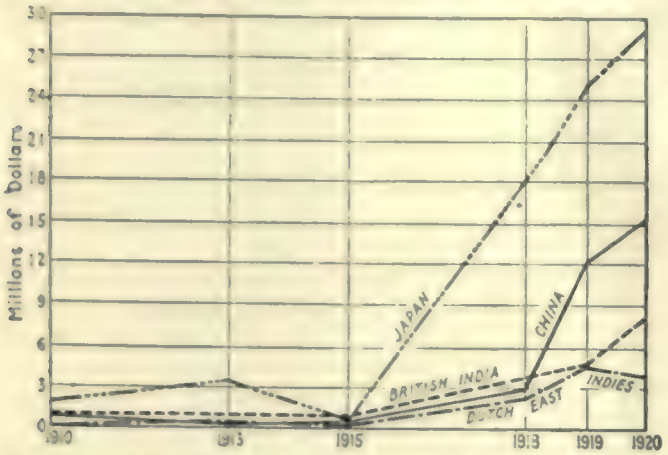


FIG. 1. VALUE OF EXPORTS OF MACHINERY FROM THE UNITED STATES TO JAPAN, CHINA, BRITISH INDIA AND THE DUTCH EAST INDIES, 1910-1920

Commerce Reports for Jan. 16, together with some other data to illustrate these changes. At the same time it was pointed out that although Asia had absorbed only 7.4 per cent of the American machinery exports of 1910 and 6.8 per cent in 1913 the indications suggest that for 1921 this participation will prove to have been 25 per cent.

There is always a danger that a statement of this kind emphasizes too strongly the expansion of certain markets and a chart, Fig. 2, has been prepared showing the experience in Latin American countries corresponding to that previously published for Asiatic countries.

It is regretted that it is not yet possible to present figures showing the experience for 1921, but the necessary data are not available. But it is felt that in the two diagrams the record presented gives the experience of those markets that show the best prospects of absorbing increasing quantities of American machinery and deserve corresponding attention. Obviously conditions in each of these sections are vastly better than in prewar days, and the value of these markets has advanced far beyond the levels that were then considered normal.

The charts show that Cuba was one of our very best markets for machinery through 1920. It is recognized that the business community there has suffered seriously since then and it will require more time for matters to adjust themselves, but the value of the market remains and trade will revive as soon as the complications of the sugar market dissolve and a reasonable period of reconstruction elapses.

Japan probably ranks next in importance and during recent years has been one of the most consistent machinery buyers we have. It is true that a great deal of this equipment was employed on its naval program, which it is understood is now abandoned. It is, therefore, anticipated that there will be a reduction in the amount of dockyard equipment absorbed in that market during the next decade. On the other hand, industrial Japan is showing very rapid development.

Mexico is apparently next in order of importance. There is reason to believe that this market has been absorbing important quantities of American machinery, and if relieved from further political disturbances will need additional equipment of great variety and in large quantities. The greatest care should be exercised in the matter of terms of payment.

China has been absorbing large quantities of American equipment in considerable variety and it would appear that the quantities and varieties may be expected to increase. The United States has heretofore secured only about 30 per cent of this business. It is hoped that the time has now arrived when the Chinese will buy increasing quantities of equipment and also will buy an increasing share from American suppliers.

Brazil and Argentina have been and are important markets. Recently there has been a disturbed situation in both of these countries, but reports indicate that Argentina has liquidated more than 80 per cent of the stocks once held in the custom house and Brazil is also making good progress.

Similarly British India and the Dutch East Indies

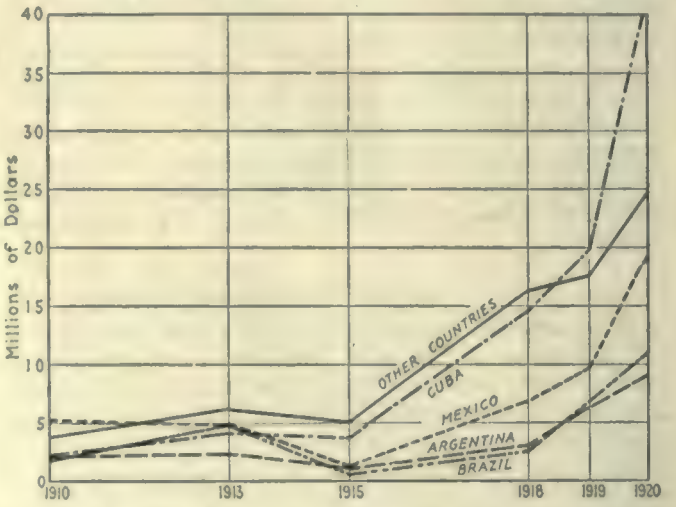
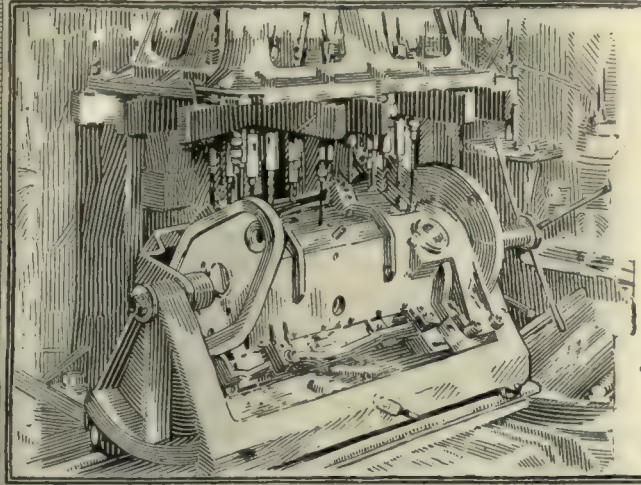


FIG. 2. VALUE OF EXPORTS OF MACHINERY FROM THE UNITED STATES TO LATIN AMERICA, 1910-1920

have felt the shock of the collapse in the world's markets, but are now on the road to recovery.

It would appear that there is reason for a good deal of optimism regarding the eight machinery markets mentioned above and several of the other lesser important markets from the American point of view, as for instance Australia and South Africa. Even though Europe has in the past been our best customer and is now demoralized, it is not wise to allow the disappointment there to hide the other opportunities which are real and are expanding.



Tool Engineering

By
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Facing Tools for Turret Lathes Continued—Arrangement of Blades in Cutter Heads—Roughing and Finishing Heads—Combination and Universal Tools

VARIOUS methods of holding cutter blades in position can be used in facing heads, some of these methods being similar to those which have been described in connection with boring bars. The manner in which the blades are arranged in the cutter head naturally determines to some extent the method of fastening to be used, but there are several points of importance which should be carefully thought of when determining on the method of fastening.

(1) The thrust of the cut should come against the solid portion of the cutter head in the majority of cases. It is advisable, however, to consider the operator and his convenience when determining the position of the various screws, pins or other means of holding. This point is not of so great importance in a cutter head which is simply used for facing one surface; but when adjustments must be made for several diameters and a number of depths, it may cause a great deal of trouble.

(2) Cutter blades which are used for facing, as well as those employed for turning and boring, should be well supported as near to the cutting point as possible, in order that there will be no vibration during the cutting action. In other words, blades should not overhang on the cutter head any further than is absolutely necessary. It is often possible to carry out a portion of the head to form a support directly under the cutting point.

(3) The overhang from the turret is important, particularly when the tool cannot be piloted. If a pilot can be used in a bushing fitted in either the chuck or the face plate, a considerable overhang from the turret can be permitted; otherwise a great deal of trouble may be caused by chatter in the unsupported tool body. There are cases when a wide facing cut must be taken, and yet there is no opportunity for support by the use of a pilot. A bracket can be provided on the cross slide or on the ways of the machine to give support when a case like this is found. An arrangement of this kind was illustrated in connection with the design of turning tools for bar work. If it is not possible to support the tool by either of the two methods mentioned, the tool body can be designed so that it will have a certain amount of spring to it, excessive vibration being absorbed by this spring. The tool can be shaped as a "goose-neck" with the hinge point above the center of the work. It will then spring away and not dig into the work.

The points mentioned here should be considered by the designer when laying out cutter heads, and provision should be made to counteract any of the tendencies mentioned. It is not possible to give fixed rules for the design of tools like these, yet the designer should always keep in mind the results produced by the cutting action of the tool. The pressure applied must be counteracted or equalized in some way or other.

In Fig. 315 is shown a cutter blade *A* used in a head *B* and fastened in place by means of a taper pin *C*. The body of the tool is slotted at *D* in such a way that the taper pin expands the slot slightly and contracts the portion surrounding the cutter, so that it holds the latter securely. Another method of holding cutter blades is shown at *E*. Here the blade is held in place against the body of the tool by a straight pin *F*, which is set into the end of the holder at a slight angle and tapered on one side, so that it acts as a wedge against the cutter.

In the example shown at *G* the body of the tool is slotted at *H* and is expanded by means of the tapered pin *K*. At *L* is shown another cutter blade which is held in place by a straight pin *M* set at a slight angle to the edge of the cutter and flatted off on one side, so that it forms a wedge and holds the blade in place. All of these forms are used for holding cutter blades, and the method selected should be one which is most suitable for the work in hand. Care must be taken in using taper pins to provide a means of removing them when it is necessary to take the cutters out. This can be done by cutting a slot or drilling a hole in such a position that the pin is readily accessible.

The example at *N* shows a counterbore which is to some extent a facing tool, although it bores a hole and faces the bottom of it at the same time. In designing a counterbore, the material which is to be cut must be kept in mind, as it has an influence on the design. For cast-iron and brass work the flutes *O* are often made straight, but for steel they are cut on a right-hand helix of about 15 deg. Counterbores for small diameters are often made with three flutes instead of four. When this design is followed, the size should be stamped on the body before fluting, as it is difficult to measure the diameter afterwards. Flutes should be cut deep enough, so that they come a trifle under the diameter of the pilot, in order to produce a clean hole. When the pilot is made as a part of the counterbore (which is not

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usually done), a groove is provided at *P* to give the necessary clearance for the cutting teeth.

The action of a counterbore is not conducive to first-class work, except for the facing of the bottom of the hole. The inside of the hole, when the work is of steel, is not usually very smooth; the cutting point is so sharp that, unless a very fine feed is used, the results obtained are not particularly good. However, as the hole produced by a counterbore is usually filled up by the body of a screw or a stud, its appearance is not of great importance. Different sizes of pilots may be used, and various methods of fastening the pilot in place. Revolving pilots are often employed in work where there is a possibility of marring a previously finished surface. In the shell type of counterbore shown, a slot is provided at *Q* for driving purposes. The collar *R* on the bar is fitted with two keys at *S*. Counterbores are often back tapered slightly for clearance.

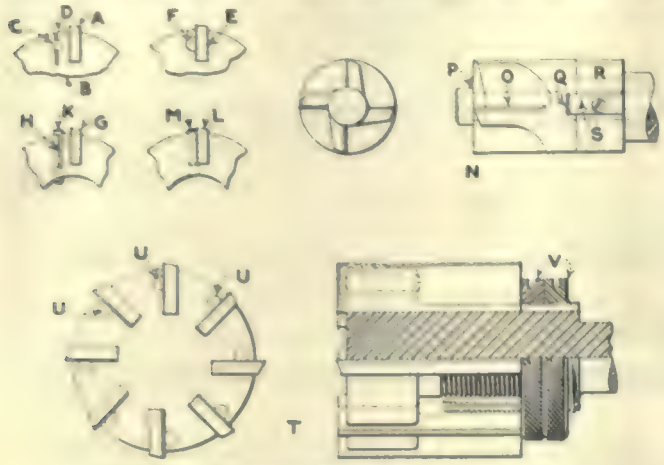


FIG. 315. ARRANGEMENTS OF CUTTERS

An example of a multiple cutter head with adjustable flat blades is shown at *T*. The blades are held in place by means of straight pins with tapered sides as shown at *U*, and are adjusted in their slots by the two nuts at *V*, which are moved by means of a spanner wrench. These nuts are of assistance in setting the blades out to depth, and they also serve as a buttress for the rear ends of the blades, thus giving a substantial support. This type of facing head can be used as a counterbore for shallow holes, by setting the blades forward a sufficient amount. For deep holes it cannot be used on account of the trouble which would be caused by chips, as there are no flutes in the tool and no chance for the chips to work themselves out of the hole.

Mention has been made of facing heads which can be used for boring, turning, chamfering and facing. In high-production work tools of this kind are often used both for roughing and finishing operations. The type of head used depends to some extent upon whether the cut is for roughing or finishing. Fig. 316 shows a roughing head at *A*. The work to be done consists of boring the inside of the flange, turning the hub and facing the web. The two tools at *B* and *C* bore the inside of the flange and turn the hub, respectively. These tools are rectangular in shape and are set at a slight angle, in order to make diameter adjustments easily. The tools at *D* and *E* are used for facing the inside of the web. These tools are wide enough so that one cut laps over the other slightly.

The various tools are held in place in slots in the body of the tool by means of square-head setscrews, as indicated. Adjustments are made by means of the screws at *F* and *G*. The body of the tool *H* is fastened to the turret of the machine, and the forward end is provided with a pilot *K* which enters a bushing in the chuck, thus giving support to the entire tool. This pilot is important, as it steadies the cut and prevents trouble which might be caused by vibration due to a considerable overhang from the turret. The tools used in this cutter head are made of rectangular stock, squared up on two sides so that they fit the slots properly. It will be noticed that the thrust of the cut is taken by the body of the tool in some cases, while in others it comes against the setscrews. The reason for this arrangement is the convenience of the operator, the screws being placed so that they are easily accessible.

Another example of a cutter head is shown at *L*. This tool was designed as a finishing and sizing head. The cutter *M* finish faces the wide flange and the tool *N* sizes the shoulder at this point. The tool *O* cuts the recess, while *P* is used to face the end of the hub. All of these tools are made from hardened and ground stock of such size that they accurately fit the slots in the body of the holder. They are held in position by means of strap clamps, as shown at *Q*, *R*, *S* and *T*.

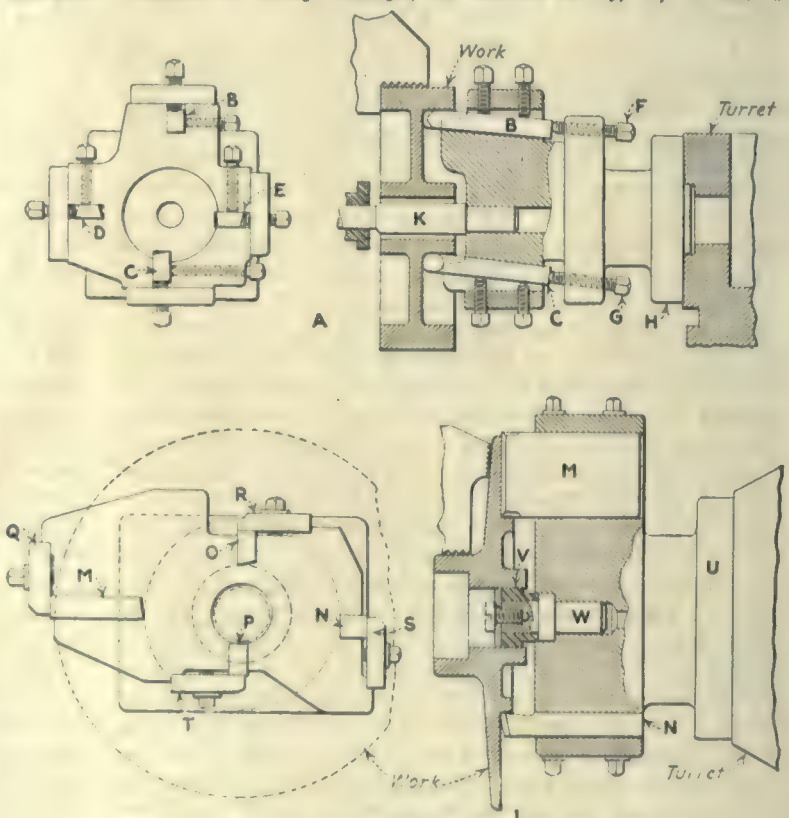


FIG. 316. FACING HEADS FOR ROUGHING AND FINISHING OPERATIONS

Adjustments are made by setting the tools up against a finished piece of correct size before setting up the clamps. The body of the tool *U* is of cast iron, and is bolted to the face of the turret. A revolving pilot is set in the end of the tool, as shown at *V*. The pilot is mounted on a stud *W* in such a way that it rotates freely

when in the work, this being done in order to prevent marring or defacing the surface.

The two tools shown in this illustration are very good examples of the type of facing heads that the designer is

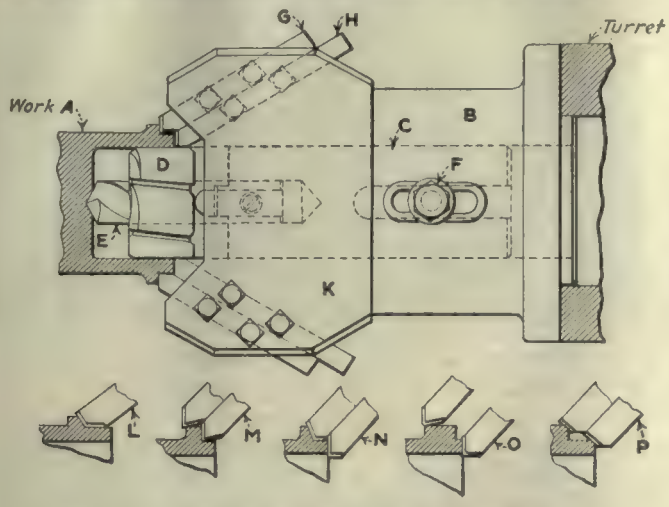


FIG. 317. COMBINATION FACING, TURNING AND BORING HEAD

frequently called upon to make. It is well to note that all facing tools are set well ahead of center, so as to produce a shearing cut, and attention is also called to the manner in which the facing tool *M* is used in connection with the sizing tool *N*. By using this method the size of the shoulder can be preserved accurately, even if the facing tool *M* becomes slightly worn. The method of applying tools of this sort to the turret is dependent entirely upon the shape of the latter, and this factor occasionally changes the design to some extent. A turret of the flat variety naturally requires a tool body of different shape than a hexagon type of turret. The matter of fastening the tool body to the turret is important; and in exceptional cases when very heavy cutter heads are used, it may be found necessary to drill and tap additional holes in the turret, in order to give sufficient stability to the tools.

Combination Heads

For small work having several different shoulders and diameters which are to be machined in relation to a hole or a counterbored portion, cutter heads are frequently designed. A very good example of this type of cutter head is shown in Fig. 317, in which the work *A* is to be machined. The head *B* is of cast iron and is bolted to the turret. Through the center of the body a bar *C* extends, and at the front end of this bar a counterbore *D* is fixed, being driven by means of a key. A spotting drill passes through the center of the counterbore, as shown at *E*. Both the spotting drill and the counterbore can be adjusted independently, and in addition thereto, the bar *C* which holds them can be moved backward or forward and clamped by means of the nuts at *F*. The tools *G* and *H* are hardened and ground so that they fit the slot in the head *K*. They can be adjusted independently, yet they must be ground accurately in order to preserve the shoulder distances.

When a series of operations are to be performed on a piece of work like that shown, several cutter heads of this kind can be used with various arrangements of tools for the different operations, as shown at *L*, *M*, *N*, *O* and *P*. The same casting can be used in all these cases, and settings of the various tools can be accurately made by means of gages. For screw-machine work of moderate size, tools of this sort are very useful and extremely accurate work is produced by them. The operations on the work can be arranged progessively, so that each tool does approximately the same amount of work. When used in connection with a counterbore and spotting drill like that shown, a part of the hole can be bored in one operation, another part in a second operation, and the final work in the last operation. The amount of time saved by this method is readily appreciated, especially when short diameters are to be turned and faced at the same time, as in the case illustrated.

It is possible to design a multiple facing head which can be used for turning, facing and boring, and which will at the same time be so flexible in its design that it can be adapted to a number of different kinds of work within its capacity. An example of a tool designed for this purpose is shown in Fig. 318. The body of the tool *A* is of substantial section, and is arranged so that it can be fastened to the turret. This body extends outward and carries a bar *B* which acts as a pilot in a bushing, either in a faceplate or chuck. As it is easily removable, it can be replaced by a boring bar carrying several cutters, if desired. The upper part of the tool body has four holes *C*, *D*, *E* and *F* at different distances from the center of the holder. A toolholder like that shown at *G* can be furnished with a turning or boring tool for different diameters. In fact, several tools of this nature can be applied to the different holes and suitable adjustments made to cover a considerable range of work.

An extension member or bracket at *H* is tongued to receive a block *K*, which can be adjusted and furnished with a cutter, as shown at *L*. On the opposite side of

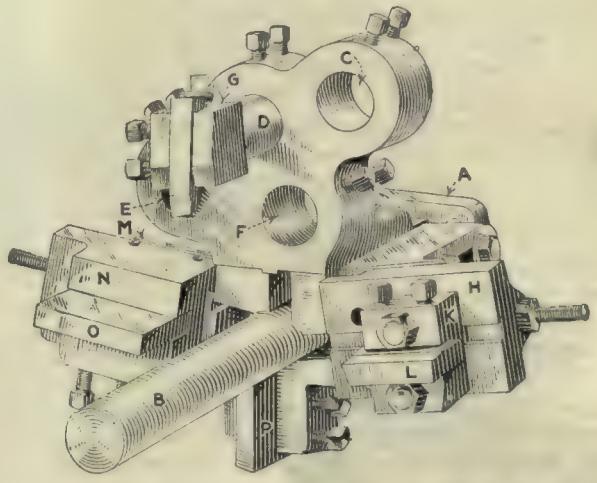


FIG. 318. UNIVERSAL FACING AND TURNING HEAD

the holder another bracket *M* is shown. It also has a holder *N* in which a facing tool *O* can be placed. The body of the holder is slotted to admit a flat-blade cutter at *P*, and suitable setscrews are provided for holding it. The adaptability of a cutter head of this sort can be readily seen, as it can be made to handle a great variety of work by suitable changes in the tool blocks, turning tools and facing tools. Opportunities are frequent in general manufacturing for the use of tools of this sort, and the designer should consider making provisions for adjustment, so that the expense of a cutter head will not necessarily be borne by the particular job for which it is intended. If it is flexible enough, the head can be used for a number of different cases.

Manufacture and Use of Diamond Cutting Tools

III. Diamonds for Drawing Dies—Diamond Dust the Only Cutting Medium—Methods of Reducing Diamonds to Dust

By ELLSWORTH SHELDON
New England Editor, AMERICAN MACHINIST

CRYSTALS of diamonds have long been used from which to make the small dies with minute apertures that are used for drawing wire. Gold, silver and platinum for making watch chains, mesh bags and similar pieces of jewelry; the countless miles of fine

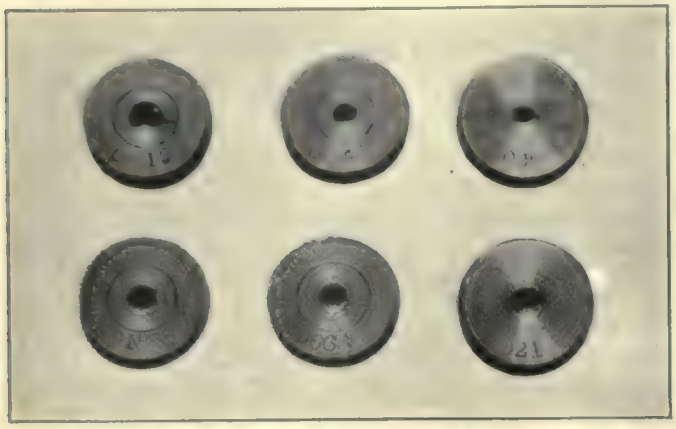


FIG. 14. · WIRE DRAWING DIES MOUNTED

copper wire used in sensitive electrical instruments, the delicate filaments of the incandescent lamp and many other materials used for hundreds of different purposes are drawn smooth and uniformly to size by means of diamond dies. These dies are made in sizes ranging from 0.0007 in. for tungsten filaments, up to 0.125 in. for drawing copper wire which must be very smooth and held to very close limits in the matter of diameter. Though the cost of a diamond die is relatively high, it retains its size and shape for so much longer periods and imparts to the wire a finish so much superior to that obtainable from steel dies that first cost need not be considered.



FIG. 15. A DIAMOND DRAWING DIE UNMOUNTED

To obtain proper support, diamond dies are mounted in metallic holders or settings, a group of which is shown in Fig. 14. Some users prefer to purchase their diamonds unmounted, as in Fig. 15, and mount them themselves, in order to use their judgment upon the shape and quality of the stone as well as to facilitate inspection of the hole.

Drilling the Dies

There are various methods of drilling and polishing a hole in a diamond drawing die. The essential steps are to take a flat stone of proper thickness, rough off the front and back sides so as to have two surfaces approximately parallel, countersink both sides and then drill and polish the hole to a very smooth finish and to accurate diameter. It is a slow process to drill so small a hole in material so hard, and to pierce a diamond often requires days, even with ideal proportions as to length and diameter of hole.

The countersinking operation is shown in Fig. 16. The stones are mounted either in chucks or upon faceplates by means of diamond cutter's wax. The chucks and faceplates are held to the spindle of the lathe by a floating connection that allows the diamond to be accurately centered without disturbing the wax setting. Several of the chucks with stones mounted in them are shown at the base of the toolrest.

The operation of countersinking is performed by hand in much the same manner that a similar cavity would be turned in a piece of steel upon a bench lathe. Several of the stones are carried along together, and, as the chucks may also be screwed upon the end of the wooden handle that is used to hold the tool, any stone may be used indiscriminately as a tool or as a piece to be worked upon. As there is practically as much material removed from the tool as from the work, an expert operator can thus dress a number of stones into shape very rapidly.

Besides the countersinking, there is more or less turning to be done upon the stones to get them to the proper shape, whether they are to be made into drawing dies or used for other purposes, and as the holding chuck can readily be floated from side to side, the operator is enabled to cut away any portion of the stone as desired.

Drills Are of Steel Wire

Because of the brittle nature of the diamond it is obviously impossible to use diamond splinters for drilling the small holes in drawing dies, and for this purpose needles of steel wire are used. The operation is not really drilling, but lapping; the end and sides of the wire becoming charged with the diamond dust and gradually wearing through the stone.

There are several types of machines used for drilling dies and all are more or less automatic. Some are vertical and others horizontal, and advantages are claimed for each; the principle involved is the same in all cases. A small chuck on the end of the spindle grips the stone, or it may be set with wax on a faceplate. It is the die which rotates and not the needle. The latter is so slender in the smaller sizes that to prevent it from bending, it is necessary to provide means of adjusting the drill-

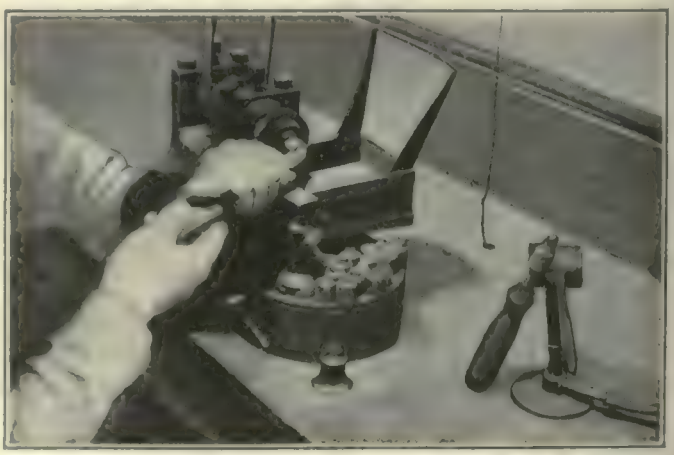


FIG. 16. TURNING AND COUNTERSINKING THE DIAMONDS



FIG. 17. MACHINES FOR POINTING PHONOGRAGH NEEDLES



FIG. 19. SALVAGING SMALL PARTICLES OF DIAMOND

ing pressure to a fraction of an ounce. The vertical machine may use weights and a balance for this purpose, while on the horizontal machines the object is accomplished by means of springs. The needle is lifted out of contact periodically by a cam, to give fresh con-



FIG. 18. PARTIAL VIEW IN WORKROOM

tact and allow the mixture of diamond dust and oil to flow under the point.

One prime requisite in a drawing die is that the hole must be very smooth. The surface of the diamond will probably take a smoother finish than any other material, and this fact, together with its undoubted wearing qualities, is the reason for its being selected for bearings in instruments where friction must be as nearly zero as possible—as for instance in certain types of electrical instruments. To polish the dies the needle carrying bar is given both a reciprocating and a rocking or swinging movement that rounds the corners of the holes and blends them smoothly into clearance spaces that were cut in the stone before the drilling was started. In this way a double conical hole is produced that has no sharp corners; a necessary condition in wire drawing dies.

Though all of this work must be under the supervision of an experienced diamond cutter, the actual operation generally devolves upon boys or girls, each of whom will operate twenty or thirty machines. About all the separators have to do is to feed diamond dust to the needles and to see that nothing untoward happens up to the time of final inspection and gaging for size.

The metal settings in which drawing dies are mounted may be of soft steel, german silver, or brass. In general the method followed is to cut a disk from an inch bar of the material, counterbore a hole halfway through it and fit a smaller disk to the counterbored hole. A small hole is then drilled through the center of both disks, the small disk taken out and, with the metal heated to plasticity, the diamond is dropped into the cavity and the small disk pressed gently but firmly upon it.

Any degree of heat short of that to be obtained in a laboratory furnace will not injure the diamond, but because of its brittle nature the pressure must be applied very gently and with thorough understanding; else the diamond will be shattered. Hence the operation is only for the experienced diamond worker.

After mounting, the die is put in the lathe and trued up by the hole in the diamond. The metal part is then faced and turned true and the center cut out with hand tools until the opening blends into the countersunk portion of the diamond.

The manifold uses in industry for a hard, sharp pointed tool has led many to turn to the diamond for this purpose as a most efficient material. Some are long sharp points, either round or having three or more flat sides; others have a blunt polished point for burnishing



FIG. 20. THE BORTZ CRUSHER'S BENCH

gold and silver; and still others are ball-shaped, for use on phonograph records. They are all made by a process of polishing or lapping in which a special machine is used; and in some cases both work and lap must rotate constantly. A row of the special machines for lapping diamond points is shown in Fig. 17, and in Fig. 18 is a general view of this part of the workroom.

Making the Diamond Dust

Diamond dust—about the only cutting "tool" that can be used for working diamonds—is produced from fragments of bortz too small to be used for any other purpose. Were it not for the value of the dust, there might be a stage at which the fragments would be of no value whatever, but as the dust ranges in value from five to twenty dollars per carat according to its fineness and clarity, and as no fragment is too small to be crushed, such a stage is never reached; therefore all sweepings and other refuse from the workrooms must be thoroughly searched. Even the work benches are scraped periodically and the diamond dust embedded in them is reclaimed. From the little pile of "dirt" before him, the diamond worker shown in Fig. 19 expects to retrieve twenty-five or thirty dollars.

The crushing bench where the bortz fragments are converted into dust, is shown in Fig. 20. The implements used are few and simple: A microscope with which to examine the crystals that may be too valuable, as they are to be reduced to dust of lesser value or to look for crystals that may not be diamond at all; a mortar and pestle of hardened steel with which to crush the fragments; several wire screens to grade the product at different stages and receptacles to hold dust and oil.



FIG. 21. ONE THOUSAND DOLLARS

No screen is fine enough to be of service in any but the preliminary stages; the final separation is by flotation in oil. Pure olive oil is the medium used, and dust from the mortar is put into the bowl of oil shown in Fig. 20 until a sufficient quantity has accumulated, when the mass is vigorously stirred and a definite quantity poured into the graduated glass where it is allowed to stand for five minutes. The liquid content of the graduate is then carefully decanted into another receptacle and the precipitate gathered up, carefully washed and dried, and put into a container marked "five minute powder." This process is repeated at lengthening intervals until the final precipitate is taken, at which time the oil will be practically clear.

A quantity of fine dust is shown in Fig. 21. Small as this bulk appears it is altogether too valuable to be left around, and these bottles were taken from the office safe to be photographed.

The photographs illustrating the manufacturing sections of this article were taken in the workrooms of the Arthur S. Crafts Co., 125 Summer St., Boston, Mass., and for that privilege as well as for much of the data from which this article is compiled, the author is indebted to F. L. Huston and F. F. Gilmore of that company, whose courtesy and co-operation is hereby acknowledged.

Various Methods for Hardening High-Speed Steel

By A. H. d'Arcambal
Metallurgist, Pratt & Whitney Co., Hartford, Conn.

In this paper I will state briefly the advantages and disadvantages of different hardening methods for high-speed steel, proposed in the 20 years which have intervened since Taylor and White made their recommendations.

Salt bath hardening was first introduced in this country in 1902. Ordinarily, barium chloride is the salt used and the operating temperature is from 2,000 to 2,100 deg. F. (1,093 to 1,149 deg. C.) Graphite crucibles are used for holding the salt, the life of these crucibles being from six to eight heats. The tools to be hardened are immersed in the hot liquid and the tools permitted to remain until the entire mass of the tool has attained the temperature of the bath. These tools are then usually oil-quenched, and drawn to from 400 to 600 deg. F. (204 to 316 deg. C.) in oil, depending upon the kind of tool.

No scaling takes place by this method, thus producing a cleaner tool than in muffle furnace hardening, but the method has the following disadvantages: (1) The quenching temperature is too low. (2) Soft scale is sometimes produced. (3) Blistering and pitting sometimes occurs. (4) Pots are very short lived.

It is a well-known fact that to obtain the highest degree of red-hardness, partial austenization must take place. This means quenching from a temperature of 2,200 deg. F. (1,204 deg. C.) and upward; indeed, the higher the quenching temperature above 2,200 deg. F. (1,204 deg. C.) up to about 2,350 deg. F. (1,288 deg. C.) the greater the effect called "secondary hardening"—the added hardness gained by tempering quenched steel. We have heated small test-pieces of high-speed steel 1½ hours in a barium chloride bath at 2,100 deg. F. (1,149 deg. C.), but the microstructure was the same as when left in the bath just long enough for the heat to soak through.

Blistering and pitting of tools heated in a barium chloride bath are said to be due to particles of the graphite crucible which have broken loose coming in contact with the tools and sticking to them. Sometimes these blisters or beads drop off, leaving pits. The longer service the bath has seen the more loss is suffered through this blistering and pitting.

A graphite pot lasts only from six to eight heats, making this method of hardening quite a costly one. A new salt is now being introduced for the hardening of high-speed steel, which can be maintained at a temperature of 2,200 deg. F. (1,204 deg. C.), thus being superior to the barium chloride bath. The container used is a graphite crucible with a cast-steel liner. In this way the steel pot is protected from the flame, and there is no danger of blistering or pitting from particles floating through the bath.

Pack Hardening

Pack hardening consists of packing the high-speed tools with charcoal in a suitable container. The container is then luted carefully with clay, and the whole placed in a furnace, the temperature brought up to around 2,200 deg. F. (1,204 deg. C.) and held there a considerable length of time. Tools are then removed, oil-quenched or air-cooled.

This method gives a tool free of scale, but has the

following decided disadvantages: (1) Quenching temperature is too low, and (2) tools are carburized. We obtained the temperature of some test-pieces with an optical pyrometer just before they were removed from the pack, and found the temperature to be about 2,050 deg. F. (1,121 deg. C.), although the furnace temperature was 2,200 deg. F. (1,204 deg. C.), and they had remained 1½ hours at heat. Scleroscope tests and micrographs verified this temperature. Furthermore test-pieces showed a gain of 0.40 per cent carbon on the surface after being given the pack treatment.

I have been informed by two different men who attempted this method that at times the cutting edges of the tools melted, due either to the higher carbon content of the surface of the tools or to the tools coming in contact with each other. One other experimenter tried to use a cast-iron box for packing, but as cast iron melts at about 2,200 deg. F. the results can well be imagined. Carborundum powder has been suggested as a substitute for charcoal for a packing material, as the former would not carburize the steel. In the writer's opinion, however, high-speed tools treated in this way would be inferior to tools heated in the semi-muffle furnace, because the steel would have to remain at a high temperature for a long time when pack hardened, thus producing a coarse-grained structure.

A lead bath was tried quite extensively about 10 years ago for heating high-speed tools, but the method did not prove a success. At 2,200 deg. F. the vapor pressure of lead is about 20 mm. of mercury, so that severe volatization will inevitably ensue. It is also quite a problem to find pots to hold the same. Difficulty is also experienced in controlling the time of immersion, as lead is a very rapid heating medium. A metallurgist for one of the large tool steel mills in England told me recently that a large amount of high-speed steel was hardened in his country by the lead bath treatment. He stated that they were able to obtain a very pure grade of lead and could operate at a temperature of 2,300 deg. F. (1,260 deg. C.).[1] His method for hardening a 1-in. high-speed hand reamer would be to preheat to 1,500 deg. F. (816 deg. C.) in a muffle furnace, then transfer the tool to the lead bath whose temperature was 2,350 deg. F. (1,288 deg. C.), hold there 15 seconds and cool in an air blast.

Most of the high-speed steel hardened in this country is heated in semi-muffle furnaces, oil or gas fired. It is always advisable to have these furnaces equipped with pyrometers, using noble metal couples. The optical pyrometer is also satisfactory for controlling these high-temperature furnaces.

Work to be hardened should be preheated to 1,500 to 1,600 deg. F. (816 to 871 deg. C.), and when thoroughly heated through at this temperature, transferred to the high-temperature furnace, whose temperature is higher than the desired hardening heat. The tool is left in this furnace until the cutting edges have attained the proper temperature—about 2,300 deg. F. (1,260 deg. C.)—and the material then quenched. Soaking at the high temperature is to be avoided, as it coarsens the grain and is likely to "burn" the steel. In such practice the time factor is evidently just as important as the temperature. Quenched tools are then drawn to the desired temperature. One great advantage of this method of hardening is the high temperature attainable, thus producing the greatest degree of red-hardness and almost complete solution of the carbides. The disadvantage is that the tool scales to a degree, which can be reduced to a minimum by a thorough preheating and the proper mixture of fuel and air in firing the high-temperature furnace. Large high-speed tools have been very successfully hardened by using two preheating furnaces; the first is maintained at a temperature of about 1,100 deg. F. (593 deg. C.) and is used as a stock furnace. The temperature of the second preheater is 1,700 to 1,800 deg. F. (927 to 982 deg. C.). The material will not scale in the first preheating furnace; while the steel will oxidize in the second preheater, it requires less time to bring it to heat, thus reducing scaling to the least possible amount.

[1] At this temperature the vapor pressure of lead is nearly 50 mm. of mercury (see J. Johnston, *J. Ind. Eng. Chem.*, vol. 9, p. 873 (1917).

Grinding Wheels Five Feet Wide

The American Emery Wheel Works, Providence, R. I., is making some grinding wheels 10 in. in diameter by 60 in. face. The latter dimension is not a misprint, even though it may seem extraordinary.

The wheels, or drums as they would more properly be called, are built up by regular methods from abrasive and bond, and are fired in the usual manner. They are not, however, made in one piece, as it was found to be impracticable to fire a wheel so wide in proportion to its diameter and get good results.

The drums are therefore made up of several sections, each section a complete wheel except that its sides are not square with the bore. The sides are quite sharply angular, so that when the sections are assembled and drawn together upon the special arbor that thus becomes an indispensable part of the wheel, the joints do not run true around the periphery but gyrate from side to side and thus present the appearance in action of a single continuous surface. This method of joining the sections eliminates the possibility of leaving marks to correspond with the joints upon the surfaces that are ground by the drums.

These solid drums are to take the place of the built-up wooden cylinders that have heretofore been used. The wooden cylinders were covered with leather and "set up" in the usual manner by brushing the leather surface with glue and rolling the drum in the abrasive. The wood wheels required redressing, which involved soaking off the old abrasive and replacing it with new, every few days, whereas the solid drums will run for a year or more without attention. They are used in special machines for surfacing linoleum.



A New Era for Industrial Relations

Capital Now Contributing in Many Definite Ways Toward Industrial Peace—Labor Must Contribute Increased Production—Interdependence Makes Proper Co-operation Vital

By A. H. RODRICK

MUCH has been written and spoken on the proper and ideal relationship between employer and employee, otherwise referred to as capital and labor. Solutions and ideas have been offered, suggested and recommended, by persons in authority and out of authority in all walks and vocations of life for perfecting an ideal state of industrial relationship—sometimes referred to as the golden age. Whether these solutions have been weighed in the balance and by actual tryout found wanting, is a question which can only be determined after exhaustive and extensive investigation, which is beyond the scope of this article. To me the only successful solution is the one that advocates a contribution from each of the classes involved, and the purpose of this article, therefore, is to advance such a solution with the hope that in it may be found such worth as to warrant serious consideration towards applying it in actual practice.

The relationship between employer and employee dates far back in the annals of history, and, though discussed to a greater extent today than heretofore, it is not of itself a new question; only the solution for a troubled industrial relationship is new. The earliest recorded strike was that of the Children of Israel, and was brought about as the result of Pharaoh's order that the Israelites should provide their own straw to make bricks. The outcome of this dispute between employer and employee, which culminated in the exodus of the Israelites from Egypt, is familiar to all readers of history and Holy Writ. From those early days to the present history records innumerable strikes and disputes between the employer and employee in various classes of industry. As the cases recorded are innumerable so the reasons for the trouble are innumerable. As time advanced the employees organized themselves into labor unions, until today society has what is known as the labor movement. Some of these unions or organizations are purely local in character, existing in and dealing only with, the industry of which they are a part, while others cast their lot with a larger body and amalgamate themselves with other trades and vocations.

In this country that larger body is the American Federation of Labor, and to all intents and purposes directs the destiny of the employees in practically all trades. Because of its representative membership the propaganda which this federation publishes and the principles it advocates not only speak the aims and views of the employees but have an effect upon public opinion and reasoning. The American Federation of Labor is organized for the purpose of "self." The preamble to its constitution cites that: "Whereas, a struggle is going on in all the nations of the civilized world between the oppressors and the oppressed of all countries, a struggle between the capitalist and the laborer, which grows in intensity from year to year, and will work disastrous results to the toiling millions if they are not combined for mutual protection and benefit." That same constitution gives as its objects the formation of various kinds of unions, local, national and international; encouragement of the sale of union label goods; the securing of legislation in the interest of the working people; and "influence public opinion by peaceful and legal methods, in favor of organized labor." The two chief unwritten objects of this federation are shorter hours and more pay for the employees. It apparently takes no account of co-operation between employer and employee, nor does it advocate increased production on the part of the employees, and the elimination of trade jurisdictional disputes when same hinder increased production.

Capital and Labor Each Helpless Without the Other

But does a successful solution for a troubled industrial relationship call for a contribution from the employees only? Any solution which advances a contribution from one of the classes only will fail. There must be a contribution from each since each is dependent solely upon the other. Certain elements are involved in the making up of capital and labor. The employer must furnish the capital which is the first necessary element in the successful conducting of the business or industry; without this the industry cannot be started. All the labor obtainable will be of no avail if the capital is not present to erect the shop and procure the machinery from which labor produces the finished product. The employee must furnish the ability to produce, and must put into practice the knowledge of his trade. Capital is obtained through the production of labor, and labor is obtained through the offer of capital. It is true that there would be no capital without labor, *a fortiori* there would be no labor without capital. Each of the contending forces, therefore, is depending solely for its existence upon the other; the success of one is the success of the other; the failure of one is the failure of the other; the interest of one is the interest of the other; and the only successful solution is the one which advocates the co-operation and contribution of each to the welfare of the other.

We are living in a progressive age; the day of lord and serf is passed; the idea of master and servant is obsolete; and the progressive employer in keeping with a new order of things has not only changed but has completely reversed his former attitude toward his employees. In practically every line of industry where the principles of scientific management have been installed will be found an employment department where the hiring, firing and welfare of the employees are carried on by a trained, organized force under the directorship of an employment manager, sometimes referred to as employment engineer, welfare officer or director of personnel. Employees are no longer hired promiscuously nor fired indiscriminately. The whims and idiosyncrasies of unscrupulous foremen are catered to no longer. The employment department by job analysis, by transfer from one shop or class of work to another, by the fitting of round pegs into round holes so to speak, maintains an efficient and contented organization, thereby improving the *esprit de corps*. Such a system not only eliminates the awful cost of turnover, which is an actual expenditure of dollars and cents, but shows the employer's

consideration for his employees. The great human element in industry is no longer ignored. The same thought and attention that is given to the purchase of material is also given to labor; the same thought and attention that is given to the preservation of machinery is now given to human beings. In addition to this method of scientific management special departments have been created such as legal, medical and dental aid where the employees can secure legal, medical and dental advice at the expense of the employer. Retirement, sick and pension systems have been inaugurated, welfare and athletic societies formed, and lunch rooms installed. Various forms of insurance for the care of employees injured both in and out the line of duty are in vogue, and in some industries employees have representation at the council table of the management. All of these departures from the old order of things not only prove capital's consideration for labor but represent in dollars and cents labor's share of the profits of the industry of which it is a part. They show that in some industries the employer is making at least a part of the contribution required of him as a class towards that successful solution which I have described as necessary.

Employees Can Contribute Increased Production

The employers have shown what contribution they can make; it remains for the employees to show what contribution they can make. At a recent meeting of the executive council of the American Federation of Labor the secretary of that federation announced in the public press that the council would attempt to secure for labor a share in the profits of corporate bodies. I have already shown where capital's contribution to the welfare and contentment of labor represents one share in the profits. Labor cannot expect to further share in the profits of corporate bodies unless it makes its contribution to the success of those bodies. The man who does not contribute cannot expect to share, and when there are no profits there can obviously be no share. The contribution of labor to capital lies in one object not yet made a part of the written constitution of organized labor, and that object is—increased production. It has been well said that a little more industry wouldn't hurt industry. Unless labor is organized in a manner that will increase production there can be no profits out of which labor could claim a share. The denial of a machinist's right to drive a nail or a joiner to unscrew a nut—so-called jurisdictional disputes—not only retards production but in many cases has been the cause of stopping production altogether. Samuel Gompers, president of the American Federation of Labor, in a recent magazine article entitled "Union Labor and the Enlightened Employer," said: "Trade unionism is a prime factor for the increase of production. Trade unionism is interested vitally in increasing the volume of production." Mr. Gompers' statements cannot be taken seriously in the light of jurisdictional disputes. As long as trade unions jealously guard craft prerogatives a whole hearted effort towards increased production cannot be put forth. The argument of organized labor against increased production is that it creates unemployment. Professor Norris A. Brisco in his book "Economics of Efficiency," shows by a concrete example that this contention is not well founded. He says in part: "History shows that increase in output in any trade always results in more men being employed, and usually in an increase in wages. The cheapening of any article in common use almost immediately results in an increased demand for that article."

In conclusion the only successful solution for a troubled industrial relationship is one which has for its foundation a contribution from each of the classes involved. Since capital is dependent upon labor and labor is dependent upon capital, these two classes are no longer engaged in a struggle, "which grows in intensity from year to year," but constitute the two major parts of an industrial machine, each depending on the other for its rightful contribution of power to propel the wheels. Capital must give to labor hours and wages commensurate with an American standard of living; it must not look upon labor as a commodity but must at all times take cognizance of the human element. Labor must give to capital an honest return in effort; it must also strive to increase the production of the article upon which engaged. When each has made its contribution then each will be entitled to share the profits whether they be cash or benefits or both. It is believed that if all employers would consider the welfare of their employees as many are now doing, and that if labor would organize for increased production, a new era for industrial relations would dawn.

Tapping With a Bent Tap—Discussion

By E. D. Ward

In looking over the American Machinist on page 857, Vol. 55, I was interested in the description of the use of the bent shank tap. I presume that others may take the matter up with you, but for fear they might not, I thought I would call your attention to the fact that in this article the writer mentioned the necessity for having the shank of the tap smaller than the root diameter of the thread. In another paragraph he suggested the possibility of securing a pulley tap.

Pulley taps are made with the shanks larger than the bottom of the thread. A tapper tap is what he should have referred to, and as a matter of fact, bent shank tapper taps are regularly made and listed by various tap manufacturers.



Operations on the Cylinders of the Wills Sainte Claire

Closed End Cylinders Require Special Tools for Machining Combustion Chambers—Special Boring Machine with Inclined Spindles—Heat-Treatment Removes Strains

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE motor of the Wills Sainte Claire resembles the Liberty in several ways, both in design and construction. The cylinders are of cast iron instead of steel, and in block instead of separate. There are two blocks each having four closed-end cylinders.

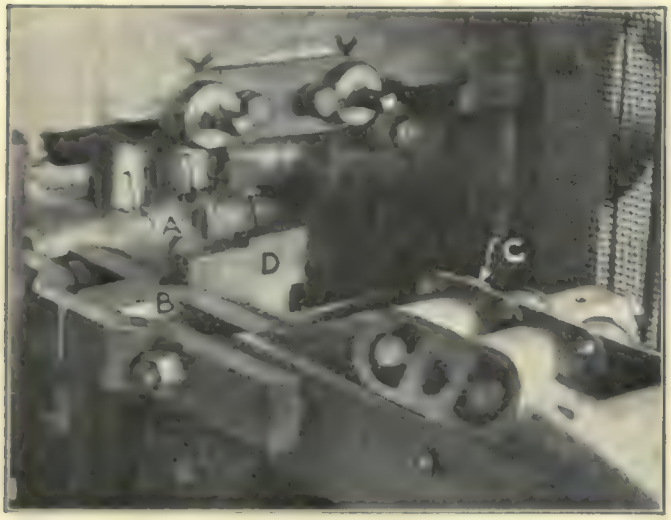


FIG. 1. MILLING LOCATING SPOTS ON FLANGE.

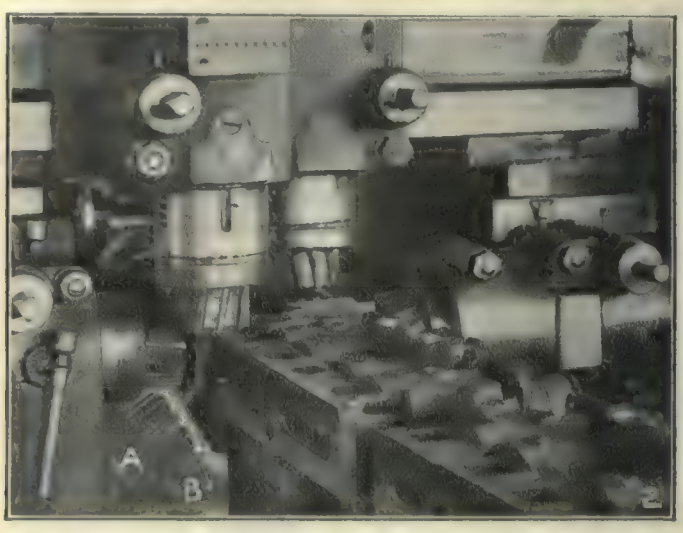


FIG. 2. MILLING ENDS AND SIDES OF CYLINDERS



FIG. 3. INCLINED CYLINDER BORING MACHINE.



FIG. 4. CYLINDER BLOCK IN PLACE

This arrangement necessitates special tools for facing and recessing the combustion chamber. After the preliminary cleaning and inspection a water test is made to prevent any machine work on defective castings. Core holes are drilled, plugged and water tested, after which the first milling operation, Fig. 1, mills the spark plug bosses and also several locating spots on the flange. This is done on a three-spindle Ingersoll machine, the three cutters being very closely grouped. The cutters at *A* mill the flange spots, one of the spots being shown at *C*. The method of clamping the work is shown at *B* and the guide plate for setting the cutters is seen at *D*.

The next milling operation, Fig. 2, machines the top and bottom of the skirt, the inlet and exhaust flanges and the water inlet flange. Points of interest are the spindles *A* at an angle, the plate *B* for setting the cutter, the stocky spindles and the keys for driving the cutters. The bottom flange is then rough profiled and finished by a second operation, being followed by several drilling and reaming operations.

The rough boring is done on a special four-spindle Foote-Burt machine which is shown in part in Figs. 3, 4 and 5. The spindles are inclined so that the chips work themselves out of the bore instead of packing into the combustion chamber. The recesses around the boring bars, Fig. 3, are to receive the projecting ends of the cylinder barrels. The flange is located on the dowel pins *A* and *B* and rests on the positioning spots shown. One of the holding clamps is shown at *C*.

In Fig. 4 is shown the cylinder block in place, the clamps *A* and *B* holding the block under pressure from the screws *C* and *D*. The clamping blocks can be moved



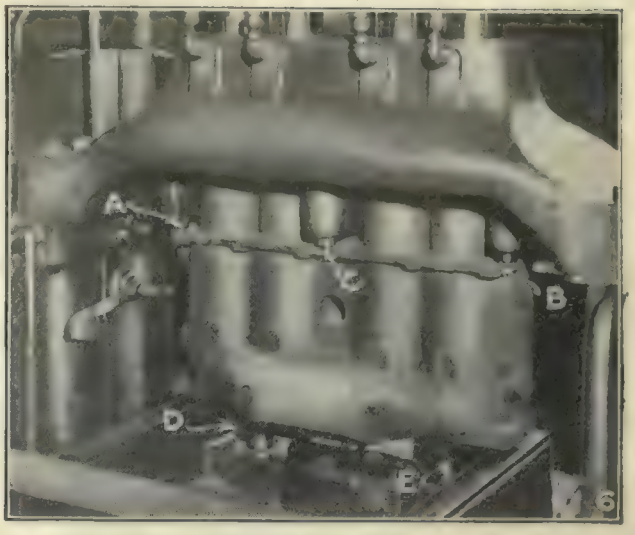


FIG. 5. THE CHUTE FOR CHIPS. FIG. 6. THE SECOND BORING CUT

in and out of position by the handle *E*. The frame carrying the cylinder block moves down over the boring bars and the chips work their way down and out the spout *A* and the chute *B* in Fig. 5. This saves considerable time and trouble and has proved very satisfactory.

The second boring is done on a four-spindle Foote-Burt machine as shown in Fig. 6. Here again the cylinders are located by the bolt holes *A* and *B* and are supported at *C*. Rams *D* and *E* come up from the bottom and force the cylinders in place against the flange. This operation removes from 0.010 to 0.015 in., leaving an equal amount for the final reaming before the grind.

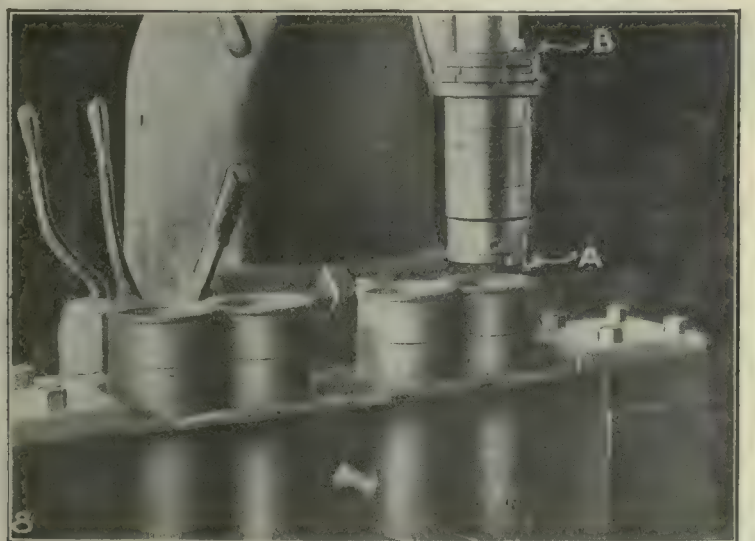
Machining the Combustion Chamber

The combustion chamber is next rough-faced, leaving $\frac{1}{32}$ in. for finish. The tool for this work is shown in Fig. 7. The bar *A* fits inside of the sleeve *B*, which in turn fits inside the cylinder bore and is anchored by the pin *C* entering one of the bolt holes in the flange. The sleeve serves the double purpose of guiding the bar and also preventing any injury to the cylinder wall from the bar itself.

The roughing cutters are held in the cutter head *D*, which has a round projection *E* fitting up into the end of the bar and held by the headless setscrew *F*. This projection, however, does not take any of the driving strains; the tongue *G* on the cutter head forms a key and is driven by the slotted end of the bar.

The fillister head screws *H* prevent the sleeve from slipping off the bar when it is removed from the cylinder. The end view of the bar shows the arrangement of the four cutters, as well as the location of the chip breaking grooves.

Next comes the rough-boring of the combustion chamber. This is done, one cylinder at a time, under a Foote-Burt heavy duty drilling machine as seen in Fig. 8. The cutting tool is shown at *A* and is fed into the work by the action of an angular piece on the collar *B*. The tool is shown in detail in Fig. 9. The main bar A carries an internal bar *B* with a pin through the upper end to prevent its turning. The angular piece *C* slides in a hardened bushing in the bar *A* and when it strikes the adjustable collar *D* it is forced across the angular opening in the bar *B*, moving this bar down by the amount of the space *E* and in turn forcing down the piece *F*. This piece moves the cutting tool *G* into the work, where it continues counterboring for the distance shown. The spring *H* returns the bar *B* to its proper or normal position as soon as the main bar *A*



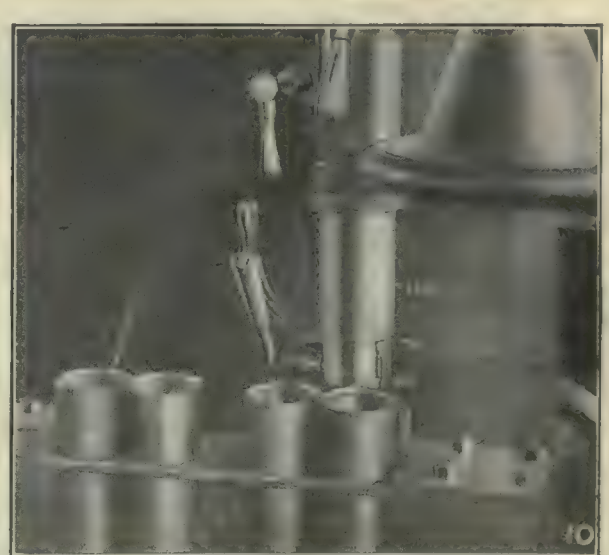


FIG. 8. BORING COMBUSTION CHAMBER. FIG. 10. FINISHING COMBUSTION CHAMBER

has been withdrawn so that the angular piece *C* rises above the adjustable collar *D*.

Another type of tool is used in finishing the combustion chamber and is shown in Fig. 10. The finishing of both the counterbore and the face of the combustion chamber is accomplished by the bar shown in Fig. 11. The bar *A* which is driven by a substantial tongue, carries the collar *B* containing the small springs shown. These springs bear on the sleeve *C* which runs on a ball-thrust collar. The pin *E*, fitting in a bolt hole, holds the outer sleeve from turning.

The facing and counterboring cutters are expanded by means of the angular strips *F* as the bar is forced down. These cutters are shown in the view at *G*, which also shows the way in which the cutters are held.

The bore is chamfered and is next reamed for grinding, in the machine shown in Fig. 12, which also shows the type of finishing reamer used.

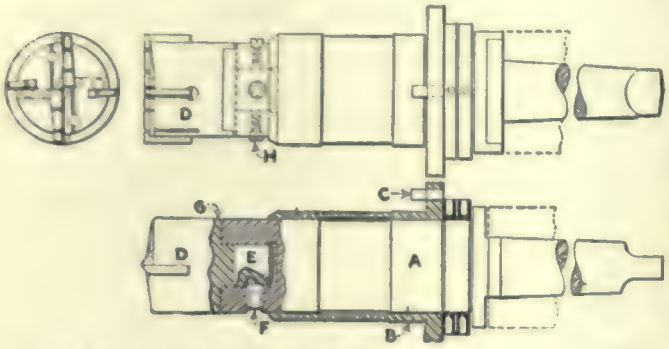


FIG. 7. TOOL FOR FACING COMBUSTION CHAMBER

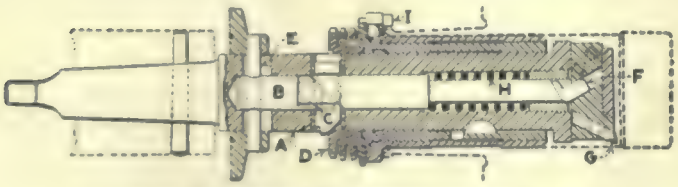


FIG. 9. DETAILS OF BORING TOOL

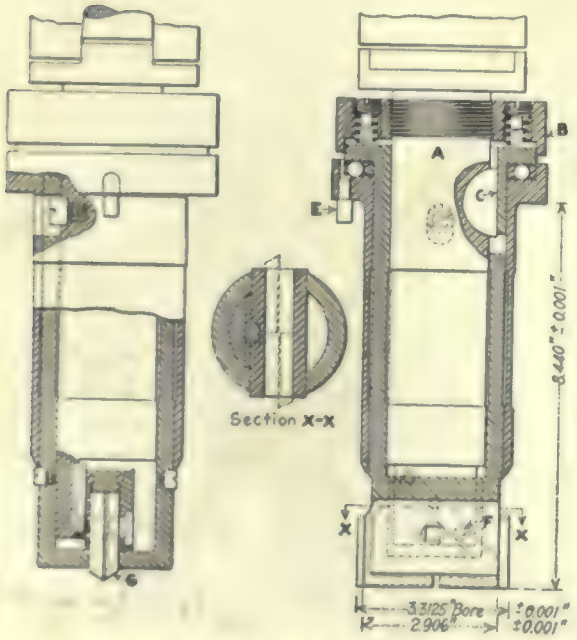


FIG. 11. DETAILS OF FINISHING TOOL

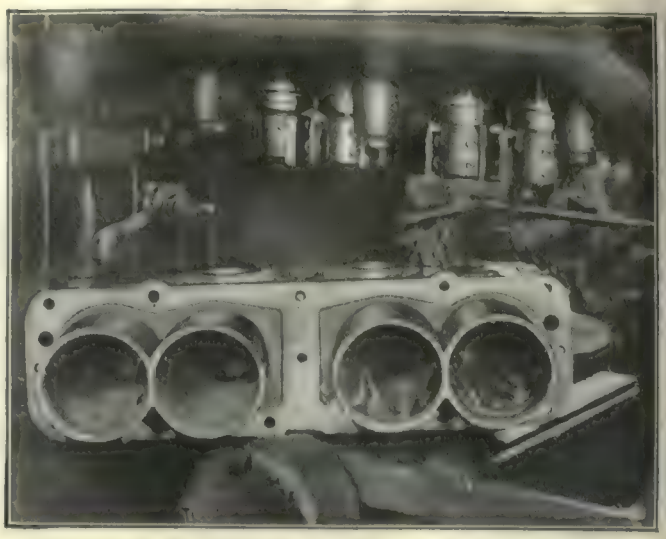


FIG. 12. THE FINISH REAMING

Then follows a number of drilling and tapping operations, including the holes for the oil tubes, the pressing in and spinning of these tubes, pressing in valve stem bushings, and the milling off of the locating spots of the flange. Next comes a heat-treatment to remove all tension from the castings. Then the valve stem bushings are finish reamed, the whole block thoroughly washed and the cylinder bores ground. A final water test, followed by the last inspection, the forty-seventh operation, completes the work.

How One Company Is Trying to Help Business

If buyers and sellers could get together and make known their wants, the sales effected would noticeably improve business because all buyers are sellers and all sellers are buyers.

An approach toward such a getting-together has been made by the S. Rose Company, Inc., of New York, importers of diamonds, carbon and bort, in the following letter sent to a large number of its customers:

Are you interested in improving the general condition of business throughout the country and will you give assistance to a movement to bring about such result?

We are making the following offer to more than one thousand of our customers: In consideration of your placing an order with us, for future delivery, for such goods as you may require in our line, we will in turn, for every order given to us in reply to this communication, place a reciprocal order with other concerns for tools, machinery, metal, and various other commodities required in our plant.

It is our thorough conviction that if a large number of manufacturing concerns would adopt the plan of action as suggested above, it would undoubtedly have the effect of placing orders on the books and thereby encourage production and a distinct feeling of optimism throughout the manufacturing world.

We earnestly suggest that, as executives, you place this proposal before the consideration of your sales and production managers; and we assure you that any suggestion that you may have to offer on the subject will be appreciatively received.

May we look for your advice and assistance in this movement?

This letter is of value because of its suggestiveness, seeming as it does to point a way to dealers in supplies such as small tools to get buying started. Any increase of business would, of course, cause greater demand for supplies of the larger class and for machines.

Planing Flat Gibs

A Difficult Job in Which Proper Clamping Plays a Prominent Part — Bending a Piece to Have It Lie Flat on Table — Tools to Use

BY TELL BERNA
Sales Engineer, The G. A. Gray Co.

TO ATTAIN accuracy in planing it is important to devote attention to the proper methods of clamping the work on the table. Notwithstanding all of the articles and discussions which have been printed from time to time, there are still many planer operators who have not grasped the fundamental ideas involved in clamping their work. The object of clamping is, of course, to prevent the work from shifting while it is being planed. It is very important that this be done in such a manner that the work itself will

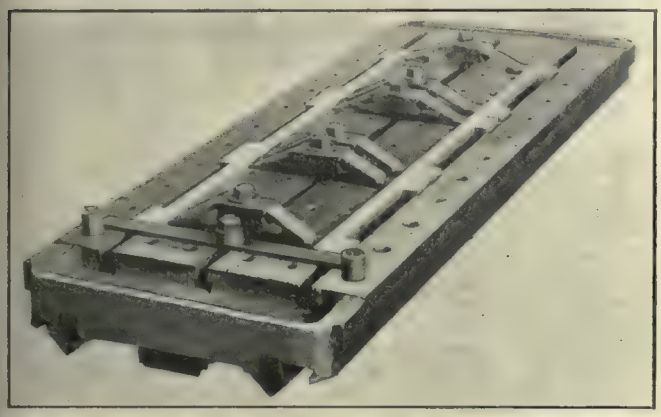


FIG. 1. PLANER TABLE SET-UP FOR PLANING THIN GIBS

not be distorted by the clamping device and equally so that the planer table will not be sprung out of shape. It is quite safe to say that most planer work is clamped too tightly.

A thin flat cast-iron gib is perhaps a particularly difficult piece to plane without springing. Such a gib is so thin that it can easily be bent, yet the highest degree of accuracy is desired so that it may be used without subsequent scraping. A planer table set-up for planing a job of this character is shown in Fig. 1. The relative position of the work and clamps is further detailed in Fig. 2. The block *A* in the T-slot of the table is a sliding fit and under no circumstances a driving fit, since to drive this block into place would tend to spring the table. The gib is pushed firmly against the block *A* by the hardened tool steel shoe *B*. The shoe is in turn clamped against the gib by the spacer *C*, made out of an old file ground to shape. With a clamp at each end of the gib, as shown in Fig. 1, the piece can be firmly held by tightening up on the clamp nut with a 6-in. wrench. It is important that good judgment be used in tightening the nut, since it is obvious that a husky operator can spring the table

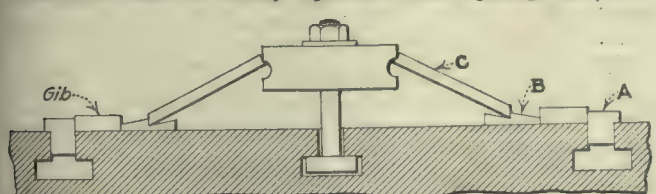


FIG. 2. DIAGRAM OF CLAMP ARRANGEMENT FOR HOLDING GIBS

if he is careless. As the gibs lie end to end, the clamp is not expected to take any of the endwise thrust, which is the greatest force to be resisted in holding the piece to be planed. The end thrust is taken by the strip which is laid across one end of the table. This strip is pushed against two stop pins on the outside edges of the table and then clamped firmly into place by the nut and bolt in the middle T-slot.

The first cut is a roughing cut over one of the wide surfaces of each gib, using the round-nose tool of common form, as shown at *A* in Fig. 3, with a feed of $\frac{1}{32}$ in. and removing a depth of about $\frac{3}{32}$ in. This should leave about 0.028 in. of metal to be removed by subsequent cuts. Using too coarse a feed may result in breaking out too large a chip at the end of the cut, thus spoiling the work.

The pieces are now reversed, the surfaces just roughed out being turned down, and it is important that the middle of the gib should be in firm contact with the table, since the clamps hold the gibs only at each end. Before clamping the gib on the planer table it should be held as shown in Fig. 4 and tapped lightly on a block of babbitt, the blow striking on the still unfinished surface. This causes a slight curvature. The gib is then reversed, and when laid on the table its middle will be in contact with the table and its ends slightly raised. The effect of bending the gib can be judged by laying it finished side down on the planer table and pushing one end as shown in Fig. 5. If the gib revolves about its center as indicated by the dotted line at *A*, we know that the ends are raised up and the piece is hollow on top. If the piece revolves about the further end as shown at *B*, we know that it

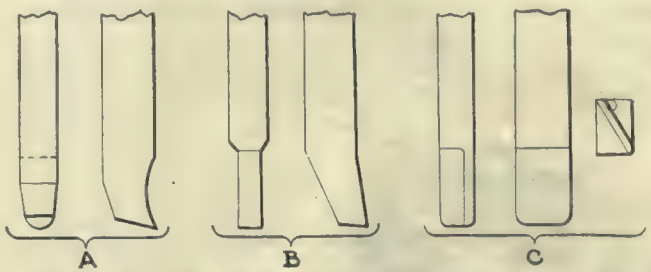


FIG. 3. PLANER TOOLS USED FOR FINISHING GIBS

is either straight, or arched, so that it is hollow on the lower side. The purpose of this bending is to make sure that when the ends are clamped down, the entire gib will be held firmly against the table. This can be readily tested by tapping the gib, showing whether there is firm contact or not. If this precaution is not observed, the center of the gib will be slightly raised from the table no matter how hard the ends are clamped; the cutting tool will depress the center of the gib as it passes over the work, and will not result in a straight or accurate job. With the method of clamping described above the gib is absolutely straight after being clamped because it is firmly brought into contact with the table at all points. The second wide surface

is then roughed out after which the gib is set up on edge and the edges are roughed out, leaving about 0.020 in. for the subsequent cuts.

The operator should now select on each piece the smoothest of the two wide surfaces and clamp the gibs with these surfaces upward, taking care to see that each piece lies firmly on the table when clamped. The pressure required to hold the gibs for the finishing cuts is, of course, lighter than that required for roughing out and therefore the effort exerted on the wrench in clamping should be correspondingly lighter. Selecting the better surface in this way eliminates the necessity of taking a straightening cut on this surface as a satisfactory finish may be obtained with one finishing cut. This cut removes from 0.006 to 0.008 in., just enough metal to get a true flat surface. For the straightening and finishing cut a square-nosed tool *B*, Fig. 3, is used. This tool is about ¾ in. wide and is used with a feed of about ⅝ in. for straightening and ½ in. for finishing. For finishing steel, the tool shown at *C*, Fig. 3, will leave a very smooth surface.

The gib is now reversed and after the curvature has been reversed so that the piece lies flat when clamped, the other wide surface is planed. This cut is, properly speaking, a straightening cut, removing enough stock to leave 0.004 in. for the finishing cut. Before the latter is taken, all clamps are loosened to permit the gib to change shape so as to relieve any internal stresses. This finishing cut completes the operations on the wide surfaces and should leave the gibs smooth and of accurate thickness at all points. Usually the gibs will be perfectly flat after the last finishing cut has been taken and the clamps have been removed. If, however, they resume a slight curvature it is a very simple matter to straighten them by tapping them on a babbitt block. If the planing has not been properly done, the gibs will not be of equal thickness at all points and it will be impossible to get them perfectly flat on both surfaces.

The narrow edge with the best appearance is now given one finishing cut, and the gibs are then reversed to take the straightening and finishing cuts on the other narrow surfaces. The gibs are invariably reclamped between cuts.

The speeds used are a matter of judgment and experience, and depend largely on the hardness of the

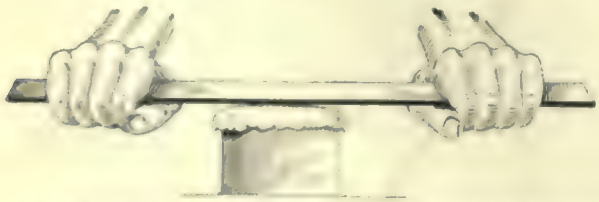


FIG. 4. METHOD OF SPRINGING GIBS BEFORE PLANING SECOND SIDE



FIG. 5. METHOD OF ASCERTAINING WHETHER GIB IS SPRUNG

metal. Cast iron may usually be roughed out at 48 ft. per minute and finished at 30 ft. per minute; the straightening cuts are taken at 48 ft. per minute. In doing this work on steel strips the speeds are about the same but depend entirely on the hardness of material.

We have in this job a paradox in that the gibs must be bent before clamping in order that they may be straight when finished. It should be clearly understood that the proper clamping plays as important a part in the work as any other element, and unless the operator is willing to give this his patient attention he cannot get the best results.

The Cost of Spoiled Work

SPECIAL CORRESPONDENCE

Although there is, unfortunately, not very much work to be spoiled at the present time, it is, nevertheless, an important point at all times and should be much more carefully considered than is always the case. An excellent poster on this subject is to be found in the shop of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, having been prepared by general superintendent Fred G. Kent. It is as follows:

SPOILED WORK

Stop a minute and consider spoiled work. If every man in this shop will appreciate fully what it means, the amount can be cut 90 per cent.

There is, first, the direct loss, which includes the cost of the material and the labor which has been spent upon it. There may be a small scrap value, but otherwise what is lost can never be recoverd. But the direct loss is only a beginning. There are other greater losses. Spoiled pieces must be replaced, usually in a small quantity lot. It costs from three to ten times as much per piece to make ten pieces in a lot as it does to make a hundred; sometimes the ratio is even greater. Also remember that rush jobs are always more expensive than regular jobs, and replacement of spoiled work is always a rush job.

While this small quantity job is being done, there might be made instead of it, some other job which is crowded out of its place in the schedule by the spoiled work. The upsetting of the manufacturing schedule is the hardest thing to put an exact value upon, but is the greatest loss that we have, due to spoiled work.

Remember that raw material not only costs money, but is often very hard to get. Every time the foundry runs on a short lot of a few pieces to replace spoiled work, it is taking time that would produce much needed material for regular work. It is also taking the time of the purchasing department in getting the order for this replacement material pushed ahead of the older orders already placed. Sometimes it is almost impossible to get the replacement material at all, and by the time it is obtained, the work for which it is needed has been delayed beyond the possibility of any approach to efficient production. In certain cases, such delay has caused a loss through penalty, which has more than wiped out any profit on the order. Also, where there are no penalties involved, the shortage on the erection floor will put off the shipment of some given machine at a time when there is nothing else that can be substituted for it on the shipment schedule. This is a loss that can never be made up.

Work that is imperfectly done, so that it must be done over or patched up, may save the direct loss of the material, but the delay due to time spent on it is just as serious and expensive as in the case of spoiled work.

Careful observation of three small rules will help greatly:

First: Make sure that the first piece in every set-up is passed by the inspector before doing any further work on the job. This is a simple rule, and must be obeyed.

Second: If a blueprint is smudged so that you cannot be sure of the figures, or if you are in doubt as to the meaning, put it up to the foreman. Don't guess. Better lose time making sure than spoil work. Don't use an indistinct blueprint; insist on a fresh one.

Third: Don't use a jig or tool that you think is in bad shape, put it up to the foreman. Don't use any jig before you are sure you understand how.

Cutting down spoiled work will save money, increase the production, cheapen the cost and raise wages.

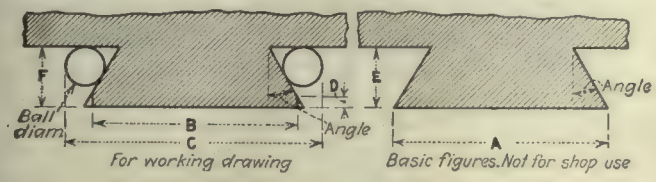
The Dimensioning of Dovetails on Drawings

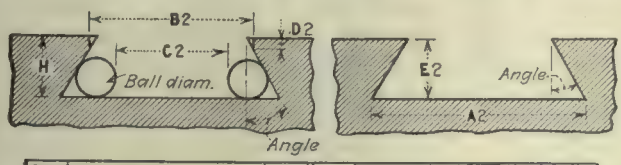
System for Giving All Necessary Figures and Enabling Checking — Two Separate Sketches Made of Each Dovetail—Proper Tolerances for Each Dimension

BY H. M. FUNNELL

THE method of dimensioning dovetails on shop drawings of machine parts should be considered under two headings: (1) The drawing should show the starting or basic point of the dovetail under consideration, so that all future checkings or redesigns can be based on a correct understanding of the original figures. Many times dimensions are given to the nearest convenient fraction, which, considering the taper gib, may be quite correct from the shop point of view; but the fraction gives no clue to the basic figures; and the checker has to calculate and guess in order to determine the starting point or basic figure. (2) The drawing should show all dimensions that are necessary for the shop to have in order to manufacture the part, and these dimensions should be in decimals and fractions, according to their importance.

However, if we put the basic figure on the working drawing, it may cause confusion and questioning in the shop. Therefore, it is suggested that a separate sketch be made of each dovetail part on the detail drawings, one for the shop and one for reference. These separate sketches need not be to scale, but should be clearly marked to indicate what they are for, as shown in the accompanying diagrams. The reason for making a separate sketch of the working dimensions is that, generally, a dovetail is drawn so small that it is not clear where dimension lines are intended to be.



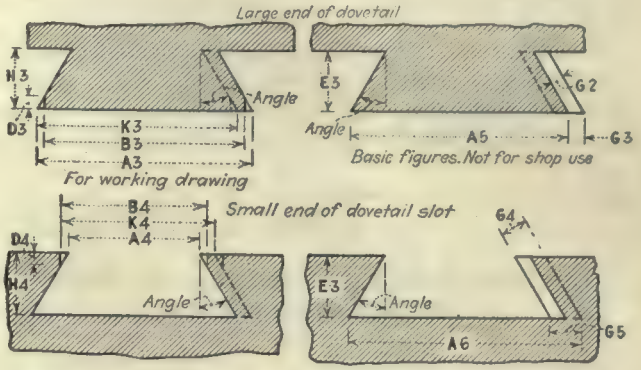


Shop Dim.	Specify Dimension as,	Ref. Dim.	Shop Dim.	Specify Dimension as,	Ref. Dim.
B	Fraction			Decimal	E
C	3-Place Decimal		B2	Fraction	
D	Fraction		C2	3-Place Decimal	
F	Fraction=(E-1/64 in.)		D2	Fraction	
	Decimal	A	H	Decimal=(E±0.002 in.)	
	Decimal	A2			

FIG. 1. LAYOUT FOR DOVETAILS WITHOUT GIBS

Considering the first class, or dovetails without gibs, it is obvious that the final adjustment must be secured by scraping to a fit. On the working sketch for this type, Fig. 1, we should show the dimensions marked *B*, *C*, *D* and *F* on the male part of the dovetail; and *B2*, *C2*, *D2* and *H* on the female part of the dovetail. On the basic-figures sketch we should show *A* and *E* for the male part, *A2* and *E2* for the female part, and, of course, the dovetail angle in all cases, and the ball diameter where needed.

It is obvious that dimensions *B*, *B2*, *D* and *D2* should be fractions. The dimension *F* is given as *E*–⅛ in. to provide clearance under the dovetail. The dimensions *C* and *C2* are given in three-place decimals, because it is desired to eliminate scraping as much as possible; but since some scraping must be done for the final fitting, there is no justification for giving a four-place decimal.



Shop Dim.	Specify Dimension as,	Ref Dim.	Shop Dim.	Specify Dimension as,	Ref. Dim.
A3	3-Place Decimal±0.005			Decimal=(A5+G3)	A6
B3	Fraction			3-Place Decimal	G4
D3	Fraction			Decimal	G5
H3	3-Place Dec.=(E3-0.015)±0.002in.		A4	3-Place Dec.±0.005	
K3	3-Place Decimal		B4	Fraction	
	Decimal=Basic Slot-G3	A5	D4	Fraction	
	Decimal	E3	H4	Fraction=E3	
	3-Place Decimal	G2	K4	3-Place Decimal	
	Decimal	G3			

FIG. 2. DOVETAILS WITH TAPER GIBS

Dimension *H* is given as *E* ±0.002, because the ball reading *C2* depends upon it; but the same reason as just given does not make it desirable to hold it closer. Dimensions *A*, *A2*, *E* and *E2* on the basic-figures sketch should be in decimals to four places, so that calculations can be made correctly, and thereby avoid addition of errors.

Considering the second class, or dovetails with taper gibs, we have a condition where a certain amount of latitude can be allowed, as we have a take-up by means of the tapered gib. On the working sketch for this type, shown in Fig. 2, we should show the dimensions marked *A3*, *B3*, *D3*, *H3* and *K3* on the male part, and *A4*, *B4*, *D4*, *H4* and *K4* on the female part. On the basic-figure sketch, we should show *A5*, *E3*, *G2* and *G3* for the male part, and *A6*, *E3*, *G4* and *G5* for the female part, showing the dovetail angle in all cases.

Dimensions *A3* and *A4* can be given as a three-place decimal ±0.005, thereby allowing the shop to measure over the sharp corners. The taper gib will take up any error due to the tolerance or to the fine edge being slightly broken. Dimensions *B3*, *B4*, *D3* and *D4* are obviously to be given in fractions.

Dimensions *H3* is given as a three-place decimal, and is equal to the basic figure ±0.002 in., or *E3*–0.015 ±0.002, the reason being that *A3* depends upon *H3*

when the angle is constant, and also that clearance is provided by making it 0.015 less than *E3*.

Dimension *K3* and *K4* should be a three-place decimal, so that the taper for the gib can be ascertained. Dimension *A5* should be a decimal, and is the basic slot minus *G3*. Dimension *E3* should be a decimal, otherwise *A5* would be incorrect, since the angle is always constant.

G2 and *G3* should be decimals, *G3* being put on the basic sketch as a precaution against using *G2* in the wrong plane. *G2* is at the narrow end of the gib space. Dimension *H4* should be a fraction equal to *E3*, any tolerance taken in the shop on a fraction being taken care of by the clearance provided by *H3*.

Dimension *A6* should be in decimals, and is equal to *A5* plus *G3*. Dimension *G4* and *G5* should be decimals. *G4* is at the wide end of the gib space, *G5* being shown as a precaution against using *G4* in the wrong plane.

With the sketches shown on the drawings, errors can be detected with a minimum of trouble, and if the various dimensions are tabulated as shown, it is easy to make all drawings to one standard. The writer once checked up some dovetails on a machine that had been built for years and found out that if the dovetails had been made to the drawings, the machine could not have been assembled. The good sense of the shop foreman and co-operation had put the work through; but imagine the results if work had been let out under contract to another company and it had made the various parts to the drawings, and then could not have assembled them. The result would be that several of the highest-paid executives in both concerns would put in valuable time to straighten it out, when a little more time of a much lower-paid man—and only one man's time at that—would have prevented not only the trouble, but the extra expense as well.

The Lubrication of Bearings

Common Sense in Locating Oil Holes—Bevelled Edges Aid in Proper Lubrication—Chamfered Piston Rings Have Increased Life—Retaining Oil in Bearings

By JOHN S. WATTS

NOTWITHSTANDING that considerable advance has been made in the study of the action of lubricant in bearings, the knowledge so gained is not being applied to many bearings outside of a few in the more important mechanisms. The cause of this disregard of the correct principles of lubrication cannot be other that apathy or ignorance, as there is in nearly all cases no additional cost incurred by applying the lubricant properly.

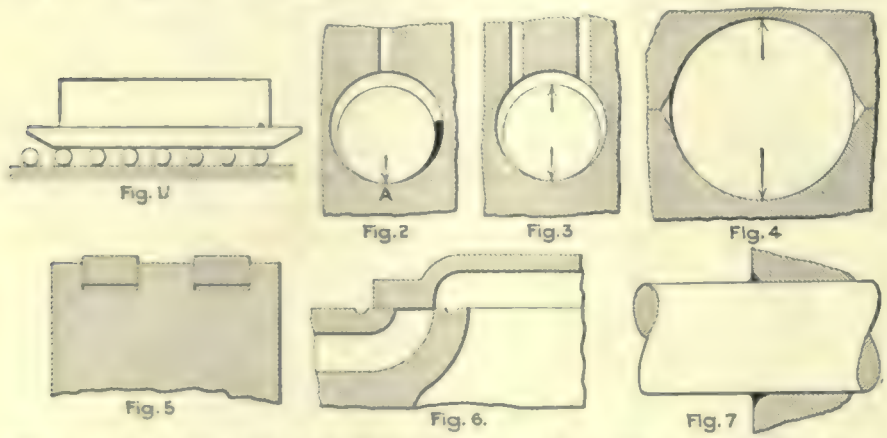


FIG. 1. OIL OR ROLLERS WILL BE PUSHED AWAY UNLESS THE SLIDING MEMBER IS BEVELLED. FIG. 2. PROPER POSITION OF OIL HOLE IN BEARING FOR CONTINUOUS PRESSURE. FIG. 3. PROPER POSITION OF OIL HOLES IN BEARING FOR ALTERNATING PRESSURE. FIG. 4. BEARING RELIEVED AT MEETING EDGES. FIG. 5. EDGES OF PISTON RINGS SHOULD BE CHAMFERED OR ROUNDED. FIG. 6. METHOD OF OILING A SLIDE VALVE. FIG. 7. ROUNDED ENDS OF BEARINGS AID IN RETAINING OIL

In a general way the problem may be stated to be that of first insuring that the oil will get completely between the two surfaces, and secondly that the oil be not permitted to escape before it has completed its work. With forced or flood lubrication a bearing may be successfully oiled even if the oilways, etc., are not laid out as well as they might be, and the common bearing occasionally oiled by a squirt can can be made to use the oil to much better purpose if the oiling arrangements are given a little study.

First take the question of getting the oil between the sliding surfaces. It is absolutely essential that the oil be admitted in such a way that it will be drawn into the bearing. The action is very similar to that of a machine on skids being traversed along on rollers. When the skids are bevelled off at the ends as shown in Fig. 1, they will ride up onto the roller ahead of them quite easily, but if the ends of the skids were cut off square, it is obvious that the roller would be simply pushed ahead and never get under them. Then again, if the weight imposed upon the rollers is too great the rollers will collapse, which is analogous to a bearing having pressure enough upon it to squeeze out the oil.

In a cylindrical bearing the same action takes place as shown in Fig. 1; the shaft being smaller than the hole we get the wedging action indicated in Fig. 2, in which the clearance is exaggerated to show more clearly the way the oil is drawn in between the bearing surfaces. In such bearings the most essential point is to locate the oil-hole so that the oil will be drawn into the bearing easily. To insure this, the oil hole must be at the point where the pressure is least, as shown in Fig. 2, because at that point the clearance between the shaft and the bearing is greatest. It will be obvious that if the oil hole is located at point *A*, it will be difficult if not impossible for any oil to enter, and that what little does get in, will tend to escape from the bearing before it is dragged around to the point *B*, where it is required.

When the pressure on a bearing is a reversing one, as on the main bearing of a steam engine, there should preferably be two oil holes, as in Fig. 3. If owing to the lack of space it is impossible to find room for both oil holes, the single oil hole should be drilled off the

center of the bearing, as otherwise if it is drilled as shown in Fig. 2, the up and down movement of the shaft in its bearing will tend to pump the oil out of the bearing.

A further improvement in this type of bearing is to cut it away at the sides, as shown in Fig. 4. The space so formed acts as an oil reservoir and gives the oil a much better opportunity to get in under the loaded part of the bearing. The part cut away is of little or no value, and so does not reduce the effective bearing surface any appreciable amount. If the bearing should heat up, the effect is for the shell to close in and grip the shaft sideways, thus increasing the friction and quickly causing a dangerous over-heating. As bearings that are cut away at the sides cannot expand enough to grip the shaft, this danger is averted. To prevent the oil escaping at the ends of the bearing, a small portion at each end is left unrelieved.

Returning to flat sliding bearings, it will be clear that if the edges of the sliding part are left square, the effect will be to scrape off the oil and such parts as piston and piston rings should always be slightly chamfered or rounded off as shown in Fig. 5. Actual experience has demonstrated that piston rings so made will outwear those made with sharp corners, because of the oil being able to get between the bearing surfaces.

There are some few cases where it is not permissible to round off the edges of the sliding part such as in steam engine slide valves, the edges of which have to be sharp and square to perform their functions in cutting off the steam. The next best method to adopt in such cases is to cut an oil groove in the stationary part, as shown in Fig. 6, and so long as this groove is kept filled with oil, the slide valve in passing over the groove will pick up some oil at each stroke.

If the principle indicated by Fig. 1 is kept in mind, there need be little difficulty in placing the oil-grooves and holes in any particular case so that the oil will be dragged in to the place where it is most needed. The next point to watch is that of keeping the oil from escaping from the bearing too quickly. Where the oil that escapes is caught in an oil-reservoir and returned to the bearing this problem is solved, but it is not always possible or advisable to arrange this and the next best thing to do is to make the bearing so that the oil will be retained as long as possible.

If a bearing is made (as it usually and wrongly is) with square ends, the oil that reaches the ends will trickle away to waste.

If, however, the ends of the bearing are rounded off as shown in Fig. 7, it will be held in the space, shown in solid black, a much longer time than it otherwise would be.

Holding Down a Job

By W. C. Searle

Holding down a job is made up of two problems. One is having, or being able to acquire, the ability to do the work. That is the technical part. The other is the ability to get along with one's associates so that the friction is not enough to cause a "fire."

I went to work for a concern making a special type of machine. I spent a number of months on the assembly floor and running off machines, then on the road demonstrating and selling.

Here is where I first began to meet the personality problem. The customer was expected to set up the machine according to directions, to run it a certain speed in the proper direction and have fixtures made for holding the work, according to directions sent him from the home office. When this was done the demonstrator came, spent three or four days explaining operations and adjustments, and teaching an operator how to run the machine. Sometimes a test for six to eight hours would be required to set a pace for the operator.

It was the demonstrator's job to make a good impression on the customer, answer all his questions and make the machine stay sold. Naturally the demonstrator must be on his best behavior all the time. He may be exasperated by machines not ready or wrongly set up, but he must not lose his temper as the customer may want more machines.

The worst case I experienced was where the customer had used a machine for a couple of years and had not given it any care. He had then written in telling what poor work the machine did.

I went to see the machine and found it badly battered and covered with dirt showing what abuse it had had. An examination showed that it was a factory job to put the machine in shape to run and I so reported both to the customer and to the home office.

A few days later I received from the home office a copy of a letter written by this customer saying that he was much dissatisfied and that the demonstrator had been there and evidently did not know the machine as he was unable to get any better work from it than he did.

As a matter of fact no work had been produced on this machine for several months and I had not attempted to produce any.

This was one of my failures on the personality side, as I should have convinced the proper person of the correctness of my judgment before leaving the factory.

After a couple of years of this kind of work I went back to the home office as an instructor and was in turn foreman, toolroom foreman and tool designer.

I had my mind set on becoming assistant superintendent for the shop was well equipped and growing larger. The superintendent and I had many discussions and when I thought I was right I stuck to my side, although when a decision was reached I did my best to carry out instructions. I placed too much emphasis in my own mind on the correctness of my mechanical judgment and not enough on avoiding the hard corners of the superintendent's personality.

The result was that after being with this company about five years the superintendent decided he could get along better without me. The manager was very considerate, telling me that because I didn't fit in one place was no reason why I shouldn't get along well in another and gave me ample time to find another job. The superintendent was afterwards factory manager but was finally compelled to leave because of crooked work. But the fact remains that if I had studied him and his methods and reactions more, I could have governed myself so as not to antagonize him and could probably have kept my job.

I have tried to make clear that holding down a job involves not only being able to learn to do the work but also means a conscious studying of one's superior officers so as not to be conspicuously objectionable.

Of course there are some men you cannot work for and retain your self respect. In that case the only thing to do is to get out. But there is nearly always a middle road that can be taken with safety and honor.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Improvised Grinding Machines

By Leonard H. Anderson

In the shops of the Scott & Williams Co., manufacturer of knitting machinery at Laconia, N. H., there is much light grinding to be done upon pieces of such large diameters that any commercial grinding machine capable of swinging them would be, in weight and cumbersomeness of operation, out of all proportion to the actual work. Special machinery was therefore necessary and the best way of providing it was to build up the lathes shown in Figs. 1 and 2, and fit them with suitable spindles to carry the grinding wheels.

It will be noted that the raising blocks are so shaped as to bring the centers well over the back shear. It is never necessary to get the grinding wheel back of the centers and this arrangement renders the full length of the cross-slide available, besides keeping the work back where a piece of large diameter will not project unduly, and be in the way of the operator.

At the moment of photographing the machine, it was set up for one of the smallest pieces that come to it, but thirty minutes later it was swinging a piece to its full capacity.

All of the movements of the original lathe, including the compound rest, are available, and the machine will thus handle any job that may be expected of any grinding machine—external, internal, facing, parallel or tapered.

Rapid removal of stock is not required. Because of the nature of the work that it is called upon to do, the parts to be ground are all within very close grinding allowances, and the small spindle and wheel will take care of the work as readily as a heavier one; besides being much easier to manipulate.

One of the jobs that frequently comes to these machines is the grinding of internal and external radii upon the countless small cam-shaped pieces that enter into knitting machine construction. The machine shown in Fig. 2 is set up for this work.



FIG. 1. LATHE FITTED UP AS A GRINDING MACHINE

The large ring mounted upon the faceplate is not a piece to be ground, but is a fixture, to the interior of which may be fastened dozens, or even hundreds, of the small cams; none of which will be more than an inch in its greatest dimension. The pieces are attached by machine screws passing through from the outside of the fixture and entering tapped holes in the cams; the same tapped holes by which they are later secured to their respective places in the knitting machine.

There is no adjustment to the fixture. Its internal diameter must be such that when the cams are attached to it the grinding radius will be correct. A fixture is provided for each size of knitting machine, and also for grinding external radii when that operation is necessary.

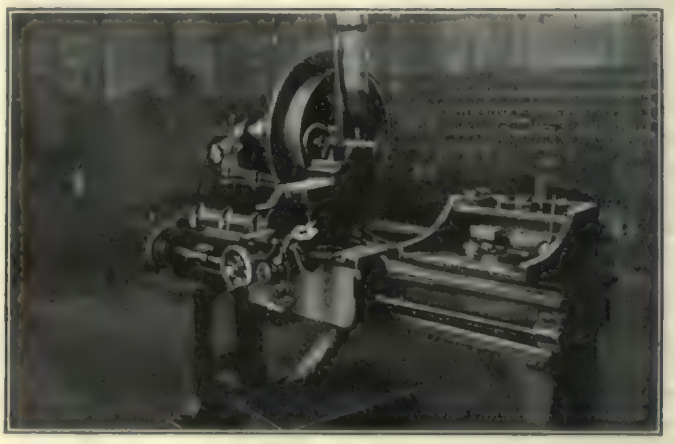


FIG. 2. FIXTURE IN PLACE FOR GRINDING INTERNAL RADIUS ON SMALL CAMS

Circular grooves in the faceplate fit the shoulders of the fixtures so that no time is lost in centering them. If the ring enters its respective groove in the plate and is drawn to place with the screws that pass through from the back of the latter, the operator knows that it is properly located and will run true.

Milling, Facing, and Cutting Gear Segments

By Milton Wright

The turning and facing of gear segments in a lathe are usually rather slow operations because of the intermittent cut which cannot be balanced and the fact that during a large part of each revolution of the work the cutting tool is idle. The illustration Fig. 1, shows how the work is accomplished in one shop by the use of a special device in a milling machine.

The device consists primarily of a frame that can be fastend to the table of the milling machine by means of two T-head bolts and nuts, the frame providing two bearings in which the work arbor is held parallel to

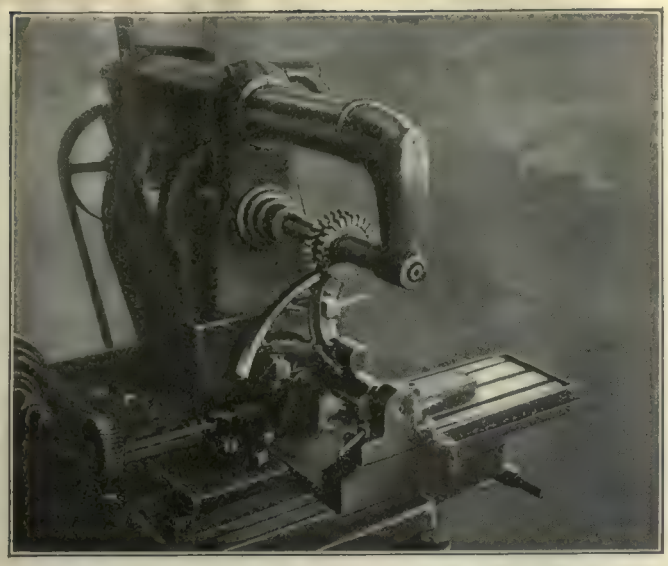


FIG. 1. MACHINING A GEAR SEGMENT ON A MILLING MACHINE

the spindle of the milling machine. The outer bearing is so made that it can be taken off by loosening a single clamping bolt for the purpose of changing the work.

To the inner end of the work arbor is keyed a worm-wheel, driven by a worm which receives its motion from a second worm and wheel, driven in turn by a universal joint that is a part of the regular feed movement of the milling machine. The gearing and one half of the universal joint are carried by a bracket which is an extension of the frame.

The work is held in position upon the arbor by a key, and is further secured by a follow nut which clamps it against a shoulder. The work of milling the outside and facing both sides is done simultaneously by a gang of three milling cutters so proportioned that the central cutter mills the periphery of the segment while the pair of side milling cutters is reducing the face width to the required dimension.

When a piece is finished and removed from the arbor the first worm may be dropped out of mesh with its wheel and the arbor turned back to bring the work-holding key in the right position for starting another piece. After a cut is started the machine may be left to itself until the work is finished and the feed stops, the operator meanwhile attending to other machines.

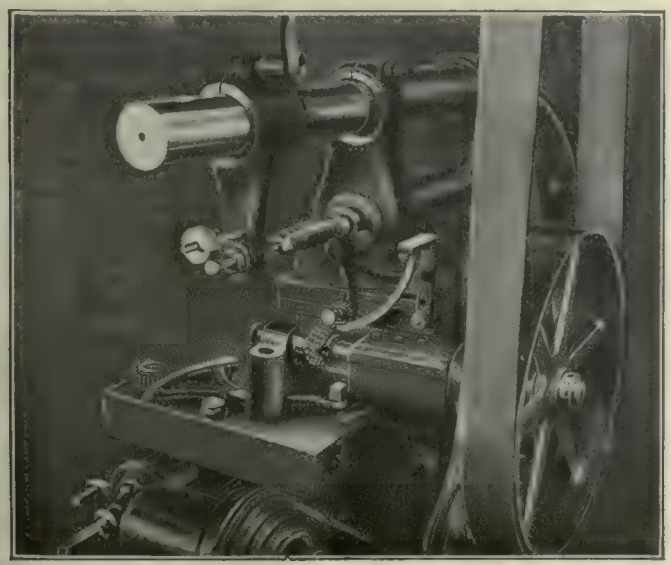


FIG. 2. CUTTING FIVE GEAR TEETH AT ONE PASS

The teeth are cut, five at a pass as shown in Fig. 2, on a Brainard automatic gear cutting machine. The unusual feature of this method is the shaping of the cutters so that five teeth may be cut at once with so little change in tooth form that the segment will run freely with its mating pinion without undue shake.

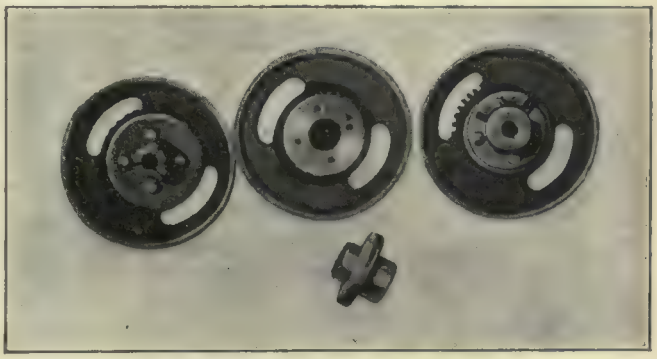
A test block with a pinion, and a stud for the hub of the segment is kept near the machine so that each segment may be tested in mesh with a master pinion as it is taken from the arbor.

Fitting Loom Pulleys With New Hubs

By William Kibler

In our shop we have more than a thousand of the loom pulleys shown in the illustration, more than one-quarter of which have been fitted with new hubs to replace breakages. The new hubs with which the pulleys are fitted enable us to force them on the shaft under hydraulic pressure of ten tons, and pulleys so repaired have never given subsequent trouble in service.

The broken pulleys, one of which is shown at the left in the picture, are centered up, bored and faced to take the new hub which is supplied with a flange



NEW HUBS IN OLD PULLEYS

by which it is bolted to the web of the pulley. The pulley to the right has been fitted with a new hub, while the one in the center has been prepared for the new hub, which is shown below it.

Broaching With a Bearing Ball

By Charles E. Frank

A good way to finish the bore of small drawing dies that must be accurate and have a very smooth surface, is to bore them to within one or two thousandths of the finished size and then push through them a bearing ball of the required diameter.

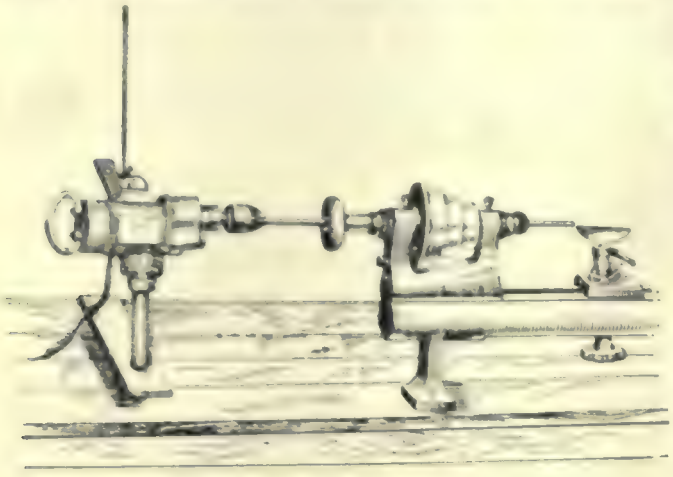
A punch should be made a close, though not tight, fit for the hole and the end cupped to match the ball. It is but the work of a moment to push the ball through the hole with this punch under an arbor press and the finish will be superior to any that can be obtained with a reamer. Plenty of oil should be used.

Bearing balls may be obtained at small cost in almost any of the smaller sizes and one ball will broach, or burnish, many holes. Moreover, in the matter of replacements, the new die will be exactly the same size as the old one if broached with the same ball.

Driving a Bench Lathe with an Electric Drill

By R. W. Hutton

During a temporary shut down we had occasion to make a number of small shouldered studs or pins from



EMERGENCY DRIVE FOR BENCH LATHE

drill rod, and having no power available for the bench lathe, we improvised the method shown in the sketch.

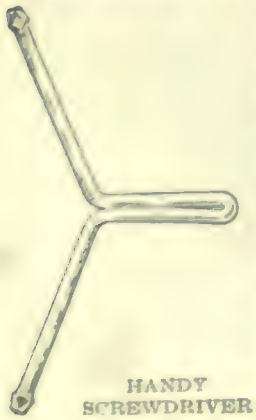
An electric drill was suspended by a stout wire from the ceiling in such a manner that it was practically in alignment with the spindle of the lathe; it was braced in position, as shown, by a board nailed to the backboard of the bench. The drill rod was then passed clear through the lathe spindle and into the drill chuck, thus being rotated by the electric drill and held true by the spring collet of the lathe.

The lathe belt was removed to allow the spindle to turn freely. When the available length of wire in the chuck was used up in making successive pins we could move the brace or substitute a new rod. The whole set-up required but a few minutes time and saved a lot of tedious labor in "pulling the belt."

Handy Screwdriver

By Alfred T. Gregory

On page 938, Vol. 55, of the American Machinist, Charles H. Willey describes a handy screwdriver that can very easily be made. My experience with screwdrivers has been that, while they at times need considerable leverage, they also need a great deal of perpendicular pressure. In the screwdriver shown in Mr. Willey's article it would be difficult to apply much perpendicular pressure, as there is no smooth gripping surface directly over the blade. To overcome this defect I would suggest that the tool be changed to correspond with the sketch herewith. Instead of making the arms straight, I have set them to form an equal angle on both sides. With this screwdriver both parts may be gripped, furnishing a good solid support for perpendicular pressure and also giving a fairly good leverage. If the leverage is not sufficient a pipe or monkey wrench may be requisitioned as was done with Mr. Willey's tool.



HANDY SCREWDRIVER

Repairing a Broken Valve Chest on a Hoisting Engine

By F. C. Sinback

Some years ago the writer had occasion to make an emergency repair on a small hoisting engine, the steam chest of which had been broken out as shown in Fig. 1 because of water freezing in it on a cold night.

The place was a small coal mine and no welding apparatus was available, nor was the machine shop equipment all that could be desired for the handling of such special jobs. Time was the important consideration and I devised the method which I have tried to illustrate in Fig. 2, using the drill press and small lathe, which were the only machine tools at my disposal. The job was prepared for the patch by drilling chipping and filing the edges of the break as straight and as square with each other as possible. Next a piece of cast iron 1½ in. thick and of suitable size was drilled out of a scrap casting (the broken frame of an electric locomotive) and the edges chipped and filed to fit as neatly as possible into the break.

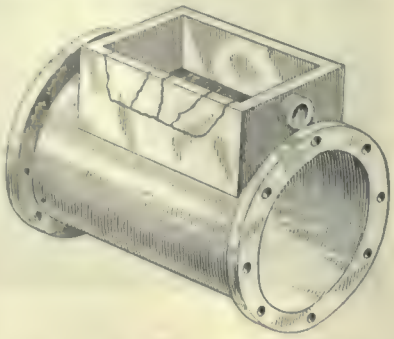


FIG. 1. VALVE CHEST OF HOISTING ENGINE, CRACKED BY FREEZING

This patch was now drilled edgewise for the two shouldered studs shown in Fig. 2, and the drilling continued into the metal of the cylinder, which was then tapped for the studs. The studs were so spaced that their upper ends corresponded to the holes in the cover of the valve chest, and the studs thus served the double purpose of holding down the patch and holding on the cover.

A strip of copper ⅜ in. thick and 1¼ in. wide, with holes to correspond to the studs, was now laid in the bottom of the break, the patch set in and the long-shouldered studs screwed home. Cap bolts through the end walls of the chest into the patch served to draw the end joints up good and snug.

To make these end joints steam tight, ⅝ in. holes were drilled along each joint, as indicated in Fig. 2,

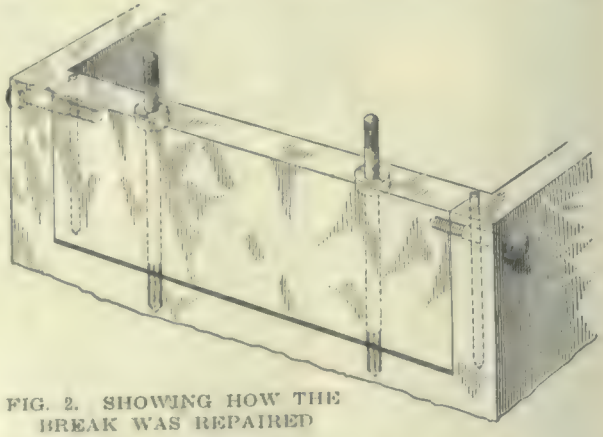


FIG. 2. SHOWING HOW THE BREAK WAS REPAIRED

so spaced that half of each hole was in the patch and half in the end wall, and far enough at one side of the center to avoid drilling through the cap bolts. Soft

copper wire $\frac{1}{16}$ in. in diameter was cut into pieces about $\frac{1}{2}$ in. long and each piece driven in tightly and swaged in place as much as possible by the use of a long hardened steel set a trifle smaller in diameter than the hole.

When the $\frac{1}{16}$-in. holes were thus filled with copper the upper surface of the walls was dressed smooth with a file and the cover put on. A thin caulking tool was used to upset or caulk the copper strip at the bottom of the joint.

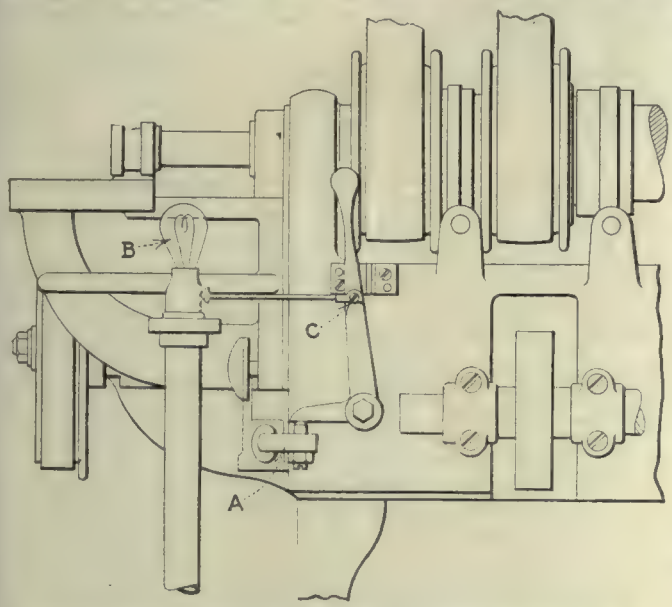
The time of the repair was 12 hours and the joint showed no leakage under working pressure. The repair seems to be permanent.

Signal for Automatic Screw Machines

By D. A. Nevin

A novel method for saving time and increasing the production of a Brown & Sharpe automatic screw machine, is illustrated herewith.

A No. 2 automatic machine was used for performing a second operation on a part made from bar stock in another machine, and all operations such as drilling,



ELECTRIC SIGNAL ON AUTOMATIC SCREW MACHINE

reaming, threading, etc., were performed automatically, as was also the opening of the chuck. The work was loaded into the chuck by hand.

The automatic shut off *A*, with which these machines are equipped, was adjusted so as to shut off the machine after the chuck was opened, but as the operator was in charge of four other machines he was not always aware that the machine was idle. The turret advanced so slowly in operation that its movement could not be discerned at a short distance and the sound of the annunciator bell was inaudible because of the noise of near-by machines operating upon square stock.

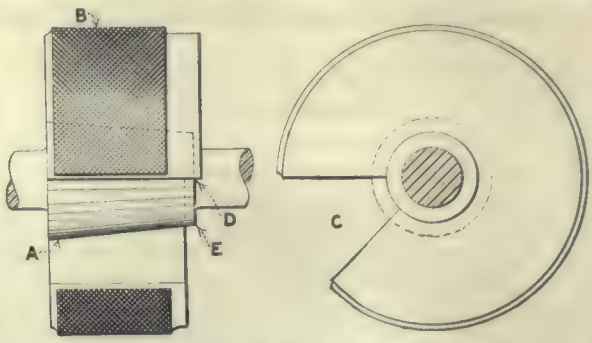
The factory manager devised an automatic signal by mounting the electric bulb *B* upon a stand similar to those used for supporting the stock when fed into the machine. The bulb is connected to the starting and stopping lever by a pull chain which is hooked to the shouldered screw *C*, added to the lever for that purpose.

When restarting the machine the chain is given an extra pull to extinguish the light, as these pull sockets alternate for light and darkness.

An Improved Taper Ring Gage

By W. Burr Bennett

The sketch herewith shows an improved ring gage which has proved very handy in use. It is simply a combination of the step-type taper ring gage and the



IMPROVED TAPER RING GAGE

plate or jaw-type taper gage. Its advantage lies in the fact that all observations are completely visible.

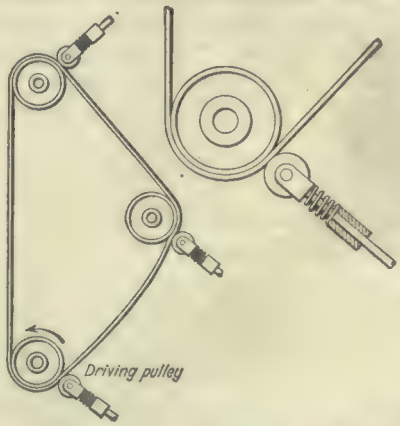
The taper part of a shaft which is to be gaged is shown at *A*, and *B* is the ring gage itself. The ring gage has the usual limit step, as at *D*, for gaging the taper fit on the small shoulder of the piece, but in addition to this a "pie section" or segment is cut out, as at *C*, which allows the inspector to see if the taper is uniform and if it makes good contact with the gage throughout its length. Of course, this gage does not have the advantage of the adjustable feature of the adjustable jaw gage, but in the opinion of our shop it is a distinct improvement over the plain step ring gage.

The gage is made from a good non-shrinking, oil-hardening steel and is either ground or lapped out.

Keeping a Belt Tight

By Harold F. Blanchard

The problem of keeping a belt tight has been solved in a new and original way by an English inventor. Heretofore it has been customary to keep a belt tight by adjustment of the distance between the pulleys; or if this is not feasible, by supplying an idler pulley which is mounted on a spring, which holds the belt tight. A new device employs a small pressure roller, backed by a coil spring. The roller is placed in contact with the belt at the point where the belt becomes tangent to the pulley. A very slight pressure of this roller results in a greatly increased grip of the belt on the pulley. This feature can best be realized by remembering that a sailor can hold a ship by exerting a very small pull on a rope, if he first passes the rope just once around a post. The same principle applies here, except the angle of wrap, instead of being somewhat more than 360 deg., is usually closer to 180 degrees.



DEVICE FOR KEEPING A BELT TIGHT

EDITORIALS

An Important Industry Is Being Handicapped

AVERY good mechanic likes to work at something new, to devise a newer and better way of doing work. And to this desire we are indebted for our advance in manufacturing methods. But as many a good mechanic knows to his sorrow, the cost of developing new machines is disastrous unless this cost can be distributed over a large output, for it seldom happens that the purchaser is willing to pay for the cost of development.

A somewhat similar case exists in connection with aircraft at the present time. Several excellent machines were designed as a result of war demands. The cost of development was high and in order to be reimbursed for this as well as to make a profit, what appear to be very high prices were named in some of the later bids for army planes.

These bids seeming too high, the army custom appears to be to award orders to low bidders whether or not they are the originators of the machine. Orders for a well-known bomber were awarded to a rival concern at a much lower price, a price which incidentally is not likely to pay for the cost of construction.

In the interest of national economy it is necessary that purchases of all kinds be made at fair figures. But great discretion must be shown or we shall greatly handicap a new industry. If the price bid by those who developed special machines at great expense was too high, would it not have been better to effect a compromise if possible, rather than turn the order over to builders who were not familiar with all the details of design and construction? The cost to such builders must include many tools and fixtures with which the originators are already supplied.

Why not lay more of the cards on the table, showing what the development cost was, how much is allotted to cover development, the probable cost of manufacture, and finally, the profit expected, much of which must go for future development? New industries require more considerate treatment than do those already established. And we need to develop our aircraft industries.

For Your Own Good, Listen to the Salesman

DON'T turn away salesmen without seeing what they have—especially now. In days gone by, with the man at the order desk so overworked that he entered orders in his sleep, with the purchasing agent overwhelmed by requisitions, and with the manager thinking production details twenty-four hours a day, it was no great fault to pass up a salesman. But with conditions as they are, if one out of twenty interviews yields knowledge of a machine or tool that can effect a worth-while saving, the time given to all of them has been well spent. And it isn't always well to leave this work to the purchasing agent. In many plants the man in charge of production, or the manager, should be on the job.

Such conclusions are the result of very simple reasoning. Right now every manager should be planning his future methods. Doing so involves studying his present equipment and finding out what there is on the market that will reduce his production costs. In his own interest he should not turn away the man who comes to his office to tell him about improved equipment. These are the times when brains are being worked hard to produce superior machines and tools and they are certain to be successful.

Reports have it that on account of the many machine-tool salesmen on the road, it is becoming very difficult to see a manager. A condition like that should not prevail because the man sent away may be the very one who is packing around real money-saving information. "I'll see him, anyway," expresses a much better attitude than does, "What's the use?"

Inadequate Accident Compensation

WITH the campaigns for safety and the adoption of laws for accident compensation in most states, we have fancied that industrial accidents were almost a thing of the past, a remnant of the dark ages of industry. With this in mind it is both startling and disturbing to note the statements of E. H. Downey, of the Pennsylvania State Department of Insurance, in an address before the American Economics Association at Pittsburgh.

According to Mr. Downey, these laws are all sadly inadequate and the compensation rarely exceeds one-quarter of the financial cost of the injuries. In other words, while we have made a beginning, we have fallen far short of what we intended to accomplish and must take further steps to secure greater protection to the workers in industry.

Another disturbing statement is that preventable accidents still form a very large percentage of an almost unbelievably large total. In six years, industry in Pennsylvania killed 16,000 people and disabled over a million more.

Federal statistics, though not as complete as they might be, indicate that at least 20,000 American workers are killed each year, 100,000 permanently disabled and 2,500,000 injured to the extent of losing working time. These figures indicate clearly that there is still much to be done to bring our industries to a safe and sane point.

Industry has made many strides during the past fifteen years in the humanizing of relations between employers and the employed. But with these figures staring us in the face we can hardly consider the work finished, even so far as physical injuries are concerned. Indifference to the injury of shopmen and failure to compensate fully for injuries received will undo much harmonizing which may have been accomplished by other means. We have made a good beginning—let us see that we carry through to a satisfactory ending.

Shop Equipment News

Boye & Emmes Coneless Engine Lathe

An 18-in. geared-head engine lathe, designated by the builders as a "coneless" lathe, has recently been brought out by the Boye & Emmes Machine Tool Co., Cincinnati, Ohio. Except for the headstock, the reversing gear and the arrangement for mounting the driving motor, this lathe is the same as the standard engine lathe built by the company as redesigned in 1919. At the time the redesigning was done, plans were under consideration for building the coneless headstock, and all parts were made strong enough to meet the requirements of the present job.

A front view of the coneless lathe is shown in Fig. 1 and an end view in Fig. 2. Fig. 3 is a top view of the headstock with the cover removed. No gears are mounted in the cover, which carries only two levers and hardened shifting forks.

Twelve spindle speeds are obtainable by shifting the jaw clutches controlling the action of the thirteen gears in the headstock. Gears are constantly in mesh and run in an oil bath. No gears are shifted endwise. The design is such that it is impossible to engage conflicting ratios of gears, as will be evident if Fig. 3 is studied.

The gears and clutches are all of steel, hardened and tempered in oil, and careful tests have proved them to be more than strong enough to withstand any load that the driving belt will transmit. The clutch jaws have an included angle of 6 deg. and a back angle of 10 deg., which construction facilitates engagement and disengagement. The clutches are broached for a sliding fit on the six splines milled integrally with the heat-treated alloy-steel shafts.

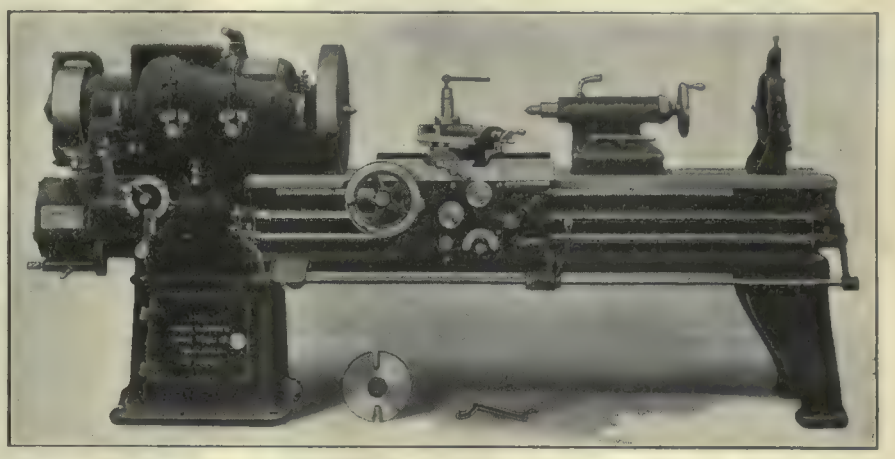


FIG. 1. BOYE & EMMES CONELESS ENGINE LATHE

Specifications: Swing: over bed, 19½ in.; over carriage, 13¼ in. Journal diameter: front, 3¼ in.; rear, 2¼ in. Journal length: front, 5½ in.; rear, 3 7/16 in. Taper, No. 4 Morse. Diameter of spindle nose, 3 in. Hole in spindle, 1½ in. Tailstock spindle: diameter, 2 5/16 in.; travel, 9 in. Distance between V's; on carriage, 14 in.; on headstock, 9 in. Travel of compound-rest top slide, 4½ in. Cuts threads, 2 to 56 per in. Feeds, ⅛ to 224 per in. Lead screw threads, 4 per in. Size of tool bit, ⅝ x 1½ in. Distance between centers with 8-ft. bed, 4 ft. 2 in. Floor space with 8-ft. bed: 10 ft. x 3 ft.; with taper attachment, 10 ft. x 3 ft. 7 in.; with motor drive, 10 ft. x 3 ft. 7 in. Weight, 4,270 lb.

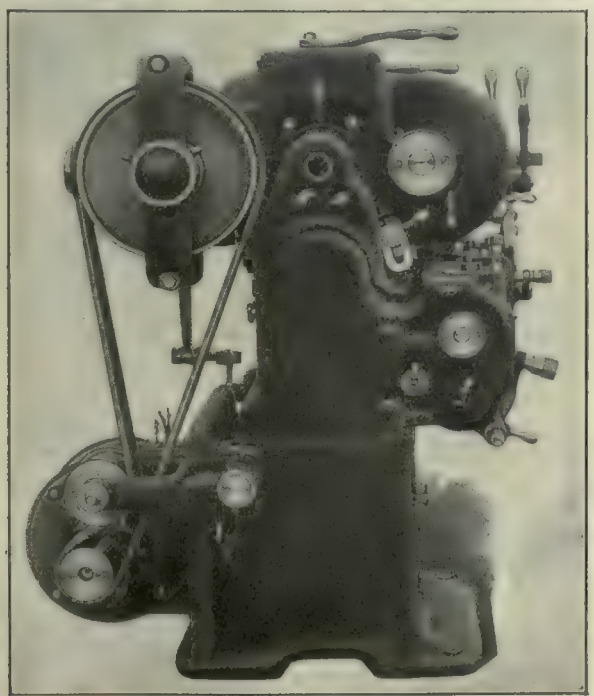


FIG. 2. END VIEW OF CONELESS LATHE

The end view in Fig. 2 shows the even balance of weight obtained by putting the back-gears in front. Drive is from the countershaft or constant-speed motor through belt to the pulley shown at the upper left of Fig. 1, which pulley is connected to the headstock gears through friction clutches for forward and reverse drive. The cabinet leg has two horizontal planed strips, both jig-drilled and tapped, and the upper one with a planed slot. All lathes are finished with these planed strips whether motor drive is ordered or not, thus making it possible to attach a motor at any future time. The motor and an idler pulley are mounted on a base plate which is jig drilled to match the cabinet leg.

The vertical lever to the right of the apron in Fig. 1 starts, stops or reverses the main spindle through the friction clutches mentioned. An auxiliary lever for performing the same functions will be seen a short distance to the left of the apron.

All levers used are either drop forgings or steel castings and the main spindle is a chrome-nickel-steel hammered forging, heat treated. All bearings, including the main spindle bearings, are phosphor bronze. It will be noted from Fig. 3 that the headstock cover does not have to be removed when the main spindle bearings need adjustment.

Any standard make of constant-speed motor may be used, providing it does not have a speed exceeding 1,160 r.p.m. A 3 to 5-hp. motor is recommended. The driving pulley is 13 in. in diameter, and has a 4-in. face for 3½-in. double belt. It should run at 350 r.p.m. which gives a range of spindle speeds from 9 to 350 r.p.m.

The top cover of the headstock has a plug which may

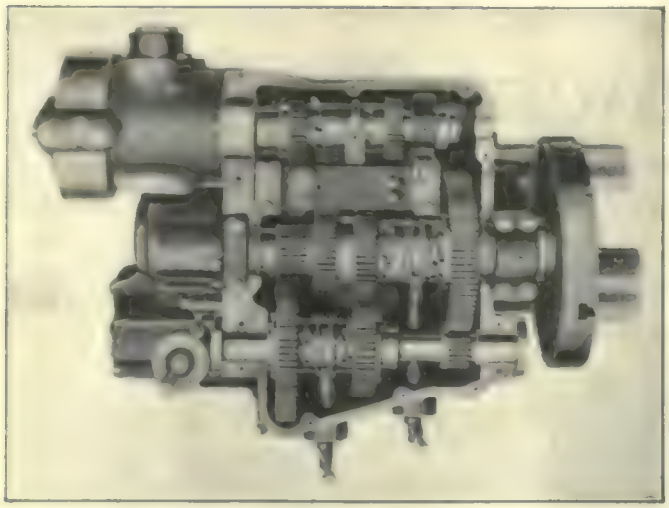


FIG. 3. HEADSTOCK GEARS OF CONELESS LATHE

be removed when oil is needed, and there is a glass oil-level tube mounted on the headstock.

The tailstock is of the cut-away type to permit of swiveling the compound rest parallel with the shears, and has a side set-over for taper turning.

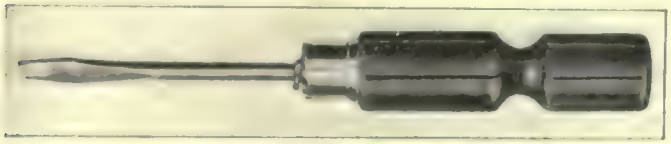
All feeds reverse in the apron, which is of the double-plate type, with bearings on both ends of all shafts and studs. Longitudinal and cross feeds cannot be engaged while screw-cutting. Forty threads, from 2 to 56 per inch, can be cut without changing gears. For metric and odd-size pitches, the stud and intermediate gears may be changed or transposed.

The equipment includes large and small face plates, one pair of centers, a center bush, a steady rest and full set of wrenches. Specifications are shown under Fig. 1.

Chapman Ratchet Screwdriver

The ratchet screwdriver shown in the accompanying illustration has recently been placed on the market by H. D. Chapman, 2929 Clifton Ave., Baltimore, Md. It is manufactured by the G. H. Binder Machine Co., 3407 Clifton Ave., Baltimore. The device is made in three sizes. Its purpose is to enable the obtaining of a strong torque on the screwdriver at the same time that the axial pressure is applied.

The end or top of the handle is rigidly fastened to the shank or blade. The lower part of the handle at the center of the tool is free to rotate about the shank. By means of a ratchet device, this lower handle may be engaged with the blade, so that it is free to turn in one direction only. The ratchet mechanism is so constructed that the direction of free rotation of the handle may be reversed. The tool may thus be used for both tightening and loosening screws, to enable the obtaining of greater turning force. The ratchet mechanism enables speedy operation, and eliminates the necessity of removing the blade from the slot in the screw between each turn that is made.



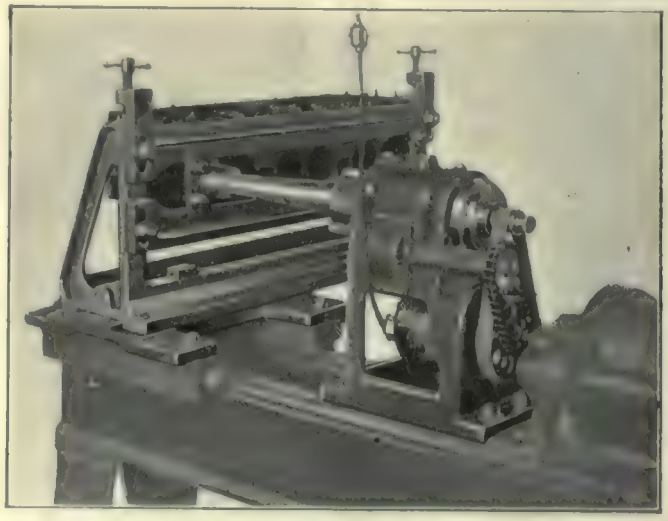
CHAPMAN RATCHET SCREWDRIVER

Liberty "Elteco" Cylinder Grinding Machine

The Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J., has recently placed on the market the "Elteco" cylinder grinding machine shown in the accompanying illustration. The machine is intended for attachment to an engine lathe having a swing of 14 in. or more. The work holder is mounted on the carriage of the lathe, the spindle head is mounted on the ways, and the headstock of the machine is utilized to drive the mechanism for imparting a rotary feed motion to the wheel spindle. The latter arrangement permits of as many changes of rotary feed as there are speeds for the spindle of the lathe.

All sizes of cylinder blocks can be ground, the inside dimension of the angle plate being 33 in. in length. The opening between the parallel bars on the plate can be varied from 2½ to 7 inches. Straps and the necessary screws for holding the blocks in place are furnished. Movement along the bed is obtained by the carriage of the lathe. The work-holding block is provided with a screw 1 in. in diameter for transverse feed. The work is raised and lowered by means of screws placed at each end.

The spindle is mounted in three S.K.F. self-aligning ball bearings, and the main bearing is made of phosphor bronze. It is driven by means of a ½-hp. electric motor, current ordinarily being taken from a lighting circuit.



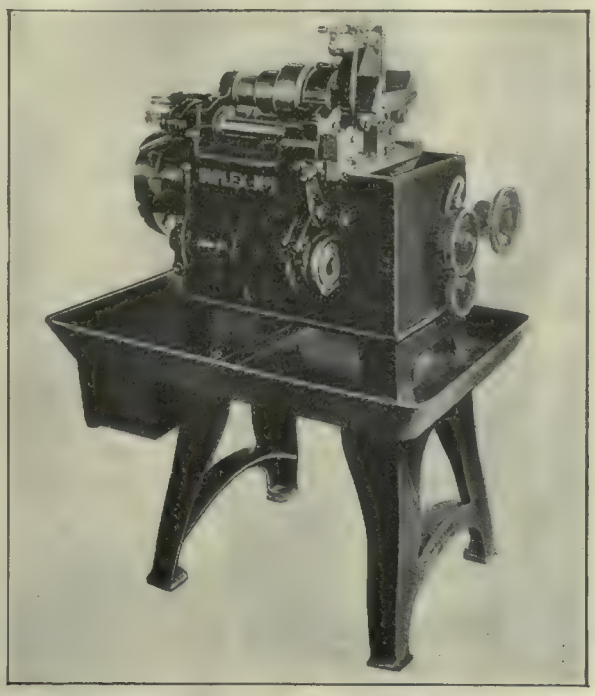
"ELTECO" CYLINDER GRINDING ATTACHMENT ON LATHE

The spindle extension is 14 in. in length; the main spindle is 4¾ in. in diameter and 9⅞ in. in length. An eccentricity up to 1 in. in diameter can be obtained, the amount being varied by means of a screw graduated to 0.0005 in. Cylinder bores from 2½ to 7 in. in diameter can be ground. The speed of the spindle is 5,600 revolutions per minute.

The rotary feed motion of the grinding spindle is obtained from the spindle of the lathe, a sprocket fastened on a taper fitted in the lathe spindle serving to drive a chain connected to the grinding machine. The longitudinal feed of the work is obtained by using the feeds provided for the lathe carriage. The machine is fully equipped with the necessary sprocket wheel, diamond dresser, abrasive wheels, screw jack, holding straps, clamping and drawing screws, and wrenches. It weighs approximately 500 lb.

Brown Duplex Forming and Cutting-Off Machine

The L. P. Brown Machine and Tool Co., Attleboro, Mass., has recently developed a machine for the forming and cutting-off of such small parts as do not require



BROWN DUPLEX AUTOMATIC FORMING MACHINE

the use of turret tools, but which would ordinarily be machined on an automatic screw machine. This machine, shown in the accompanying illustration, provides for the rapid and accurate production of such parts, releasing larger and more expensive machines for work that will more completely employ their functions.

The machine has two spindles, and handles bar stock up to ¾-in. in diameter, producing two identical or dissimilar parts at each cycle. Both spindles are driven through a single three-step cone and spiral gearing. A two-speed countershaft provides six speed changes from 240 to 1,820 revolutions per minute. The driving cone runs on roller bearings.

The feeding mechanism is independent of the forming movements and may be set to feed any length up to 3 in. Or, by providing extra sets of dogs for the feeding cam, it can be made to "repeat" and deliver stock up to 12 in. in length at each cycle. The chucks are adjusted by means of nuts at the rear end of the spindle and may easily be changed. They are so designed that the collets themselves do not move with the feed and thus there is no danger of variable feed, by reason of endwise movement at the moment of closing.

The spindles are hardened, ground and lapped, and run in phosphor-bronze bearings that are adjustable to compensate for wear. The thrust is taken at the rear end of the spindles on hardened steel and phosphor-bronze washers.

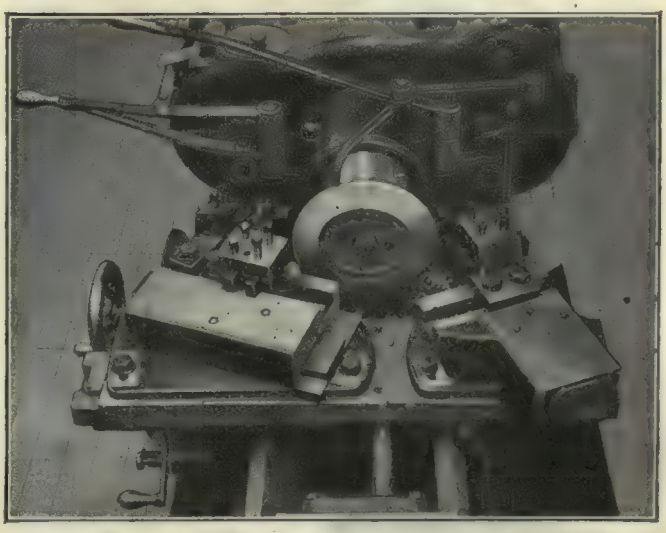
The forming tools are carried upon a single cross-slide and operate simultaneously, though independent adjustment is provided for each. The cutting-off tools are carried upon slides that are disposed at an angle of 30 deg. to the vertical, to allow clearance between the forming and the cutting-off tools. Both cutting-off slides are operated from the same cam and move together, though the toolholders are capable of independent adjustment.

The machine occupies a floor space of 44 in. parallel to the spindles and 26 in. at right angles thereto. The equipment includes a two-speed countershaft, two spring-chucks and feeding fingers, two wire stands, oil pump and piping, and all necessary wrenches.

Warner & Swasey Bevel Gear Attachment

The Warner & Swasey Co., Cleveland, Ohio, has recently brought out an attachment for use on its No. 3-A universal hollow-hexagon turret lathe when machining bevel-gear blanks. The attachment, which is shown from above in the accompanying illustration, can be interchanged with the top slide of the regular carriage, so that the machine may be used part time on other work than bevel gears, if desired. The construction is heavy and rigid, so that cuts to the capacity of the cutting tool may be taken. The device can cut all standard angles on blanks up to 14 in. in diameter.

The two tool slides are operated by the hexagon turret and saddle. The shaft shown between the ways of the machine is mounted on the turret and engages a double pinion in the saddle. This pinion engages also a rack in the saddle, transmitting to it motion toward the rear of the machine. The movement rotates two other double pinions, which engage with racks fastened to the tool slides. The front slide

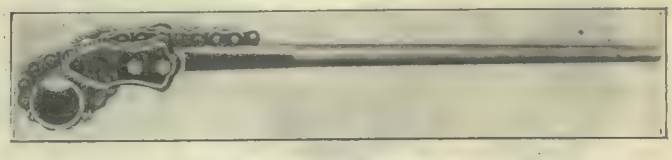


WARNER & SWASEY BEVEL GEAR ATTACHMENT

operates on one side of the gear and the rear slide on the other, both moving at the same time. In this way, faces of bevel gears can be quickly machined.

Armstrong Chain Pipe Wrench

The Armstrong Bros. Tool Co., Chicago, Ill., has recently placed on the market the chain pipe wrench shown in the accompanying illustration. The jaws are



ARMSTRONG CHAIN PIPE WRENCH

provided with long bearings on the bar, and with flanges to guide the chain and to protect it from abrasion. Two chrome-nickel steel bolts serve to fasten the jaws to the bar. The construction is said to prevent the tendency of the jaws to work loose and to spread, thus allowing the chain to become wedged and damaged by pinching.

The handle is forged high-carbon steel, and the jaws are drop forged and hardened. Two types of chain can be furnished, the flat-link style as shown, and the cable-link chain. The wrench is made in seven sizes, for use on pipe and fittings from ⅛ to 16 in. in size. The wrenches vary in length from 20 to 78 in.; in weight from 5¾ to 98 lb., and in length of chain from 13½ to 72 in., depending upon the size of the wrench.

Louisville Sensitive Electric Drilling Machine

The Louisville Electric Manufacturing Co., Louisville, Ky., has recently placed on the market the 12-in. motor-driven sensitive drilling machine illustrated herewith.



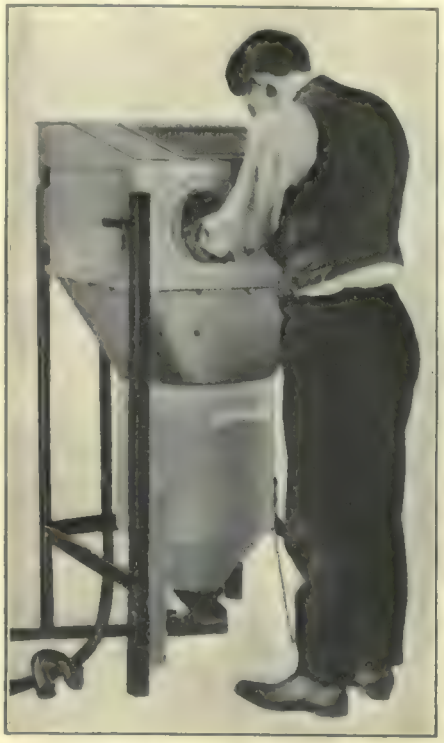
LOUISVILLE SENSITIVE DRILLING MACHINE

The operating handles are arranged for ease and convenience of operation. The spindle is made of high-grade spindle steel, and is counterbalanced by a spring. The rotor of the motor and the friction disk are mounted on ball bearings. The maximum driving pull is determined by the weight of the disk, being constant. The friction drive is completely inclosed and so constructed that the friction surfaces are kept free from oil. The speed of the spindle can be easily adjusted. The table is counterbalanced by a weight in the column. The motor and controlling switch are built in the machine. The motor is of rugged construction and can be furnished to suit the characteristics of the circuit available. The machine is made in both the bench or floor types. A V-block, and cup and point centers are furnished as standard equipment.

The capacity of the machine is up to a ½-in. hole in the center of a 12-in. circle. The greatest distance from the table to the spindle is 39 in., the vertical adjustment of the table being 32 in., and that of the spindle arm 8 inches. A ½-hp. motor running at 1,725 r.p.m. is used. The speed of the drill spindle varies from 450 to 1,200 r.p.m. The maximum height of the machine with the spindle up is 76 inches.

Pangborn Portable Sand-Blast

The Pangborn Corporation, Hagerstown, Md., has recently placed on the market a hose-type sand-blast of such small size that it can be picked up and easily carried by the operator. The hose machine consists of a suction-type gun, with the blast action controlled by a trigger in the handle. Compressed air passing through the air jet creates a vacuum, by which the sand or metallic abrasive is brought from the hopper to the gun body. The body forms a mixing chamber for the air and abrasive, and gives it a swirling action, increasing the effectiveness of the blast stream. Quickly interchangeable nozzles, one being shown on the floor in the accompanying illustration, make possible the use of the device on a variety of work. The blast operates on any air pressure from as low as 5 lb. up to 100 lb. The operator is usually protected by a special helmet and heavy gloves.

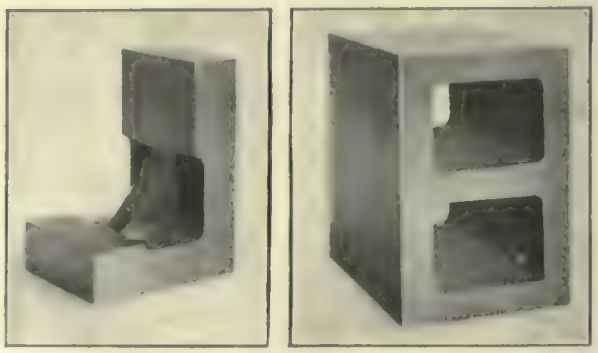


PANGBORN PORTABLE SAND BLAST AND CABINET

A small cabinet that can be set over the hopper of the hose sand-blast can be supplied, the illustration showing it in use. It furnishes a means of cleaning small parts, being a complete and self-contained continuous-operation cabinet sand-blast. In this case, the operator is not exposed to flying particles, but views the action through the glass.

Simplex Precision Toolmakers' Knee and Box Parallel

The Simplex Tool Co., Woonsocket, R. I., has recently placed on the market the precision toolmakers' knee shown at the right of the accompanying illustration.



SIMPLEX BOX PARALLEL AND TOOLMAKERS' KNEE

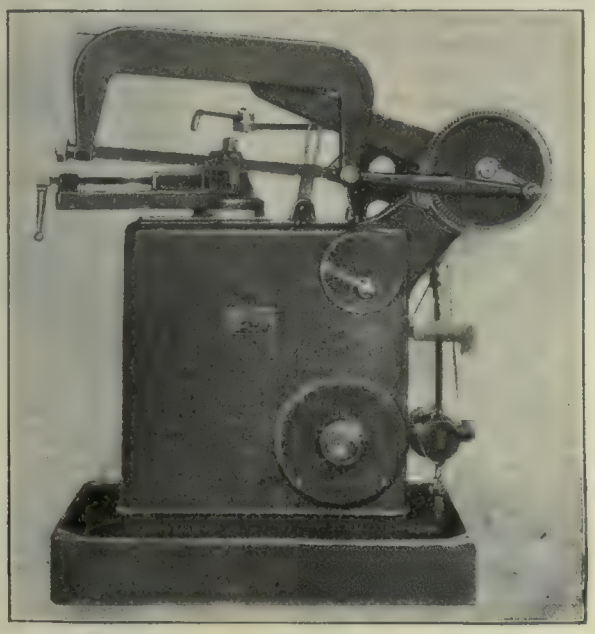
The device is particularly adapted to use on gage and small work of a light character, and may be employed for both inspecting and laying out work of this nature. It can be used either with or without a magnetic chuck, being clamped directly to any desired surface. The knee is made in one size, 2½ x 3 x 4 inches.

The precision box parallel shown at the left has also been placed on the market very recently. This device is intended for larger work than the ordinary parallels, and is for use in either the machine shop or toolroom for inspecting and laying out large work. It is made in four sizes from 4 x 4 x 6 in. to 6 x 14 x 16 inches.

Both the parallels and the knees are made of the best grade of cast iron and ground to a very smooth and accurate finish.

Louisville Motor-Driven Hack-Sawing Machine

The motor-driven hack-sawing machine shown in the acompanying illustration has recently been placed on the market by the Louisville Electric Manufacturing Co., Louisville, Ky. The motor and control switch are built into the machine in such a manner as to be out of the way and protected from injury. The machine is of



LOUISVILLE MOTOR-DRIVEN HACK-SAWING MACHINE

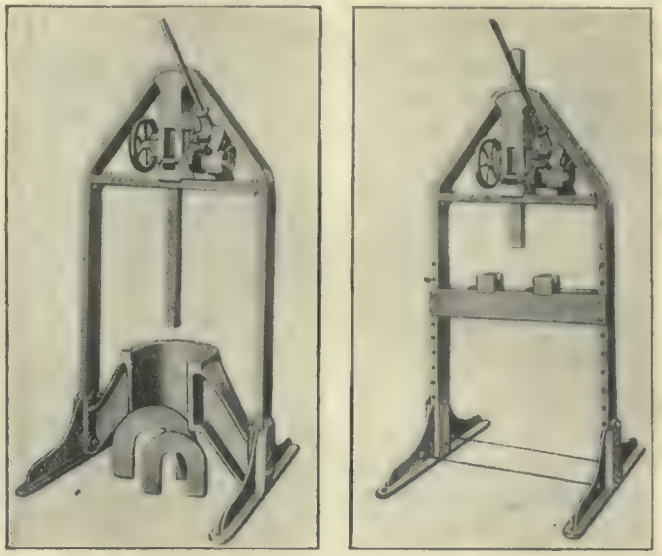
symmetrical design, and the controls are conveniently located for operation.

The vise swivels, and is graduated to facilitate cutting angles. The stroke is adjustable from 5 to 7 inches. Two speeds, 45 and 90 strokes per minute, are provided, so as to suit the work. Stock up to 5 in. thick can be cut. The saw blade is 16 in. in length. Since the saw slide is above the blade, chips can not fall between the sliding surfaces.

The feed is by gravity, and the saw arm can be raised and held in any position. An automatic stop is arranged to stop the motor when the piece has been cut off. The motor is fitted with ball bearings, and can be furnished for the circuit available. It has a capacity of ½ hp. An oil pump can be furnished. The machine can be mounted on wheels to make it portable. It is 36 in. high, occupies a floor space of 18 x 36 in., and weighs 450 lb.

Evansville Garage Arbor Presses

The Evansville Arbor Press Co., Evansville, Ind., has added to its line the hand-operated arbor presses shown in the accompanying illustration. The presses are in-



EVANSVILLE GARAGE ARBOR PRESSES

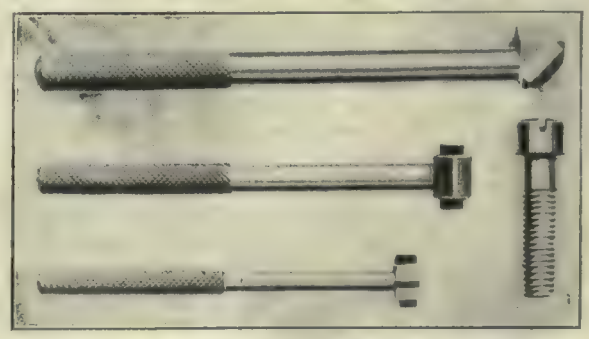
Specifications: Diameter of work accommodated: No. 8, 30 in.; No. 9, 40 in. Largest arbor opening, 8 in. Capacity over table: No. 8, 27½ in.; No. 8-B, 36 in.; No. 9, 30 in.; No. 9-B, 44¾ in. Height: No. 8, 72 in.; No. 9, 77 in. Floor space: No. 8, 38 x 40 in.; No. 9, 36 x 51 in. Net weight: No. 8, 585 lb.; No. 8-B, 450 lb.; No. 9, 715 lb.; No. 9-B, 585 lb.

tended especially for automobile repair shops and service stations, and are each made in two sizes.

Presses Nos. 8 and 9, shown on the left are made with stationary cast-iron tables having 10-in. openings. Two U-shaped castings are furnished, with which the size of the opening may be reduced to fit different classes or sizes of work. The table on the Nos. 8-B and 9-B presses, shown at the right, consists of a pair of adjustable side bars. The larger size, No. 9-B, is constructed of a heavy 6-in. channel frame bolted to cast-iron bases. The channel uprights are 40 in. apart. The side bars which form the table are adjustable to any height, this table being equipped with steel sliding supports for use when straightening shafts and rods. The operator stands directly in front of the work while using the press. Quick return of the ram is obtained by means of the handwheel. Adjustable friction rollers bear against the ram.

Porter Utility Offset Screwdriver

The Porter Products Corporation, with offices at Syracuse, N. Y., and factory at Brewerton, N. Y., has recently placed on the market the utility offset screw-



PORTER UTILITY OFFSET SCREWDRIVER

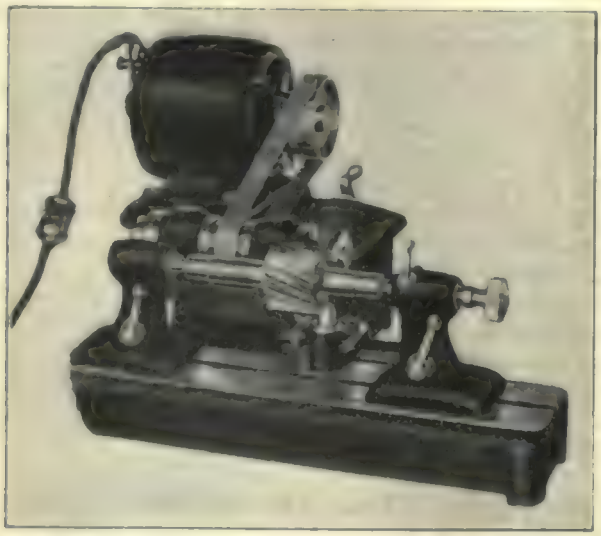
driver shown in the accompanying illustration. The device is intended for working in close quarters, being developed especially for automobile use, where compactness of construction prevents the use of the ordinary screwdriver. The device operates on the same principle as a wrench; that is, with the handle at right-angles to the axis of the screw.

On each of the four sides of the head is a blade set at an angle of 45 deg. to the one on either side of it. It is possible to drive a screw in a place where only one-eighth of a turn of the handle about the axis of the screw is possible, a quarter revolution of the tool in the fingers bringing the blade in position to engage the slot for each successive stroke. When there is room for a quarter turn on the screw, the tool is rotated a half revolution between each stroke.

Because of the fact that a powerful leverage is obtained on a screw, large wood screws or machine screws can be easily set up tightly. The tool is useful for loosening screw bolts that have rusted in place. The screwdriver is made of tough steel and heat-treated. The blades are accurately machined, so as to engage the screw slot positively. The tool is made in three sizes, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in., the thickness of the blades being 0.040, 0.050 and 0.078 inch.

Liberty "Elteco" Portable Bench Cutter-Grinding Machine

The accompanying illustration shows a cutter-grinding machine recently placed on the market by the Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J.,



ELTECO" BENCH CUTTER-GRINDING MACHINE

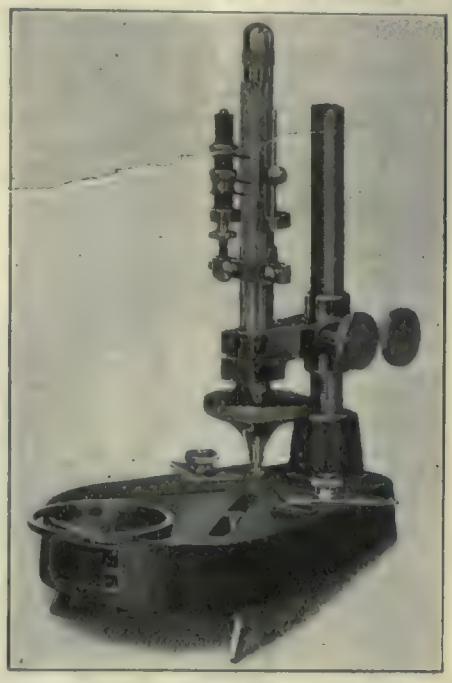
under the trade name of "Elteco." The device is easily portable, and is intended for use on a bench for cutter grinding ordinarily performed on larger machines. No countershaft is necessary, the machine being driven by a motor taking power from the lighting circuit.

The motor has a capacity of $\frac{1}{4}$ hp., being driven by either direct or alternating current, as required. It is mounted on a slide so as to adjust the tension of the belt by which it is connected to the wheel spindle. The spindle carrying the abrasive wheel is hardened and ground and mounted in adjustable taper bearings, so as to compensate for wear. The wheel head is provided with a transverse movement of 4 in. obtained by means of a crank-operated screw.

Work requiring straight grinding is mounted on centers, the swing being 7 inches. The maximum distance between the centers is 9 in. For the grinding of cutters requiring angles or tapers, an attachment not shown is provided for mounting on the table. The longitudinal movement of the attachment for feeding the work is $1\frac{3}{8}$ in., the feed screw being operated by a crank. The machine is fitted with a grinding wheel, two arbors, and with two special studs equipped with spacing collars for holding the work while grinding on angles.

Coats Piston-Ring Prestometer

The Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y., has recently placed on the market the instrument shown in the accompanying illustration for gaging the thickness of piston rings. The device consists of the prestometer fluid micrometer gage mechanism fitted to a special base suited to the requirements of the work. It provides a means of very rapidly inspecting the thickness of piston rings and work of a similar nature. The base plate is made of cast iron, instead of case-hardened steel, as formerly employed for the prestometers. The reason for the use of iron is that the steel plates are apt to warp and become bulged in the center. The base is fitted with collapsible legs, so that it can be either tilted or used in a flat position, as best suited to the position of the operator and the needs of the work.

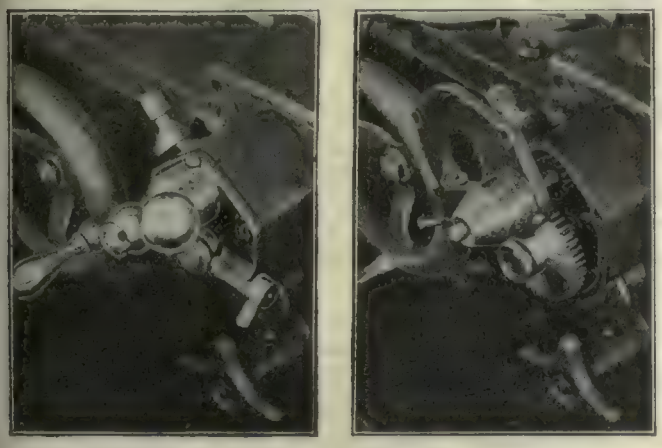


COATS PISTON-RING PRESTOMETER

The wing back stops facilitate the setting of the work. The chief feature of the device is in the two slots, extending radially at 60 deg. to each other from the point of contact of the measuring ball. These two slots hold contact points that are adjustable in position, so as to accommodate rings of any diameter up to 5 in. The piston ring rests on the two movable contact points and on the stationary one directly under the ball of the prestometer, thus giving a three-point support and removing the ring from contact with the base while it is being gaged. The contact points consist of standard $\frac{1}{4}$-in. steel balls. These balls may be easily removed from the holder by means of a pin, so that they can be replaced when worn. It is necessary to make the contact points renewable, because of the fact that freshly ground rings show a considerable abrasive action when they are slid across the contact points continually

Cross-Slide Stop for Worcester Lathes

A stop for limiting the movement of the cross-slides of lathes has been devised by the Worcester Lathe Co., Worcester, Mass. The device is applicable to any lathe of this concern's manufacture, without other alterations of the machine than the substitution of a cross-feed screw with a longer shoulder. The illustration shows two views of the device, the view at the left giving the normal position of the parts, while at the right the handle has been removed from the screw, the hold-



CROSS-SLIDE STOP FOR WORCESTER LATHES

ing screws withdrawn from the cover and the latter swung to one side to disclose the working parts.

Referring to the view at the right, a pinion keyed to the cross-feed screw is at all times in mesh with a gear which turns freely on a stud set into the back of the case. The ratio of reduction is three to one. Back of the gear and turning upon the same stud is a worm wheel, meshing with a worm keyed to the short spindle that terminates in the knurled adjusting knob and graduated dial at the left side of the box.

In adjacent faces of the gear and worm wheel are stop pins, one pin in each part and located at the same radial distance, so that when the worm wheel and gear are close together the pins will interfere. The gear cannot, therefore, turn through a complete revolution. The cam lever, shown at the left of the box, operating in a groove in the hub of the gear, serves to slide the latter to and from the worm wheel, so that the stop pins either will or will not interfere, according to the position of the lever.

In cutting a thread, or in other work where the tool point must be fed in by small and definite increments, the cross-slide is run forward in the usual manner with the device inoperative, until the tool point is nearly or quite to cutting position. The cam lever is then turned forward to slide the gear toward the worm wheel. The knurled knob, and through it the worm wheel, is now turned back until the stop pins are in contact, thus setting a positive stop for further forward rotation of the cross-screws.

To allow the tool point to advance 0.001 in., the dial is turned forward one graduation, thus slightly separating the stop pins and allowing the cross-feed screw handle to be turned forward by that amount. Because of the large reduction obtainable through the worm and worm wheel, the 0.001-in. graduations on the dial are spaced $\frac{1}{8}$ in. or more apart. This permits of adjustment of the tool within very close limits.

The advantage of the device lies in the fact that the stop is imposed against the rotation of the screw, instead of against the forward movement of the slide. Therefore, no excess pressure inadvertently applied to the handle will move the tool beyond its predetermined limit, for the reason that such excess pressure cannot be transmitted to the slide. By turning back the cam lever, the device is thrown out of action without disturbing its setting. The slide may then be run forward or back at will, and returned to its former position with certainty by merely turning the lever to re-engage the stop pins.

Farm Machinery Needed in Italy

Improvement in the demand for agricultural implements in Italy has been noticed of late, which seems to presage the end of the suspended business in agricultural supplies resulting from the "buyers strike" of last spring, which was caused largely by the high cost of American machinery through the sharp rise in dollar exchange.

American machinery retains its popularity, but the low cost of production in European countries is a serious factor, which the American manufacturer must take into consideration in order to maintain his hold in this market. Plows are being manufactured in Italy at the rate of 3.10 lire per kilo, as compared with 3.70 to 3.80 lire at the beginning of the year (1 lira = $0.193 U. S. currency at normal exchange). Due to the low exchange value of the mark, Germany is offering plows as low as 3 lire per kilo. The same condition prevails regarding other implements. For example, German mowers are being offered at 1,400 lire and American mowers at 2,300 lire. However, the German machine is very inferior to the American, and this superiority is appreciated by Italian buyers.

There are protective duties on practically all agricultural implements, the duty on tractors being especially high. It varies from 60 to 95 gold lire per quintal, the variation depending on the weight of the tractor. This seriously affects the importation of foreign tractors and results in most of the demand being supplied by Italian manufacturers.

In 1920 the United States supplied 37,674 quintals of the 125,276 quintals representing the total importation of farm machinery in Italy, or 30 per cent, against 79 per cent of the total imported the previous year. The exports of implements from the United States to Italy in 1920 were 35 per cent less in value than for 1919, and for the first nine months of 1921 they showed a decrease in value of 75 per cent as compared with the corresponding period of 1920.—*Commerce Reports.*

Railroad Equipment in Russia

Production of locomotives and railway cars in Soviet Russia by the twenty-one factories engaged in this work shows a considerable decline for the first six months of 1921, as compared with the latter half of 1920, the contributing causes being lack of provisions and scarcity of fuel, as stated in a report from Consul Leslie A. Davis, at Helsingfors, Finland.

Twenty-one locomotives were constructed during the first six months of 1921, compared with 39 for the last six months of 1920, while only 229 cars were built during the former period as against 257 during the latter period. Construction of rolling stock has decreased each year since 1915 and practically none is now going on.



NEWS SECTION

The week of February 5 to 12 is National Smile Week

Perfect Package Campaign a Success

Shippers of the country made a score of 99.10 per cent in the "Perfect Package Campaign," according to a recapitulation of the results of the movement just announced by the joint campaign committee of the American Railway Association and the American Railway Express Co., which conducted the campaign throughout the country last November. Reports of the business handled and the number of exceptions taken on packages, because of some error or defect in packing, marking or registration, were tabulated in Chicago.

During the "Perfect Package Month," as November was designated, the railroads were credited with handling 9,339,745 freight shipments, to which 101,760 exceptions were filed by the carriers. During the same period, the express company handled 10,899,352 shipments, to which 81,070 exceptions were taken. In other words, all of the carriers handled 20,239,097 shipments, freight and express, on which 182,830 exceptions were entered by carriers, giving a national percentage of 99.10 per cent.

These figures were tabulated from reports received, up to December 22, 1921, from 1,294 cities in the United States, divided into five classes, according to population. The exception reports covered errors made by shippers in the packing and marking of shipments, and in making out bills of lading or express receipts. A number of the smaller communities failed to forward their reports in time and were not included in the recapitulation.

—— *SMILE* ——

To Build Shipyards at Budapest

A correspondent in Europe informs us that the firm of Schneider-Creusot Co., which is known as the "Krupp" of France, has entered into a contract with the Hungarian government to construct a huge commercial port at Budapest. The improvements will include extensive docks, large storage buildings, repair shops and shipyards. According to the terms of the contract, the Schneider-Creusot firm will hold a monopoly for the entire exploitation of the port for a period of sixty years, after which time the Hungarian state takes possession.

Commerce Commission Considers Freight Rates

That railroad rates on iron ore should be reduced materially has been the contention of many witnesses appearing recently before the Interstate Commerce Commission during the consideration of the case which involves a review of the rate structure of the entire country. P. S. Sprague appeared for the Lake Superior Iron Ore Association. His argument dealt chiefly with the rates from the mines to the upper Lake ports, but the need for the reduction also applies between the Alabama mines and Southern furnaces. Closely linked with this demand has been the insistence that the rates on pig iron must be reduced before any material reduction in the cost of steel can be effected. The present rate on pig iron was declared by some witnesses to be throttling the whole foundry industry.

Judging from questions asked and the general attitude of the commission, it seems probable that rates will be reduced on basic commodities, particularly on low-class freight. It is very evident, however, that the commission is going to be absolutely sure that the transportation machine is not impaired by these reductions. The members of the commission in each instance are calling for facts and figures and apparently are not convinced that a reduction in rate in many cases will mean increased revenue through an increased volume of business.

Practically all witnesses agree that coal should be favored in the matter of reductions. The general opinion seems to be that coal rates should at least be relieved of the 1920 increases. In that connection, it is pointed out that iron ore rates have not been increased to the same relative extent as have the rates on coal.

—— *SMILE* ——

Machinery Tax-Free in Italy

An article under the heading "Tariffs and Trade Regulations," in *Commerce Reports* for Jan. 30, advises that the Italian government has reinstated the provisions of a decree authorizing the admission of machinery and construction material for use in establishing new industries or for use in new industrial procedures installed in old industrial establishments free of customs and consumption taxes.

Non-Magnetic Compass for Aircraft

Much thought has been given to the development of a non-magnetic compass light enough for use on aircraft. Many engineers have been at work on it and some very definite plans have been under way for at least two years, although no such compass was on the market. The Bureau of Standards now announces that after a year's work on the problem it has produced a compass of this type, crediting the idea and its development to Drs. Paul R. Heyl and Lyman J. Briggs, both of the bureau.

The action is said to depend upon a revolving coil of wire and is claimed to function very satisfactorily both in straight flying and in stunting airplanes. The weight is given at 13 lb., which is little more than half the weight limit set by air service men.

—— *SMILE* ——

Foundrymen Change Meeting Place

Final arrangements have been made for holding the annual convention and exhibit of the American Foundrymen's Association and allied societies in Rochester, N. Y., during the week of June 5, instead of in Cleveland as was previously announced.

This decision was reached following Conferences on Jan. 18 and 19, with Mayor Kohler, of Cleveland, at which time it was learned that due to the incomplete condition of Public Hall, it would be impossible to hold the convention in Cleveland. The activities will be held at Exposition Park.

—— *SMILE* ——

Federal Commission Frees Machinery Builders

The Federal Trade Commission has dismissed complaints of unfair competition against certain companies engaged in the manufacture and sale of road machinery. The companies are: Buffalo-Steam Roller Co., Buffalo, N. Y.; Barber Asphalt Paving Co., Philadelphia, Pa.; Dyar Supply Company, Cambridge, Mass.; Universal Road Machinery Co., Kingston, N. Y.; New England Road Machinery Co., Boston, Mass.; and Buffalo-Springfield Roller Co., Springfield, Ohio.

The Swiss Machinery Industry in 1921

BY A CORRESPONDENT IN THOUNE

The Swiss machinery industry went through a severe crisis in 1921. The export trade has greatly decreased, due partly to the large stocks of raw material which were bought at high prices and which have not yet been consumed, but chiefly on account of the depreciation of foreign exchange. The price of pig iron fell from 30 francs per quintal in January, 1921, to 17 and even to 15 francs in November and December. Copper dropped from 215 to 173; zinc from 512 to 350; steel from 47 to 27; seamless tubes from 128 to 54, and so on down the line. Labor conditions also contributed largely to the depression. The establishment of the 8-hr. day and higher wages has had a disastrous influence upon the industry. In several branches of the machinery industry the working day has already been prolonged and wages have been reduced, in the first attempt to come back to pre-war conditions.

The locomotive industry alone has had no reason to complain as it suffered very little from the general depression. This is due chiefly to the fact that on account of the electrification of the Swiss Federal Railways, as well as most of the private lines, considerable orders for electric locomotives were placed. The manufacture of steam locomotives has largely decreased. This branch of the Swiss industry has lately received some orders from abroad.

MACHINE TOOLS OVERSTOCKED

The machine tool industry, however, was not as active. The home demand was very small, manufacturers buying only the tools that are absolutely necessary; stocks of American, German and English machines are still plentiful and imports of these tools into Switzerland has been reduced to a minimum. The activity in the motor and accessory industries, though not to be compared with former years, was in some respects satisfactory. Exports of embroidery from Switzerland fell from 215,000,000 francs in 1913 and 425,000,000 francs in 1919, to 134,000,000 francs in 1921. The demand for cotton and woolen spinning and weaving machinery was also very small.

The automobile industry suffered very badly. The sale of war stocks, especially of heavy motor trucks, had a deplorable influence on this industry and one of the largest Swiss manufacturing plants was obliged to shut down on account of a lack of orders. The large electric manufacturing plants of the country profited by the numerous orders placed by the railways, and also booked quite a few important orders from foreign nations. Several larger orders were received for turbines, dynamos and motors. The demand for agricultural machinery and implements is also small, the local market being well supplied by foreign manufacturers.

Since the autumn of 1920, the paralysis of the buying power of Switzerland has become more and more evident. The low rate of exchange enables other countries to replace the high-priced Swiss machines by their own cheaper makes, thus diminishing the export market.

Some Statistics on Japanese Machine Tool Imports and Exports

Comparison of export figures, Great Britain, U. S. A. and Japan:

		All kinds of machines	Machine tools only
Great Britain	1913	370,000,000 yen	10,000,000 yen
	1920	374,000,000 yen	21,700,000 yen
U. S. A.	1913	. . .	32,000,000 yen
	1920	494,000,000 yen	96,000,000 yen
Japan	1920	17,000,000 yen	800,000 yen

Imports of machine tools into Japan were:

	In weight, lb.	In price, yen
1912	12,600,000	3,960,000
1913	9,950,000	3,280,000
1914	7,690,000	2,480,000
1915	2,390,000	890,000
1916	3,200,000	1,780,000
1917	6,240,000	3,200,000
1918	8,900,000	6,640,000
1919	10,240,000	10,560,000
1920	14,470,000	13,650,000

Machine tools imported into Japan during 1920 were:

Lathes	4,800,000 yen
Turret lathes	100,000 yen
Planers	380,000 yen
Shaping machines	500,000 yen
Vertical planers	280,000 yen
Drilling machines	800,000 yen
Milling machines	1,580,000 yen
Boring machines	700,000 yen
Gear-cutting machines	20,000 yen
Sawing machines	40,000 yen
Hammers	500,000 yen
Compressors	50,000 yen
Bending machines	40,000 yen
Punching and shearing	190,000 yen
Grinding machines	210,000 yen
Miscellaneous	150,000 yen

A comparison of the numbers of foreign and domestic made machine tools, actually in use in shops of shipbuilders and ship repairers follows:

	Domestic %	Foreign %	% of Whole
Lathes	49.6	50.4	38.7
Turret lathes	41.8	58.2	1.2
Planers	50.6	49.4	4.7
Shaping machines	58.8	41.2	3.7
Vertical planers	56.5	43.5	2.3
Drilling machines	49.6	50.4	17.1
Milling machines	47.6	52.4	3.1
Boring machines	26.4	73.6	4.2
Gear shapers	46.2	53.8	0.8
Sawing machines	48.0	52.0	0.4
Hammers	59.1	40.9	3.7
Presses	47.1	52.9	0.8
Compressors	64.2	35.8	1.6
Bending machines	58.1	41.9	1.8
Punching and shearing	60.2	39.8	5.7
Grinding machines	50.1	49.9	6.5
Miscellaneous	61.4	38.6	3.7

Comparison of the numbers of foreign and domestic made machine tools, actually in use at 150 works.

	Domestic %	Foreign %	% of Whole
Lathes	66.6	33.4	42.0
Turret lathes	59.9	40.1	2.3
Planers	53.0	47.0	3.8
Shaping machines	63.4	36.6	4.2
Vertical planers	61.3	38.7	2.0
Drilling machines	51.7	48.3	15.6
Milling machines	47.7	52.3	2.3
Boring machines	46.3	53.7	6.2
Gear shapers	23.7	76.3	1.1
Sawing machines	43.6	56.4	1.3
Hammers	49.6	50.4	1.1
Presses	63.6	36.4	1.6
Compressors	31.2	68.8	596
Bending machines	56.1	43.9	0.6
Punching and shearing	54.9	45.1	3.5
Grinding machines	37.2	62.8	4.2
Miscellaneous	52.9	47.1	1.9

The following figures were compiled from diagrams issued by the Japanese government's statistical bureau:

	Production of all kinds of machines in the country	Exports of all kinds of machines from the country	Exports of machine tools only
1915	2,000,000 yen	. . .	. . .
1916	8,500,000 yen	8,500,000 yen	. . .
1917	10,000,000 yen	9,200,000 yen	640,000 yen
1918	19,000,000 yen	15,800,000 yen	1,000,000 yen
1919	13,500,000 yen	16,700,000 yen	960,000 yen
1920	9,500,000 yen	17,000,000 yen	800,000 yen

Patent Office Bill Passes House

Despite the opposition of such influential members as majority leader Mondell and Chairman Madden of the Appropriations Committee, the House passed without amendment the Patent Office relief bill by the overwhelming vote of 305 to 44. The Senate Committee on Patents expects to consider the bill immediately and it is known that a majority of the committee favors the reporting of the bill to the Senate on the earliest possible date.

The opposition to the bill was based largely on the ground that increases in salary, in some cases amounting to as much as 50 per cent, are being allowed to one group of employees. If the same salary scale were applied to the three hundred thousand other employees of the Government, outside the postal service, it would mean a tremendous increase in the Federal expenditure. Messrs. Mondell and Madden urged that Patent Office employees await the passage of the Lehlbach reclassification bill which has already passed the House.

Mr. Mondell contended that the higher rates are too high and the personnel provided is unnecessarily large.

The main three provisions of the bill are that it provides a substantial increase in salaries, particularly to the technical employees of the Patent Office; it provides for an increased personnel, and authorizes an increase in fees sufficient to cover the increased expenditures. Due to the low salary scale, the Patent Office has lost a large percentage of its more experienced examiners and workers with technical experience. During the last sixteen months there has been a turn-over involving one-fourth of the total force of 437 examiners. As pointed out by Representative Vestal of Indiana, who was one of the active supporters of the measure, this has caused the work to be handled much more slowly until the work of the office is 60,000 applications behind. It also was pointed out that the work in the Patent Office is increasing by leaps and bounds. During the calendar year of 1919 the number of patent applications totaled more than 76,000—exceeding by 19,000 the number of applications filed in 1918. The 1918 total was exceeded by 24,000 applications in 1920, and 1921 exceeded 1918 by 30,000 applications. In 1921 there were 87,408 applications for patents, 5,596 applications for designs, and 16,234 applications for trade-marks, making a total of 109,238 applications. This is an increase in work during four years of 65 per cent.

Technical societies and other organizations are largely responsible for the pressure which forced the passage of the bill over the protest of House leaders. This support came principally from the National Research Council, American Engineering Council, Manufacturing Chemists Association, American Institute of Electrical Engineers, American Patent Law Association, National Association of Manufacturers, American Society of Civil Engineers, American Society of Mechanical Engineers, National Automobile Chamber of Commerce, Automotive Electrical Association, Electrical Manufacturers Club, American Institute of Mining and Metallurgical Engineers, American Bar Association, and the American Chemical Society.

Manufacturers Urge American Valuation Principles

American valuation will be endorsed by the Senate Finance Committee. This is the conclusion of most of those who attended the special tariff convention of the National Association of Manufacturers, which was held in Washington, Jan. 30 and 31. The delay on the part of the committee in agreeing to the plan laid down in the bill passed by the House of Representatives, has been due to the determined opposition of two Republican members of the committee. This was revealed when delegations of manufacturers called on the Senators and Representatives of their respective states. The names of the two Senators, who are held to be responsible for the delay, were not disclosed.

The gathering of several hundred manufacturers from all parts of the country demonstrated that there is little division of opinion among them as to the necessity for levying the ad valorem duties on American prices. This opinion is so universally held because manufacturers generally believe that no equitable foreign value can be arrived at with currencies in a jumble and with opportunities favoring more than ever the undervaluation of foreign-made goods.

The convention listened with careful attention to a detailed statement by H. E. Miles, of Racine, Wis., who appeared in opposition to American valuation.

Fraudulent Valuation

One of the most significant features of the convention was the establishment beyond any reasonable doubt that under-valuation and fraud are practiced to a very considerable extent by many foreign producers. The testimony of men who have first-hand information in this connection was convincing on that point. Among the others who brought out that phase of the situation was William Burgess, of the United States Tariff Commission. He told of several trips which he had made abroad to investigate fraud in the valuation of commodities intended for sale in the United States. The extent of under-valuation "went far beyond my anticipation or greatest guess," he said.

"The great body of the importers," continued Mr. Burgess, "are just as honest as is the great body of manufacturers, but one dishonest importer can have a very demoralizing influence. He can import his goods, valuing them at such a price that will demoralize the other importers and compel them either to go out of business or to follow his examples. I have made six trips to different parts of Europe and another to the Orient to look into the matter of valuation. I was made to realize the impossibility of finding true foreign market values. On one trip I developed the fact that I could not get a wedge into any information for two months after my arrival. Afterwards I found that it was on account of a ring, tied up with certain officials of our own Government who had advised the manufacturers on the other side that I was coming over and to look out for me. I had a commission from one of the largest houses in this country to make such purchases for its account as would establish a true wholesale selling value abroad. The man who was honestly endeavoring to find out the prices and purchase the goods for me was boycotted. Orders were issued from New York to see that he got no more goods. Every manufacturer in that line in France, in Germany, in Holland and in Belgium refused to sell him goods. He was ruined financially."

Walter Camp, of Connecticut, in the course of his remarks said: "This is the Garden of Eden. This is the place where they all want to come. This country is the place where they want to fish and they want us to cut bait. Do not be deceived by those who are interested in telling us that we must have a big export trade now that our factories are so expanded. Do not follow false counsel and let those who give it come in behind you and take the domestic trade which constitutes 90 per cent of our business, while you are chasing poor credit customers who consume 10 per cent of our output."

An original communication from a member of the German economic council was presented at the convention, showing how German manufacturers, barred from many countries, are forced to sell goods at such low prices in the United States that in some cases they have put Japanese plants out of existence. A substantiated example was given in the form of a thermos bottle which cost 9.2 cents to make in Germany. The cost on a similar article made in Norwich, Conn., was $1.011.

It was contended that the American valuation plan is only a form of administration and has nothing to do with rates. It was declared repeatedly that it is the only recourse against fraudulent valuations and is absolutely necessary to break up the form of manufacturers who ship their goods to themselves in this country. If a manufacturer invoices goods to himself he can value it at nearly any price that he may choose.

"On to Germany"

One of those who spoke told how the Board of Appraisers at New York had sent a highly qualified agent to Germany in an effort to get the proper value of the German product. He went to the manufacturing town and endeavored to get the value. His presence was discovered and both the Mayor and the Chief of Police advised him to leave the town as soon as possible. In fact he was followed through the streets and was branded as an American spy. He was denied all information. This was cited as characteristic of the difficulty in establishing values in a foreign country.

Herbert J. Wynne, of Rochester, N. Y., told of a trip he made to Germany last October. Out of 400 first-class passengers, 300 were men headed for Germany to buy anything they could buy. One of the passengers confided to Mr. Wynne that he had a letter of credit in his pocket for $250,000 and he expressed the hope that he would be able to spend every cent of it in Germany. "You know, you get very intimate on shipboard," said Mr. Wynne, "and I was told more tricks than I ever believed existed. I was told how to cheat the United States Government and particularly how I could cheat the German government."

Mr. Miles, who appeared in opposition to the American valuation, declared that there is nothing in the thermos bottle example that can be stopped by American valuation. It is like taking a headache powder for corns, he said. It would take 1,000 per cent duty to protect against that German thermos bottle, he pointed out, and the American people never have stood for more than a 50 per cent duty and even that rate could not be applied very frequently. You can save the cutlery industry by a 500 per cent tariff, but that is like shooting into a crowd of friends because there is one man in the crowd you want to get. You would have to cut loose forever from England, our greatest buyer; from Canada, our second greatest buyer, and from all the people with whom we fought in the war. Prices of 329 different articles retailed in stores increased 260 per cent from 1914 to 1919, Mr. Miles said. Under American valuation the tariff would go up 260 per cent. He urged that the tariff be handled so that the people will respect it and not turn on it and force it down to an unreasonable level. "There is some under valuation," said Mr. Miles, "but it applies on a very small percentage of the imports."

The convention adopted a memorial urging the President and Congress to retain the provisions of America valuation in the Fordney tariff bill. A committee of ten was appointed by the chair to present these views to the parties named.

—*SMILE*—

Crissinger Suggests International Exchange

A suggestion for the stabilization of international exchange, made recently in a public address by D. R. Crissinger, comptroller of the currency, has attracted wide attention in financial circles. The following paragraphs give his ideas stripped of detail.

The history of monetary systems, under a fair analysis, will justify the conviction that it is possible to create a special medium of accounting and settlement for an especial class of transactions, namely, those in international trade, and gradually to lift this trade above the ruck of disorganized domestic money conditions.

Whether such an institution should engage in deposit and discount operations, has been the subject of much discussion. That it should do so, confining its operations carefully to the furtherance of international trade, would not be at all difficult to contemplate.

Such an institution might issue an international currency, or it might conduct its operations in the terms of American dollars, Swiss francs, Dutch guilders—of any money system that is recognized as securely on a gold basis. Former Secretary of the Treasury Shaw recently proposed the employment of the American dollar in settlement of international transactions, pointing out that the amount of dollars that would require to be actually shipped from country to country in settlements would be almost ridiculously small in proportion to the volume of business done. The idea of an international trade banks is not essentially different, and it would appear more effectively because it would not be subject to the charge that the money and banking system of a particular country were getting too great a prestige. It is not impossible or impracticable, provided we have vision, imagination and initiative enough to lead us to a careful exploration of possible methods.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
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Business would be better in the United States if thoughtful men were not somewhat alarmed at the recklessness of the public borrowing that is being planned. At Albany a measure that calls for the expenditure of $329,000,000 in improving the port of New York is being favorably considered. State or City bonds will have to be sold to raise this money. As to the cost of the Federal bonus proposed, the Secretary of the Treasury says that it is estimated at from $1,500,000,000 to about $5,250,000,000. The minimum amount immediately required is put at $425,000,000 a year for the next two years. This sum represents the interest on ten billion dollars for a year at 4¼ per cent.

State bonus legislation which calls for many millions is pending in Colorado, Connecticut, Delaware, Florida, Indiana and Maryland. In other states the bonus bond issues made or definitely in contemplation aggregate $424,000,000, and Massachusetts has already distributed $20,000,000 among her soldiers, most of which has been raised by taxation.

It is estimated that over $1,250,000,000 will be expended in road construction this year. Bonds will be issued to raise most of this money and because tax exempt securities can be so readily sold nearly every political community in the country is pledging its credit to get funds that will be given away or spent for public improvements that may or may not be essential.

Will Bring Inflation

No one can even guess how much money will be thus provided and disbursed within the present year. The total can hardly be less than two billion dollars, in addition to the regular Federal, State, City and County budgets. The result must be a general increase in taxation and while the first effect of putting all this money in circulation will be to raise prices and inflate credit, those in whom the instinct of thrift still survives are really aghast at the remoter prospect.

I know that to be of any value this letter must be a practical common sense interpretation of the week's business news, rather than a recital of the meaningless details of the various markets, and I am therefore moved to say that since it seems presently impossible to check the prevailing extravagance in public expenditure we must be prepared for the inevitable but meretricious boom that it will inspire. Whether it be wisely or wastefully spent the expenditure of two billion dollars will put a lot of people at work and the wages earned will be used to buy the things that are for sale.

This is, in fact, one of the main arguments used to justify these enormous appropriations by the legislators who vote them and it would have force if the taxes were not already so high that they are paralyzing and the sale of tax exempt securities paying a comparatively low rate of interest did not so deplete the supply of capital that private enterprise is at a great disadvantage in the money market. But protest against them as we may we must take things as they are and in trying to understand the commercial and financial developments we should not ignore the shadows that coming events cast before them. The advance in cereals, especially wheat, the firmer markets for hogs and hog products and the improvement in sterling, which is now only 12 per cent below par, all probably represent the first response of sensitive markets to the impending expansion of American credit that will be called inflation when it ends and and contraction sets in. In time the upward movement is likely to extend itself to other commodities. In each case it will probably be attributed to special causes, just as the advance in wheat is related to the "drought talk" but underlying the whole series of bullish phenomena is a widening apprehension of the fact that the supply of money will shortly be augmented and that it will move with increasing velocity from hand to hand.

That this process has already commenced is perhaps indicated by the Federal Reserve Bank statement which shows a decline of one per cent in the reserve ratio, despite another increase of $7,000,000 in the gold held. It may, however, be premature to assume that the reserve ratio has passed its maximum, although there are many things that suggest that conclusion. None of the other markets as yet seem to share the buoyancy noticeable on the Chicago Board of Trade, but sugar, of which we consume ninety pounds per capita, costing at six cents a pound (about $600,000,000) has been very steady and a rapid distribution of the much talked of surplus seems in progress.

Commodity Market Firm

It is to be doubted whether the importance of sugar in our national food bill is generally understood. It is second only to wheat, for which we pay an average of probably $800,000,000 a year. As this comes to be appreciated a greatly increased interest is to be expected in sugar "futures," which are now actively traded in on the New York Coffee and Sugar Exchange.

Cotton has also been somewhat firmer during the week. The influences at work in the cotton market are so complex and often so invisible that they defy analysis, but here again it seems possible that the effect of possible inflation is being felt in advance. There is no immediate scarcity of cotton in prospect and there is a growing belief that an increased acreage will be planted this spring, but at or about sixteen cents the market shows great resistance, although the bears have had a threatened strike in New England and a panicky collapse in the price of East India cotton to help them.

In the cotton goods market business is dull. The heavy losses caused by the failure of Childs, Joseph & Co., who owe about $8,000,000, have had a dispiriting effect. A large portion of this sum is due on account of cotton goods sold for export and there is small hope of any substantial recovery. Wool is another article that is mysteriously firm. Statistically, supplies are ample, but at each successive auction sale there are buyers for every pound offered.

And so I might go through the whole list of commodities. Rubber and silk are the only important staples that have not shown an upward tendency and their weakness seems to be due mainly to conditions in the Orient rather than here. The steel industry is rather more active but there is still plenty of room for improvement. Copper is static but it is significant that Phelps, Dodge & Co. are to resume mining operations. After a year of great depression the shipping business seems to be picking up and freight rates are advancing.

Bond Sales Increasing

In the financial market Liberty Bonds have recovered some of last week's decline in the hope that a Bonus Bond issue may be averted, but the bond market generally is easier and appears to be satiated. Some of the recent issues, including the $30,000,000 sold by the Chicago, Burlington & Quincy Railroad, are below the issue price upon reselling by underwriters. Upon the whole stocks are firmer, but the activity has been sporadic and it cannot be explained by a generalization. The liquidation of marginal holdings was completed months ago and prices now respond readily to bullish manipulation when it is applied; but there is no spontaneous bullishness as yet.

The news from Europe has no special significance for American business men. Those who expected that the existence of the alchemists stone would be revealed at the Genoa Conference are somewhat disappointed that Uncle Sam is not likely to attend and there is talk of postponing the gathering.

It does not make much difference. The world is tired of inconsequent conferences. It is time for it to stay at home, work hard, economize and stop borrowing. When we learn to do this in America we will prosper, but it seems probable that we are going to have one more inflationary fling before we are willing to settle down and save money. Meanwhile "Watch your step" should be the motto of those who can keep their heads.

The Trend of Business Improvement—Plants Resuming

The General Electric Co., Windsor, Conn., is operating its local plant on a full-time schedule, and employees who have been with the company for a period of five years or longer have received a bonus of 5 per cent, based on their earnings for the last six months of 1921.

The Standard Castings Co., Lansing, Mich., has resumed production at its plant following a shut down of several weeks.

The Hedden Iron Construction Co., New York, is operating its structural steel and iron works at West Elizabeth, N. J., at full capacity with regular working force.

The Lackawanna Railroad is arranging for increased operations at its East Buffalo, N. Y., shops and about 250 men will be added to the force. The company has placed orders for new machine tools to cost about $185,000, a number of which will be installed at the local plant and the remainder placed in service at the Scranton, Pa., works.

The Ideal Furnace Co., Milan, Mich., has resumed operations at its plant after a shut down of several weeks.

The Rolls-Royce of America, Inc., is operating its automobile manufacturing plant at Springfield, Mass., under a 48-hour week schedule, and has added about seventy-five men to the working force within the past fortnight, bringing the total employees to about 300.

The National Maccore Co., Kalamazoo, Mich., is arranging for immediate increased production at its plant for the manufacture of automobile motors. Orders have been received from the Checker Taxicab Co., Chicago, Ill., for 1,800 motors, and from the Commonwealth Motors Co., Chicago, for 750 engines, the contracts totaling more than $1,500,000 in value.

The Erie Railroad Co. has resumed operations at its shops at Hornell, N. Y., following a shut down for a number of weeks. The working force will be increased gradually until a full quota of men is employed.

The Ninth Street Pipe Shops, Gadsden, Ala., have resumed production after an idle period of several weeks, and have booked orders insuring operations for some time ahead.

The Arvac Manufacturing Co., Anderson, Ind., manufacturer of disc universal joints for automotive service, is arranging plans for immediate increased production at its plant, and will place orders for additional machinery for plant expansion. Orders have been taken from the Velie Motors Co., Moline, Ill., for 1,000 disc joints for February delivery, and for about 6,000 joints for propeller shaft work. R. O. Bright is president.

The Phoenix Iron Works, Meadville, Pa., will increase operations at its local plant for the fabrication of about 5,000 tons of steel plate, to be used in connection with an order for seventeen oil storage tanks for the Sinclair Crude Oil Producing Co., to be located at Cushing, Okla. Each tank will be of 80,000 barrels capacity.

The American Furnace and Foundry Co., Milan, Mich., is operating at capacity, and plans for early increase in operations for the production of furnaces and furnace castings. Tentative plans are being considered for the erection of a new addition.

The Gray & Davis Co., Boston, Mass., manufacturer of starting and lighting systems for automobiles, is increasing production at its plant for equipments for the American Bosch Magneto Co. Manufacture in January exceeded 12,500 systems, as compared with 9,093 in December, and the production schedule calls for 15,000 in March.

The Standard Steel Car Co., Pittsburgh, Pa., has taken a contract for the construction of fifty-three steel mail and baggage cars for the Chicago, Burlington & Quincy Railroad, and will handle the work at its plant at Hammond, Ind.

The Martin-Parry Corporation, York, Pa., manufacturer of automobile bodies, is arranging a production schedule of 40,000 motor truck bodies during the present year, to be used by the Willys-Overland Co., Toledo, Ohio. The work will be divided between the company's shops at York, and at Indianapolis, Ind. The company has plans under consideration for the establishment of a branch plant at St. Louis, Mo., and for a new mill in Louisiana.

The Illinois Central Railroad Co., Chicago, Ill., has placed orders for 36,000 tons of steel rails, the contracts being divided between the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., 20,000 tons; the Illinois Steel Co., Chicago, 11,000 tons; and the Inland Steel Co., Chicago, 5,000 tons.

The Transue & Williams Steel Forging Corporation, Alliance, Ohio, has resumed production at its local plant following a curtailment for a number of weeks.

The Buffalo Steel Car Co., Buffalo, N. Y., will give employment to about 300 men at its local plant for repair work on 850 hopper and box cars for the Lackawanna Railroad. Operations at the shops will be increased.

The Bryden Horseshoe Works, Catasauqua, Pa., operated by the Manufacturers' Iron & Steel Co., are maintaining continuous production and have plans in progress for early increase in capacity.

The Central Foundry Co., New York, N. Y., has resumed operations at its branch plant at Medina, N. Y., following a period of curtailment; the plant gives employment to about 100 men.

Acer & Wheadon Co., Medina, N. Y., manufacturer of sheet metal products, is operating at full capacity and plan to double the present plant output with employment of about fifty additional men. Plans are under way for the erection of an addition, 85 x 100 ft., to provide for the expansion.

The Westinghouse Electric and Manufacturing Co. has added 200 to the production force at its Springfield (Mass.) plant and is now employing 1,300. This increase is due principally to the rapid rise in demand for radio apparatus. All the company's orders for small radio sets are being manufactured there. A convention of sales managers from all branches east of Chicago was held at the plant Jan. 26 and 27, for the purpose of giving instruction in the mechanism and use of various Westinghouse products.

Rolls-Royce of America, Inc., Springfield, Mass., is making weekly additions to its factory force, and is now employing 300. The basic pay rate has been reduced from 57 to 42 cents an hour, with a continuance of the bonus system hitherto in force.

Chicago Letter

There is continued dullness in the local machine tool market. Inquiries as a whole are fairly plentiful but in most cases are for small and miscellaneous equipment. A few dealers report January business as very good. Nothing as yet has been done by the Rock Island Railroad on its large list, issued sometime ago. The Sante Fe has made additional purchases this week and at the present time is inquiring for three motor-driven tool-post grinders for internal and external grinding. The Illinois Central is still holding off with its shop equipment list but it is expected to be heard from soon.

Sometime ago the Streets Company issued a large list of machinery and equipment wanted. It later developed that they were contemplating to undertake the manufacture of steel cars and the list was only to give them a better idea of the project. The local dealers have hopes that this will really develop into business later. The American Car and Foundry Co. is contemplating a new plant for the manufacture of steel cars. A few weeks ago a group of Southern lumbermen, represented by James N. Litsey of this city, purchased thirty-eight acres of land near Fifty-second Ave. and West Pershing Road and announced through Mr. Litsey that they were contemplating the erection of a $250,000 plant to build and repair railroad freight cars.

The Checker Taxicab Co. placed an order last week for a few lathes and other equipment. The American Steel Foundries purchased a No. 1½ Cincinnati cutter and tool grinder. The G. A. Ball Bearing Manufacturing Co. has moved into its newly erected plant and is expected to be in the market for at least a few new machines. The Vienna Model Bakery Co. has not awarded the contract for the construction of its new plant but expects to within a few days. It will cost approximately $150,000 with equipment.

Notices of auction sales are numerous, very much to the discontent of the dealers. Auction sales have been going on for the past six or eight months at an average of about two a week. Last week there were four: The Central Tool and Supply Co., 39 South Desplaines St.; Hermes Manufacturing Co., 448 N. Well St.; Chas. Schultz Paper Box Manufacturing Co., 2373 Milwaukee Ave., and the Universal Service Co., 4527 West Lake St. The influence of these bankruptcies is largely offset by the number of new corporations.

Great crowds attended the Automobile Show and the general opinion among the exhibitors was that it was a great success. In addition to the automobiles and accessories there was a good display of machinery and machine tools.

—— *SMILE* ——

Automotive Stocks in Brazil

Imports of automobiles into Brazil have been insignificant for several months past, with few German, Belgian, and Italian cars arriving. Sales from the stocks of American cars have continued, due to price offers at fixed exchange rate of five or six milreis to the dollar. The demand for cheaper American cars has been good, especially for use as taxis, the Fiat being their most important competitor. There has been little business in higher-priced passenger cars.—*Commerce Reports.*

Business Items

The Northern Motor and Machine Co. has been incorporated at Tonasket, Wash. Capital stock $25,000. Incorporators are C. N. Merrill and M. E. Bowen.

The Standard Motor Co. has been incorporated in Springfield, Mo., to manufacture and repair motors and automobiles. J. G. Graves, P. R. Palmer and C. E. Woodruff are named as directors.

The Frank G. Payson Co., Chicago, Ill., general sales agents for "Logan" air operated devices, has been dissolved. The sales of Logan products will be handled from the Logansport, Ind., office of the Logansport Machine Co., with Frank G. Payson in charge.

The Wayne Machinery Co., Taylor St., and Lake Erie R.R., Fort Wayne, Ind., with branches in Louisville, Ky., and Dayton, Ohio, announces that it is not connected in any way with any concern of a similar name.

A controlling interest in the Bollman-Wilson Foundry Co., Cincinnati, Ohio, has been purchased by William Gilbert, president of the Cincinnati Steel Castings Co. The amount concerned is said to be $150,000.

Employees of the Springfield (Mass.) Armory have voted not to accept a pay reduction ranging from 10 to 25 per cent., recently announced by the commandant. Owing to objections by union machinists it was also voted not to form a welfare association among the employees.

The Connecticut Iron and Metal Co., 63 Knowlton St., Bridgeport, Conn., has recently filed papers of dissolution with the Secretary of State of Connecticut.

The Dayton-Dowd Co., Quincy, Ill., announces the opening of a district office in Pittsburgh at 809 Keenan Bldg., which will handle the sales of that company's centrifugal pumps and underwriters' fire pumps. The office will be in charge of T. J. Barry, who for the past several years has been connected with the home office on engineering and sales.

As the result of action taken in the Kosciusko, Ind., Circuit Court recently, W. S. Felkner has been named receiver for the Economy Tool Co., at Warsaw, Ind. He is instructed by order of the court to dispose of the assets and to pay the creditors. Mr. Anderson, head of the concern, was in court and asserted that the assets of the company are almost double the liabilities, indicating that the receiver will be able to pay all claims in full. The Economy Tool Co. moved to Warsaw from Chicago about a year ago.

The Bass Foundry and Machine Co., of Fort Wayne, Ind., has filed articles to increase its capital stock from $1,700,000 to $2,100,000. The amount of $400,000 will be raised by an issue of 6 per cent cumulative stock, which is to be used to replace bonds of the company, officials state.

Personals

W. H. SAWTELL is now tool equipment engineer for the Mehl Machine Tool and Die Co., Roselle, N. J.

HARRY A. HOPF, formerly organization counsel of the Federal Reserve Bank of New York, has established the H. A. Hopf Co., with offices in the Barrett Bldg., 40 Rector St., New York City. Mr. Hopf will practice management engineering and will be assisted by Mark W. Jones, formerly of the Edison industries; R. C. Foster, of DuPont de Nemours & Co.; and G. B. Buck. Walter S. MacArthur will be Western representative with offices in the Webster Bldg., Chicago, Ill.

ROBERT M. GATES has resigned as engineer for the Lakewood Engineering Co., Cleveland, Ohio.

H. D. JAMES, manager of the central engineering department of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has been elected president of the Engineers' Society of Western Pennsylvania. Frederick Crabtree was elected vice-president.

R. M. WILLIAMS has been elected president of the Thomas Cox Machinery Co., Little Rock, Ark. Mr. Williams takes the place of A. B. Cox, who resigned Jan. 1.

L. H. HOUGHTON has been appointed superintendent of the machine tool division of the Greenfield Tap and Die Corporation, Greenfield, Mass.

ANDREW H. GREEN, JR., vice-president of the Solvay Process Co., Syracuse, N. Y., has been elected president of the Charcoal Iron Co. of America. Mr. Green fills the chair recently vacated by Frank W. Blair, who resigned.

A. J. HAMBLEN has recently been transferred from the Pacific coast sales division of the Gilbert & Barker Manufacturing Co., to the general sales department at the home office in Springfield, Mass.

M. D. MORLEY has been appointed far eastern sales and engineering representative of the Combustion Engineering Corporation and is located at present in Manila, P. I.

SYDNEY E. PHILLIPS, Hartford, Conn., has recently been appointed temporary receiver of the Connecticut Blower Co., Inc., Sheldon St., Hartford.

L. C. FERGUSON, of the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently been assigned to the Chicago office of the company, to have charge of the sales promotion work in that territory.

HENRY C. STEVENSON, 305 Warner Bldg., Bridgeport, Conn., has been appointed receiver of the Garrison Company, Inc., manufacturing engineer, with a plant at Bridgeport, Conn.

S. C. HOPE, of the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently returned home after eighteen months' stay in Europe.

DONALD F. HODGDON has been transferred from the position of instructor in machine shop practice at the Motor Transport Training School at Camp Holabird, Baltimore, Md., to the position of assistant head of the machinist department of the War Veterans Bureau, Vocational School No. 1, Camp Sherman, Chillicothe, Ohio.

BURTON C. WARNER, secretary of the Baird Machine Co., Stratford, Conn., machinery manufacturers, was elected a vice-president and a director of the Stratford Trust Company, at the annual meeting held recently.

E. S. CUSHMAN, of the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently been placed in charge of the independent oil sales division of the company. K. A. Martenson, will be assistant to Mr. Cushman.

H. L. CARPENTER, JR., has been appointed traveling representative in Western Pennsylvania for the Ajax Metal Co., of Philadelphia, Pa. Mr. Carpenter was formerly in charge of the company's offices in Pittsburgh and in Philadelphia.

WILLIAM B. TODD, vice-president of the Union Drawn Steel Co., Beaver Falls, Pa., has been appointed sales manager of the cold-rolled department of the Jones & Laughlin Steel Co., of Pittsburgh, Pa.

CLIFFORD WATSON, vice-president and director of the Sheet Metal Manufacturing Co., Youngstown, Ohio, announces his resignation from those offices.

H. W. CROSS, formerly of the General Electric Company, is now manager of the New England office of the C. H. Wheeler Manufacturing Co., at Boston, Mass.

Obituary

HENRY A. CARPENTER, former president of the New England Foundrymen's Association, died suddenly on Jan. 29 at his home in Providence, R. I. He was fifty-three years old.

GEORGE W. ELMES, treasurer of the William T. Johnson Co., Cincinnati, Ohio, machinery dealers, died in Newport, Ky., on Jan. 24. He was sixty-five years old.

JOHN HENRY LEWIS, president of the Jones & Lewis Bolt Manufacturing Co., of New York died last week at his home. Mr. Lewis was also president of the William Gaskel Bolt Manufacturing Co., of Greenpoint, Long Island.

Road Builders Exhibit Latest Machinery

Over two million dollars' worth of machinery, materials and equipment was exhibited at the twelfth annual congress and show of the American Road Builders' Association. The exhibit occupied the large Chicago Coliseum and annexes for five days—Jan. 16 to 20 inclusive. There were 177 exhibitors.

The convention sessions brought out many technical papers which provided much discussion of the problems of road builders. Legislation received a great deal of attention, the congress endorsing the Woodruff Highway Bill, now pending in Congress, which appropriates $100,000,000 as Federal aid for road building.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Clamp, Diemaker's

Art Tool Co., 16 Montgomery St., Bridgeport Conn.
"American Machinist," September 8, 1921

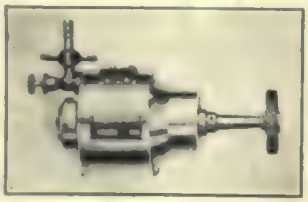
This clamp is intended for holding a die and punch together when scribing or "off-setting." Adjustable toes accommodate punches of different heights, and joints in the crossbar permit the tool to adapt itself to varying widths. There are no screws or loose pins in the toes. They are free to be moved up or down when no work is in the clamp, and will hold firmly against the pressure of the screws when the pins fall into any of the notches upon the bars. The clamp is made of casehardened mild steel.



Grinder, Pneumatic, Turbine-type.

Onsrud Machine Works, Inc., 3908 Palmer St., Chicago, Ill.
"American Machinist," September 15, 1921

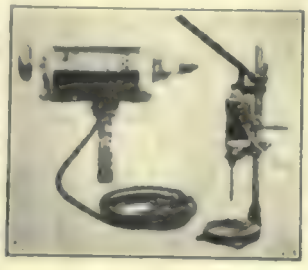
This device has a high-speed motor propelled by compressed air and intended especially for driving grinding wheels. It is said that the motor attains a speed as high as 30,000 r.p.m., the speed being controlled by means of a valve at the entrance of the air to the housing. Although the complete unit weighs only 5¾ lb., it is said to be capable of producing ¾ hp. The unit can be held in the hand and operated the same as a portable grinder. It is especially intended for attachment to machine tools and holding fixtures for special purposes can be furnished. The grinder ordinarily requires 10 to 12 cu.ft. of free air per minute at a pressure of 70 to 100 lb. per square inch.



Drill, Portable, Electric.

Electro-Magnetic Tool Co., 2902 Carroll Ave., Chicago, Ill.
"American Machinist," September 15, 1921

The tool has a capacity of ¼ in. A stand, shown at the right, makes the tool serve as a small drill press. The motor is series wound, has a large commutator, and an aluminum ventilating fan. The gears are hardened and ground, and all are removable. The spindle shaft is equipped with ball thrust bearings and runs in bronze bearings. A switch gives control of the tool at the handle. All connections are made in the switch box, the cover of which is removable. The commutator may be inspected and the brushes removed simply by taking off a cover plate.



Block, Test, Toolmaker's.

Art Tool Co., 16 Montgomery St., Bridgeport, Conn.
"American Machinist," September 15, 1921

This squaring and testing block is for use in laying out and testing work upon the bench plate. It is hardened and ground square and true in all planes, and the V-groove is accurately located with respect to the sides. It is claimed to be free from error to 0.0001 inch. A yoke is furnished to hold round work in the "V," the yoke being held in slots that are milled in the same face as the "V," so that the block will rest squarely upon any one of the other five sides. Tapped holes are located in convenient places on each of the surfaces to facilitate clamping.



Toolbits, Standard.

New England Tool and Machine Co., Inc., 51 Taylor St., Springfield, Mass.
"American Machinist," September 8, 1921

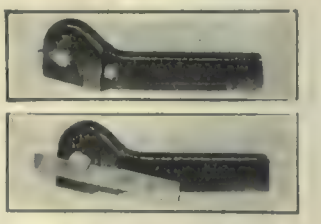
The toolbits are said to be cut from annealed bars of highest quality high-speed steel. They are formed, hardened and ground to standard shapes, with standard clearances. Cutting edges are provided on both ends. The line includes diamond points, side tools, round-nose tools, U. S. Standard thread tools for all pitches, V-thread tools and cut-off tools. The sizes furnished are ⅜, ½, ⅝, ¾, ⅞ and 1 inch.



Toolholders, Spring.

Willard Tool Co., Inc., 105 East Main St., Chicago, Ill.
"American Machinist," September 15, 1921

The holder is made of drop-forged steel, and is hardened to a spring temper. The "goose-neck" is formed by means of a saw-cut through the body of the shank. At the top of the illustration is shown the regular form of threading and forming toolholder having a right-hand offset. The toolbit is carried in a square broached hole, and a non-binding clamping device operated from the side is employed to hold it in place. At the bottom of the illustration is the cutting-off toolholder of the right-hand offset type. The cutting-off tool is also made in a right-hand straight style. The device is made in sizes.



Boring Head, Adjustable.

Rickert-Shafer Co., Erie, Pa.
"American Machinist," September 15, 1921

The device is provided with two hollow-head setscrews for holding the cutting tool in the shank, and can be furnished with the size and style of taper shank required. A micrometer dial is used to vary the eccentricity of the toolholding shank. The dial can be set to zero for any setting of the tool. A clamp both locks the toolholder in the required position and draws it against the body. The head is made in three sizes. The adjustment of the tool each side of center is ¼ in. for the No. 1 size, ½ in. for the No. 2, and ¾ in. for the No. 3.



Boring, Drilling and Milling Machine, P. & H.

Pawling & Harnischfeger Co., 38th and National Aves., Milwaukee, Wis.
"American Machinist," September 22, 1921.

The machine is made in several sizes, the one illustrated being the No. 4-F, the smallest of the series. It is intended to drive high-speed tools to the limit of their capacity. The principal features to which the maker calls attention are the narrow guiding surfaces, the feed screws operating in tension, the provision for taking up wear on all sliding parts, and the centralized control. There are eight boring and drilling feeds for the spindle, operating in either direction, and eight milling feeds to the column and saddle. The rapid power traverse has a constant speed of 60 ft. per min.



Clip, paste on 3 x 5-in. cards and file as desired

Book Reviews

An Investigation of the Fatigue of Metals. By H. F. Moore and J. B. Kommers, research professors of engineering materials, University of Illinois. Bulletin No. 124 of Engineering Experiment Station, University of Illinois. Investigation conducted in co-operation with the National Research Council, the Engineering Foundation and the General Electric Co. Paper covers, 185 pages, 6 x 9 in., 46 illustrations and charts, 12 tables. Published by the University of Illinois, Urbana, Ill. Price 95 cents.

The volume tells of the conditions, the procedure and the results obtained in tests on the failure of ferrous metals under repeated stress. It contains much information in the form of micrographs and curves. It was observed that there was a well-defined critical stress at which the relation between unit stress and the number of reversals necessary to cause failure changed markedly. No simple relation between the endurance limit and the elastic limit was found, no matter in what manner the latter was determined. The ultimate tensile strength and Brinell hardness furnished better indices of the endurance limit. The "rise of temperature" method also may be used for this purpose. The volume gives the relative merits of other methods of determining the endurance limit, and explains the phenonema observed in each case. It gives recommendations for further experiments. The report is valuable because of the first-hand data that it contains, and because it contributes some real thought to the subject of the failure of metals under repeated stress.

Structure and Related Properties of Metals. Circular No. 113 of the Bureau of Standards; can be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C. Price twenty-five cents.

This circular which replaces one of earlier date (No. 42, Metallographic Testing), is a comprehensive discussion of that phase of metallography indicated by the above title. The numerous examples which have been used throughout the test have been taken from the results of metallographic examination made by the bureau, of specimens submitted for examination, as well as those used for research. The various methods for revealing the micro-structure as well as the meaning of the features revealed are discussed, and a list of re-agents for revealing the microstructure included. By means of numerous "live" examples the conditions which affect the structure of metals are discussed, also the effect of structural features upon mechanical and chemical properties of metals. A rather comprehensive discussion of the applications of the microscopy of metals is given.

Friction and Carrying Capacity of Ball and Roller Bearings. Technologic Paper No. 201, Bureau of Standards; can be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C., price ten cents.

The experiments about which this paper is written were undertaken by the Bureau of Standards, at the suggestion of the Navy Department, to determine the maximum safe load, and the static friction under load, of ball and flexible roller bearings. Tests were made on balls of 1.00, 1.25 and 1.50 in. diameter in grooved races and on rollers 1.25 in. in diameter and 5.25 in. long in flat and cylindrical races. The ratio of friction to load is practically constant and equal to 0.00055 for all three sizes of balls up to a "critical" load which varies with the diameter of ball. A similar "critical" load, 25,000 lb., was found for the roller bearings with a ratio of friction to load equal to 0.00075.

The paper was preperad by H. L. Whittemore and S. N. Petrenko, mechanical engineers of the bureau.

Kritik des Zeitstudienverfahrens. By I. M. Witte. Seventy 6 x 8½-in. pages. Published by Julius Springer, Berlin.

This is a short study of the progress and present status of time and motion study work in America and Germany. One chapter is devoted to the Taylor time studies, one to time study in America and one to time study in Germany. Of the other two one is introductory and the other describes modern motion study practice as developed by F. B. and L. M. Gilbreth.

A chronological bibliography is added as an appendix.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A commercial agency firm in Spain desires to purchase and secure an agency for the sale of all kinds of tools, machine tools, steel and iron tubes for steam, gas, and water. Quotations should be given c.i.f. Spanish port. Payment to be made on arrival of goods. Correspondence should be in French or Spanish. Reference No. 660.

A commission agent in Palestine desires to purchase and secure the representation of firms for the sale of general hardware, safes, galvanized-iron pipes, water pumps, motor-vehicle accessories. Quotations should be given c.i.f. Jaffa. Reference No. 664.

A firm engaged in the general commission business in Argentina desires to secure the representation on commission from manufacturers of iron and steel, construction materials, plain and barbed wire. Reference No. 677.

An agency is desired by a commission merchant in Spain for the sale of electrical supplies, railway supplies, such as rails, ties, plates, bolts, nuts, switches, and frogs; machinery; electric motors; small pumps, etc. Reference No. 704.

The purchase and agency are desired from manufacturers by a merchant in India for the sale of cycles, motorcycles and motor cars. Quotations should be given c.i.f. Madras. Payment to be made against documents. Reference No. 681.

A trading company in England desires to purchase engineering spares, lubricators in cast iron, malleable iron, blued steel, and brass; light feed and telltale lubricators; lubricating oils, fuel oils, Diesel oil, and gas oil. Quotations should be given c.i.f. English port. Terms: Cash against documents on inspection of goods. Reference No. 702.

A commercial agency firm in Sweden wishes to secure the representation of firms for the sale of automobiles. Quotations should be given c.i.f. Stockholm or Goteborg. Reference No. 687.

Catalogs, prices, and full information regarding sawmill machinery are requested by a business man in Nigeria, Africa. He is particularly interested in the purchase of a device for sawing trees into boards, scantlings, etc. Quotations, if possible, should be given c.i.f. Lagos, Africa, or f.a.s. New York. Reference No. 688.

Pamphlets Received

Arc Welding: Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. A small leaflet, No. 1825, published by this company, covering the use of arc welding for repair and reclamation. It also tells how costs can be reduced by the use of arc welding.

Industrial Salvation: By Clinton E. Woods, industrial engineer, 1421 Chestnut St., Philadelphia, Pa. A constructive analysis of the present industrial situation with many pointed suggestions for remedies. Mr. Woods attributes the chaotic state of affairs in many businesses to a lack of proper accounting methods, which leaves the manufacturers in darkness as to his costs at a time when he needs this information most. Mr. Wood is a noted authority on industrial engineering questions.

Handbook for Drillers: Pamphlet distributed by the Cleveland Twist Drill Co., Cleveland, Ohio. It is intended for students in drilling problems, and is an introduction to the theory underlying the use of the twist drill.

Industrial Rehabilitation: Federal Board for Vocational Education, Washington, D. C. Bulletin No. 70 of Series 3, on services of advisement and co-operation in civilian rehabilitation of persons disabled in industry or otherwise. It deals specifically with some of the concrete problems of industrial rehabilitation. The material was gathered by F. G. Elton and J. A. Kratz, of the board, and Dr. Frank Harrison, of the U. S. Public Health Service.

Trade Catalogs

Hunter Saws and Tools. Hunter Saw and Machine Co., Pittsburgh, Pa. Catalog E illustrating and describing a comprehensive line of solid and inserted tooth metal cutting circular saw blades, inserted tooth setting device, serrating device, slate saws, pipe cutters, circular knives, rotary shear blades, saw sharpening machines, rivet sets, chisel blanks and a few specialties. The booklet is beautifully made up with illustrations and a substantial cover.

Inserted Tooth Cutters. Ingersoll Milling Machine Co., Rockford, Ill. A four-page circular devoted to a description of five types of Ingersoll cutters.

National Keyseating Millers. National Machine Tool Co., Cincinnati, Ohio. A twenty-page catalog illustrating and describing a line of keyseating millers for use in a drilling machine for milling internal key seats. The catalog covers twenty different diameters of millers.

Oilgear Control Pumps. The Oilgear Co., 60 Twenty-seventh St., Milwaukee, Wis. Bulletin No. 6, describing the latest model oil gear control pump manufactured by this company; illustrations showing the construction of individual parts are provided, as well as detailed specifications.

Wagner Polyphase Motor. Wagner Electric Manufacturing Co., St. Louis, Mo. Circular describing the new Wagner Pow-R-full motor.

Niagara Presses. Niagara Machine and Tool Works, Buffalo, N. Y. A voluminous catalog, No. 54, bound in imitation leather, containing about 300 pages of descriptions of the various squaring and rotary shears, rolls, punches, tinsmiths' tools and machines, power presses, etc. Complete and detailed information on each machine is given and the pages are well illustrated with pictures of the complete machines and individual parts.

Wagner White Light Converters, Wagner Electric Manufacturing Co., St. Louis, Mo. A series of small circulars describing the Wagner white light converter, Type S. C. The covers of each circular picture some famous movie star, a novel way of attracting attention to the material inside.

Universal Grinder. Arva Stroud, 327 Broadway, New York City. Circular describing in truly Gallic fashion, a line of grinders manufactured by Rene Volet, in France. Nine operations are illustrated.

Drill and Tap Grinders. Bickford-Switzer Co., Greenfield, Mass. Catalogs describing, with illustrations, some new principles of design in drill grinding machines. Specifications for each machine are furnished.

Sebastian Lathes. Sebastian Lathe Co., Cincinnati, Ohio. Catalog No. 26, describing by word and picture a comprehensive line of cone head, geared head and quick-change lathes.

Blackmer Pumps. Blackmer Rotary Pump Co., Petoskey, Mich. A circular briefly illustrating a few Blackmer pumping units.

"Gewe" Cutting Machine. General Welding and Equipment Co., 74 Brookline Ave., Boston, Mass. Catalog describing the "Gewe" automatic cutting machine, patents for which are now pending.

Franke Flexible Couplings. Smith & Serrell Co., Newark, N. J. Bulletin No. 32 describing a line of flexible couplings for direct-connected machines. The couplings are made by the Franke Co., New Brunswick, N. J.

Forthcoming Meetings

American Boiler Manufacturers' Association: Winter meeting, Feb. 13, Fort Pitt Hotel, Pittsburgh, Pa. H. N. Covell, secretary, 191 Dikeman St., Brooklyn, N. Y.

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24. Engineering Societies Building, New York City. B. Staughton, secretary.

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3, Hotel McAlpin, 34th St. & Broadway. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

The Weekly Price Guide

THIS WEEK'S MARKET

Although the Pittsburgh mill price of $1.50 on structural steel continues to prevail, it is applicable to increasingly smaller tonnages. Quotations as low as $1.40 per 100 lb. on soft steel bars and tank plates have been effected on sufficiently large orders. Mill shipments, New York, on bars, shapes and plates are quoted at $1.83@$1.88 per 100 lb.

Electrolytic copper in New York warehouses is quoted at 14⅛c. as against 14⅜c.; tin at 32½c. advanced from 32c. and zinc at 5¼c. as compared with last week's quotation of 5⅜c. per lb. Lead demand steady but prices remain unchanged. Zinc sheets (casks) in fair sized lots are quoted at 9.15c. as against 10.65c. per lb. in Cleveland warehouses.

Dealers' purchasing prices on old metals have dropped ¼c. per lb. on all classes of non-ferrous materials and discounts on leather belting have declined about 5 points in the New York market.

Linseed oil is quoted in New York at 79c. as against 77c. and in Chicago at 84c. as compared with 80c. per gal. one week ago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by Th. Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.25
Tin, 5-ton lots, New York	32.50
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 4.90; New York	5.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.25
Babbitt metal (best grade)	31.00	41.00	36.00
Babbitt metal (commercial)	16.00	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.00	11.00	11.00
Copper, heavy, and wire	10.75	10.50	10.00
Copper, light, and bottoms	8.75	9.00	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	6.00	6.50
Brass, light	4.25	4.25	5.00
No. 1 yellow brass turnings	5.50	5.00	5.75
Zinc	2.75	2.00	2 75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.05½@.09	.09	.11
Wiping cloths per M., 13½x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	2.50	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.79	.80	.84
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$2.75@$3.00	
Coke, prompt foundry, Connellsville	per net ton	3.75@ 4.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.50	$3.25	$3 43
Cone heads, ditto (net)	3.60	3.35	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.90	$0.85	$0 90
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Gadsden—The Etowah Fdry. & Machine Co.—one hand operated 3 ton overhead traveling crane.

Ala., Fairhope—The Farmers Co-operative Ice & Creamery Co., E. C. Rockwell, Secy.-Treas.—deep well pumps, 90 to 100 ft.

Ark., Little Rock—The Arkansas Platinum Development Co., P. O. Box 815, C. C. Williams, Secy. — complete reduction machinery.

Conn., Stratford—C. W. Beeman, Lordship Manor—one arbor press for garage use.

Conn., Waterbury — Connecticut Gears, Inc., 545 Cooke St., T. Clark, Pres. and Treas.—one 3 in. J. & L. flat turret lathe.

Ga., Rome—C. H. Nichols, 216 West 5th Ave.—one 10 to 20 ton raw water, motor driven ice machine complete.

Ill., Chicago—The Chicago Roller Skate Co., 4458 West Lake St.—one No. 2 Baird burnishing barrel, single or double.

Ill., Chicago—Hoeft & Co., 400 North Ashland Ave—one No. 4 straight sided press or double column for short stroke.

Ill., Chicago—The U. S. Ball Bearing Mfg. Co., 4535 Palmer St., J. C. Ness, Purch. Agt.—Vanadium sheet steel of the following analysis: carbon—.2 to .3; Manganese—.5 to .8; Vanadium—.15; Phosphorus—.045 (maximum); Sulphur—.050 (maximum); sizes preferably 19 to 21 gauge, 12 in. wide and 10 ft. long

Ill., Chicago—W. E Williams, 28 East Jackson Blvd.—one speed lathe.

Ill., Kankakee — The Kankakee Rug Cleaners, 1145 South Osborne Ave.—laundry machinery.

Ill., Peoria—B. Ley, 200 Culter St.—three horning presses similar to No. 12 and No. 14 Toledo.

Ill., Rockford—The Old Colony Chair Co., Seminary St.—woodworking machinery including sander.

Ill., Kankakee — Mang & Zeisler, South Schuyler Ave.—lathe and drill press for proposed garage.

Ia., Clinton—F. Smith & Son, 600 Railroad St., manufacturer of boxes—woodworking and milling machines.

Ia., Davenport—A. J. Lerch Co., 120 West 3rd St., sheet metal working machinery.

Ky., Leitchfield—The Leitchfield Laundry, L. Vienez, Mgr.—one 75 to 100 lb. capacity steam washer, extractor and 3 roll ironer and other laundry equipment (new or used).

Ky., Lexington — The Kentucky Fruit Laxative Co., Inc., 172 Georgetown St.—fruit grinders (on order of meat chopping machines); wrapping machines capable of wrapping sticky ground fruit; machinery for mixing sticky and tough masses.

La., New Orleans—The Model Sheet Metal Wks., 624 Julia St., V. Palazzolo, owner—equipment for repair shop.

La., New Orleans—The Standard Equipment Co., 622 Tchoupitoulas St.—one 10 ft. power brake, ¼ in. plates.

La., New Orleans—The Valley Ice Co., C. A. Vitter, 1125 Julia St., Purch. Agt.—modern machinery for proposed ice plant on Rocheblave and Republic Sts.

La., New Orleans—The O. H. Van Horn Co., 518 Camp St.—one No. 55 or No. 60 Heald grinder (used).

Mass., Quincy—The city—equipment for manual training department of proposed high school on Coddington St.

Mass., Worcester—The Wickwire Spencer Steel Corp., 69 Hammond St.—straightening and cutting machine, Shuster or another similar make.

Md., Baltimore—The Amer. Concrete Tie & Products Co., Inc., 201-5 Gaither Bldg., or 111 North Charles St., J. W. Ritter, Secy.—complete line of machinery for plant manufacturing concrete products.

Md., Baltimore — Slaysman & Co., 801 East Pratt St., machinery manufacturers—horizontal boring, milling and drilling machine, Lucas type preferred (used).

Mich., Detroit—The Grand Sheet Metal Wks, 2113 Grand River Ave.—sheet metal working equipment.

Mich., Detroit—The Harwick Stamping Corp., Miller Rd. and Thayer St.—miscellaneous stamping equipment.

Mich., Detroit—F. Horawa, 4234 Mt. Elliott Ave.—one lathe, 12 in. to 14 in. swing, (used).

Mich., Detroit—C. L. Schwartz, 602 Hammond Bldg.—one drill press and lathe, (used).

Minn., Cloquet—The Northwestern Paper Co., C. I. McNair, Mgr.—machinery for sulphite paper mill.

Minn., Minneapolis—The Mirviss Mfg. Co., 116 Washington Ave., N.—Special machinery for proposed overall factory at Amery, Wis.

Minn., St. Paul—The Heaters, Inc., 1927 Dayton Ave., D. B. Howard, Purch. Agt.—One 24 in. to 30 in. throat punch, capacity ¾ in. in ¾ in. One 4 ft. to 6 ft. squaring shear for eight gage stock. One bevel shear. One power roll for 6 gage, 7 ft. long. One angle roll. One rotary shear, throatless preferred. Six 1-ton triplex hoists. (New or used.)

Mo., Joplin—The Economy Tire Co., 833 Main St., F. C. Allen, Mgr.—equipment and machinery including 3 cavity tire moulds, air bags, buffer, automobile tire tools and electric motors, 5 hp.

Mo., Joplin — The Empire Electric Machine Co., 4th and Joplin Sts., R. Camblin, Mgr.—coil spreader, taping machine, coil winder, and impregnator tanks.

Mo., Joplin—C. Flowers, 1605 East 7th St.—hand drill press; hand emery wheel, 8 in.; and work bench lathe.

Mo., Joplin—C. Weaver, 107 East 7th St.—one 3 hp. motor, lathe, drill press and emery wheel.

Mo., Kansas City—The Berkowitz Envelope Co., Traders Bldg. — One linotype machine, No. 9.

Mo., Pierce City—A. Kuklenski & Sons—garage tools including vises, drill presses and automobile repair tools.

Mo., Pierce City—The School Bd.—manual training equipment including saws, planers, electric rip saw, boring machine, hammers and lathe.

Mo., Springfield—The Shea & Morris Monument Co., 1112 Boonville Ave.—electric traveling crane for heavy stone work.

Mo., St. Louis—E. B. Lamgenberg, 4057 Forest Park Blvd.—machinery for use in manufacture of galvanized and tin furnace pipe and fittings.

Mo., Webb City—The Jefferson Highway Garage, Daugherty St., J. V. Lear, Mgr.—electric drill press, lathe and emery wheel.

Mo., Weston—J. R. Schumacher—Machinery for refrigerator plant.

N. Y., Buffalo—R. E. Dougan Co., 66 Oak St.—one 14 x 22 Colts-Armory press.

N. Y., New York—I. P. Fink, Inc., 24th St. and 10th Ave.—one 10 ft. power brake to work sheet metal up to 16 gage.

N. Y., Troy—The Alpha Brush Co., J. W. Brandshaw, Purch. Agt.—rotary blower similar to P. H. & F. M. Roots machine, size 4 or smaller.

N. C., LaGrange—S. T. Mears—machinery for cotton mill.

N. C., Spindale—The Horn Co., C. Horn, Pres.—machinery for braiding rag rugs.

N. C., Wilmington—The Carters Production Wks., 210 South Water St. O. Carter, Mgr.—Yates, Berlin or other good standard 8 x 14 or 20, four side planer for planing mill, (used).

O., Akron—Brown-Graves Co., 65 East Miller Ave., manufacturer sash, doors and interior finish—one veneer jointer (used).

O., Cleveland—The Bd. Educ., c/o F. G. Hogen, Dir. of Schools, Rockwell and East 6th Sts.—equipment for manual training at West Technical High School, including one band sawing machine, one 18 in. hand planer and jointer, one 30 in. single surface planer, one double arbor Universal saw, Universal revolving oil stone tool grinder, 2 wood turners and one combinaton band saw setting and filing.

O., Cleveland—The city, J. F. Maline, Dir. of Pub. Service, City Hall—one steam driven locomotive crane for the garbage reduction plant at Willow.

O., Cleveland—The Hoff Mfg. Co., 5209 Prospect Ave.—No. 2½ Universal milling machine.

O., Columbus—The Ramey Mfg. Co., 31 South Wall St., E. J. Ramey, Pres. and Genl. Mgr.—electric welder and cutting machine, 6 ft. wide.

O., Toledo—The Toledo Metal Furniture Co., Dorr St.—one No. 63 Toledo punch press and one No. 52 Bliss press.

Okla., Hammon—C. T. Lee—concrete block machine.

Okla., Tulsa—The Public Service Co., of Oklahoma, 107 East 4th St., c/o J. McCrary, Treas.—boilers, engine, and machinery, and equipment for proposed ice plant at Atoka.

Ore., Molalla—H. Russell—machinery for drying prunes.

Pa., Greensburg—Kelly & Jones Co., (iron pipe fittings, brass and iron valves), C. H. Sparrell, Purch. Agt.—one press similar to Bliss No. 5.

Pa., Lester—The Lester Piano Co., G. Miller, 1306 Chestnut St., Phila., Treas.—additional woodworking machinery.

Pa., Norristown—The Herald Co., 73 East Main St., R. S. Jones, Owner—additional printing plant equipment.

Pa., Phila.—Moore & White Co., 15th St. and Lehigh Ave., (machinists)—additional machinery and tools for new factory.

Pa., Phila.—The Penna. Sugar Refinery Co., 1037 North Delaware Ave., G. H. Earl, Mgr.—additional sugar refining machinery.

Pa., Phila.—The Reyburn Mfg. Co., 32nd St. and Allegheny Ave.—one model C or small Becker vertical milling machine, (used).

Pa., Phila.—E. Sutro & Sons, Thompson and Clearfield Sts., P. E. Sutro, Purch. Agt.—machinery for new hosiery factory.

S. C., Greenville—The Chamber of Commerce, Textile Hall, O. W. McCarrell, Secy.—Bids will be received until Feb. 15, machinery for creamery.

Tenn., Old Hickory—(R. D. from Shelbyville)—The Southland Motor & Body Corp., Inc., P. A. Wells, Secy.-Treas.—large sheet steel rollers, shears and breakers.

Tex., San Antonio—C. R. Tips, 605 Natl. Bank of Commerce Bldg. (glass manufacturer)—bottle blowing machinery, air compressor, pumps, gasoline and oil engines, fire bricks, structural steel, and oil tanks.

Va., Chatham—J. Whitehead—machinery for the manufacture of brooms, particularly wire winders and straw cutters.

Va., Danville—The Register Publishing Co., 115 South Union St., R. A. James, Jr., Owner—modern printing press and equipment for newspaper printing plant.

Va., Norfolk—The Hampton Roads Equipment Co., Inc., 251-252 Arcade Bldg., W. L. Duncan, Genl. Mgr.—revolvator, 2,000 lb. capacity, operated by hand winch; motor equipped, equipment to lift approximately 16 ft.

Va., Red Oak—D. F. Dunlop—medium size planer and matcher, 4 sides, not less than 6 x 18 in., for wood-working plant, (used).

Va., Richmond—The Richmond Mill Supply Co., Inc., P. O. Box 208, Manchester Station, T. A. Henderson, Purch. Agt.—Boom swinging electric hoist, A.C., 3 phase, 60 cycle, 220 volt motor, direct connected, to handle stiff leg derrick of 12,000 lb. capacity; also prices on hoist without motor. One each, 150, 100 and 175 hp. both slip ring squirrel cage, A.C., 3 phase, 60 cycle, 220 volt, motors.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—ten or twelve cranes including two 150 ton ladle cranes for Steubenville and Portsmouth plants.

Wis., Evansville—The Solid Set Broom Co., c/o R. M. Richmond—modern broom making machinery.

Wis., Madison—Dane County, c/o M. Sommers, 512 West Wilson St.—complete refrigeration machinery.

Wis., Madison—The Kennedy Dairy Co., 618 University Ave.—ash hoist and conveyor also refrigerating machinery and special dairy equipment.

Wis., Merrill—The Merrill Buick Co.—lathe, grinder, drill press and motor.

Wis., Milwaukee—E. Froelich, 222 12th St.—drill press suitable for garage duty.

Wis., Milwaukee—H. Grimes, 1165 35th St.—planer, band saw and jointer.

Wis., Milwaukee—The Huebsch Mfg. Co., 366 Brady St., J. Huebsch, Purch. Agt.—one 4 ft. radial drill.

Wis., Milwaukee—P. Kammers, 1301 7th St.—one drill press.

Wis., Milwaukee—The Routbord Mfg. Co., 86 3rd St., manufacturers of tools and dies, Z. Routbord, Purch. Agt.—drill press, medium size, and bench press.

Wis., Milwaukee—The Wisconsin Dye Wks., 614 Mitchell St.—gasoline storage tank and pump.

Wis., Mineral Point—W. Kislingburg—electrically driven floor surfacing machine.

Wis., Neillsville—P. M. Warlum—sheet metal working machinery.

Wis., Sheboygan—The S. W. Miller Piano Co., 2020 North 15th St.—special machinery and woodworking machinery for proposed piano factory on Niagara St.

Wis., Stevens Point—The Pfiffner Co., 229 Franklin St., E. J. Pfiffner, Purch. Agt.—woodworking machinery, sticker, etc.

Wis., South Milwaukee—The Bucyrus Co.—crane, also equipment for the manufacture of iron castings.

Wis., West Allis—The Kroening Constr. Co., 68th and Greenfield Aves. (garage and millwork)—drill press, emery wheel and chain hoist.

Wis., Whitelaw—The Cream Valley Co-operation Co., c/o J. Ebert, Route 1—separators and churns, (belt driven).

Wis., Wisconsin Rapids—The Grand Rapids Canning Co., H. Dorn, Mgr.—canning and crating machinery.

Ont., Belle River—The Dover Oil Co.—equipment, tanks, piping and drilling equipment.

Ont., Cottam—J. J. Vance—complete saw mill equipment. Estimated cost, $25,000.

Ont., Kitchener—The Greb Shoe Co.—$25,000 worth of special shoe making machinery and equipment.

Ont., London—The London & Port Stanley Ry., Philips St.—derrick, clam shell buckets and unloading and operating equipment for coal unloading depot at Port Stanley. Estimated cost, $25,000.

Ont., London—T. Terry, 150 Fullarton St.—equipment for garage and auto repair shop. Estimated cost, $40,000.

Ont., Windsor—Leggatt & Platt Bed Co., 928 McDougall St.—enameling plant and special equipment for the manufacture of beds. Estimated cost, $28,000.

Metal Working Shops

Cal., San Mateo—The Mineral Metal & Byproducts Co., First Natl. Bank Bldg., San Francisco, is having preliminary plans prepared for the construction of factory buildings here.

Ill., Chicago—M. Tauber & Sons Corp., 2231 Wabansia Ave., is having plans prepared for the construction of a 1 story, 67 x 190 ft. ice plant and a 1 story, 85 x 109 ft. garage at 2231 North Wabansia Ave. Estimated cost, $75,000.

Ill., Cicero—The Cicero-Chicago Corrugated Co., 1542 South 51st St., has awarded the contract for the construction of a 1 story, 130 x 130 ft. factory to replace the one destroyed by fire. Estimated cost, $75,000.

Ill., Kankakee—Mang & Zeisler, South Schyler Ave., plans to build a 1 story garage. Estimated cost, $50,000. Architect not selected.

Ill., Peoria—The Peoria Auto Parts Co., 817 South Adams St., is having plans prepared for the construction of a 2 story, 60 x 100 ft. garage, repair shop, etc. Estimated cost, $120,000. B. L. Hulsebus, Jefferson Bldg., Archt.

Ind., Crown Point—J. N. Coleman, Archt., 6257 St. Lawrence Ave., Chicago, will soon receive bids for the construction of a hospital including a 2 story, 50 x 80 ft. service building, for the Crown Point Hospital. Total estimated cost, $800,000.

Ind., Evansville—The Bucyrus Steam Shovel Co., Decker Rd., is having plans prepared for the construction of a 1 story, 120 x 240 ft. factory. Estimated cost, $40,000. Private plans.

Kan., Hutchinson—The city, c/o R. B. Lee, Engr., City Hall, is having plans prepared for the construction of a 1 story garage. Estimated cost, $50,000.

Ky., Louisville—Joseph & Joseph, Archts., 800 Francis Bldg., will soon receive bids for the construction of a 2 story, 60 x 200 ft. garage on 3rd and York Sts., for the Haury Motor Co., 811 South 3rd St. Estimated cost between $60,000 and $100,000.

Md., Baltimore—The Maryland Steel Rolling Co., 203 Fidelity Bldg., plans to build a factory on 6th and Monument Sts. Estimated cost, $85,000. Private plans.

Mich., Detroit—T. J. Doyle, 4462 Woodward Ave., has awarded the contract for the construction of a 1 story, 60 x 451 garage and service station on Jefferson Ave. Noted Jan. 12.

Mo., St. Louis—W. F. Parks, Frisco Bldg., will build a 3 story, 98 x 180 ft. garage on North Euclid Ave. Estimated cost, $50,000.

Mo., St. Louis—S. Simon, c/o Williams & Bland, 2717 Chestnut St., has awarded the contract for the construction of a 1 story, 189 x 331 ft. service and parcelpost station. Estimated cost, $150,000. Noted Jan. 26.

Mont., Bozeman—The University of Montana, State Bd. of Examiners, Helena, has awarded the contract for the construction of a 1 story, 119 x 182 ft. engineering shop, here. Noted Jan. 19.

N. J., Camden—The S. V. Reeves Stove Co., 22nd and Haynes Sts., will build a 2 story, 40 x 40 ft. stove foundry. Estimated cost, $15,000.

N. J., Camden—H. Read, 1103 Haddon Ave., has awarded the contract for the construction of a 1 story, 67 x 100 ft. garage at 1105 Haddon Ave. Estimated cost, $40,000.

N. Y., New York—The Cutting Larson Co., 109 West 64th St., has awarded the contract for the construction of a 6 story, 100 x 120 ft. automobile service building on 66th St. between 11th and 12th Aves. Estimated cost, $250,000.

O., Cleveland—R. S. Mueller Electric Co., 2143 Fairmount Rd., has awarded the contract for the construction of a 2 story, 63 x 94 ft. factory and garage on East 31st St. near Payne Ave. Estimated cost, $50,000. Noted Jan. 26.

O., Cleveland—The Stone Improvement Co., Rockefeller Bldg., has awarded the contract for the construction of a 1 story, 100 x 150 ft. office and garage on East 83rd St. and Carnegie Ave. Estimated cost, $50,000. Noted Dec. 8.

O., Lakewood (Cleveland P. O.)—H. B. Townsend, c/o W. J. Mooney, Archt., 17430 Woodford Ave., has awarded the contract for the construction of a 2 story, 60 x 100 ft. garage on Detroit Ave. near Fry St. Estimated cost, $40,000.

Pa., Phila.—The Bureau of Water, City Hall, is having plans prepared for the construction of a 1 story, 100 x 160 ft. garage and machine shop on 28th and Cambria Sts. Estimated cost, $60,000. Private plans.

Pa., Phila.—J. M. White Co., 1116 Olive St., has awarded the contract for the construction of a 2 story, 16 x 17 ft. and 54 x 60 ft. factory at 1122-28 Olive St., for the manufacture of wire braiding. Estimated cost, $25,000. Private plans.

Pa., Sharon—The Wilton Tool Mfg. Co., c/o U. Wilton, 2123 Grand River Ave., Detroit, Mich., has awarded the contract for the construction of two factories, 1 story, 20 x 100 ft. and 1 story, 50 x 200 ft., here. Estimated cost, $50,000. Noted Jan. 26.

Wis., Milwaukee—The Wisconsin Dye Wks., 614 Mitchell St., is having plans prepared for the construction of a 1 story, 60 x 120 ft. garage on 8th Ave. Estimated cost, $40,000. H. W. Voelz, 86 Michigan St., Archt. and Engr.

Wis., South Milwaukee—The Bucyrus Co. is receiving bids for the construction of a 1 story, 60 x 278 ft. iron foundry. F. D. Chase, Inc., 645 North Michigan Ave., Chicago, Engrs.

General Manufacturing

Cal., Newman—The Natl. Ice Cream Co., 371 Guerrero St., San Francisco, is having plans prepared for the construction of a 1 story ice cream plant here. Estimated cost, $40,000. J. T. Ludlow, 420 Montgomery St., San Francisco, Archt.

Cal., Riverbank—The Atchinson, Topeka & Santa Fe Ry., 605 Market St., San Francisco, has awarded the contract for the construction of an 84 x 134 ft. ice plant, here.

Conn., Waterbury—C. J. Bailey, Archt., 63 Bank St., is receiving bids for the construction of a 2 story, 60 x 120 ft. cracker plant on West Liberty St., for the Natl. Biscuit Co., 22 Spring St.

Ill., Chicago—The Franklin Mfg. Co., Chester and Clybourn Aves., manufacturer of asbestos material, has awarded the contract for the construction of a 3 story, 25 x 40 ft. addition to its factory. Estimated cost, $15,000.

Ill., Chicago—The Vienna Model Bakery Co., 1040 Vernon Park Ave., is receiving bids for the construction of a 3 story, 120 x 140 ft. bakery at 1226 West Congress St. Estimated cost, $150,000. McCormick Co., Century Bldg., Pittsburgh, Pa., Archts.

Ill., East St. Louis—The Obear Nestor Glass Co., Bway and Belt St., has awarded the contract for the construction of a 1 story, addition to its glass factory. Estimated cost, $75,000. Noted Jan. 12.

Ill., Kankakee—The Kankakee Rug Cleaners, 1145 South Osborne Ave., are having plans prepared for a 2 story, 50 x 125 ft. laundry and cleaning building. Estimated cost, $150,000. Private plans.

Ill., Park Ridge—The Northwestern Ice Co., will receive bids until Feb. 15 for the construction of a 1 story, 50 x 130 ft. ice cream plant. Estimated cost, $40,000. W. C. Robinson, Pres. Architect's name withheld.

Ind., Bloomington—Showers Bros. Furniture Co. plans to build a furniture factory. Estimated cost, $500,000. H. K. Ferguson Co., 6523 Euclid Ave., Cleveland, O., Archts.

Ind., Muncie—The Ball Bros. Glass Mfg. Co., 9th St. near Macedonia St., will build a 2 story, 90 x 300 ft. storage and manufacturing plant. Estimated cost, $150,000.

La., New Orleans—The Valley Ice Co. plans to build an ice plant (100 ton capacity) on Rochelbl Ave. and Republic Sts. Estimated cost, $30,000. C. A. Vitter, 1125 Julia St., Purch. Agt.

Mass., Holyoke—W. Skinner Co. has awarded the contract for the construction of a 4 story, 70 x 200 ft. silk cloth mill on Bond St. Estimated cost, $100,000.

Mass., Mittineague—The Strathmore Paper Co. has awarded the contract for the construction of a 1 story addition to its paper factory. Estimated cost, $20,000.

Mass., Waltham—B. O. and G. C. Wilson, 196 Cambridge St., Boston, are having plans prepared for the construction of a 4 story, 60 x 200 ft. drug factory on River St., here. Estimated cost, $150,000. H. M. Hope Eng. Co., 186 Devonshire St., Boston, Engrs.

Md., Baltimore—The Amer. Ice Co., Calvert Bldg., is having preliminary plans prepared for the construction of an ice storage plant on Cough and Regester Sts. Estimated cost, $50,000. W. S. Engliss, care of owner, Engr.

Minn., Cloquet—The Northwestern Paper Co. is having plans prepared for the construction of a 3 story sulphite pulp mill. Estimated cost, $500,000. C. I. McNair, Mgr. G. F. Hardy, 309 Bway., New York, Archt. and Engr.

Minn., Newport—The Farmers Terminal Packing Co., 920 Commerce Bldg., St. Paul, is having plans prepared for the construction of a 1 story, 100 x 100 ft. ice plant. Estimated cost, $60,000. H. Edmunds, Secy. Newstrom-Lindquist Co., 810 Lumber Exchange, Minneapolis, Archts.

Mo., St. Joseph—The Bd. of Managers of State Institutions, Jefferson City, is having plans prepared for the construction of a 2 story kitchen, bakery and storage building, at State Hospital No. 2, here. Estimated cost, $150,000. Siemens & Arnhold, Bartlett Bldg., Archts.

Mo., St. Louis—E. Lantz Archt., 603 Post Dispaten Bldg., is receiving bids for the construction of a 5 story, 63 x 90 ft. factory and warehouse at 1130 South 6th St., for J. Weisert Tobacco Co., 1120 South 6th St. Estimated cost, $70,000. Noted Feb. 2.

Mo., St. Louis—The Natl. Chair Co., Main and Clark Sts., plans to build a 2 story chair factory on East Grand and Bulwer Sts. Estimated cost, $60,000. J. J. Yawitz, Pres. Architect not selected.

Mo., St. Louis—J. Wiesert Tobacco Co., 1120 South 6th St., is having plans prepared for the construction of a 5 story, 63 x 90 ft. factory and warehouse on 6th St. Estimated cost, $70,000. J. Wiesert, Pres. E. Lantz, Post Dispatch Bldg., Archt.

N. Y., Brooklyn—The Amer. Tobacco Co., 54 Park Ave., has awarded the contract for the construction of a 7 story, 50 x 90 ft. factory on Sanford St.

N. Y., New York—The Knickerbocker Ice Co., 45 East 42nd St., has awarded the contract for the construction of a 7 story, 70 x 90 ft. ice plant on Elizabeth St.

O., Cleveland—H. C. Benjamin, 3085 Lincoln Blvd., has awarded the contract for the construction of a 2 story, 50 x 60 ft. laundry at 1443 East 120th St. Estimated cost, $40,000.

O., Columbus—H. C. Goodman Co., 31 North 4th St., is having plans prepared for the construction of a 3 story, 160 x 240 ft. and 64 x 200 ft. shoe factory on West Broad St. Richards, McCarty & Bulford, 584 East Broad St., Archts. Noted Jan. 12.

O., Dayton—The Terminal Ice & Cold Storage Co. will receive bids until Feb. 6 for the construction of an 8 story, 135 x 150 ft. refrigerating and cold storage plant on Baker and Ludlow Sts. Estimated cost, $500,000. G. B. Bright Co., 103 Marquette Bldg., Detroit, Archts. Noted Jan. 6.

Okla., Atoka—The Public Service Co. of Oklahoma, 107 East 4th St., Tulsa, c/o J. McCrary, Treas., plans to build a 48 x 84 ft. ice plant, here. Estimated cost, $15,000, Private plans.

Pa., Altoona—The Confederated Home Abattoir Co., 123 Willow Ave., has purchased a site on Eldorado Rd. and plans to build a 3 story, 100 x 130 ft. meat packing plant. Estimated cost, $150,000. F. Rider, Secy.

Pa., Annville—The Greeb Shoe Co., 531 Market St., Phila., has had plans prepared for the construction of a 1 story, 51 x 178 ft. shoe factory, here. Estimated cost, $125,000. H. T. Haner, 3110 West Columbia Ave., Phila., Archt.

Pa., Johnstown—The Leopold Bakery, Haynes St., will open bids about April 1 for the construction of a 3 story, 50 x 120 ft. bakery. Estimated cost, $150,000. G. L. Leopold, Mgr.

Pa., Norristown—The Norristown Journal has awarded the contract for the construction of a 3 story, 30 x 60 ft. printing plant on Main St. Estimated cost, $25,000.

In

1921

We published 2277 Machine-tool and Machinery-wanted items, and 3037 items on new and enlarged Metal-working Shops and General Manufacturing Plants

Are you making the most of the opportunities offered in these columns

Pa., Phila.—The Boice Folding Box Co., 4020 Spruce St., has awarded the contract for the construction of a 2 story, 50 x 56 ft. folding box factory on Ogden and Hatton Sts.

Pa., Phila.—Collins & Aikman have awarded the contract for the construction of a 6 story, 62 x 120 ft. plush factory on Viola and 51st Sts. Estimated cost, $110,000.

Pa., Phila.—The Curtis Publishing Co., c/o C. H. K. Curtis, Pres., Independent Sq., is having plans prepared for the construction of a 3 story, 120 x 150 ft. printing plant on 7th and Sansom Sts. About $200,000. F. C. Roberts & Co., Real Estate Trust Bldg., Engrs.

Pa., Phila.—The Ferris Shoe Co., Monnouth and Janney Sts., Frankford, is having plans prepared for the construction of a 3 story, 260 x 293 ft. shoe factory on 6th St. and Duncannon Ave., here. Simon & Simon, 239 South Juniper St., Archts.

Pa., Phila.—The Penna. Sugar Refinery Co., 1037 North Delaware Ave., has awarded the contract for the construction of a 2 story, 70 x 137 x 175 ft. sugar factory on Delaware Ave. and Laurel St. Estimated cost, $50,000.

Pa., Phila.—S. & M. Dye Wks., Inc., Schillier and Richmond Sts., has awarded the contract for the construction of a 2 story, 49 x 162 ft. wool factory. Estimated cost, $30,000.

Pa., Phila.—The Tasty Baking Co., 2335 Sedgley Ave., has awarded the contract for the construction of a 5 story, 100 x 100 ft. bakery on Hunting Park and MacMichael Sts.

R. I., Woonsocket — Jules Desurmont Worsted Co., Fairmount St., will soon award the contract for the construction of a 2 story addition to its yarn mill. Estimated cost, $75,000. Private plans.

Va., Petersburg—The Cockade City Mills, Inc., is having plans prepared for the construction of a flour mill, to consist of a 6 story, 36 x 72 ft. main building, a 2 story, 36 x 60 ft. storage annex, and a 36 x 36 x 80 ft. head house for cleaning and storage, etc., on South St. Estimated cost, $100,000. W. I. Wheary, Secy. and Treas. Architects name withheld.

W. Va., Morgantown.—R. A. Wilbourn Co. has awarded the contract for the construction of a 3 story, 36 x 100 ft. addition to its ice cream plant. Estimated cost, $55,000. Noted Jan. 19.

Wis., Amery—The Mirviss Mfg. Co., 116 Washington Ave., N., Minneapolis, Minn., plans to build a 2 story, 50 x 100 ft. factory here, for the manufacture of overalls. Estimated cost, $60,000. Architect not selected.

Wyo., Cheyenne—The Wyoming Packing Co. has been incorporated to take over the Hammond Packing plant at 1709 Capitol Ave., here, and plans to build a new plant in the near future.

Wis., Madison—J. Feldman Paper Box Co., 515 Regent St., plans to build a 2 story, 60 x 120 ft. box factory. Estimated cost, $50,000. Architect not selected.

Wis., Madison—The Kennedy Dairy Co., 618 University Ave., is having plans prepared for the construction of a 2 story, 85 x 132 ft. dairy on Washington St. Estimated cost, $100,000. E. Tough, 24 East Mifflin St., Archt.

Wis., Marinette—The Hagemeister Products Co., Manitowoc Bldg., Green Bay, has purchased a site on Marinette Ave., here, and plans to build a 2 story, 120 x 125 ft. ice cream factory. Estimated cost, $100,000. G. Schober, Secy. Architect not selected.

Wis., Milwaukee—The American Granite Wks., 15th and Cleveland Aves., plans to build a 1 story, 60 x 350 ft. granite works on 15th Ave., to replace the one destroyed by fire. Architect not selected.

Wis., Prairie-du-Chien—The Prairie-du-Chien Woolen Mill Co. is having plans prepared for the construction of a 2 story, 47 x 187 ft. woolen mill. Estimated cost, $200,000. F. H. Poehler, Pres. Parkinson & Dockendorff, Linker Bldg., LaCrosse, Archts.

Wis., Sheboygan—The S. W. Miller Piano Co., 2020 North 15th St., has purchased a site on Niagara St., and plans to build a 2 story, 56 x 108 ft. piano factory. Estimated cost, $65,000. Architect not selected.

Ont., Peterboro—Red Arrow Tires, Ltd., 309 George St., has awarded the contract for the construction of a 2 story tire factory. Estimated cost, $35,000.

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The Bedaux Principle of Human Power Measurement

Origin, Definition and Scope—the B, or Unit of Measurement—Application to Compensation of Labor—Isolation from Methods, Equipment and Piece Rates—Simplicity of Records

By L. C. MORROW
Managing Editor, American Machinist

THE industrial world is well acquainted with several management, production, or efficiency systems that have as their aim the scientific determination of the most economical methods and use of equipment, the production that may be expected from labor, and the remuneration that should be accorded for that production. It has not become acquainted to any great extent with the Bedaux principle of human power measurement and its application in industrial plants, which it is the purpose of this article to explain.

The Bedaux system is being practiced by the Chas. E. Bedaux Co., engineers, of Cleveland, Ohio. Mr. Bedaux originated the principle and developed the system. So far as may be said of any pioneer work, it has passed the strictly experimental stage. It is now being used in the United States in some of the plants whose names and products are known to everyone. The system is characterized by the fact that it deals only with the measurement of human power, not entering the field of method and equipment. What part it plays in management will be shown.

As defined by its originator, the Bedaux principle of human power measurement is a rule of action around which a system has been built whereby there can be expressed in one common unit the work done by every human being, whether laborer or supervisor, in relation to the work that should be done. Its purpose is to provide a common denominator to which productive activity in all industries can be reduced.

Mr. Bedaux's extension of the definition states that the system permits just reward and promotion, enables accurate determination of the relation of requirement to capacity and makes possible the comparison of productive against waste effort, with the constant and exact knowledge of what should be correct in all cases.

From these statements the evident hypothesis is that the principle is definitely intended to possess a scope that will permit of its application to any productive process of any magnitude. The reader must decide whether or not the hypothesis is upheld.

The principle and system exist as the result of Mr. Bedaux's attempts to supply a substitute for the usual time-study methods which he became convinced were possessed of inherent weaknesses, in that they lacked a standard of measurement for labor, considered only the actual time to perform an operation, and did not take account of the nature of the strain on the human body. This conclusion was formed during the first several years that Mr. Bedaux spent in America, where he had come from France. He worked at many jobs, some among them bringing him into contact with time-study methods, affording the knowledge of tremendous waste in industry, and proving the existence of the field for the industrialist, or industrial engineer. He eventually engaged in time-study and efficiency work, returning for a time to France to practice.

His experience as a whole led him to believe that no matter how carefully a time-study is made, there is almost certain to be an inequality of values—some will have soft jobs, some will have better machines, some will fail because of the fault of management. These observations led to the belief that man should be considered as a force, renewed by rest, food and thought; that the force is spent in certain elementary performances, lifting, pulling, pushing, pressing; and that the nature of a movement and the frequency of its repetition determine the amount by which the force is drawn upon. The result of these beliefs was an attempt to determine the elementary motions employed by man in working, and the rest periods related to them, so that the values ascertained could be used as a basis in all time-study work.

To concretely express his conclusions, reached in this manner, and strengthened by experiment, Mr. Bedaux (in 1911) formulated a law:

> *For a muscular effort of a given power the ratio of strain is directly proportional to the rapidity of motion and completion of the cycle.*

and a corollary:

> *Rapidity of motion is inversely proportional to weight handled, pressure applied and length of cycle.*

For example, to illustrate the law, wrapping a box of safety matches in light-weight paper would require only slight muscular effort and the motion and the completion of the cycle would be of great rapidity. The ratio of strain would be great. Wrapping a two-foot cube box weighing forty pounds in heavy tarred paper would require great muscular effort and the motion and the completion of the cycle would be of low rapidity. The strain would be relatively slight. The corollary may be applied to the same example.

The first law and its corollary were later supplemented by a second law:

> *For a muscular effort of a given power the duration of work and rest periods is inversely proportional to the rapidity of motion.*

Reverting to the example of the wrapping of the two boxes, the second law means that since the rapidity of

motion in wrapping the matches is great, the work and rest periods should be short, while they should be long for the operation of wrapping the large heavy box.

The application of these laws to time-study was of course the embodiment of the consideration of strain. The results seemed to the originator of the laws to reduce to such an extent the inequalities in values that he began to standardize his data by building up a curve showing the rest or relaxation times that should be considered as necessary to offset working times, the whole based on length of cycle. This curve, begun in 1911 and finished in 1916, is the key part of the present system. It is called the relaxation curve and its limits for relaxation time in proportion to working time are 15 per cent and 210 per cent.

In practical application the time-studies are quite different from those made in usual time-study practice, both in nature and purpose. They are conducted by practical workmen employed in the departments studied in order to facilitate understanding on the part of all employees of the important part strain plays in the determination of job values. Moreover the time studies are used merely as a check so far as productive motions are concerned. They do, however, assume considerable importance in the analysis of all that is not strictly productive motion, as they are used in verifying the established strain ratios. It is considered that the form of time study generally practiced, while it shows inequalities of time in repeated fractions of operations, does not analyze the causes of the inequalities, and therefore tends toward erroneous conclusions.

In applying the system it was found that sequence of motion had a strong bearing upon strain. For example, if a sequence is made up of thirty motions,

DEPT. SECTION QUARTER, 19

	OPERATORS			HOURS			BEDAUX					OPER	ALLOWED Bs		
Week Ending	Prod.	Non-Prod.	Below Stand.	Product.	Non-Prod.	Total	Productive on Stand.	Productive at 60	Set up	Scrap	Total	B-Hr.	To Equal Standard	Idle Time	Breakdown
4-11-21	33	11	11	1561.0	540.0	2101.0	95040			464	95524	69.0	6976	3095	190
4-18-21	34	12	9	1637.0	554.0	2191.0	105332			343	105675	72.0	5972	3455	730
4-25-21	34	11	9	1035.0	367.0	1402.0	70567			442	71009	72.0	4626	1435	175
5-2-21	34	12	4	1593.0	576.0	2169.0	116687			449	117136	73.0	9408	340	490
5-9-21	27	12	3	1304.0	576.0	1880.0	97668			490	98158	80.7	2317	635	
5-16-21	29	12	6	1407.8	552.9	1960.7	103030			691	103721	73.9	5306		
5-23-21	31	14	7	1562.7	645.1	2207.8	109578			960	110538	73.9	6084		75
5-30-21	33	15	7	1634.4	706.7	2341.1	118157			696	118853	74.5	6549		
6-6-21	34	15	4	1321.4	593.1	1914.5	95504			934	96438	76.5	3764		75
6-13-21	34	15	5	1553.2	693.3	2246.5	110564			3070	113634	77.0	3988		
6-20-21	30	13	9	969.6	451.3	1420.9	78801			971	79772	86.2	1430		
6-27-21	31	14	2	1427.5	648.4	2075.9	122687			783	123470	85.9	1244		
7-4-21	30	13	1	1573.9	629.0	2202.9	131050			1690	132740	83.3	380		
Quarterly Fig.															

	DIVISION OF PRODUCTIVE PAYROLL						COST PER B					
Week Ending	Total	Prod. at Std.	Prod. at 60	Set up	Scrap	Allowance	Product.	Stand.	Prod. at 60	Set up	Scrap	Allow
4-11-21	$790.67					$129.00	$0.00532	$0.00696				$0.00136
4-18-21	870.47					116.60	0.00526	0.00716				0.00110
4-25-21	571.01					57.80	0.00509	0.00727				0.00092
5-2-21	903.08					41.60	0.00774	0.00739				0.000357
5-9-21	786.33					58.30	0.00805	0.00744				0.000596
5-16-21	839.32					77.20	0.00815	0.00741				0.000749
5-23-21	879.77					79.00	0.00803	0.00731				0.000721
5-30-21	925.76					69.10	0.00784	0.00725				0.000584
6-6-21	748.16					59.60	0.00783	0.00721				0.000624
6-13-21	841.38					76.65	0.00760	0.00691				0.000693
6-20-21	557.97					31.80	0.00705	0.00668				0.000403
6-27-21	785.57					7.85	0.00640	0.00634				0.00006
7-4-21	846.99					2.45	0.00645	0.00643				0.00002
Quarterly Fig.												

FIG. 1—BEDAUX

The heading *Operators* covers the total number of operators, which equals the productive plus the nonproductive. The column *Below Standard* shows the number of productive operators below standard. The heading *Hours* covers the productive and nonproductive hours worked by the department and their total. The heading *Bedaux* covers in the column *Productive on Standard* the number of Bs produced by the productive operators on work on which B values have been set. The figures are obtained from the work records. The column *Productive at 60* is for record on operations on which no B values have been set. The column *Set-up* is used to record Bs on set-up work on which B values have been set. The column *Total* equals the sum of the other columns (in the example shown "Productive on Standard" plus "Scrap"). It represents the total energy expended. The *Operator B-hr.* is equal to the "Productive on Standard" divided by the number of "strictly productive hours." The "strictly productive hours" equals "Productive on Standard" in Bs, divided by "Productive Hours" minus the quantity *Total* (under "allowed Bs") minus Bs allowed to equal standard, divided by 60. For example, to obtain the *Operator B-hr.* in the first line,

$$\frac{95{,}060}{1{,}561 - \frac{18{,}511 - 6{,}976}{60}} = 69 \text{ (approx.)}$$

The value 69 is

fifteen of them identical, the strain will be greater if the fifteen identical ones are together than if they alternate with the others. As a consequence there was built up a table of added allowances on the sequence of motion. In the same way another table of allowances was made to take care of the effect upon strain of the position of the body. As an example, strain is greater when performing an operation with the elbow at the height of the shoulder rather than at the height of the waist.

Once having the capacity to determine the exact nature of the strain, and therefore the exact allowance for relaxation required, the industrialist is in position to arrive at a figure of effort and relaxation combined which becomes comparable in all cases. It is necessary however to have a unit of measurement, or in other words to make uniform application. The Bedaux system reduces everything to what would ordinarily be called points, but which the system terms Bs.

A B is a fraction of a minute of work plus a fraction of a minute of rest, always aggregating unity, but varying in proportions according to the nature of strain.

Continuing the example of the simple operations of wrapping the two boxes: If because of the nature of the operation on the wrapping of the small box the allowance for rest must be 160 per cent, the base cycle of performance being one second, the total becomes one second plus 1.6 sec., which equals 2.6 sec., or B0.0433 (2.6 ÷ 60). And if because of the nature of the operation on the wrapping of the large box, the allowance for relaxation must be 30 per cent, the base cycle of performance being four minutes, the total will be four minutes plus 1.2 min., which equals 5.2 min. or B5.2. The two oper-

2446-10-11-21-1500

ALLOWED Bs			Dept. B-Hr.	NON-PRODUCTIVE Bs						
Reoper	Misc.	Total		Supervision	Handling	Clerkship	Maintenance	Shutdown	Total	Week Ending
1150	7100	18511	61.0	2880	29505				32385	4-11-21
1215	4880	16252	64.0	2880	30345				33225	4-18-21
734	985	7955	68.0	1840	20180			4160	26180	4-25-21
1627	370	5635	73.0	2880	31650				34530	5-2-21
1593	3304	7849	75.0	2880	31665				34545	5-9-21
1115	4024	10444	70.1	2880	30594				33474	5-16-21
1726	3928	10813	70.1	2880	35826				38706	5-23-21
1992	987	9528	72.3	2880	39522				42402	5-30-21
1731	2588	8258	72.3	2358	32184			1044	35586	6-6-21
1900	5200	11088	71.1	2880	38718				41598	6-13-21
1349	1992	4771	81.2	2088	24198			792	27078	6-20-21
		1244	85.9	2880	36024				38904	6-27-21
		380	83.3	2880	34860				37740	7-4-21
										Quarterly Fig.

Non-Prod. Payroll	COST PER B				RATIO OF			Super.	Base of Super. Premium	Premium		
Total	Non-Prod.	Std. N-Prod.	Total	Std. Total	Allow to Std.	N.-Prod. to Prod	Std. Tot. to Tot.	B-Hr.		Bs		Week Ending
$233.47	$0.00245	0.0020	$0.01077	$0.01773	0.195	0.29		100.4				4-11-21
254.07	0.00241	0.0020	0.01067	0.00916	0.154	0.29		55.0				4-18-21
186.52	0.00264	0.0020	0.01073	0.00927	0.113	0.33		58.8				4-20-21
231.33	0.00198	0.0020	0.00972	0.00939	0.0483	0.256		70.6				5-2-21
231.57	0.00236	0.0020	0.01039	0.00944	0.0402	0.294		68.2				5-9-21
224.51	0.00217	0.0020	0.01032	0.00941	0.101	0.266		63.8				5-16-21
257.25	0.00230	0.0020	0.01033	0.00931	0.0987	0.286		63.2				5-23-21
269.80	0.00228	0.0020	0.01012	0.00925	0.0806	0.291		66.2				5-30-21
240.02	0.00251	0.0020	0.01034	0.00921	0.0857	0.320		65.8	57.5	8.3		6-6-21
251.67	0.00227	0.0020	0.00987	0.00891	0.1002	0.298		64.2	58.5	5.7		6-13-21
185.58	0.00235	0.0020	0.00943	0.00868	0.0603	0.331		74.7	59.7	15.0		6-20-21
239.13	0.00194	0.0020	0.00834	0.00834	0.0094	0.303		85.9	60.0	25.9		6-27-21
232.24	0.00177	0.0020	0.00822	0.00843	0.0003	0.274		85.5	60.0	25.5		7-4-21
												Quarterly Fig.

ANALYSIS FORM

a measure of the operators in the department. It represents the operators' speed while working on productive work.

The columns headed by *Allowed Bs* are self-explanatory. The figures under *Department B-Hr.* measure the department as a whole (in contra-distinction to the values measuring the operators on strictly productive work). They are attained by dividing the "Productive on Standard" by the total hours of the producers. To obtain the 61 in the first line, 95,060 ÷1,561 = 61 (approx.).

The columns under *Non-productive Bs* are self-explanatory. So are the columns under *Division of Productive Payroll* and *Cost per B*, with one exception, the column *Standard Non-productive*, which is determined by observation. The columns under *Ratio of* are self-explanatory. The figures under *Supervision B-hr.*, which measure the supervision, are found by dividing the total actual B cost into the product of the department B-hr. and the standard total B cost. To obtain the value in the first line, 61 × 0.01773 ÷ 0.01077 = 100 (approx.).

The *Base of Supervision Premium* is determined by the ratio of trained help to new help. The *Premium Bs* equal the supervision B-hr. minus the "Base of Supervision Premium."

Under ideal conditions the figures in the three columns Operator B-hr, Department B-hr and Supervision B-hr should be the same.

ations should produce in each case a number of pieces such as to make an equal number of Bs in a given time. The number of pieces would be in this illustration approximately 13,860 and 115 respectively.

If in wrapping the small box the operator produces 18,000 pieces in a day of 10 hours, the productive value is 779 B (18,000 × 0.0433). As the value of the strain has been determined for the wrapping operations on both boxes, the same, or another operator should produce with equal application, skill and strength, a value, in working on the large box, of 779 B, or 150 wrapped boxes (779 ÷ 5.2). Because of the exact determination of strain in each case, a difference in the quantities of Bs produced would indicate a difference in application, in skill, or in strength.

In all lines of endeavor a human being should reap reward directly proportional to his productive effort, so that consideration of reward must enter into a proper system for the determination of remuneration. How reward is provided in the Bedaux system is best shown by continuing with the example used heretofore:

As allowance for relaxation has been introduced into the expression of the unit, the operator taking the normal amount of rest should produce, on any job, 60 B per hour. The operator who wraps 18,000 small boxes per day, aggregating an energy value of 779 B, exceeds normal by 179 B and his B-hr. measurement becomes 77.9. It is with the expectation that he will produce normally, or at the rate of 60 B per hour, that he is given remuneration at a given rate of say 30 cents per hour, a price representing the value of that skill normally exerted. The measurement of 77.9 B-hr. indicates two things: first, that he has exerted himself beyond normal and is therefore entitled to a reward; second, that by electing to produce more than standard he has compelled a performance above normal from those whose co-operation he must have in order to produce at all, *i.e.*, indirect labor and supervision. Their extra efforts in turn indicate that the operator is entitled to only a part of the remuneration for production above normal.

The reward to the operator may arbitrarily be placed at 75 per cent of the money value of the Bs produced in excess of standard, namely 179. The other 25 per cent may logically be placed in a reserve fund to provide for the reward of indirect labor and supervision on the basis of their respective B-hr. or individual measurement.

Assume that on another day the same operator produces 16,000 pieces or 69.3 B in nine hours, and that during the tenth hour, because of shortage of material, lack of space or receptacles, breakdown of machinery or tools, or any other cause beyond his control, the operator is compelled to remain idle. Being an hourly worker, he receives pay for the idle hour, or the equivalent of 60 B, a total of 753 B for nine hours' actual work. The B-hr. value for the operator is then 77, but the B-hr. measurement of the performance of the department is 69.3. The analysis of the cause which compels the reduction from 77 to 69.3 permits the measurement of all branches incidental to production, and of supervision.

Dept. Sect. Week Ending

	NO. 1238	B-HOUR LAST WEEK 82				NO. 1246	B-HOUR LAST WEEK 38				NO.	B-HOUR LAST WEEK		
	NAME Harry Duell					NAME John Russo					NAME			
Day	Hours	Total Bs	Scrap Bs	B Hour	Premium	Hours	Total Bs	Scrap Bs	B Hour	Premium	Hours	Total Bs	Scrap Bs	
M	10	840	–	84	1.26	10	464		46					
T	10	864	–	86	1.38	10	483		48					
W	10	902	–	90	1.59	10	390		39					
T	10	856	–	86	1.35	10	296		40					
F	10	830	–	83	1.21	10	455		49					
S	5	400	–	80	.52	5	290		58					
WEEK	55	4692		84.8	7.31	55	2508		46.7					

FIG. 2—PLANT POSTING SHEET

The cut shows two units of the posting sheet. General practice is to make the posting sheet large enough to contain postings of 18 or more operators. Operator No. 1238 is figured at a rate of 42 cents per hour. The record of operator No. 1246 is posted in red ink because his measurement is below 60. One of the methods used to encourage operators to pass 60 B per hour is to post all below 60 in red.

The measurement of supervision for a department is made as follows: The standard productive cost per B, the actual productive cost per B, the standard non-productive cost per B and the actual non-productive cost per B are determined. The two productive costs and the two non-productive costs are added in each case to give the total standard cost per B and the total actual cost per B for the department.

The department B-hr., obtained by subtracting from the operator B-hr. the units allowed for causes beyond the control of the operator, permits a comparison between actual accomplishment and possible accomplishment and gives the true measure of supervision when cost is taken into consideration. The measurement of supervision expressed in percentage, or as the ratio of standard to actual, is obtained by multiplying the standard B cost by the department B-hr. and dividing the product by the actual B cost.

It becomes evident that if a supervisor allows his department B-hr. to decrease through losses of possible production, his actual B cost increases beyond standard, automatically reducing the supervision B-hr. below the department B-hr. thus penalizing supervision by oblig-

ing it to accept less than the possible financial returns.

In principle the measurement of non-productive departments, when B values are not directly established for the work of the individual, is obtained in the same way as is the measurement of supervision. The only difference is that the B cost of operating the department affected becomes the principal factor in the calculation.

Inspection is another form of endeavor to be cared for. In the application of the B system inspection is divided into preventive and positive. Preventive, or floor inspection, is rewarded on the relation of department B-hr. to percentage of scrap, in a ratio making it more profitable to the inspector to have a department B-hr. of 60 with no scrap than a higher B-hr. with a scrap percentage above zero.

All operations of positive inspection have a B value that allows treatment similar to that of any productive work. B values on rejected pieces are of course higher than on accepted parts, which places rejection at a premium. But the salvage department, benefitting even more by sending back into process pieces erroneously rejected by positive inspection, prevents abuse. Thus a treble check, without decrease of possible production, is obtained.

Planning becomes merely the relating in detail of the B values of parts to be manufactured to the B capacity of departments, sections or groups, indicated by operator and department B hours.

Two forms are necessary in keeping record of accomplishment, an analysis sheet and a plant posting sheet. Examples are shown in Figs. 1 and 2. A careful study of them will indicate the quantity of clerical force required to keep the records for a plant of a given size.

Recapitulation

A recapitulation of the salient features of the Bedaux principle and system is afforded by these statements:

The principle aims to establish a standard of measurement of labor.

The essential part of the system is a relaxation curve, its values determined by trial. It is based on length of cycle of operation only but is supplemented by tables of added allowances controlled by sequence of motion and position of the body.

The unit of measurement of accomplishment, called a B, is one minute, divided into time for work and time for rest.

All computations are made in Bs. The actual money paid to a worker is determined by multiplying his hourly rate by the number of hours worked. It is given to him in an envelope. In another envelope he is given an additional amount determined by multiplying all Bs over standard by three-fourths of his hourly rate divided by 60.

There are no piece prices.

Supervision and indirect labor are rewarded for extra effort reflected in production.

Method and equipment do not enter into the system. (Improvements in method and equipment call for the setting of revised B standards.)

There is one unit to use in all records of production of individual and department. Two forms are necessary.

Painting Machine Tools White

By Frank C. Hudson

I am much interested in the experiment of H. Beckford & Co. in painting machine tools white, as told by Ellsworth Sheldon on page 1013, Vol. 55, of American Machinist.

I don't know when or where it originated, but the first place I ever saw it was in the Pittsburgh Locomotive Works in 1894. It was particularly striking there because of the smoky, murky atmosphere of Pittsburgh at that time, and also because it was not confined to a few machines. Every machine in the shop was resplendent in a coat of white. And, as the manager, the late D. A. Wightman, told me, "it saved its cost in bolts and nuts and other things which were hidden by the shadows on the floor near the machines."

Another experiment was at the old Bullock Electric Co., in Cincinnati, where every machine shone with a coat of aluminum paint.

The fact remains however that few places continue to keep machines painted white or in very light colors. The last paragraph of Mr. Sheldon's article ought to be perfectly true but experience hardly bears it out. At any rate I have never known machines to be kept painted white many years in any given shop. I've always thought I would do it in a shop of my own, but it never seems to last. Perhaps others know where it has.

Removing White Lead from Stampings

By I. B. Rich

All of the problems of making certain pieces of work are, unfortunately, not always confined to the piece itself. Such a case is to be found in the drawing of heavy brake drums for automobiles. On account of the heavy metal handled it is customary to use white lead as the drawing lubricant. The annoying problem is the removal of the white lead after drawing.

When white lead is mixed with linseed oil, as is frequently if not usually done, its removal is quite a task. If, however, the white lead is mixed with kerosene, any of the good cleaners, such as oakite, will remove it without difficulty. This will help considerably in preparing such parts as require a white lead lubricant, for further machining or for assembly.



Making the Latrobe High-Speed Twist Drill

Steel Rolled to Obtain Greatest Density at Points of Wear—Flutes Milled After Twisting —Drills and Shanks Assembled by Unusual Methods

By S. ASHTON HAND
Associate Editor, AMERICAN MACHINIST

IN THE manufacture of high-speed drills the Latrobe Tool Co., Latrobe, Pa., supervises the rolling of the steel from which they are made. Great care is exercised to insure that the steel shall be so rolled as to give high density to the points of greatest wear in the finished drill. For instance, in making a 1⅜-in. drill, an

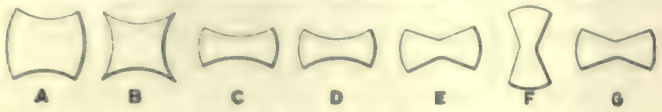


FIG. 1. SUCCESSIVE STAGES IN ROLLING THE BAR

8-in. ingot is cogged under a hammer to a 2-in. square bar and further working is done by rolling. In the first pass between the rolls, the bar is reduced to 1¼ in. square and in the second pass it is brought to the shape shown at *A* in Fig. 1.

The bar is then turned 90 deg. and rolled to the shape shown at *B*. The following passes gradually bring the bar to the shapes indicated at *C*, *D*, *E*, *F* and *G*. At *F* the bar is again turned 90 deg. and then back to the normal position for the last pass at G.

That the methods used in hammering and rolling, result in working the steel to a high density at what will be the lands and cutting edges of the finished drill may be seen by the micro-photographs in Fig. 2. The parts of the bar from which the specimens for the micro-photographs were taken are indicated by the black dots in the section diagrams at the left of each halftone.

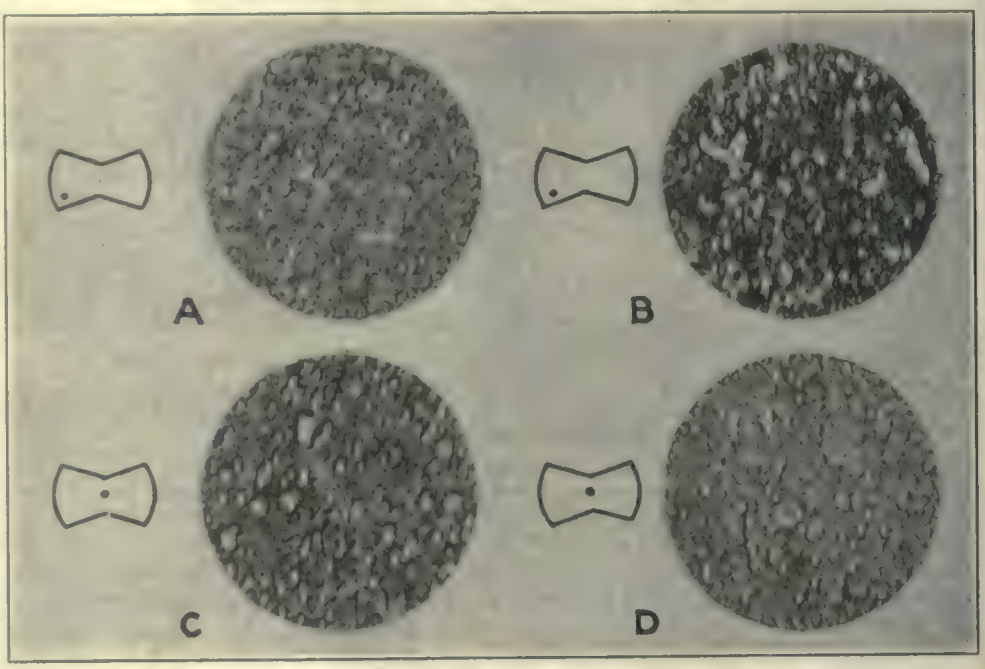


FIG. 2. MICROPHOTOGRAPHS OF CROSS AND LONGITUDINAL SECTIONS

Micro-photographs at *A* and *C* were taken from cross-sections of the bar while those at *B* and *D* were taken from longitudinal sections. The samples photographed were taken from an annealed bar which showed the following analysis: Carbon, 0.66; silicon, 0.20; manganese, 0.23; sulphur, 0.015; phosphorus, 0.013; tungsten, 18.15; chromium, 4.01; vanadium, 1.05. All the photographs show highly worked areas, with the carbides well broken up and evenly distributed.

The drill blanks are cut from the bar on a band saw and packed in pots with one-third charcoal and two-thirds sand for annealing. They are heated in a gas furnace to 1,700 deg. F. and allowed to soak for 10 hr., when the heat is reduced so they will cool to 1,200 deg. F. at the rate of 20 deg. per hour. At this point the gas is turned off and cooling takes place naturally and gradually.

Twisting is done by hand in a machine provided with a number of round plates having central openings of the shape of the rolled bar and free to revolve within an upright barrel. A hot blank is fed through the openings in the plates until the lower end enters a stationary die at the bottom of the barrel. As twisting progresses the stack of plates revolves. The motion of the lower plate is arrested by a pin bringing up against the end of a slot in the die at the bottom, giving the blank a certain amount of twist at the part in the lower plate. The bottom plate now being stationary, holds the bar at that point. As twisting progresses the second plate is brought to a stop, by a pin against the end of a slot in the lower plate and so on until the top plate is stopped, when the blank will be twisted to the helix angle determined by the location of the stop pins and slots. The blank is removed from the machine vertically by a twisting motion. By reversing the direction of motion, the apertures in the plates will be so aligned that the next blank can pass through them and enter the stationary die in the bottom of the machine. Twisting can then proceed as before.

MILLING THE FLUTES

After the blanks have been centered, pointed and rough-turned, the flutes are finished to shape by a milling operation as shown in Fig. 3. This operation is one not generally done on hot-twisted drills, the flutes being finished by grinding and polishing.

The cutters for milling the flutes are relieved in a straight line instead of being eccentrically relieved, as is usual. The reason for this is that when eccentrically relieved cutters used on high-speed steel become dull, they are apt to be scored for a considerable distance

along the relieved part of one or more teeth; and in sharpening them by grinding the radial faces of the teeth, so much metal would have to be ground away that two or three sharpenings would be all they could stand before reaching scrap condition.

Sharpening a fluting cutter on the straight relief is

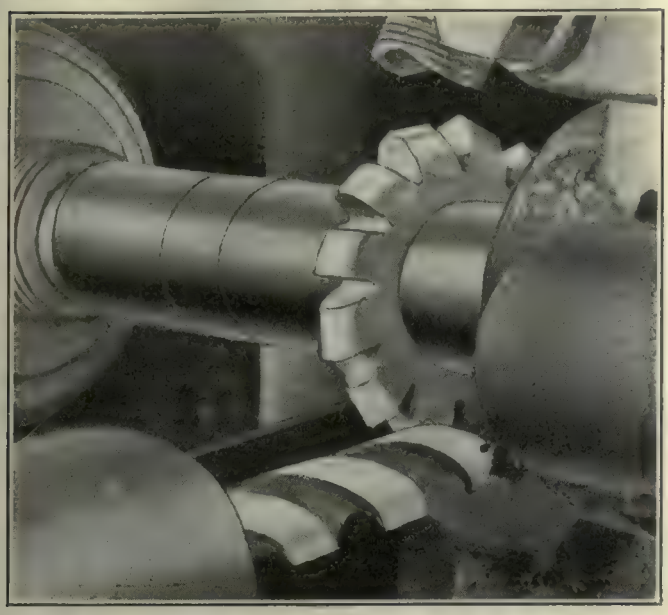


FIG. 3. MILLING THE FLUTES

shown in Fig. 4. The cutter is located on the stud *H* attached to the arm *B*, and the arm rocked while the top of one tooth is in contact with the abrasive wheel. Indexing from tooth to tooth and grinding the top of each sharpens one side of the cutter. The form of the cutter is not symmetrical and while the curves on each side are of the same radius their centers lie in different planes. In sharpening one side of the cutter it lies against the arm *B*. In sharpening the opposite side it is placed on a stud provided with a shoulder and is kept a certain distance away from the arm. Grinding each side of the cutter in different positions in relation to the arm *B* results in giving it the proper shape.

Milling the clearance on the drill lands is done in the usual manner. The setup and operation may be seen in

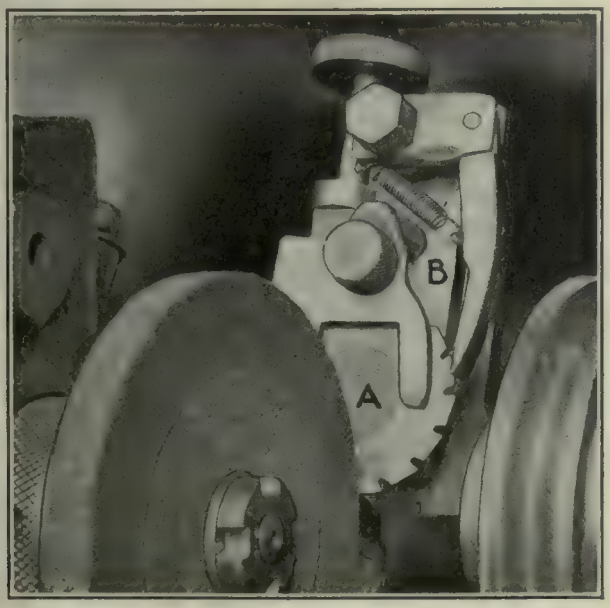


FIG. 4. GRINDING A FLUTING CUTTER

Fig. 5 very clearly and need no detailed description.

Twisted high-speed drills of the two-piece type are attached to their shanks by several methods, according to the size. Drills from $\frac{3}{16}$ to $\frac{7}{8}$ in. are electrically butt-welded to the shanks. From $\frac{5}{8}$ to $1\frac{1}{2}$ in. the shanks are counterbored to a taper of $3\frac{1}{2}$ in. per foot. The mating ends of the drills are turned to the same taper and have a series of fine pitch rings cut on them, very much like a thread without lead.

For drills over $1\frac{1}{2}$ in. the shanks, besides being counterbored to a taper of $3\frac{1}{2}$ in. per foot, are internally threaded on a Lees-Bradner thread milling machine. The mating ends of the drills are turned to the same taper and threaded to fit the shank, the operation being shown in Fig. 6.

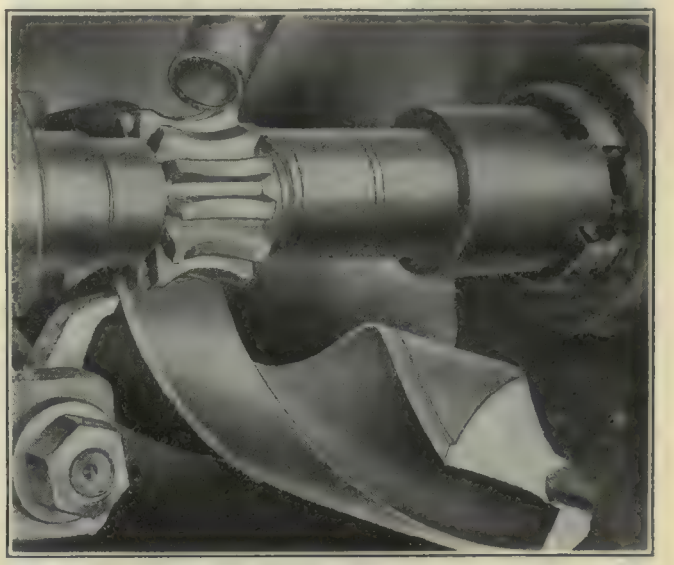


FIG. 5. MILLING CLEARANCE ON THE LANDS

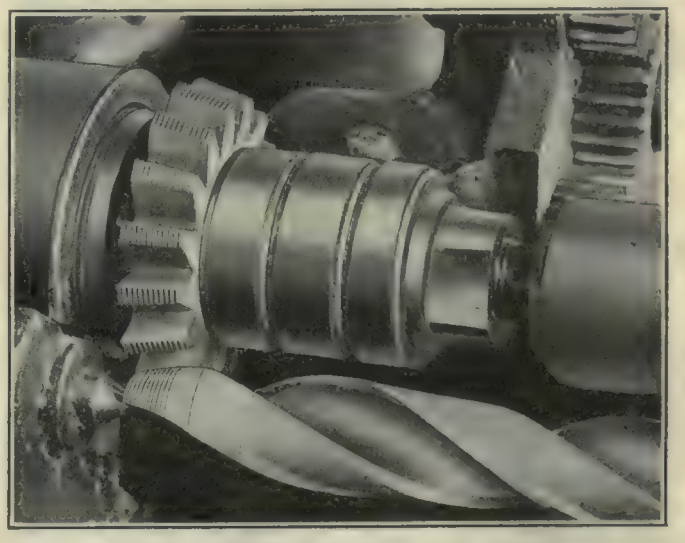


FIG. 6. THREADING FOR THE SHANK

In heat-treating, the drills are preheated to 1,500 deg. F., in a circular gas-fired furnace, and allowed to soak at the saturation point for about 20 min., after which they are transferred to the high-heat furnace where the temperature is raised to 2,500 deg. F. They are then quenched in oil. Tempering is done in molten saltpeter at a temperature of 1,100 deg. F., where the drills are held for about 2 min., after which they are sand blasted at the point where the sockets are to be attached.

Drills with sockets loosely assembled by hand are put

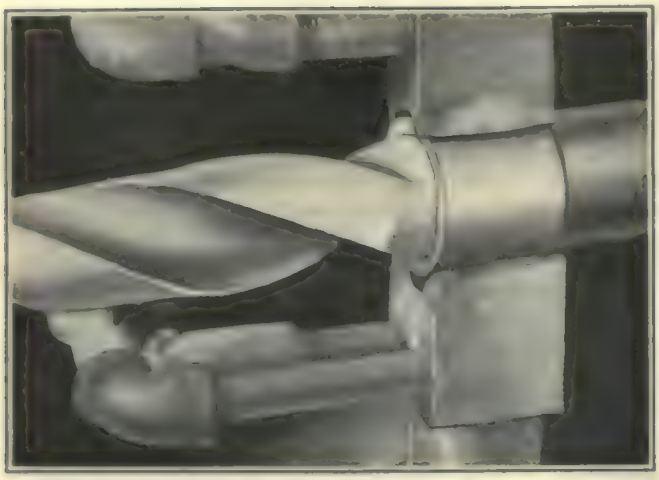


FIG. 7. HEATING IN THE SPOT-WELDING MACHINE

in a Thompson spot-welding machine, Fig. 7, and heated at the joint to 1,500 deg. F. They are then taken to a spinning lathe and rapidly revolved while the two spinning tools *A* and *B*, Fig. 8, are brought with great pressure against the joints, closing the metal of the shanks



FIG. 8. ATTACHING THE SHANK BY SPINNING

tightly on the drills. To further insure the tightness of the joints they are brazed.

Heating in the welding machine requires about 30 sec., and a surprising thing is that while the metal is brought to a red heat at the joint, the heat is communicated to the rest of the drill so slowly that the temper is not effected at any vital spot, and besides, the drill can be handled at the ends with the bare hand.

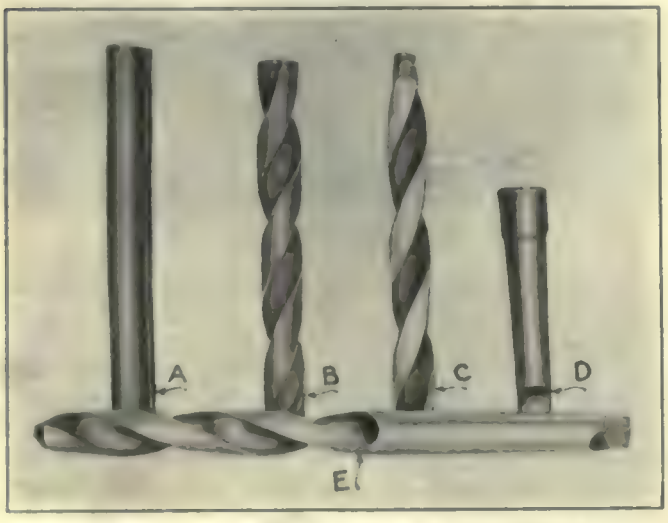


FIG. 9. SOME STAGES OF MANUFACTURE

The drills are then thoroughly cleaned by sand blasting after which they are ground for size and clearance in the direction of their length, the amount of clearance being 0.001 in. per inch of length.

Grinding the Cutting Edges

Next the cutting edges are ground to shape on a Sellers twist-drill grinding machine and finally the trade mark and size are rolled in on the body next to the shank. At this point the drills have been somewhat annealed by heating in the spot-welding machine and the brazing furnace but are still quite hard and it is surprising to see how well the marking rolls stand up to the work.

In Fig. 9 is shown some of the stages through which the drills pass in the course of manufacture. At *A* is a blank as cut from the bar; *B* shows the blank after being twisted, and at *C* after fluting, milling the clearance and the threads. *D* is a taper shank with interior threads milled and the tang formed, while at *E* is a completed drill.

What Are the Worker's Prospects in the Machinery Building Industry?

By P. A. Fredericks

Referring to the article by A. W. Forbes, which appeared on page 667, Vol. 55, of American Machinist, the writer believes that the chart would be much more useful if plotted for "years of experience" instead of "years of age," and if the increase in wages was represented as a percentage instead of in dollars. A chart for draftsmen was published in an article by the writer on page 1069, Vol. 54, which will show what I have in mind. This chart was originally made to form a foundation for reasonable wage advances during the war period and was used as follows:

The man's experience was considered both before and after entering our employ. This was then checked on the chart against what he was able to do. As the chart was based upon data prior to 1914 the above method indicated what per cent he should have been increased in salary if conditions were normal. To this was added a percentage of increase to allow for the increase in the cost of living from the time he entered our employ. The index figure of increased cost of living was taken from the Bureau of Labor statistics.

That this method was fair and the data reasonably accurate was evident by the fact that we lost very few men that we wanted to keep during the entire war period. The men knew how their rates were arrived at and showed confidence in the fairness of the results.

The above method removes Mr. Forbes' trouble of having his "curves upset by the conditions of the past six years," and can be recommended from experience, if used with the judgment and discrimination necessary to any method of determining fair salaries.

It will be noted that for any given individual starting in our employ at any given date, the general chart could be modified by the cost of living index to produce the correct curve for that individual, and this was done in many instances.

The Training of Workers in Manufacture

II. General Conditions of Apprenticeship—Things Necessary for Training—Problems Arising from the School—Plant School vs. Part-Time and Continuation Schools

By J. V. L. MORRIS

THE argument for apprenticeship is briefly this: Such employments as have an extended and recognized field of practice and which enlist the better grade of workingman, utilizing both his technical knowledge and manipulative skill, and requiring an extended period of participation for mastery, and which can be embarked upon in the simpler processes by the immature worker, can be economically prepared for by apprenticeship. The patternmaker's and toolmaker's trades are outstanding examples suggested by this study. Another is the hand compositor's trade in the printing industry. There are, of course, the other somewhat similar trades of the shipbuilding industry and of the railroad shops.

In the Vocational Education Survey of Minneapolis the following reasons are advanced for apprenticeship:

"(1) A more careful selection of men who want to follow the trade results.

"(2) The apprentice advances into journeymanship with more interest in his calling.

"(3) The best time to get full knowledge of different machines and processes is while the learner is young. With proper apprenticeship training the youth learns best methods at the outset, instead of unlearning bad practices later.

"(4) Where school training accompanies shop practice, the youth gains technical mastery over processes which would otherwise be mechanical, and learns to adapt himself to changing conditions as the untrained machine worker never can.

"(5) Wider knowledge of all processes gives him an understanding, even in specialized work, which machine hands cannot have.

"(6) Apprentices of the future, if some better method of teaching can be found, will be not only all-around men, able to cope with every situation, but also men from whom the shop can obtain foremen and technicians.

"Modern industry may even complete an organization in which all the work is done by machinery made almost automatic and operated by machine hands, but will always have a need of the men who are masters of its processes to bind them all together and to direct the labor of the machine worker."

Conditions for Good Apprenticeship Training

It should be stated that the first requirement for satisfactory apprentice training is adequately varied shop experience under good shop instruction. Advocates of the continuation schools for trade training would frequently have one believe that the problem of instruction in the skilled trades is solved by the establishment of such schools. There is no attempt to belittle the utility of that movement in stating that the best of instruction in such schools will never make efficient mechanics without adequate experience in the manipulative phases of the trade, which under apprenticeship can only be obtained in actual shop production.

Two methods are possible to provide this shop experience. One is to provide a separate training shop equipped with all the standard tools of the trade, where general experience may be obtained for at least a part of the apprenticeship. The other is to arrange an orderly program through all the various types of employment at the trade in the regular production shops of the plant, under adequate supervision to see that the shop foremen do not interfere with the satisfactory learning of the trade by keeping the apprentice at jobs unprofitable from the standpoint of learning, or long after the process or operation has been thoroughly learned.

The separate training shop seems of particular importance in teaching the machinist's or toolmaker's trades, though where there is good co-operation from the production departments it may not be necessary. In one plant the apprentices are in the separate training department throughout their apprenticeship. In other plants the period is one or two years, after which they are placed at regular production but under supervision for varied experience.

A matter of prime importance is the quality of the apprentice supervisor. In many plants he has had technical training; but it is probably of greater importance that he have the qualities of a good teacher, a strong human interest in the apprentices, a thorough knowledge of the trades taught, and considerable practical experience in at least one of them himself. Also he should have a personality which will secure him recognition as being on a par with the shop superintendents.

Of almost equal importance is the quality of the shop instructors. It goes without saying that they should be first-class mechanics, chosen because of their liking for the work of teaching, and desirably given some instruction in their teaching. In the Santa Fe shops they are provided at the ratio of one instructor to twenty-five apprentices. A ratio of one to fifteen or twenty apprentices is sometimes recommended. In case there is no separate training department, their positions are usually those of assistant foremen or gang bosses.

For the supplementary instruction provided in the apprentice school there seems considerable variation in the amount of time allotted. In some plants only about two hours is provided per week; in others as much as eight hours is given to it. The usual practice seems to be about four hours a week.

However, it would seem that the amount should vary with the technical content of the trade. If it is the tool or instrument maker's trade, six or eight hours per week is not too much. If it is one of the maintenance trades or one where there is no necessity for acquiring skill in drafting, two or three hours per week may be sufficient for the phases of instruction directly related to the trade in hand.

In many apprentice schools there does not seem to be sufficient attention given to this relating of the school instruction to the trade involved. In many cases all are given the same course, no matter what their trade may be. If only machinists, draftsmen and patternmakers are concerned, there may be some reason in that prac-

tice, as the instruction in these trades should in large measure be similar; but blacksmiths and foundrymen have little use for some of the instruction in drafting and advanced mathematics and are frequently unable to grasp it, as usually they are boys with very meager educations. For them, coupled with fundamental trade arithmetic, there are possible units of applied science, iron and steel metallurgy and the like, which are both interesting and within their grasp, as explaining phenomena which they have observed in their own trades. However, the amount of this instruction required by them is very limited.

There is an opinion among many supervisors that there should be some instruction in the civic-moral field to combat the present industrial unrest, and to prepare the apprentices for their approaching duties as citizens, a matter which may be of greater interest to them at the time of apprenticeship than earlier when they were in public school. To quote from the 1920 report on trade apprenticeship of the National Association of Corporation Schools:

"A system for teaching industrial economics is of vital importance and would, if properly carried out, probably do more to create satisfactory industrial relations than any other single subject."

Of course the matter needs to be handled with much perspicuity, as there would doubtless lurk a suspicion of capitalistic propaganda in the minds of many of the boys, if the instruction were introduced in a school which they were attending under compulsion as a part of their apprenticeship. It should be said that, while practically no courses of this sort were found in the apprentice schools visited, the importance of the type of instruction was generally recognized.

General Instruction

The law of New York State, passed in 1919, establishing part-time and continuation schools, states that the courses of study "shall include among other subjects instruction in American history, the rights and obligations of citizenship, industrial history, economics, the essential features of the laws relating to the industries taught."

The report of the Committee on Education of the New York State Federation of Labor for 1919 contains the following item: "We recommend that courses of study be organized in history, civics, labor, health and compensation laws, and economics, under the guidance of the State Department of Education. If labor is to intelligently exercise its fullest political power, the members of unions and other wage earners should have exact and scientific knowledge of the subjects mentioned."

It is thus seen that both organized labor and the public education authorities endorse such instruction. The citations from the law for part-time schools of one state and from the recommendations of a committee of the labor federation refer primarily to public education, but are believed suggestive of the attitude of the public, and hence worthy of consideration in planning the program of an apprentice school whether under public or private auspices.

In several corporation schools there is an attempt to rate the apprentice on his qualities of character useful in his employment. These are, of course, but estimates of his instructors, supervisors and foremen, but may be highly useful in stimulating the apprentice's recognition of the relation between his work efficiency and his moral qualities, and to the management in selecting individuals worthy of promotion to positions of responsibility.

While adequate shop instruction is urged as of prime importance, the related work of the apprentice school is of sufficient value to recommend teachers of the first quality. Ordinarily they are technically trained, and usually have first-hand experience at the trades whose book phases they are to teach.

The formula $E = M + (T + I)$, borrowed from Bul. 52, Federal Board for Vocational Education, is a satisfactory means for expressing the desirable content in trade training, in which E represents the equipment in skill and knowledge required for efficient service in the trade to be taught; M the manipulative skill required either with tools or in the control of machines; T the technical knowledge essential in the particular trade; I the industrial insight or general trade content desirable as functioning in industrial efficiency.

In some cases it may be desirable to differentiate in the instruction the T, or elements of specific trade technical content in the particular trade, from the I, or those of general trade content. At least that seems the practice in several apprentice schools. The T instructor will be in close touch with the actual work the apprentices are doing, while the I instruction will contribute the factors of more general nature and common to all the trades taught.

In this practice there is sometimes urged a warning against "cold storage" teaching, i.e., of providing instruction which we believe will sometime be useful to the student, but which has no immediate application. There is much cogency in the warning, as there are apprentices who will become excellent mechanics, but who are incapable of assimilating instruction beyond that of immediate application in their work. The solution of the problem may be that worked out at the West Lynn plant of the General Electric Co., where an engineering school has been provided for the high-school graduates and simpler apprentice courses for those who have no aptitude for the advanced work. This has been shown to have been very successful in training the more capable, while offering ample opportunity for training the mechanic of average ability. The Westinghouse Electric Co. provides for the advanced instruction in a voluntary evening technical school. Many progressive communities provide the additional opportunities in public or semi-public evening technical schools.

The practice in the apprentice departments studied was to provide the classrooms inside the plant and as near the shop as possible. It should be noted that an extensive or expensive equipment is not absolutely necessary. For drafting instruction only suitable drawing space with materials are required, and for the other classes comfortable seats and a blackboard. Of course, it probably adds somewhat to the popularity of the apprentice department to provide equipment equal in quality to that of the public schools. In two plants moving picture equipment was available, as used for the mass education provided for all employees. Another has a projectoscope. The railroad-shop schools were stated to have gathered much illustrative material.

This additional equipment may be justified as placing the apprentice school on a par with the public high school, with which it must compete to secure the better type of boys, and for whom it offers equal or superior opportunities to the free public school. But it should be recognized that the apprentice is paying for all

elaborateness of equipment in the difference between the wages paid to apprentices and to those at regular production but with no supplementary instruction; for apprentice instruction must in general be a profitable venture in order to justify it to the directors of an industrial corporation.

The increasing practice seems to be to place the supplementary instruction during the regular working hours. There are some distinct advantages in this practice:

(1) It permits the full time utilization of school instructors most advantageously.

(2) It lessens the possibility of overworking the apprentices by requiring class attendance after they have been exhausted by their shop work, and provides for more time for recreation after work hours.

(3) More is accomplished in the school studies if the students are fresh, and it provides a welcome break in the shop work.

It should, however, be urged in favor of the after-work school:

(1) There is less reason for placing the school instruction during working hours with an eight-hour day than in the former nine- or ten-hour day. In one plant the shops ceased work at 3:45. It would be quite possible for these to provide from one to two hours instruction directly after work, and still give the apprentices time for some recreation. Another company where work ceases at five provides a lunch for the apprentices, after which an hour and twenty minues of class work is provided, which permits the boys to leave at 6:40.

(2) The after-work school permits the employment of instructors on a part-time basis. Usually in this way members of the engineering or drafting staffs or a skilled mechanic can be utilized for the instruction.

(3) There may be so much disorganization of the work of the plant by withdrawal of the apprentices for shop instruction, that the manufacturer may prefer not to employ any apprentices if part-time instruction is required, and an opportunity of learning a trade will thus be lost to the young men concerned.

(4) The apprentice must expect to pay by proportionately reduced rates of pay for his reduced production, resulting from being withdrawn from the shop to attend classes, for the overhead on his idle machine, and for the attendant disorganization of the shop. This disorganization is particularly apparent when, for example, an apprentice is a member of an assembling gang.

One solution of the problem devised at the Watervliet Arsenal is to require that the instruction shall be half on company time and half on the apprentice's, by requiring that on his instruction days he quit at six rather than five.

As the disadvantages seem greater when the apprentice is at regular production than when working in the training shop, it might be possible if a training department is utilized to provide the school instruction on company time while working in that department, and in the advanced years when at regular production, on the student's time. This would lessen the likelihood of over-fatiguing the younger apprentices, and still not unnecessarily disorganize production.

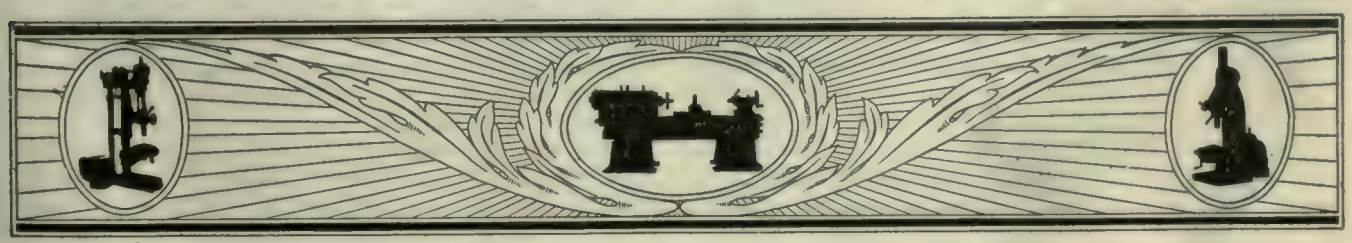
In the plants investigated, the apprentice schools provided by the company seemed in general markedly better than where provided by the public school authorities. Teachers conversant with actual shop conditions were employed. They could be enlisted from the personnel of the company or, if employed at full time, were selected for thorough competency. There was a more harmonious working with the company's administrative force, and a greater assurance of so arranging the apprentice's employment in the shops to assure optimum learning conditions. Moreover, the general management took a greater personal interest in the apprentices, which should assure their meritorious advancement when opportunity afforded.

Some arguments in favor of the part-time school provided at public expense are that it is held a function of the democratic state to provide, as one goal of its educational program, such instruction as will increase the vocational competency of its citizens. Also, the civic-moral instruction desirable can be provided by the authority of the state, presumably neutral as regards capital-labor conflict, without a suggestion of the capitalistic bias accompanying the corporation school. The expense of the instruction under corporation auspices is really borne by the apprentice, as it is to be expected that apprentice training will be a profitable enterprise and that the manufacturer passes on the costs of instruction to the apprentice by reduced rates of pay. In the smaller plants there are no facilities for instruction in the way of a drafting room and classroom and the small number of apprentices does not warrant the employment of an instructor, or properly supervising his instruction.

Somewhat the same discussion recommends that the classrooms be as conveniently accessible to the shops as possible inside the plant. There is little loss of time in passing from shop to school and no necessity is felt for changing from work to street clothes. There is greater co-ordination of school with shop instruction, and a single supervisor may direct both types of instruction. In some cases it may permit the employment of the same instructor for both the shop and school. This practice was noted in the shipyard investigated.

If, however, the plant has no available space or is hostile to supplementary instruction and unwilling to provide it, the public school may be utilized. This is, of course, recommended where there are too few apprentices to form a class or to differentiate the apprentices into classes suited to their varied attainments. In most cases under these circumstances one or two half days are taken for the instruction.

When after-work instruction is provided, one plant has arranged that the classes come directly at the close of work rather than in the evening. This practice is recommended when some or all of the apprentices live at a considerable distance from the plant.



The Power of Life Saving

An Appeal to the Economic and Social Sense of Management

By OTTO P. GEIER, M.D.
Director, Employees Service Department, Cincinnati Milling Machine Co.

THE power of life saving in industry was recently demonstrated to the public in an unusual way. Ten corporations of Cincinnati, through their group of industrial physicians and nurses, through a safety man and a workman, joined forces at the recent Cincinnati Health Exposition to demonstrate to the 100,000 or more visitors that medical supervision in industry is a vital factor in any health program, community or personal; that it is doing for the adult not only what medical supervision is doing for the school child, but that it is a great social and educational force for the employer and the employee, as well as engineering, medical, nursing and dental professions.

To our knowledge, this was the first attempt on the part of industry to crystalize in the form of a public exhibit the purposes and possible accomplishments of industrial medicine. The public ordinarily sees only the unfavorable side of industry as it reflects itself through press reports of labor disturbances and strikes.

This exhibit set forth the fact that the making of men is quite as important as the making of goods. It tried to prove that intensive health work in industry was a practical paying proposition in increased energy and good will, and as such was a big factor in the human equation between employer and employee. It set forth the principle that good business is based on justice and right; that men at heart are square and moved by the same human emotions; that all men seek leadership and that society fares well or ill depending upon whether the leadership that appears is sane, intelligent, constructive, or whether it is irrational and destructive; that the employer is largely responsible for the type of leadership that prevails in our communities; that the right and wrong of our present industrialism so thoroughly permeates our individual and collective thinking that we are right or wrong in our mass consciousness just to the degree in which industry succeeds or fails in establishing high principles of action and deserved leadership.



FIG. 1. A MINIATURE SHOP SHOWING UNSAFE, UNCLEAN WORKING CONDITIONS

They are the cause of frequent accidents and unnecessary illness. They are generally accompanied by wasteful methods, careless treatment of employees, and a slipshod wage system. The combination produces constant dissatisfaction and irritability in the shop and at home.

Wise men know that enormous effort is being made both from without and within, to infect our citizenship with the stagnating liberty of Russia. Wise men see that class-consciousness most easily permeates where industrial strife is most constant. The present unemployment situation has furnished fuel to the fires of discontent. Who knows when this country will again be fully employed? How long can we stand the new competition of the disordered world status? Will we not need every pound of possible energy out of millions of well-minded co-operating workmen, working under sober, fair minded, capable industrial management, to preserve our industries and national being?

The far seeing industrial leader knows that we cannot secure the needed energy and co-operation, the willingness to produce, out of men whose bodies are cramped by sickness and whose minds are twisted and poisoned through seeming injustices, through unnecessary suffering by injury and ill-health. The intelligent, employing groups know that the new competition will not permit the wastage of millions weekly on account of preventable illness and accidents. This country could perhaps stand this loss when the products of its natural resources were finding ready markets the world over, but not now.

We must stop the leaks—all the wastage, not only industrial but public and political. Big men are needed everywhere, to think, to plan for the people as a whole, to assume leadership, for then and then only may we hope that your America and mine may hold its place and yet prove again the wisdom of our forefathers in founding this democracy. Are the industrialists meeting this challenge for leadership?

Many industries have shown their ability and leadership by instituting far reaching health programs within their walls, but the public and the medical profession

have never been given a composite view of this very advanced health work as was done through the Industrial Physicians' exhibit at the Cincinnati Health Exposition.

The Workman Speaks

Color and action were given to the exhibit in that machinery was in motion in the two contrasting miniature workshops, shown in Figs. 1 and 2, where machine operators, taken from factories, held the attention of the visitors all through the afternoons and evenings by their constant comments on the advantages and disadvantages of their respective working conditions.

The man in the overalls held the stage not to decry working conditions but to constructively criticize the good and the bad in present day methods of production and in simple language to point the way to safer, healthier working conditions, with a larger output per man, with better wages, with less injury and sickness, with friendlier relations between employer and employee, with lesser burdens on society and with better citizenship throughout. The shower of sparks off their respective emery wheels always drew a crowd to the rail in front of their little shops. Then each in turn would enliven his audience with the feelings that come to workmen as they face their daily jobs, explaining how these feelings are influenced by the conditions under which they work, how they affect bodily and mental vigor, how they affect their output in the working hours, and finally how they influence their behavior to their families and to the community at large after working hours.

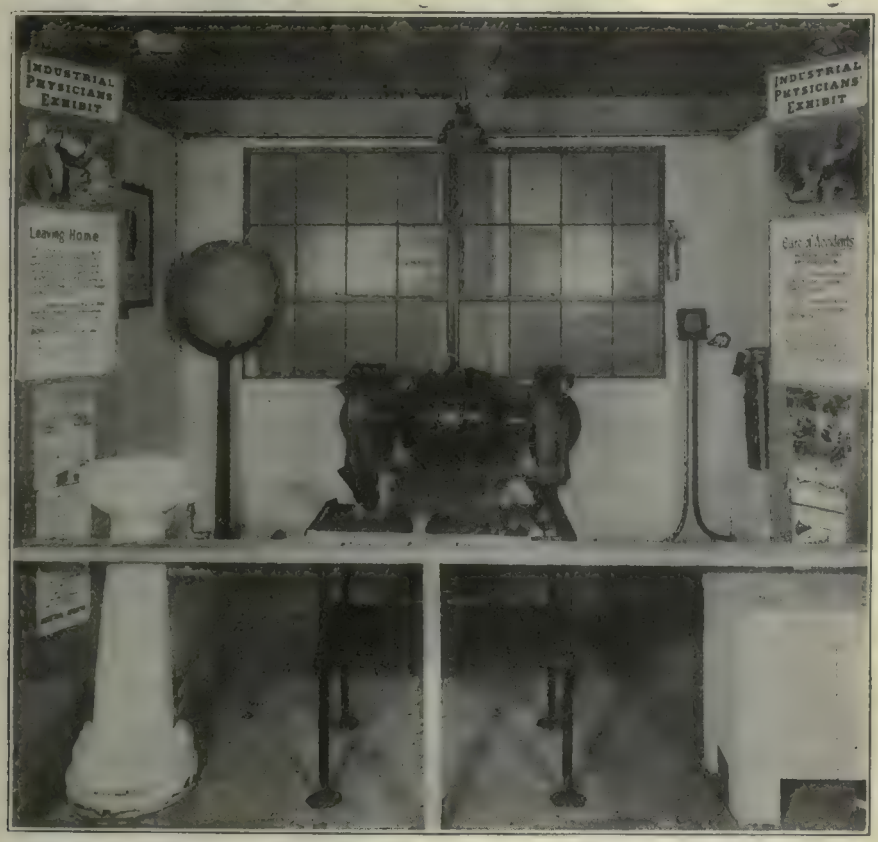


FIG. 2. A MINIATURE SHOP SHOWING SAFE, SANITARY WORKING CONDITIONS

Proper lighting and ventilation are provided. So are reasonable comforts and conveniences. A fair wage system is in use. The results are team work, fair play, good shop government—in a word, good citizenship. Compare this shop with the one shown on the opposite page.

To begin with, this was a joint exhibit of the work of ten companies in this vicinity employing full-time physicians. Upon my able associate, Dr. C. L. Ferguson, fell the many weeks' task of gathering medical, surgical, dental and employment data upon which were based the posters and graphic representations used in the eight booths of this exhibit. Two of the posters are reproduced in Figs. 3 and 4.

Our general plan was to give the public a composite view of industrial medicine as it was practiced in the ten plants, presenting the average conditions rather than the advanced work done in any one or more of the plants. It was interesting for instance to note that 11,800 physical examinations were made in all in 1920; that the average percentage of rejections was 5.7; and that rejections varied from 1.2 to 8 per cent.

It was impressive to note that among 11,800 employed, 70,000 medical cases and 35,000 surgical cases visited eight industrial dispensaries, making a total of 250,000 visits and revisits for all causes.

Some of these industries reported that as high as 7 per cent of the working force daily sought the physician's aid for one reason or another. The average ratio of medical to surgical visits was as 7 is to 3.5. The collected data showed on the other hand that almost invariably the sickness rate and absence because of sickness were materially reduced, in some instances being cut in half; that lost time from infected wounds, after installation of medical service, with its prompt and proper treatment, reduced infection cases to the negligible point.

In compiling statistics of this work one cannot escape the indisputable fact that *industrial medicine* is *preventive medicine practiced on the firing lines;* that the daily supervision, the frequency of observation, the early diagnosis and prompt treatment constitute the sanest and most economical way of preventing human wastage; that they keep the front line of industrial attack and maximum production intact; that they are the best means yet devised for keeping the old time "evacuation stations" or hospitals and clinics free from overflow of chronically incapacitated dependents; that to reduce the size of the human scrap heap most systematically we must move more of our scientifically trained medical men up to and on the industrial firing line.

Organized Labor's Position

Organized labor has, in the main, raised objection to physical examinations and medical supervision in industry, claiming that too many men are thereby thrown on the human scrap heap. Further, that industry is largely responsible for the physical defects in individuals and that society must see to it that these individuals also be given a chance to provide for themselves, that the unfit must be carried along with the fit at the cost of industry.

Answer has been made to this position that labor gains nothing by being ignorant of its physical impairments, that the making of physical examinations is the first and fundamental step either toward physical restoration or proper placement in jobs suited to the individual. Furthermore that society gains in knowing the size of the human scrap heap and what factors contribute to it so that legislative and other steps may be taken to prevent human wastage.

However intelligent consideration of the subject now brings nearly all of us to the view that the making of physical examinations is a decided step in the conservation of human life—that the mass of workers in any plant are entitled to protection against the spread of contagious disease that comes with this practice; that the hazard of having operators of machines, cranes and other transporting methods subject to epilepsy, heart failure and defective vision cannot be tolerated.

Physical examinations by industry hold a serious lesson for the medical profession in that a very large percentage of the men examined report this experience as the first time that they had ever been completely examined by a physician. It is also a first time for them to become really interested in themselves as physical entities. With this physical examination comes a larger interest in the desire to know the real basis for any illness, an earlier seeking of medical attention, a greater willingness to employ physicians more frequently and to submit to surgical and other procedure when necessary.

When labor was scarce all manner of devices were used by industry to attract the worker, many of which were socially and economically unsound. The American workman fortunately has an independent attitude toward *coddling welfare* work. The present industrial depression, unfortunate as it is, will serve a real purpose in eliminating the frills and furbelows of such welfare work.

Work Here and Live Longer

In strong contrast to the useless welfare work is the real service that is rendered the worker and society in providing good working conditions, stability of health, the reduction of suffering and loss from disease and accident that usually attends intelligent medical supervision. The far-seeing employer has not scrapped the services of the medical department in these parlous times, but recognizes that the physician can make a real contribution to a better morale and the necessary higher output per man at lower cost, that is so greatly needed at this time. Work here and live longer is a sane democratic appeal to the best type of employee.

Absence in industry on account of illness varies from 3 to 8 per cent. Industrial medicine can reduce the absence on account of illness to 1½ per cent, perhaps even lower. Accepting the lower figure of 3 per cent as the normal and 1½ per cent as the attainable through medical supervision, we should save for each worker 4½ days of earning power each year. The 11,800 workers who made nearly 250,000 visits in 1920 to the seven industrial medical departments were diagnosed early, sent home when incapacitated for work, advised to consult their family physicians, and where necessary, referred to specialists. These 11,800 workers, saving 4½ days each at an average wage of $5, would experience a total saving of $265,500.

The thoughtless employer blames the labor agitator for most of the radicalism that appears in the ranks of labor, giving little thought to the fact that he may be quite a contributor to that state of mind. The employer too frequently forgets the enormous advantage that he holds over the labor leader in that he, through his organization, is in daily contact with the worker, whereas the radical labor leaders' contacts are but intermittent. Too few employers appreciate that the unclean, unsafe shop where the foremen and executives drive rather than lead their men—where even the common garden variety of human considerations, comforts and conveniences are missing is also the shop where the men's minds are daily poisoned against organized industrial leadership, and conversely therefore opened to any other leadership that may offer. It is during the working hours of the day that men's minds are most alert and receptive. It is important therefore that the impressions that are hourly being made upon those minds should be free from fair criticism. Unnecessary and frequent accidents, preventable occupational hazards, thoughtless treatment of employees, wasteful methods of production, slipshod wage systems, where the employee is unable to check his own earnings, are all factors that lead to disagreeable relations between the employer and employee and add to the age long gulf between labor and capital.

Better Citizenship

The Disarmament Congress at Washington has spelled a new era between nations and promises the release of billions of dollars, now used in the manufacture of instruments of destruction, permitting these sums to be used for the improvement of living and working conditions and educational facilities for the peoples of all the world. It may be said with equal truth, that if organized labor and organized capital could also be disarmed to the end that the ever constant strife between these two groups could be lessened, billions of dollars in added production, added earnings, would take the place of the fierce wastage that now occurs because of this constant strife.

The condition of industry, the relations between employer and employee, are a very fair index of the character of any country or community. The individual employer too frequently forgets that his particular industry is but a part of the whole and that the character of relationships that exist between himself and his men leavens the state of mind that exists between the employing and employed classes of his community, and that the general quality of the citizenship of which his men are a part, is raised or lowered, depending upon whether or not he, through his organization, is producing happy contented citizens.

It cannot be denied that clean working conditions, reasonable comforts and conveniences, a fair wage system, and considerate personal relations throughout the working hours, produce a state of mind, a shop spirit, a certain morale, that makes for a feeling of responsibility throughout the organization, an appreciation of the necessity for organization, and the part that each must play in such. Out of this feeling of mutual trust and confidence there grows a respect not only for the industry but for society as it is organized, and a better quality of citizenship is the net result.

The consideration of the health of the worker is but one factor in the important personal relations program, but it goes a long way to help make men sane both in body and mind. You cannot build up contented citizenship which is suffering from unnecessary illness and



FIG. 3. WHY IS THE AVERAGE MAN SO CARELESS OF HIS EYES?

injury. Many of the so-called grievances can be traced to a physical basis. Not the least satisfaction that should come to the intelligent employer, in creating a good shop morale through these various methods, should be that he also creates thereby happier and more contented conditions in the homes of his employees. And thus is effected an even wider circle of citizenship.

The dollars and cents value of the prevention of unnecessary accidents has been so thoroughly proved by the National Safety Council that little need be added in that direction. What the employer has failed to sense, however, is that enormous savings can be made by the prompt and efficient treatment of all accidents as they occur and that the installation of a medical department in industry has long ago been taken out of the charity welfare class. The immediate attention to injuries by men especially trained in that work, not only reduces the number of infected cases to practically nothing, but greatly shortens the period of disability, reduces unnecessary pain, reduces the loss of wages, and of course adds to production.

There is some danger, now that industry has allowed a fixed charge in its budget to cover the cost of industrial accidents through workmen's compensation acts, that it feels that its responsibility in this direction is closed. We do know on the other hand that a great percentage of accidents and their expensive sequels are largely preventable and that these present fixed costs might well be reduced by one half. It is time that industry wake up and supply the leadership that will make of the state compensation commissions great social agencies for the prevention of accidents and for the proper treatment when they occur and thus save to society the present waste of men and money.

Leaving Home

An interesting illustration, used at the exhibit, shows a happy workman leaving his home in the early morning hours, waving "Goodbye" to his wife and children. In Ohio, each year approximately 4,000 such men wave their goodbyes in the morning, never to return alive. Thousands upon thousands more are brought back home crippled for life and unable to care for their families, which even though they receive compensation for permanent disability, are most likely, in the end, to become a future charge on the community. In the same way, $5,000 or $6,000 as compensation for death on account of injury, merely cares for the family temporarily, but permanently takes out of the community a productive citizen who was not only providing for his family but was adding to the total wealth of that community. Good health, good shop spirit, good relations and good management go hand in hand. With the establishment of this new specialty, industrial medicine, and the placing of the physician in industry, medical attention has for the first time become daily and conveniently accessible to the adult. Intensive preventive medicine applied to the individual here becomes possible. It is sought by 7 per cent of the working force each day in some industries. To supply such service costs from $5 to $12 per employee per year. The fact that the best managements in the country have continued this service indicates that it must pay for itself. Poor health is a drag on employee and management and spells the idle machine, lost wage and production, in all three of which society is vitally interested. Good health, of course, means exactly the reverse.



FIG. 4. THE BAD TOOL BRIGADE THAT SHOULD BE DISCHARGED

Increased Confidence in the Leadership of Management

The space here allotted permits the telling of but a fraction of the effort made to show the public the interest that industry has in the life saving program. The Health Exposition at large tremendously stressed the power and values in good health. Industry in general should sieze upon the opportunity that this type of work offers to improve its relations with the worker and its position with the public. In these days of the increase of repetitive processes management must solve the problem of better interesting and satisfying the mind of the worker. Increased confidence in the leadership of management cannot come through the fat pay envelope alone. A shop spirit, a personality, will tend to satisfy the workers' desire to escape the dulling effect of machine processes. To institute measures that meet some of his basic human needs will be of assistance, and of these none is more basic than an interest in the health of his mind and body.

Machining the Mack Crankcase

An Unusual Milling Cutter—Zylol Used for Detecting Cracks—Methods of Boring and Reaming—Gages for Final Inspection

By Fred H. Colvin
Editor, American Machinist

BOTH the upper and lower crankcases of the Mack motor are of aluminum, the lower portion having oil distributing pipes cast in place, as can be seen in Fig. 1. There are also oil troughs under each connecting rod which serve to strengthen the lower crankcase very materially.

The first operation in the upper crankcase is to drill the corresponding oil tube holes, after which the joint surface is milled as in Fig. 2, and then the cylinder block surface as shown in Fig. 3. Fig. 4 shows the milling of a type of crankcase used on the larger motors.

The holding fixtures, shown in Figs. 2 and 3, are of very simple design and the milling cutter, designed by L. S. Ayer, factory manager of the Plainfield, N. J., plant, is clearly shown. Details of this cutter are shown in Fig. 3. The cutter is 22½ in. in diameter and has ten teeth. The teeth are set at an angle of 10 deg. and are held in place by two screws, as shown. The heads of these screws lie in a pocket provided by the shape of the outside of the cutter head and do not project beyond the outside diameter of the cutter head itself. Fig. 2 also shows the protective screen used to prevent the chips flying as the cutter plows through the work.

Fig. 3 gives a closer view of the milling cutter and shows the key by which it is driven at *A*. It also shows the cylinder surface being milled near the flywheel end. A somewhat different fixture and also a smaller chip guard is shown in Fig. 4. This fixture provides support for the bolt flange of the crankcase at *A*.

The eight valve guide holes are drilled in the jig shown in Fig. 5. Here the crankcase is carefully located sideways and raised against the under side of the jig as shown. A little study will show the various features of the jig and it will be noted that hooks are provided for lifting it from the machine.

The bolt flange is drilled under the large multiple drilling machine, shown in Fig. 6. Here again the design of the fixture can be studied to advantage. The crankcase is supported at four points in a sort of cradle which slides under the large plate carrying the drill bushings, and is then raised into contact with it.

Then come several milling and drilling operations, after which the crankcase is bored for the crankshaft and camshaft bearings, together with the starter holes. This boring is done in the fixture shown in Fig. 7, on a lathe provided with a special driving head. The construction of the holding fixture can be readily seen, while neither the boring bars nor their guides need any special comment.

The crankshaft and camshaft bearings are then care-

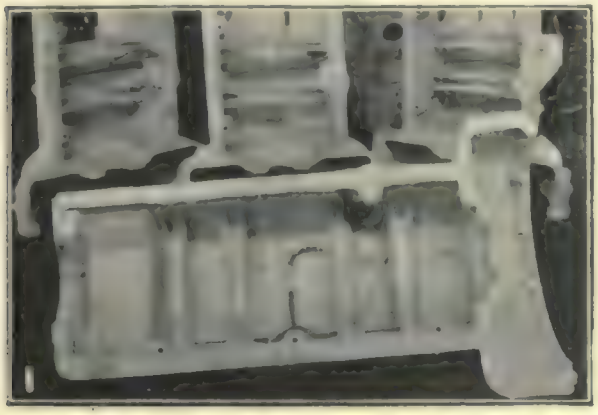


FIG. 1. CRANKCASES SHOWING OIL TUBES.



FIG. 2. MILLING CYLINDER SURFACE

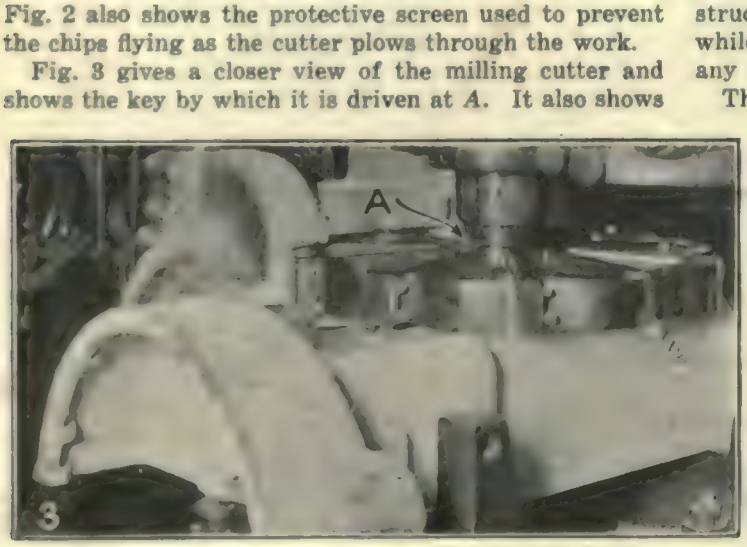


FIG. 3. THE MILLING CUTTER.

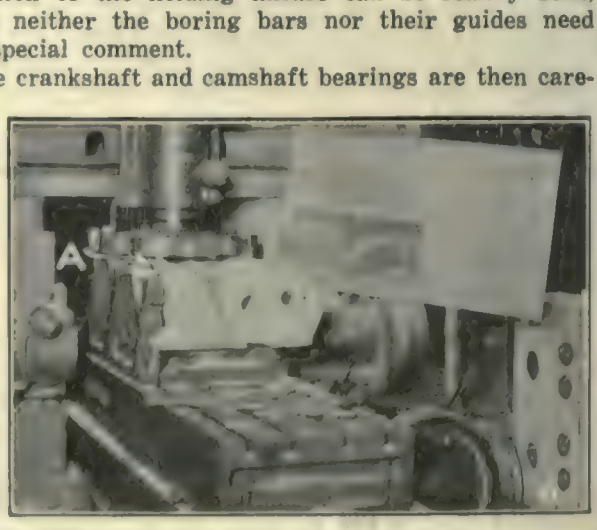
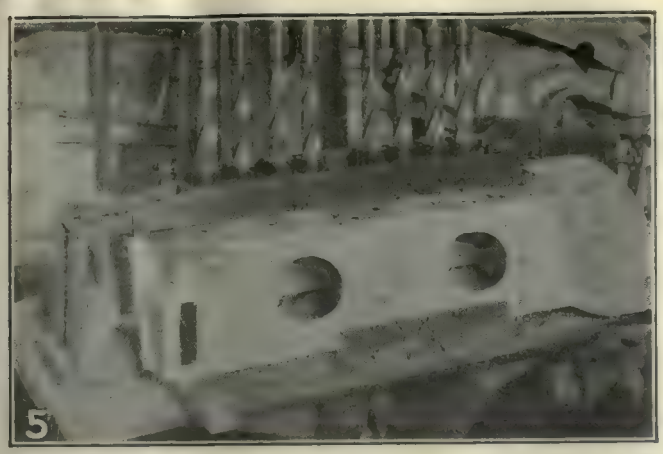


FIG. 4. ANOTHER MILLING FIXTURE



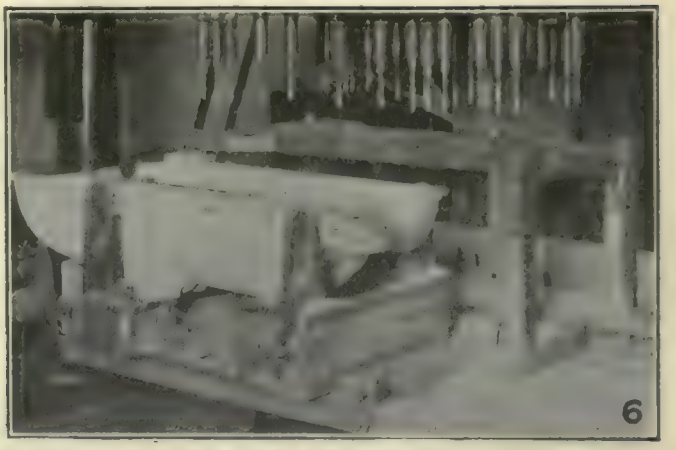


FIG. 5. DRILLING VALVE GUIDE HOLES. FIG. 6. DRILLING THE BOLT HOLES

fully hand reamed as shown in Fig. 8, the loose connection between the wrench and the boring bar effectively preventing any unusual side stresses during the reaming operation. This view also shows (in the background) the construction of the driving head for the two crankcase boring bars which were designed and built especially for this work.

After the crankcases have been completely machined, they are lightly painted with a thin water paint after which they are sprayed with Zylol under pressure. as shown in Fig. 9. This instantly detects any cracks which may have developed and which have escaped all previous inspection and prevents the possibility of sending out crankcases which may soon develop cracks from flaws in the castings themselves.

The final mechanical inspection is done on the bench shown in Fig. 10, where all the important dimensions are carefully checked by means of the various gages shown. Included are surface gages, plug gages, snap gages, special locating gages, and a gage for the cylinder bolt holes as shown at the right. They provide for a very complete inspection of every detail.





FIG. 7. BORING FOR CRANKSHAFT AND CAM SHAFTS. FIG. 8. HAND-REAMING THE HOLES





FIG. 9. INSPECTION FOR CRACKS. FIG. 10. THE FINAL INSPECTION

Japan As a User of Automatic Machine Tools

About Two Hundred Automatics Now Being Used—Increased Use Will Become Imperative —The Japanese Are Realizing the Advantages of Automatics

By ARTHUR JACKSON
Tokyo, Japan

JUST as an expensive and scarce supply of labor has made America the leading nation in the world manufacturing and using automatic machine tools, so has a cheap and plentiful supply of labor made Japan the smallest user of labor-saving machines of the world's great powers.

At present there are only about two hundred automatic machines used in Japan.

Geographically, Japan is placed in Asia in relatively the same position as is England in Europe, and with China, Manchuria and the rest of the East becoming more and more modernized, therefore demanding manufactured goods in greater quantities every year, Japan is in an ideal location. Her natural mineral resources are not great, but her cheap electric power, cheap and willing labor, and splendid mercantile marine counteract any deficiency that she has in mineral resources.

Japan Has Good Markets

Not only has Japan a good external market near at hand, but she has a good internal market for manufactured goods, for each year sees her take a great step forward in Western modes of living. In all her cities immense modern buildings have been and are being erected, the streets are being widened and paved, and the disgusting practice of carting human feces through the streets is fast giving away to the modern system of water sewerage. At present automobiles and motor trucks are not really practicable in the cities, but national highways are being planned, and when they are realized there will be a big demand for motor cars and trucks.

Japan is one of the leading nations of the world in the use of electricity. Almost every house, whether it be palace or hovel, is lighted by this means, and it certainly seems queer to see an electric light burning before an idol in the country shrine. Electric fans are in general use, and electric irons and cooking devices are becoming popular.

Japan suffers severely from earthquakes and floods, the latter being the more terrible, for every year there is a great loss of life and property from this cause. At the time of writing over three hundred lives have just been lost by flood in southern Japan. Fires also play great havoc in Japan. Last winter there were several villages destroyed, and in Tokyo alone there were over five thousand houses burned. It may be asked in what respect has all this to do with automatic machines. The answer is that Japan, in order to finance big schemes for the prevention of flood and fire, and also to raise her standard of living, must rely more and more upon her industrial progress, as her agriculture does not properly support her present population.

America, Great Britain and France are her greatest competitors in the rest of the Orient. In fact Japan at present is hardly able to compete with them either in prices or in quality, although her workmen are the lowest paid. The reason is not far to seek, for although the other countries mentioned pay their workmen high wages, they are better able to produce well and accurately finished articles at a very low cost because they use automatic machines and other labor-saving devices. The Japanese engineers are well aware of this fact and previous to the present financial depression the manufacturers commenced to order large numbers of automatic machines. Most of the machines ordered were bar-working machines and now most of the leading factories have planned to install automatic machines for chuck work and automatic milling machines.

The principal argument that the Japanese have against an automatic machine is that a long time is required to set it up. The writer has been able to demonstrate that in many instances on the modern automatic machine work can be set up and the first piece machined in much quicker time than is possible on hand turret lathes, and the same piece of work can be set up and machined quicker on a hand turret lathe than is possible on an engine lathe.

The practice of having one man attend to a battery of several automatic machines does not seem to appeal to the Japanese, as they usually prefer to have a man attend to each machine, but as the workmen improve and wages become higher and labor more scarce, the practice of having a man attend to more than one machine will become general. The Kawakita Deuki Co., of Osaka, which has had three automatics running for several years, making small motor parts, has two men tending the three machines. The time taken to produce the particular piece of work on these machines compares very favorably with the time taken on the same work on the same machine in America.

Some Japanese Plants

The Nippon Seiko Kaisha, Ltd., manufacturer of ball bearings, is hardly able to compete with those of foreign make in spite of the heavy duty on the latter. This company is now making plans to equip its plant with automatic machines and bring its manufacturing methods up to date. A number of the large textile machine builders are about to do the same.

Factories are being erected for the manufacture of the Diesel oil and other internal-combustion engines that are being used in increasing numbers on the fishing boats and other vessels. Airplanes and hydroplanes are being built, and the manufacture of various articles usually purchased abroad has commenced, all of which calls more and more for automatic machines.

Japan has reached a point where she must either go forward and use up-to-date, modern, labor-saving and accurate machine tools, or rely on obsolete inaccurate, hand-operated machine tools and so be hopelessly outclassed by her well-equipped rivals in the engineering field. Japan, who in the recent past has been very quick to take hold of our methods, will not fail to grasp her opportunity at this time. The more she extends her engineering activities the more she will require to import up-to-date machine tools and the better customer of America she will be.

Department Layout in the Colburn Shop

Arrangement for Machining, Erecting, and Testing Units and Complete Machines—Toolroom Arrangement and Heat-Treating Department—Lavatory and Coatroom

By FRED. H. COLVIN
Editor, American Machinist

THE center aisle with its industrial railway track, shown in Fig. 1, is taken from the opposite side of the shop from that of the view shown in a previous article. This view shows something of the arrangement of the different bays; the traveling crane at *A*, one of the department foreman's desks at *B*, and the general foreman's desk at *C*. The heavy duty drilling machine department is shown in Fig. 2, where also may be seen the steel barrels used for holding work that comes from the machines. These barrels are provided with trunnions which make it easy to pick them up on suitable trucks and move them to any desired point. This view also shows a surface plate at the end of the aisle for inspection of any work which may require it.

The gear cutting department is shown in Fig. 3, which gives a particularly good idea of the saw tooth construction of the roof, and the lighting secured by its skylights.

The toolroom is at the end of the building and the lighting is especially attractive as can be seen in Fig. 4, which shows the individual motor drives, the use of individual toolracks or stands, and gives a fair idea of the arrangement of the machinery in this department. Individual work benches with their ends against the





FIG. 1. ALONG THE CENTRAL CROSS AISLE. FIG. 2. HEAVY DUTY DRILLING MACHINE PRESS DEPARTMENT





FIG. 3. THE GEAR CUTTING DEPARTMENT. FIG. 4. THE TOOLROOM ARRANGEMENT

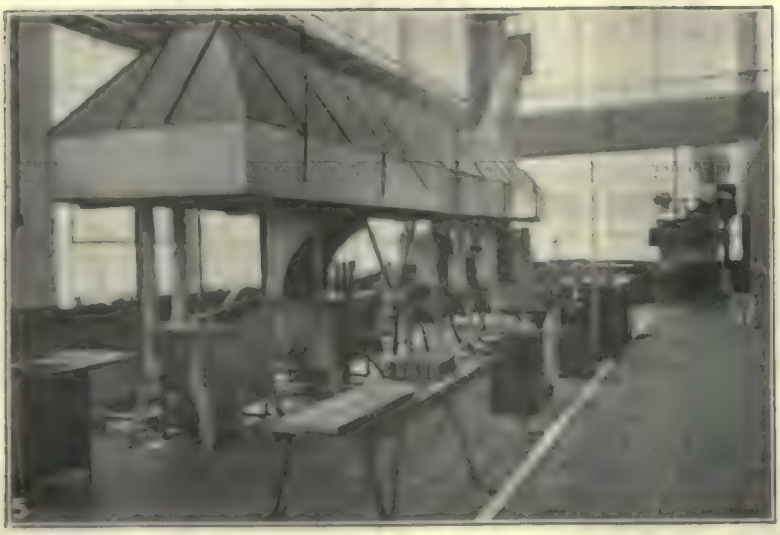




FIG. 5. THE HEAT-TREATING EQUIPMENT. FIG. 6. UNIT ASSEMBLY FOR HEAVY DUTY DRILLS

large window can be seen at *A*, at the far end of the room, while beyond them is the hood over the furnaces in the heat-treating department.

as one for heating crucibles of lead or some of the various salts. Suitable quenching tanks are also provided and a sandblast machine may be seen at the further



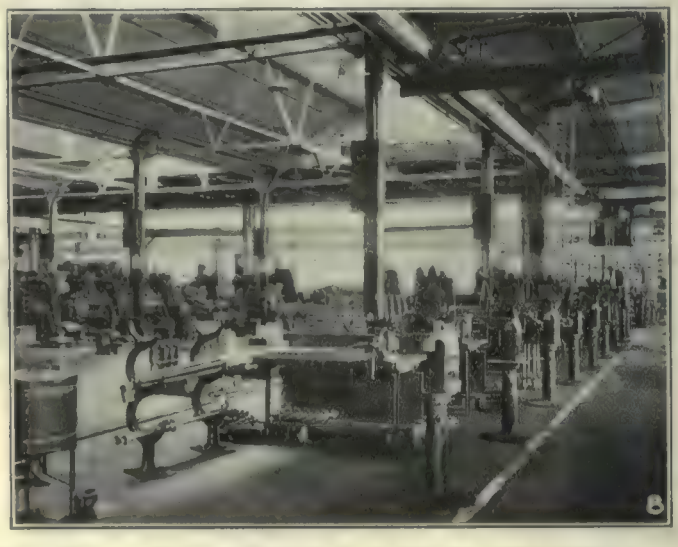


FIG. 7. TESTING DRILLING MACHINE BEFORE SHIPMENT. FIG. 8. FINAL ASSEMBLY OF HEAVY-DUTY DRILLS

Details of the heat-treating department can be seen in Fig. 5, all necessary equipment being generously provided. Furnaces of various kinds form part of the equipment, including both open and muffle types as well

right-hand corner. The fumes from the furnaces are caught in the large hood and carried off by the pipe shown at the further end.

One of the assembling departments, used for build-





FIG. 9. ASSEMBLING LARGE BORING MILLS. FIG. 10. TOOLCRIB, WASHROOM AND LAVATORY





FIG. 11. AN OPEN METHOD OF CLOTHING STORAGE. FIG. 12. THE FOREMAN'S DESK

ing units of Colburn heavy duty drilling machines, is shown in Fig. 6. This view also shows the types of stands and work benches used in this department. It will be noted that the round column pedestal is used both singly and in pairs.

The method of testing completed machines is shown in Fig. 7. Each column of the testing bay is provided with suitable electrical connections and motors are located so as to be conveniently used in making the running tests.

The Final Assembly

The final assembly department is shown in Fig. 8. The test columns shown are used for testing both manufacturing and standard type drilling machine heads. Each head is finished at the end of the line of benches and then carried by crane to a test column. It is then removed from the test column and placed on the column upon which it will be shipped. Bar stock racks are used for holding long screws and other parts which are liable to damage unless properly protected in some way.

The assembling department for the boring mills and heavy drilling machines is shown in Fig. 9. This, it will be seen, is one of the head houses and is served by a 15-ton crane with a 5-ton auxiliary hoist. In spite of the fireproof construction sprinkler heads are provided so as to reduce the fire risk to a minimum. A complete boring mill is shown being delivered to the shipping platform through the open doors at the end of this bay.

Fig. 10 shows the washroom, lavatory and the central tool storage crib. Little comment is necessary but a careful study of the substantial and attractive arrangement is worth while. The large windows of translucent glass in the lavatory, light it up perfectly and the compactness of the plumbing cannot fail to appeal to all engineers. The toolcrib is particularly well arranged and easily accessible.

A view of the coatroom, at one end of the shop, is shown in Fig. 11. The finishings are somewhat unusual in that open racks with suitable hooks and ample provision for hats are provided in place of the steel lockers which have been so common for the past few years. The angle of the top over the hat shelf effectually prevents the accumulation of bundles of any kind. This arrangement gives an open view of the coatroom at all times and as the door is kept locked, except at the proper hours for coming to, and going from, work, it is believed that it may prove more advantageous than the usual lockers. A few lockers for special purposes are provided in the corners, as can be seen. This view also shows more of the steel barrels used in handling castings and forgings.

Each department foreman has a substantial steel desk and stool as shown in Fig. 12. He is provided with a time stamp and a card rack for each man in his department, as well as an automatic interior telephone communicating to all parts of the plant, including the office. This arrangement is very neat, giving the foreman ample space for keeping all necessary records and other information. The facilities are such that the foreman has an incentive to produce better work and takes pride in the development of his department. There are many points in connection with these various views which will well repay a careful study. Better yet, the plant itself should be visited if it is at all possible to do so.



Bigger Business Will Need Better Railroads

Lack of Equipment Will Hold up Business Resumption — the Government Should Aid Railroads Before Helping Foreign Nations

By HERBERT HOOVER
Secretary of Commerce

IN RESPONDING to the invitation to discuss some of the problems present in your general railroad investigation, I shall devote myself to three of the railway topics which especially arise from the present economic situation.

I do not need to review at length that we are recovering from the destruction and inflation of the greatest war in history; that we are suffering from the waste, the extravagance, and over-expansion of the post-war boom; and that the war has brought about great shifts in the movement and price levels of commodities between nations.

I would, however, suggest that it might be profitable for our people to get a somewhat clearer perspective of our own, and the world's, troubles and problems. Even a superficial survey must bring us out of an atmosphere of gloomy introspection into an assuring realization that, great as our dislocations may seem to be, we relatively are in an enviable position. Our nation is unshaken and as a people we are getting our bearings in a world of perplexing economic adjustments. While there is unemployment and lack of profit taking, we are free of panic. We are comparatively more restless than injured. For instance as heavy as our tax burden is it is still less than one-half as great in proportion to our national productivity as the other states in the war.

The violence of our readjustment, however, is without parallel and we sometimes tend to color our measures for the future by the depression we are in. The fact is that we must predicate all plans for the future on the ultimate return of the American people to a normal economic activity, with our annual progress in the expansion of our production, of our plant and equipment, of our skill and our efficiency. There can be no question that this return will take place, and no responsible body will approach our problems on any other basis.

If we look at the national economic situation as a whole, the greatest impulse that can be given to recovery from any source whatever is a reduction of rates on primary commodities combined with the immediate resumption of railway construction and equipment. The first depends upon reduction of operating costs; the second upon restoration of credit for our railways.

The Need for More Railroads

One thing is absolute. Our transportation facilities are below the needs of our country, and unless we have a quick resumption of construction, the whole community—agricultural, commercial, and industrial—will be gasping from a strangulation caused by insufficient transportation the moment that our business activities resume. For the past five years we have had no consequential expansion to our railway transportation machine. With but one interval of nine months in 1918 and 1919 we had a car shortage throughout the whole of the years 1916-17-18-19 and 20. This shortage rose to as high as 160,000 cars with a corresponding shortage of motive power. We paid tremendous sums in commercial losses and unemployment in consequence. We laid it onto the war. We should lay it onto our lack of foresight and antagonism to railroads.

Our country is more dependent upon railway transport than any other. All others have comparatively greater coast lines and internal waterways. The experience of the twenty years before the war has shown that we must build an extension of lines, including terminal facilities, additional sidings, etc., every year equal to the construction of a new railway from New York to San Francisco. We must add at least 120,000 cars and 2,500 locomotives annually to our equipment. Since we entered the war in 1917 we have constructed at least 10,000 miles of railways less than our increasing population and economic development called for, and we are behind in rolling stock by about 4,000 locomotives and 200,000 cars. I wish to emphasize that unless we can have an immediate resumption of construction and equipment, our commercial community will pay treble the cost of the whole of them in their losses of a single season. The very moment that we reach anything like normal business we shall see a repetition of car shortages, followed by an increase in the cost of coal to the consumer from one to three dollars a ton; we shall again see premiums of twenty cents a bushel for the use of cars for moving grain; we shall in fact see a shortage of commodities to the consumer; and we shall see gluts upon the hands of the producers. We shall see factories filled with orders again closed for lack of cars; we shall see large intermittency in employment; and we shall see the usual profiteering in commodities due to a stricture between the producer and consumer.

Furthermore, there is nothing that is so irrecoverable a loss to the nation as idle shops and idle men. Today we have both. There is nothing that will so quickly start the springs of business and employment as an immediate resumption of construction and equipment of the railways. When business does resume, we shall need all of our capacity for the production of consumable goods. We shall not only find it strangled for lack of transportation, but we shall find ourselves plunging into the manufacture of this very railway equipment and construction in competition with consumable goods for materials and labor. Herein lies the basic cause of destructive price inflation and booms, with all their waste and over-expansion. In times of depression, we should prepare for the future and by doing so we can cure the depression itself.

If we examine the fundamental reasons for failure to resume equipment, we will find them in the loss of confidence in railways as an investment and the competition of tax-free securities. We have passed the period of credit strain in this depression. Surplus capital is pouring by hundreds of millions monthly into tax-free securities and foreign loans, and yet our railways are unable to finance the most moderate of construction programs. The confidence of the public in railway investments was at so low an ebb before the war that finance, by the issue of common and preferred

Statement before the Interstate Commerce Commission.

stocks, had become impossible and railway expansion was living on bond issues. The confidence of an assurance and continuity in earning power to cover this burden of bonds has been even lowered since the war began, because of the uncertainties of both rising and falling prices, of rising and falling wages, of rising and falling rates preventing all regularity of earnings upon which an investor could be convinced, even if no other difficult factors entered into the problem.

If we look to the immediate future with its complete necessity of paring the railway earnings down to little more than bond interest, until we give relief to the shipper (and thus the primary foundation to business recovery) I can see little likelihood of convincing the investor as to his margins of safety. There is an atmosphere that our railways will never again earn profits, and that they are not as an industry worthy of investment, and that because private investors will not come to their assistance nobody can do anything.

Far from its being impossible for our railways again to return to a profitable footing, I believe it is possible to demonstrate that on an average they will become very profitable. If we assume that the reduction of prices and wage levels will settle at a plane no lower than 50 per cent over pre-war, and if we assume that the present rates are to maintain, and if we assume restored traffic, then the earnings of our railways would exceed 15 per cent on the whole of the commission's tentative valuation.

In these circumstances it seems to me vital that the railways, as our greatest industry, should propose a courageous program of broad visioned betterments, and if necessary the Government should consider giving the use of its superior credit. It would not cost the taxpayer a cent to give the Government guarantee to equipment trusts upon the primary responsibility of the railways the proceeds devoted entirely to improvement and equipment. This is no proposal to take money from the taxpayer. It is a proposal to save him from paying treble the amount of his guarantee in profiteering and losses. It will render a reduction of rates earlier, for unless something is done the improvements will have to be paid over years out of increased rates.

A real program of construction would in its various ramifications give relief to five or six hundred thousand of our unemployed. It would enable even added numbers to increase their standard of living, and thus give increased market to the produce of our farmers. Our farmers who look to foreign markets for their surplus should stop to consider that our home consumption of meat decreased nearly 7 pounds per capita in 1921, due mostly to unemployment, and that if this decrease could be overcome it would be worth more than a 35 per cent increase in exports.

Help the Railroads First

We talk glibly of giving billions of credits to foreign countries, to increase our farm exports. I wish to say with all responsibility for the statement, that a billion dollars spent upon American railways will give more employment to our people, more advance to our industry, more assistance to our farmers, than twice that sum expended outside the frontiers of the United States—and there will be greater security for the investor.

Finally I want to refer to the veritable witch's cauldron being fed constantly with hates distilled from the misdeeds of railway promoters in the past, from the conflicts between the railways and the farmers, between the railways and their workmen. From all the confusion that arises from it we destroy our railways and destroy ourselves. With this commission on one hand assuring honesty in finance, justice to the shipper and the railways investor; with the Railway Labor Board assuring justice to workers and, above all, with a great spirit of public service in our generation of railway managers, it is time to call off the witches and take some vision of our national situation if we are to pull ourselves out of this depression.

Before entering upon the question of readjustment of rates, I wish to set out some factors in the present economic situation that bear upon the entire question. The following table shows a few commodities and service groups, compared to 1913 as 100:

Farm crops, at the farm	98
All animals, at the farm	92
Retail foodstuffs	150
Cotton, at the farm	136
Wool, at the farm	101
Retail clothing	213
Steel billets, Pittsburgh	113
Copper	86
Zinc	90
Pig iron, Pittsburgh	128
Bituminous coal, at the mine (estimated 4 districts)	160
Bituminous coal (retail various localities)	198–220
Yellow pine lumber (at the mill)	189
Douglas fir lumber (at the mill)	125
Lumber (retail), partly estimated	200
Cost of living, variously estimated from	162–180
Wage scales (approximate):	
Farm labor	135
Textile industries	210
Steel industries	150
Railways	200
Metal trades	218
Building trades	190
Coal mining scales	173

This table at once demonstrates:

(1) The inequality in prices and wages between different groups of commodities.

(2) The great increase in spread between "producer's" and "consumer's" goods.

(3) The lag in wage scales.

As the population engaged in the "deflated" producer's goods—agriculture, and metals, wood, etc.—comprises one-half the total in number of the nation, their power to buy the same ratio of consumer's goods has been reduced to less than 70 per cent of pre-war, and is the consequent cause of a large part of the industrial and commercial unemployment and stagnation in our cities and our transportation.

I wish to especially call your attention to the indicated enormous increase in spread between primary producer's and ultimate consumer's goods. In considering it, we must bear in mind that when we use 100 for both consumer's and producer's goods of 1913, we have already included the spread between producer and consumer at that period. I therefore believe that the index numbers indicate an increase of 100 per cent in the actual spread. It is right here where the most of our economic difficulties lie today. Our increased cost of manufacture and distribution bears two relations to the rate question—first, that the increase of rates of from 30 to 700 per cent in different commodities are part of it, and are in turn partly caused by it; and second, the increased rates bear very unequally on different groups in the community.

If we search for the cause of this increase of spread we shall find therein a vast complex of increased taxation, increased wages, rents, and a dozen items, all reacting upon each other, and also expressing themselves in increased cost of operating the railways. For instance, the total increase in national, state and municipal taxes since 1913 is approximately $5,640,000,000. At the present purchasing power of the dollar, our total

national productivity is probably somewhere around fifty billions of dollars, of which over 10 per cent must now be devoted to increased taxes. This sum of money must be obtained either from the producer or the consumer and in any event a considerable part of the taxes contribute to widen the spread. Because the increase in spread due to taxes necessitates a spiral of increased wages, rents, etc., and before its force expends itself, my own opinion is that possibly 20 points in the distorted index number flows from increased taxes.

The increase of railway rates since 1913 in Class I, railways 1921, is about $2,600,000,000, of which about $1,400,000,000 are due to wage increases and about $160,000,000 to tax increases. If our traffics were normal the total increase of rates would be more like $3,500,000,000. These sums enter into this increase in the spread and carry with them a further trail of increased living costs and again a spiral of higher wages, rents, etc., in all other branches of manufacture and distribution.

I wish to digress for just a moment from railway to agricultural subjects, to point out that the recent projects for fixing farm prices by law are apparently founded on the notion that by raising agricultural prices up to the levels of consumer's goods we can remedy the extreme hardship of our farmers. Even if it be possible to raise the prices, much less advantage would accrue to the farmer than anticipated. Unless the spread is decreased by actual savings, the costs of manufacture and distribution would be at least partially increased by higher prices of producer's goods. The spread is fundamentally due to increased cost of manufacture and distribution, not to the fall in producer's goods. The real remedy is an attack upon the causes of the spread and thereby to bring consumer's goods down to the producer's buying power.

It is a certainty that in order to decrease the spread, railway rates must come down and for rates to come down costs of railway operation in wages and prices of supplies must be reduced. Until this adjustment is secured the economic machine will continue to move slowly. We cannot and should not expect wages to come back to pre-war levels. Many of our wage scales were too low in pre-war times. They can follow down step by step with the cost of living, but there are permanent charges in this spread, such as the taxes, which will hold the cost of living above pre-war levels.

Method of Readjusting Rates

The involved complex of transportation rates was obviously originally based on some relationship to the value of commodities, mitigated by competition. In other words, the old slogan of "what the traffic will bear" had some economic background. But this entire conception of ratemaking was destroyed by horizontal raises. We have rates clearly beyond what the traffic can bear.

The increases in railway rates during the past five years have fallen with extraordinary inequality on different commodities and different groups of people in the community. The country grew up, its industries were distributed under ratios of costs between different commodities, ratios between raw materials and finished goods, ratios between the farm and city. These have all been distorted by the horizontal rises. The increases in rates since 1914, for instance, have added probably less than 1 per cent to the price of cotton goods on the average haul but it has added probably 60 per cent to the price of coal. The increased rates since 1914 have added nearly 100 per cent to the cost of assembling the materials for pig iron.

All this is artificially forcing our industries to move toward their raw materials. This does not alone represent the starting of a new factory; it is a movement of the whole mechanism of the community, labor, homes, schools, railways and whatnot—an enormous duplication of plant and loss of capital. We will ultimately have the rates readjusted and then we will destroy the new industries created under it.

Of equal importance there is a new economic light on this distortion of rates evident under the stress of the last few years. That is, the better realization that some increases of rates come mostly off the producer while others are paid by the consumer. Increases in spread between producer and consumer do not fall equally upon each of them. In primary commodities where the price is fixed by international competition, the increase or decrease in rates is a deduction from the producer. Take wheat, for instance, the point of competition with foreign produce lies at Liverpool. The net to the producer is Liverpool less transportation and other handling charges. Therefore increases of rates are a deduction from the farmers' price. The same thing applies to the producer in certain cases of domestic competition. Also where there is rapid turnover, as in manufacture, and consequent ability to reduce supply, the consumer pays the freight, as processes of productivity will not continue below profit point. In most manufactured commodities the consumer pays the freight, for production quickly shrinks when prices at the factory become unprofitable and the price to the buyer is the factory price plus the freight. For instance, in hides, the farmer gets the international price less freight. On boots he pays the manufacturer's cost, profit and freight.

It appears to me that with the paralysis induced by the increased spread, we have to take a broader vision of what part of the community is suffering most and direct such concessions through the railway rates as can be given to that group—if we would better equalize the whole economic lead.

During the past eight months, the railways have made many thousand readjustments of local rates in endeavoring to heal local distortions, but I am convinced that the whole railway rate structure needs a most systematic overhaul in the light of these new economic forces that have been brought into play. We obviously must maintain the average rate that will support our transportation systems adequately and such an overhauling of rates might quite well mean the advancement of rates in certain commodities in order that compensation can be given to others where there is undue duress.

If I were to discuss the rates charged today I should say at once that a decrease in passenger rates is not nearly so vital to the community as freight rates, for passenger rates do not enter into the spread in proportion to the relative volume of earnings. If I were examining the freight rates I should at once say that coal, metals, wood and agricultural and other producers goods should be reduced to the bottom before L. C. L. and class rates are touched.

I would be willing to go even farther and say that I am convinced that even if the commission cannot at the present moment justifiably reduce railway incomes a single dollar, it is warranted in investigating the pos-

sibility of some relief to the more distressed commodities by a revision of some rates upward.

Determination of anything in the nature of permanent rate basis is in my own view impossible at the present time because the last five years of changing administration, irregular traffic and wildly fluctuating wages and prices of materials give us but little reliable historical criteria upon which to base the future. We are in the midst of violent economic readjustment of a profound industrial depression. No one can determine to what plane the reduction in operating costs will settle. No one can estimate the volume of traffics that are probable for any particular period ahead. It appears to me, therefore, that the commission will need to temporize with the situation for some time, and that its conclusions may well fall into three periods: (1) The immediate present; (2) during the early period of decreasing costs and increasing efficiency and slowly recovering traffics; (3) normal operations.

If we survey the results of the past year in the application of present costs and rates, we find many railways failing to earn interest upon their borrowed capital; we find some others more fortunately situated who have earned dividends on their share capital. One or two exceptions of low bonded indebtedness have done extraordinarily well on their share capital. If we survey the situation by districts, in order that single instances do not mislead us, we will find that the whole of the Class 1 Southern roads barely covered bond interest, while the most fortunate group, the Western roads, shows an earning of only 4 per cent in 1921 upon the tentative valuation. Moreover, it is obvious that maintenance has been held to a low level and new equipment and extensions practically nil.

I believe there are cases where earnings could be increased by lower rates. I know that it is contended that such opportunities do not exist, but no one can review the testimony given here during the past few weeks without concluding that the rates in special instances are stifling business.

The Second Period: During 1922

We must assume that those railway wages and supplies which are out of line will at least in part follow down to the levels of decreased cost of living; we must assume that the efficiency that is slowly emerging after the government management will still further increase; we must assume that the volume of traffics will increase toward normal.

I have the feeling that the railways, being our greatest business, will agree that all these savings should be instantly devoted to relief in the rates on primary commodities, in order that we should expedite the recovery that can only come through decreased spread between producer's and consumer's goods.

I recognize that the uncertainty and slow reduction of rates in this fashion will itself delay business recovery because of the uncertainty of business as to its future costs. If our railways were in position to stand the temporary shock it would be infinitely better to drop the rates on primary commodities tomorrow—our business recovery would come faster. But we cannot ask the impossible.

If we look further to normal times, we could make a rough calculation that present wages and costs, at say 50 per cent above pre-war, would show that the railways can earn somewhere around a billion five hundred million dollars, in excess of the 6 per cent minimum upon tentative valuation. As I have stated, relief is first more critically needed in the rates on primary commodities. Some estimates given to me indicate that approximately 35 or 40 per cent of revenues are involved in the groups more urgently needing relief.

Efficiency of Railways

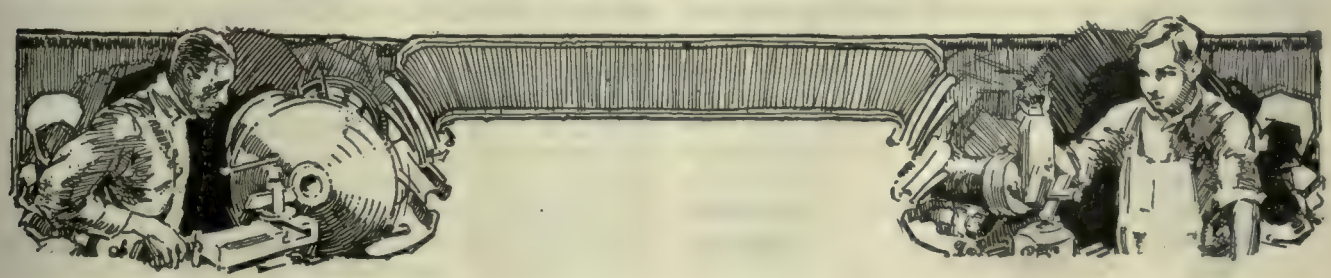
A great deal has been said about the inefficiency of our railway system. I do not sympathize with these statements. Comparison with foreign railways of the fundamental criteria of per-ton-mile costs, train loading and so forth, in the light of our cost of living, will demonstrate that our railways are of higher standards, better in methods than others and are growing in efficiency.

The consolidation of our railways into larger systems has been contemplated in our legislatures for some years past as a gain in efficiency. Its value can be overestimated—it is not a panacea for all trouble. It does give hope, however, of economies in further efficiency from more complete utilization of rolling stocks and terminals, some small degree of saving in overhead and saving in current inventories. But its greatest saving would probably be decreased cost of proper finance, increased financial stability and fuller independence from the supply companies.

It is probably unnecessary to refer to the question of government ownership. No one with a week's observation of government railways abroad, or with government operation of industry in the United States, will contend that our railways could ever be operated as intelligently or as efficiently by the Government as through the initiative of private individuals. Moreover, the welfare of its multitude of workers will be far worse under government operation.

We are struggling with the great problem of maintaining public control of monopoly, at the same time maintaining the initiative of private enterprise. I believe that we are steadily progressing to solution.

Great social and economic problems find their solution slowly and by a process of trial and error. We have tried unregulated monopoly, and have tried government operation, and found the error in them. We still have much to solve if we are to maintain our transportation. Much of this solution depends upon the successful initiative of the railways themselves and much of the shaping of these matters lies, fortunately, in your able hands.



Attributes of a Successful Foreman

The Opportunity of Foremanship—Great Advantage of a Cool Head—"Bossism" vs. Leadership—Method of Rating the Men—Planning the Work

By JOHN S. WATTS

THE position of foreman is the logical stepping stone from the ranks to a ranking and should be aspired to by the young mechanic as soon as he feels confident of his ability to handle any work that is part of his trade. It is not essential, nor is it hardly possible, that the aspirant for a foremanship should be an expert in every operation that is to be performed in his shop, but it is most desirable that he should be able to perform every operation, even though he may not be able to do it as quickly or as well as the expert. At the very least he must know how the work should be done, and this is best learned by having executed the work itself. While it is true that many successful foremen have been made out of men who could not themselves perform all of the operations that are being done by the men under them, this lack on the part of the foreman is always discovered by the men, and constitutes a serious disability to him, which has to be overcome by extra ability in other directions.

In nearly all cases the promotion to a foremanship comes without previous training for the office, and unfortunately it is very seldom that such training is possible. The position is made still harder by the fact that the man who tackles his first job as foreman is in a position where he can be, and is, easily compared with his predecessors, and should he fail to measure up to the standard set in the mind of his superior, he is rarely ever given the chance to rectify his mistakes although his failure may be due simply to a lack of experience. In the latter case, on a longer trial he might prove highly successful.

The Critical Time

On this account, the first month or so in the position of foreman is the most trying time of any man's career, calling as it does for the exercise of faculties which have previously been undeveloped, and as it is impossible for his wellwishers to do much in the way of assistance, he is in a most vulnerable position for the attacks of his enemies.

The opportunity is likely to come to any good mechanic at the most unexpected time, and if he fails to be prepared it is unlikely that the chance will come again. It therefore behooves the ambitious man to be prepared as far as possible, and not to rest content with thinking that a high grade of mechanical skill will be sufficient to carry him through. He should at least study the methods of the foremen with whom he comes in contact; much can be learned from both good and bad foremen by comparing the difference in their methods, and the results obtained by each. Having been through the mill myself from apprentice to superintendent, I have had experience with foremen of all kinds, good, bad and indifferent; therefore, I propose to touch upon the qualities that are common to good foremen, and also the principal reasons for the failure of the poor ones.

The first and most necessary requisite of the aspirant to a foremanship is the ability to control his emotions absolutely. He who would control others must first of all be master of his own mind, and must have exercised this control over himself long enough for it to have become a habit and not a conscious effort.

There will be many times when a foreman will be tempted to give way to anger, such as when by some stupid mistake a man spoils a piece of urgently-wanted work. To waste time in blasphemy or swearing at the culprit only results in still further delay and also in an exhibition of weakness. The real foreman will remain calm, and thus his brain will be in condition to quickly evolve a way of remedying the mistake and to issue the necessary orders. The habit of swearing is one that should be avoided, even if indulged in only under extreme provocation, as it is apt to increase the tendency to lose control of oneself through anger. Indeed, the use of any unnecessary words in conversation or in issuing orders is a waste of time, and any tendency to loquacity in speaking or even in writing should be sternly repressed.

The Value of Conciseness

One foreman I knew who was otherwise a fairly good man, was finally asked to resign for the sole reason that the simplest question put to him would involve one in an extended conversation covering perhaps fifteen minutes, when as many seconds should have sufficed. Not that he wandered from the subject in question, but that he could not give a direct and concise answer to the question; he must cover the whole subject, bringing in matters irrelevant to the point under discussion until in shear weariness one often left him talking in the middle of a sentence and obtained the information wanted by some other means.

A common failing with all humanity is the dislike for meting out punishment for stupidity or wrong doing except when in anger. This failing should be conquered as it leads to injustice, making for the imposition of a heavy penalty for a trifling offense done when the foreman happens to be in a bad humor, or the complete disregard of a serious offense if the foreman happens to be in a happy frame of mind. Any foreman who allows his emotions to control him to this extent soon loses the confidence of his men, and will be accused of favoritism of which he may be quite innocent.

On the other hand, by keeping always in a calm state of mind he is able to supervise the work with even-handed justice to all, his men will gain confidence in his fairness, he will find it easy to keep discipline, and his men will work for him to the best of their ability.

The foreman should regard himself as the leader of his men, not as their boss or driver, nor even as a commander; in giving out work to a man, he should consider that he is issuing instructions, not giving orders or commands. It is folly for a foreman to adopt a tone of command in speaking to his men; they are not compelled to obey his commands, although they may do so for a time in preference to quitting the job. The wise foreman will remember that the men can choose whom they will work for, and that they naturally resent a foreman assuming an authority which he does

not actually possess. The bullying type of foreman will be compelled to use a more moderate tone toward the more skilled men in order to retain them, and as this cannot fail to be observed by the other men, it will result in the loss of any respect they may have had for their foreman.

The fact that a foreman's success depends very largely upon the way his men work for him should never be lost sight of by the beginner. He will learn this if he holds the position long, as the fact will be impressed upon him so thoroughly that he will never overlook it. Experience has proved that the "leader" type of foreman will always get a higher production and a much better quality of work than will the domineering type.

All foremen, and especially new ones, are in a position that lays them open to easy criticism, so until their success is proved they should be wary of their steps. There are always many jealous people ready to spread the story of any little mistakes they may make, even though it may be of no importance. The foreman should not be afraid to criticize a man's method of handling his job, but he should be sure of his ground even to the point of delaying action until sure of his position.

A little instance will explain the point; I was given a planer job to do in a small shop where each man had the run of the shop, so far as using any particular machine was concerned. The job was obviously one for the small planer, but being unable to find the size of bolts needed at the small planer I went over to the large planer and started it up, as the table covered the place where the clamp bolts were kept. Just as I got the large planer started, the foreman, who was new on the job, came along and rather abruptly told me to put the job on the small planer. I of course explained that I was simply borrowing some bolts from the larger planer, which had he held his peace for half a minute he would have seen. Unfortunately for him quite a number of the men heard him and the snickers that he heard made the rest of that day rather uncomfortable for him.

Nevertheless, if one is sure that a job is being handled wrongly one should not be afraid to say so. The operator should be told just why his way is wrong, and the foreman should be sure that he is convinced before leaving him. Considerable tact is required in these cases, as some men are very obstinate about admitting their mistakes and some will harbor resentment, feeling that they have been shown up before their fellows.

If for any reason a man is unsatisfactory and has to be discharged, a foreman must have a really good reason for discharging him. It must also be one that can be demonstrated satisfactorily, as it is in the exercise of this function that the foreman is most open to criticism of favoritism or wrong doing, and the sympathy of his critics and even of his friends will naturally be with the discharged man unless the foreman has an obviously good reason for the dismissal.

In most shops the foreman has the onus of rating the men's pay in accordance with their value to the company, and in the smaller shops especially, this duty is one that is difficult of performance with satisfaction and justice to all. Here the foreman is between two fires; on the one hand he has his superiors whom he has to convince of the necessity of granting increases to certain of the men, and on the other hand, the men look for increased wages as their skill increases, with the result that in trying to satisfy both parties, he is subject to criticism from both sides.

Frequently the man who is applying for an increase will cite the rate of some other man as being higher than the applicant's in proportion to his skill. As the applicant naturally chooses for comparison that man whose rate gives him the best case for an increase, the process soon becomes endless unless great care is taken in setting all the rates. The granting of one increase will bring in its train demands from another whose rate is low when compared with the one just increased, and so on *ad infinitum*.

As quickly as possible after assuming charge of a shop, the manufacturer should make up a list of all his men, rating them by percentages of efficiency according to output, versatility, dependency, etc., and as he comes to know each man's capabilities better this list can be revised until he has a fairly just rating of all the men. Then if their rates are adjusted by judicious increases according to this rating, it should be possible to prove either to the applicant for an increase that he is receiving a wage in proportion to his skill as compared to the other men, or else to show the manager that the applicant is deserving of an increase.

In distributing the work among the men, much time can be wasted by not being ready to assign another job to a man the moment he completes the one in hand. The foreman should have a list of all the men employed, and keep on this list one job ahead for each man. Indeed, if possible, it is better to have every job in sight assigned to somebody. This will insure always having work ready for each man, and the material, tools, etc., for the next job can be ready at the machine before the man has completed the previous job, thus preventing the waste of time between jobs so common where the foreman has no systematic ability. This list should be made out carefully, so that if the foreman is called out of the shop for any length of time, or is absent through sickness, an assistant can keep the shop running temporarily.

Finally, the man who gets a foreman's job must learn to disregard the whistle. This may come a little hard at first, after years of dropping all thoughts of work the instant the buzzer blows, but no foreman ever succeeded who started and stopped by the time-clock. During the normal working hours, the demands on a foreman's time for instructions, supervision and consultation are so pressing that he will have scant time for that "planning ahead" of his work which is so essential to success. This planning will take up some of what have been his leisure hours, but if he is worth his salt the satisfaction of successful administration will more than compensate for the loss of other more or less inane amusements.

This may read as a rather discouraging and formidable array of virtues to be achieved by him who would attain success as a foreman, but the goal is one well worth striving for. Bear in mind that for the mechanic practically the only road to a higher position is through a foremanship, and that this position once gained and successfully held opens up a vista of greater possibilities, the first step being the most difficult of accomplishment.

Indeed, the cultivation of the necessary qualities of self-control and the ability to handle men are of themselves a sufficient reward in the increased confidence and happiness which they bring to their possessor, even without other gain, but the possessors of these virtues are so few that one who has them will not be long without some chance for promotion.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Collet Chucks for Holding Delicate Parts

By Milton Wright

In the making of knitting machines there are many delicate parts like that shown leaning against the tool-post of the lathe in Fig. 1. These parts are often,



FIG. 1. INSIDE AND OUTSIDE COLLETS ON ENGINE LATHE

though not always, of brass and must be handled very circumspectly in order to avoid distorting or bruising them.

To enable the operatives to handle them quickly without danger of spoiling them, engine lathes, bench lathes, hand milling machines and gear cutters, wherever the parts are worked upon, are fitted with the interchangeable collet chucks shown.

The chucks are made for both internal and external grip. The same chuck body holds either collet and of any size, so that all the operator has to do to chuck a piece of work is to pick up the collet that



FIG. 2. COLLET CHUCKS FOR FILING AND POLISHING

fits it, spin it into the seat in the chuck body, and put in the work; less time required to do it than to write the description.

The outside collets are knurled on the periphery so that a hand grasp is all that is necessary to tighten the work, even for a turning or facing operation. The internal chuck, shown on the spindle nose in Fig. 1, is tightened by means of a wrench on the tapered drawbolt that passes through the collet into the body of the chuck.

In Fig. 2 are shown a number of the collets on the bench lathe so that filing, polishing, or hand turning may be done without the expenditure of time or energy in devising means to hold the piece.

The chuck bodies, fitted to the various machine spindles, are of steel and carefully ground to the correct taper. The collets are usually made of cast iron, and the slotting is carried only as far as the threaded portion, so there are never any loose parts to be watched.

The making of the collets is a simple and inexpensive lathe job; good practice for the apprentice boy in the tool room. If he should spoil one now and then the loss would be inconsiderable.

Chuck for Drilling Two Widely Separated Holes in Alignment

By Amos Ferber

The piece shown at *A* in the illustration is the vertical shaft bearing bracket of a Scott & Williams knitting machine. It is of cast iron, about 8 in. long, and the hole in which the shaft takes its bearings is drilled and reamed for a short distance only at each end; the central portion of the casting being cored out.

To drill the hole at one setting would require a long slender drill which, on starting the hole in the second portion, would necessarily be unsupported for a considerable part of its length and would, therefore, be quite likely to run out and destroy the accuracy of alignment.

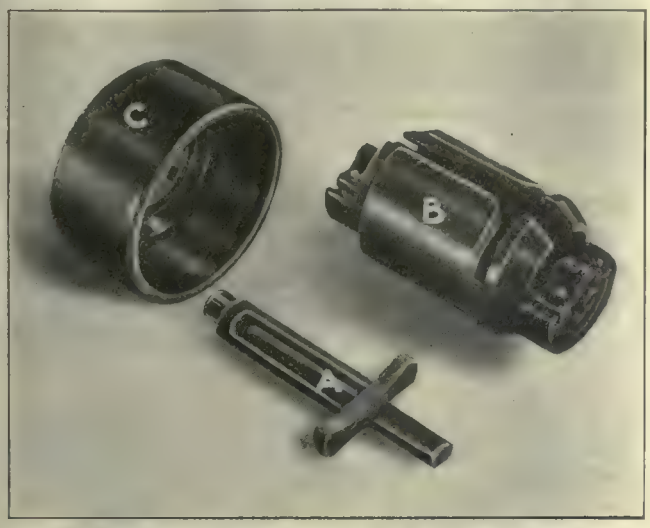
A method of drilling from the outer ends was sought that would allow the use of short drills and at the same time preserve the alignment despite the separate setting that would be required. The chuck, shown in part at *B* and *C*, was the solution.

The chuck body screws to the spindle nose of a J. & L. turret machine and the outer end of the body is recessed to take the cradle *B*, which holds the piece to be drilled. The recess in the chuck body is larger in diameter than the cradle, and the bottom of the recess is beveled to match the beveled end of the cradle.

The knurled ring *C* is recessed in the same manner with a corresponding bevel at the bottom of the hole, and screws over the chuck body so that when assembled with the cradle in place the latter is held by end pressure alone; the bearing being only upon the beveled surfaces. The cradle is symmetrical so that it is held either way by the chuck and is accurately centered by the bevels.

The work rests in V-blocks at each end of the cradle and is secured by caps that are fastened with small

machine screws. Because of the shape of the piece it is necessary to remove the screws at each reloading. When in place, the work becomes rigidly a part of the



THE WORK AND PARTS OF THE CHUCK

cradle and the whole is handled into and out of the chuck as one piece.

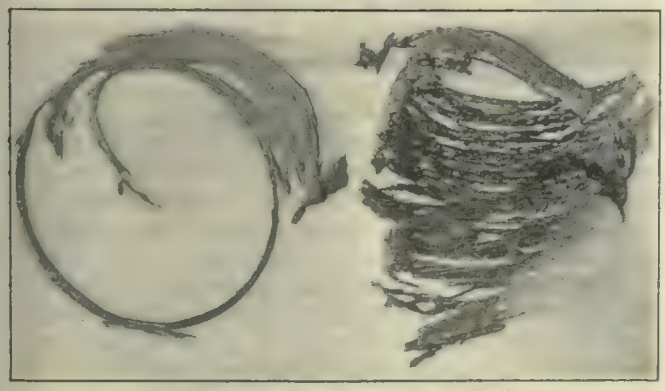
Two drilling and reaming operations are required; the hole at one end being drilled and reamed, the ring taken off and the cradle reversed without disturbing the work, and the drilling and reaming operation is repeated. As a precautionary measure a line reamer is passed clear through each piece as it is taken out of the cradle, but the reamer finds nothing more to do than to finish size the hole, as the two parts thereof are in practically perfect alignment as the work comes from the chuck.

Peculiar Chip From a Boring Tool

By R. Grant

The accompanying halftone shows a curious chip that came out of the end of a steel tube that we were boring. The tube was about 6½ in. in diameter, and the roughing cut, removing ⅛ in. diameter, pushed out such chips ahead of it.

The curvature of the chip was reversed; having the scale upon the outside of the curve. The tubes were carried in supports bolted to the carriage of



PECULIAR BORING CHIP

an engine lathe and the boring was done with a tool in a bar upon centers. The complete ring at the right came at the end of the cut.

How a Difficult Piece Is Hardened

By Leonard H. Anderson

The ring shown in the illustration is 19 in. in diameter and upon its periphery are 600 narrow slots cut by a saw in an automatic gear-cutting machine. The slots are 0.035 in. wide by 0.182 in. deep. The ring is a "cylinder" for a knitting machine and the slots are the channels in which the knitting needles work.

The slots must be of uniform width and depth in order to permit the extremely rapid reciprocating movement to which the needles are subject; there must be no tight spots to interfere with the free movement of the needles, nor must there be any looseness to allow them to shake or move sidewise.

Merely to harden the ring would not be difficult; anybody with sufficient knowledge of the action of fire and water upon steel could do it. To harden it so that each one of the 600 slots shall be a perfect fit for its individual needle after hardening is a job that might well cause consternation to the hardener who is not accustomed to this class of work.

The slots are cut slightly deeper than is required to clear the needle so that the outer diameter of the ring may be ground, but since it is obviously impossible to grind the bottoms of the slots, any distortion of the ring in hardening would result in making the slots of different depths after grinding the outside; leaving some of the needles loose and binding others so that



A DIFFICULT PIECE TO HARDEN

they would not move. This consideration is what makes the hardening a difficult job.

The heating is done in a gas fired furnace fitted with two electric pyrometers for determining the heat. The work is packed in a rectangular iron box, the dimensions of which are such as to allow about 3 in. clearance at the four points where the circle of the ring approaches the straight sides of the box, and a similar clearance is allowed at top and bottom. The packing material is ground bone.

After the box is placed in the furnace, the heat is gradually raised to 1,450 deg. F., where it is allowed to remain for a period of four hours. The temperature is then permitted to fall to 1,400 deg. for a few minutes before taking the box out of the furnace.

For quenching, a cylindrical tank of oil about four feet in diameter by six feet deep is provided. A hoop, made of iron pipe and of approximately the same diameter as the ring, has four stout wires depending from

it, each ending in a hook about two feet below the hoop.

The heated ring is suspended from these hooks and a board is passed under the hoop to furnish a convenient means of carrying it. When all is ready, the ring is lowered vertically into the oil until the board rests across the edges of the tank.

The heated ring thus suspended in the middle of a large volume of oil creates a circulation of the latter which, because of the ample space surrounding the ring, is free to flow upward and thus prevent the formation of gas pockets while insuring a steady stream of comparatively cold oil to all parts.

The work is allowed to remain without movement in the quenching tank for about five minutes; the exact time having been determined by long experience. It is then transferred to a similar, but smaller, tank of heated oil for tempering. Upon removal from the tempering bath it is cleaned with sawdust and allowed to cool in air.

A distortion of more than 0.002 in. from true roundness or a crack in any one of the 600 divisions between the cuts would be sufficient cause for rejection. That very few are lost out of the large number constantly passing through the hardening room is a distinct credit to the men who handle the operation.

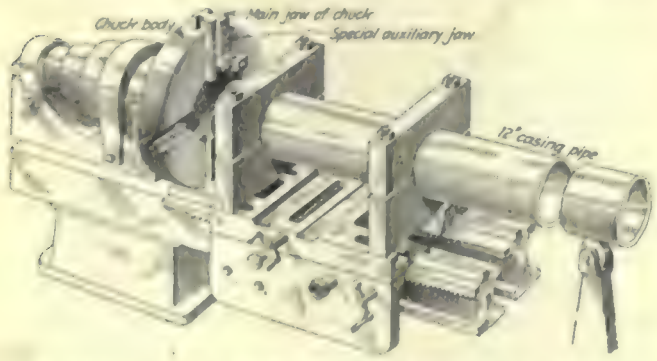
Improvised Turning, Threading or Trepanning Rig

By H. Beard

In a job shop, especially in the oil country, one is likely to get occasional jobs that require threading or short turning operations on pipes or bars that are too long for the lathe or too crooked to swing. In such cases I have found the rig shown in the sketch to be very handy.

The chuck used should have at least one tightly fitting jaw, but as fitting it for this work does not in the least incapacitate it for its regular duty, the best chuck in the shop may be used without compunction. If the chuck is of the kind that has its jaws made in two parts, the necessary holes are already in the main jaw and the chuck itself requires no preparation whatever; simply take off the auxiliary jaw and attach the toolholder to the main jaw by means of the regular screws.

The wooden clamps *A* must, of course, be made up to suit each job, but this can be done very quickly



TURNING OR THREADING THE ENDS OF LONG OR CROOKED PIPES

if a bandsaw is available, and in but little more time if the hole must be bored.

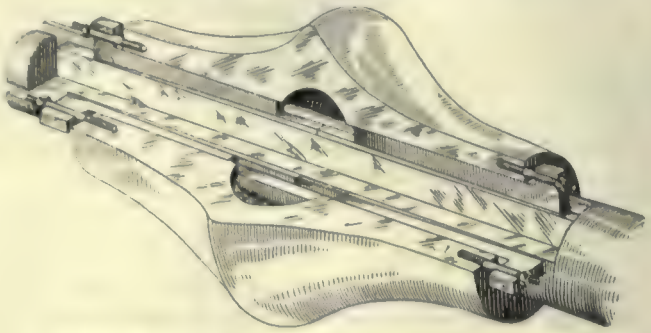
A star wheel fitted to the chuck screw, and a pin clamped to any convenient part of the lathe in such position as to engage with the points of the star wheel, will provide an automatic feed movement in case it is desired to face or undercut work such as pipe flanges, when on the pipe, or other work that must be held stationary while the tool revolves.

A chuck fitted up in this way for a lathe or drill press, and provided with a pilot for steadying the work, makes a very good adjustable trepanning tool.

Keying a Large Fan on an Engine Shaft

By F. C. Sinback

Some time ago the writer was called upon to make a repair on a large engine-driven ventilating fan used in a coal mine. The fan was mounted directly upon



KEYING A FAN HUB TO AN ENGINE SHAFT

the shaft of a single-cylinder reciprocating engine, which had no other duty than to drive the fan, and the fan itself constituted the flywheel.

As the machine was designed to be erected in the field, the hub of the fan was made a push, or light driving fit upon the shaft and was secured by a feather key let into the shaft and over which the hub must be driven. Setscrews through the hub bore upon the top of the key and were depended upon to hold the fan securely in place.

If such a design had been used upon a belt or motor-driven fan where the torque or driving impulse would be practically constant it would in all probability have proved satisfactory; but in this case the constant yank of the engine in passing over the centers soon caused the hub of the fan to work loose and become in a fair way to destroy both key and keyseats. This action was of course cumulative, growing noticeably worse from day to day as the movement increased, until it soon became evident that a repair was necessary in order to forestall a complete breakdown.

To make the repair the fan was dismounted and a portable keyseat miller was used to redress and at the same time deepen the keyway in the shaft. A second keyway of the same dimensions was made in the shaft at 90 deg. of rotation from the first. As we had undertaken the repair promptly, the keyway in the hub did not need much attention.

Two headed keys were then provided, as shown in the sketch, to take the place of the single long feather key, and thin tapered fillers were placed in the bottom of the keyway. The keys were then met and driven home, one from each side of the hub.

Two similar keys and fillers were placed in the new keyway but, as there was no corresponding keyway in the hub at this place, the outer surfaces of the keys were rounded to conform to the contour of the

bore and the keys acted only as wedges to tighten the hub on the shaft.

After the machine had been running for a day with the new keys in place the keys were again driven up solidly with sledge and drift bar; this practice was repeated each week thereafter until no more movement of the keys was perceptible. No further trouble was experienced.

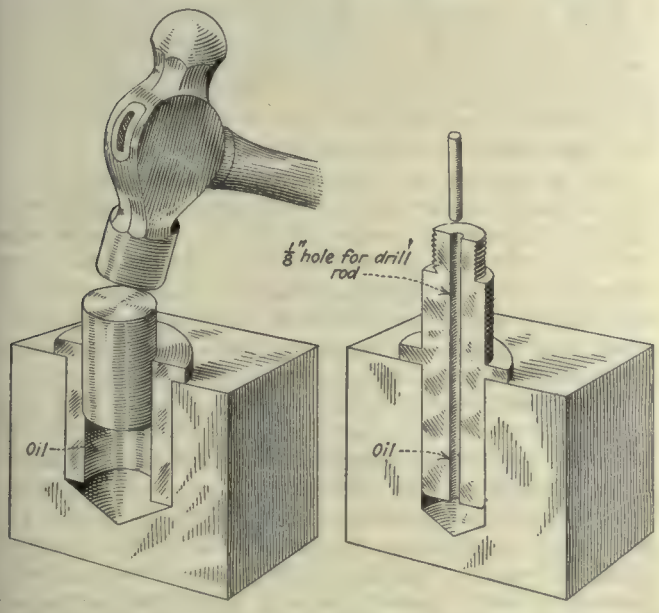
For this class of machine that is to be assembled in the field I do not believe in feather keys. Good substantial taper keys should be provided. The hub may then be slid into place easily and after the keys are driven up tightly there will be no chance for further movement.

Bushing a Blind Locating Hole

By H. P. Camp

On page 978, Vol. 55, of American Machinist there was described by Charles Reimschissel a method of removing a bushing from a blind hole, which seems to be the practical way under favorable conditions and provided, of course, the nut is not forgotten at the time the bushing is forced into the hole.

The accompanying sketches show how the bushing could have been removed if the nut were forgotten, and also how the same method is applied in case of a stud. The removal is accomplished by means of a



FORCING OUT A STUD OR BUSHING BY OIL PRESSURE

piece of drill rod or smooth round piece of steel fitting the hole freely but without shake.

The hole is first filled with oil from any convenient oil can, then the rod inserted and given a smart, quick blow with a hammer. Usually the bushing will come out with the first attempt.

The rod should not be any longer than is necessary. If too long it will be liable to spring or bow.

Stiffening a Boring Bar

By Dexter W. Allis

A boring bar will do much better work, and chatter less, if a metal wedge is forced between the back end of the bar and the toolholder.

Avoid Danger When Drilling in the Lathe

By Harry Senior

From time to time there have appeared in the columns of the American Machinist articles and letters telling the manner in which a drill or reamer should be held in the lathe when performing chucking operations, if the operator would avoid the danger of personal injury. To my old-fashioned mind, though all of these letters have pointed in the right direction, none of them have quite reached the mark.

It is the usual practice in chucking work in a lathe to place a common lathe dog on the shank of the drill or chucking reamer with the tail of the dog pointing toward the business end of the tool, and then to set the center-hole over the point of the tail center and feed the tool to the work with the screw of the tail-spindle. To prevent the tool from rotating with the work a bar of steel (usually a convenient lathe tool from the tool board) is thrust between the tail of the dog and the shank of the drill or reamer, with the free end resting upon the wing of the carriage.

Where the Danger Comes In

This, so far, is a dangerous condition. When the drill breaks through the work (a reamer is likely to "draw in" at any time) it is very likely to jump off the slight hold furnished by the center and twist out of line, thus cramping the drill in the work and fetching the lathe up "all standing." When this occurs, and its occurrence is practically inevitable, the drill or reamer will be ruined, the work will be shifted or perhaps thrown out of the chuck entirely, and there is an excellent chance that *somebody*, not necessarily the operator, will get hurt.

To prevent such a contretemps the writers of the above mentioned articles all advocate the placing of a lathe tool (reversed) in the toolpost in such position that it will bear against the dog and thus interpose the resistance of the carriage, which will be pushed along by the feeding pressure applied to the tail-spindle screw. This method removes most of the *probabilities* of accident but *none* of the dire *possibilities;* in fact it aggravates them. The operator is gambling upon the carriage to do just what he intends it to do. But it may not.

Now the right way to avoid all danger from this source was forcibly demonstrated to me about forty years ago through the medium of smashed fingers, a ruined reamer, and the good offices of a kindly-eyed, stern-voiced, gray-haired old man of the type whose scarcity we now mourn. He said: "Turn your dog around, sonny, so that the end of the tail will be about flush with the end of the reamer shank. Now set that tool in the toolpost so that it bears against the yoke of the dog as close to the shank of the reamer as you can get it, and be sure that it is so placed that the reamer, dog and all, can run with the lathe without hitting anything. Now throw that boring tool that you are using for a bar into the scrap-box and substitute a pine stick."

When I had done all these things he said further: "Now you can go ahead as fast as you want to. If anything happens the stick will break and the reamer and dog will run quietly around with the lathe. All you will have to do will be to get another stick. *Now* you have got to nurse a bunch of sore fingers for a week and I have got to buy a new reamer."

EDITORIALS

The Wave of Economy Threatens to Submerge the Department of Commerce

DISQUIETING news keeps leaking out from the committee room where hearings are taking place on the appropriations for the Department of Commerce. There is grave danger that the spirit of virtuous economy which flames high in the breast of Congress will burn out the good with the bad, and leave Mr. Hoover with his hands tied.

The Department of Commerce gets but one-half of one per cent of the total appropriation for running the country. It is about the only arm of the Federal Government that is of any service to business. The modest increases requested by the Secretary of Commerce have been approved by General Dawes, Director of the Budget, and thus receive the stamp of expert approval. This should be sufficient for any one but the politician, who looks for votes rather than for chances to improve government services to the citizen.

The politician, however, has his ear to the ground listening for the voice of his constituents. If he hears no voice raised in support of the appropriations for commerce, he is more than likely to decide that the general showing of reducing the total budget will be sufficiently popular to obscure the elimination of vital aids to business. It is not sufficient to make your own voice heard in Washington—see to it that every business man near you does likewise.

The Soldiers' Bonus and Business

THE question of the soldiers' bonus is again being forced to the front. And, as it involves the problem of raising additional revenue in enormous amounts, it interests every business man who is endeavoring to readjust his affairs on a sound basis.

It is not a question of gratitude for those who endured the hardships of war. Whether they went voluntarily or because they were forced into it by the draft does not especially matter. They went because it was their part to play. They played it well and we all honor them for it. As a matter of fact most of them couldn't have been kept out of the fight.

Thousands of the soldiers themselves are opposed to the proposed bonus. Those who require medical attention or financial assistance, or both, should receive what they need freely and generously. But no bonus can ever repay the suffering and hardships they endured. Those who do not require it should not be placed in the position of accepting gratuities.

We heartily approve of a real vocational training for all ex-service men who desire it. But the way in which this has been administered in the past is not particularly encouraging. This training can be carried out, however, so as to be highly beneficial both to the individual and to the country as a whole.

It is well to bear in mind the aftermath of the civil war as to the question of pensions. The milking of the U. S. Treasury by thousands, who never deserved pensions at all, is a well-known story which we cannot afford to repeat.

Organizations, which have the real interest of ex-service men at heart, will not urge an indiscriminate bonus to all who wore the uniform. Neither will they threaten legislators who oppose it. They can and should do much to insure proper treatment of those disabled in any way. They can and should insist on a fulfillment of the promises made regarding vocational and other training. But any attempt at a wholesale raid on the treasury will not be to the best interests of the country nor to themselves. Every business man should oppose it because it is unsound.

It's Time for Real Sales Engineering

EVERY shop manager or superintendent who is likely to be found in the running next year, is already beginning to plan for future changes in a more or less definite way. He has of course, been thinking about it for some time but there is a decided feeling that the bottom of the depression has passed and that the shop which isn't actually ready for business is likely to be left by the wayside. This feeling has reached the stage where methods are actually being planned and the wide awake shop managers are more receptive to ideas than has previously been the case.

Now is the time for missionary work to be done, both by the use of the printed word and by sales engineers, men who know not only prices but just what the machines will do—and how they will do it. Traveling expenses are still high, but railroad fares have been relieved of the 8 per cent war tax and in some few cases hotel rates have receded a trifle. But regardless of the cost, the time for missionary work is at hand.

This means more than salesmanship in the ordinary sense. It means that real engineers, familiar with the machines and their possibilities, must do thorough educational work with those who can use to advantage machines of their particular kinds. This is no time for glittering generalities. Before men will even consider replacing present equipment, they must be convinced beyond a doubt as to increased production or better work, or both.

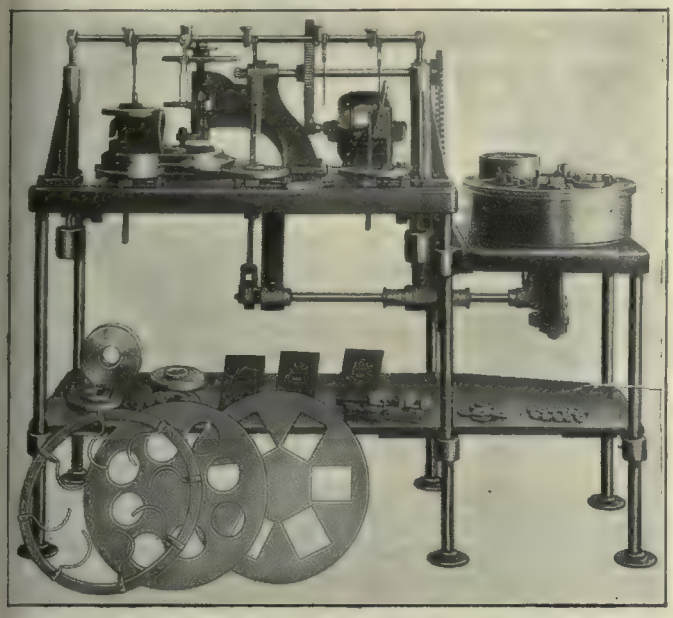
The sales engineers must in fact be production men as well. They must be able to analyze the other man's problem, show him how and why the machine tool in question is adapted for the work, and give fairly definite figures as to production and its cost. Care should be taken to stress production as the main point. Machine tools should never be sold on any other basis. The most successful factory managers do not buy so many pounds of iron and steel at so much a pound. They buy the ability to produce, or production capacity, and prices should always be considered from that standpoint.

Immediate orders are not likely to be forthcoming in many instances, although they are being placed in more cases than we are apt to realize. But missionary work at this time will bear fruit in the months to come. It's time for real sales engineering.

Shop Equipment News

Foster Air-Brake Valve Finishing Machine

The machine shown in the accompanying illustration is intended for finishing the working parts of the valves employed in railroad work for air-brake equipment. It is semi-automatic in operation, and intended to give much more rapid and more accurate lapping than that performed by hand. It has recently been placed on the market by the Walter H. Foster Co., 50 Church St., New York, N. Y. The machine enables the finishing mechanically of both slide valves and their seats, the lapping being done by the machine. It is thus possible to maintain flat surfaces to the edges of the ports and openings.



FOSTER AIR-BRAKE VALVE FINISHING MACHINE

At the right side of the machine is shown a rotating disk for lapping the parts. Plates, such as those standing in front of the machine, are used to hold the parts in position on the disk. In the illustration, several types of valves are being lapped at one time. The plates are made to accommodate both the seats and the rotaries of engineers' and of independent brake valves, the graduating valves and slides for triple valves, as well as the slides for the distributing valves. The lapping plate and the work holder rotate in opposite directions and are eccentric to each other. Consequently, the work is constantly changing its position on the lapping plates. This method of operation enables both the obtaining of flat surfaces on the parts and the keeping of the lapping plates true.

It requires from 5 to 15 min. to lap a surface, although ordinarily a number of pieces are finished at one time. The lapping plates are kept plane and in the proper condition by the rotary mechanism shown at the back of the machine on the left-hand side. Two plates are rotated against each other with the centers eccentric, so that they are ground perfectly true.

The horizontal rod shown at the top of the machine reciprocates in a vertical plane, so as to move through a distance of about 1 in. the lap sticks that it holds. This part of the apparatus is intended for finishing the seats in the body of the valve itself, and is so arranged as to hold five valves at one time. An arrangement is provided at the bottom end of each lap stick for holding it in the proper position against the work. The bars used for this are adjustable as to the pressure applied, and automatically drop down out of the way when the lap stick is removed. At one station there is a fixture for finishing the seat for the graduating valve. The mechanism at any station can be stopped and started independently of the others.

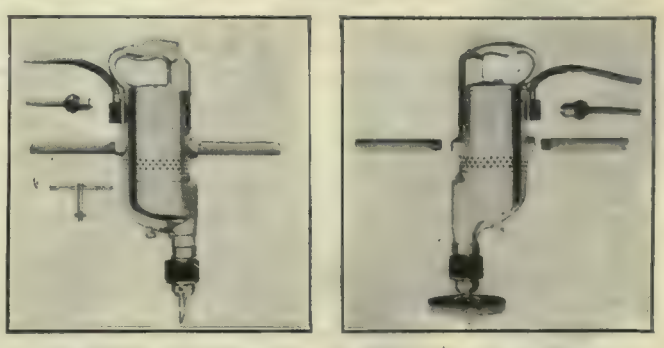
A ¼-hp. motor is ordinarily used to drive the machine, although tight and loose pulleys can be employed instead. Clutches are provided, so that one part of the mechanism can be operated while the rest remains idle, if so desired. The machine requires a floor space of 64 x 28 in. and weighs 1,200 pounds.

Wodack Combination Portable Electric Drill and Grinder

The Wodack Electric Tool Corporation, 23 South Jefferson St., Chicago, Ill., has recently placed on the market a combination portable electric drill and grinder. The tool is shown in the accompanying illustration as adapted to both drilling and grinding work. It has a drilling capacity of ⅛ to ⅝ in. in steel, and when used as a grinder it carriers a 6 x ¾-in. abrasive wheel. The device is similar in construction to that described on page 37, Vol. 54, of AMERICAN MACHINIST, except for the fact that its speed is different.

Two speeds are provided, the slow one being for drilling and the fast one for grinding. The tool can be quickly changed from high to low speed and from grinding to drilling equipment. The motor develops ½ hp. under load. Due to the fact that it is of the universal type, it can be operated on both direct and alternating current having the same voltage. The switch is located in the handle at the top, and is of the make and break, automatic-stop type. The operator must grip the handle or apply pressure to close the circuit.

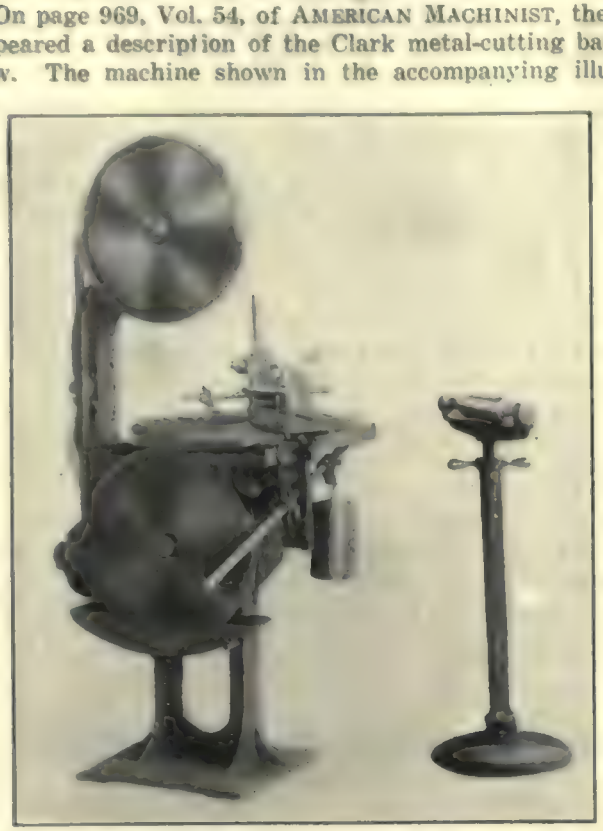
Aluminum castings and ball bearings are used throughout. The total weight is 19 lb. All parts of the tool, including the motor, are made in the Wodack factory. The device is adapted to general work.



WODACK COMBINATION DRILL AND GRINDER

Clark Metal-Cutting Band Saw

On page 969, Vol. 54, of AMERICAN MACHINIST, there appeared a description of the Clark metal-cutting band saw. The machine shown in the accompanying illustration and recently placed on the market by the Clark Tool Works, Inc., Belmont, N. Y., is very similar in construction to the machine previously described, although it is provided with such features as a movable carriage, gravity feed, work-holding vise and motor drive not incorporated in the former model.



CLARK METAL-CUTTING BAND SAW

The machine is equipped with ball bearings throughout. The upper wheel bearings are packed in grease, while the lower bearings are lubricated from the gear box. The machine is driven by means of an electric motor mounted at the back. The motor connects directly to a gear box located on the side of the frame opposite the wheels. Two speeds, controlled by a handle on the outside of the box, are provided. The machine has a capacity of 6 x 12 inches.

The table is pivoted in the center, so that it can be swung in either direction to allow long bars to clear the saw at the back of the machine. The saw guides are mounted on the table and swing with it, thus holding the saw at right-angles to the work at all times. Due to the construction, the saw is twisted only when cutting off long pieces, and then only sufficiently for the work to clear the saw at the back of the machine.

The movable carriage operating on the table is provided with a gravity feed. By changing the position of the weight on the lever, the pressure of the feed can be controlled. Stops are provided so that the travel can be adjusted. The work-holding vise is so mounted on the carriage that by loosening one capscrew it can be turned to permit of holding the work at any angle to the saw that is necessary. By removing this capscrew, the vise can be lifted off, thus leaving a smooth table 20 x 24 in. in size for use in cutting plates. An adjustable ball-bearing stock stand, shown at the right of the machine, is also furnished.

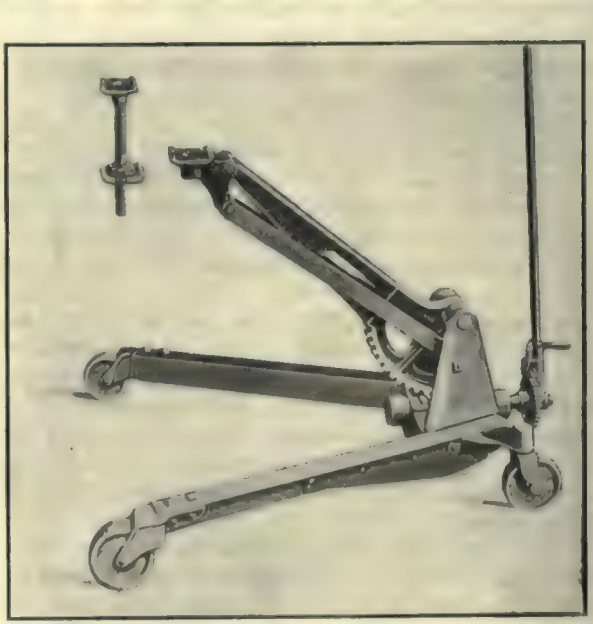
Weaver Hi-Lift Jack

The accompanying illustration shows the "Hi-lift" jack recently placed on the market by the Weaver Manufacturing Co., Springfield, Ill. The jack is intended primarily for use in garages for the lifting of trucks and passenger cars. It enables the operator to raise one end of the chassis, so as to provide sufficient room for working conveniently on the under parts of automobiles. By merely raising the weight of the car from its springs, such jobs as oiling springs and replacing broken leaves and worn shackle bolts can be performed.

The jack is mounted on four casters, the two near the operating lever being provided with ball and roller bearings. The load rests on the end of the arm pivoted at the narrow end of the base. By means of a ratchet and worm and wheel, this arm can be raised or lowered. The operation is performed by means of the long lever shown at the right, although for rapid operation, the long lever can be removed and the worm turned by means of the crank. The travel of the saddle at the end of the arm is from a minimum height of 7 in. to a maximum of 38 in. from the floor. By means of the screw attachment shown, a maximum height of 45 in. can be obtained. Due to the fact that motion is not reversible through the worm gearing, there is no danger of the arm lowering unless the worm wheel be turned. No ratchet or catch is necessary to hold the mechanism at rest.

For the raising and carrying of truck wheels, an attachment can be fastened to the end of the arm, so that a plate on the attachment can be inserted underneath the wheel. Two small arms steady the wheel to prevent it from falling, and the clearance space allowed is sufficient to permit of the use of a wheel puller. The saddle is always in a horizontal position, due to the connecting links, so that there is no danger of the load sliding off.

The jack is made of steel and malleable iron, and has a lifting capacity of 3,000 lb. The maximum width is 40 in., so as to provide sufficient clearance for lifting truck wheels and yet permit the jack to pass between the front or rear wheels of a car. The jack weighs 225 pounds.



WEAVER HI-LIFT JACK



NEWS SECTION

Safety Congress To Meet in Detroit

Monster preparations are being made by the Detroit Board of Commerce for the annual Safety Congress of the National Safety Council, which will be held in that city during the week of Aug. 28 to Sept. 2. A committee of prominent Detroit citizens has been selected to arrange the details of what promises to be the greatest conclave of engineers and educators along safety lines that was ever brought together. S. C. Mumford, president of the Detroit Safety Council, is chairman of the convention committee. He is being assisted by representatives from civic and social bodies, welfare and industrial associations and the municipal and state governments.

Through the courtesy of the Board of Education, the meetings will be held in the new Class Technical High School. The school affords ample facilities for the exhibit of safety apparatus and devices, machinery and manufacturing processes. It is expected that nearly five thousand firms will exhibit their products.

Coal Enough for Forty-One Days

A report on stocks of bituminous coal has been prepared jointly by the Census Bureau and Geological Survey under direction of Secretary of Commerce Hoover.

The total commercial stock of this coal on Jan. 1, 1922, it is estimated, was 47,000,000 tons. This was 16,000,000 tons, or 25 per cent, less than the amount in storage at the end of the war.

In fact the stocks were found to be slightly smaller than on Nov. 1, 1921, when 48,000,000 tons were on hand. The public utilities and railroads, the report shows, have taken the precaution to increase their stocks during November and December, but their gains have been offset by a decrease in the stocks of industrial consumers and retail coal dealers.

The present stock is sufficient to last about forty-one days, if perfectly distributed. By classes of consumers, the figures are: Railroads, 35 days; coke plants, 42 days; steel works, 48 days; electric utilities, 51 days; coal-gas plants, 89 days; other industrials, 51 days. Retail coal yards have bituminous enough to last 33 days and anthracite sufficient for 44 days.

Railroad to Spend Forty Millions for Equipment in 1922

The Atchison, Topeka & Santa Fe Railway will spend $43,150,000 for improvements and new equipment in 1922, W. B. Storey, its president, announced last week at the close of the company's regular monthly board meeting. Of this he said $11,000,000 represents carry over from last year on work authorized but not done.

Mr. Storey said the expenditure would require no new financing, as the company has a substantial amount of cash and Liberty bonds in its treasury and a reasonable amount will also be provided from current earnings. He said the road's requirements were such that $60,000,000 annually should be spent for the next three years.

The 1922 outlay includes $11,750,000 for the completion of betterments already begun; $22,000,000 for new work, including 75 miles of new second track in Arizona; $1,400,000 for a new fifty-five mile line leading west from Santata, Kan.; $8,000,000 for new equipment; $6,662,236 for additional maintenance, and sums of $1,500,000 or less for such items as bridges, trestles, culverts, stations, office buildings, yard tracks, sidings, signals, shop machines, tools and assessments for public improvements.

Discontinue Temporary Ordnance Depots

The War Department has requested Congress to appropriate $1,642,351 for the removal of ordnance stores from temporary to permanent ordnance depots, to permit disposition of the temporary depots. It is estimated that the Government will realize $3,500,000 in disposal of surplus ordnance material, and save at least $400,000 a year by discontinuing temporary depots. In the interest of economy it is planned to move the material to the nearest point where permanent storage is available.

A. S. T. M. Meeting To Be Held in June

Notice has just been received that the twenty-fifth annual meeting of the American Society for Testing Materials will be held in Atlantic City, N. J., from June 26 to July 1. Headquarters will be at the Chalfonte-Haddon Hall Hotel. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa., is secretary of the society.

Machine Tool Builders Revise Constitution

The committee of the National Machine Tool Builders' Association, which was appointed to revise the constitution of that body, has completed its work. The document with the changes will be submitted for the approval of the members at the annual meeting to be held in May.

The committee consisted of O. B. Iles, International Machine Tool Co.; Paul E. Thomas, Kempsmith Manufacturing Co.; and H. P. Dix, Wilmarth & Morman Co.

Cadillac Tool Co. Officials Form New Organization

The Cadillac Tool Co., of Detroit, Mich., has been dissolved and the officers of that company have banded together in a new organization which is to be known as the Cadillac Machinery Co. This change came about following the death of Percy M. Fowl, president of the tool company. Mr. Fowl requested that the business which he started some years ago, be carried on by his associates.

The new company will not manufacture machinery, but will engage in the sale and distribution of tools and machinery in the same territory in which the old company operated. Salesrooms have been opened at Lafayette and Beaubien Sts., in Detroit. C. L. Campbell is president of the new company. Others associated with him are C. E. French, L. E. Bugbee, C. G. Valentine and R. J. Borneman.

Standards Committee Approves Specifications of Testing Society

The American Engineering Standards Committee has approved as tentative American standard the specifications of the American Society for Testing Materials for: cold-drawn bessemer steel automatic screw stock (A32-14); cold-drawn open hearth steel automatic screw stock (A54-15); methods of chemical analysis of manganese bronze (B 27-19); methods of chemical analysis of gun metal (B 28-19).

These specifications may be found in the 1921 volume of "A. S. T. M. Standards." Copies may also be obtained from the American Engineering Standards Committee, 29 West 39th St., New York City.

Machine Tool and Other Business in Germany

By H. A. Carstens
American Manager, Alfred H. Schutte, Cologne, Germany

Germany is busy—very busy. Prices have been going up as the exchange value of the mark has gone down, but the peak seems to have been reached although no one can say definitely as to that. Wages have been going up also, but neither prices nor wages have kept pace with the fall of the mark. Early in December, 1921, a mechanic earned about 15 marks, 15 pfenigs per hour, or about 70 cents a day. He must exercise great care but can get along fairly well. As compared with 1914 we may say he is, perhaps, 60 per cent as well off as then.

The worst feature is that nothing is settled; there is as yet no assurance as to the future. But everyone is working, and working hard. First, to forget the horrors of the past and to have something definite to do; second because without work even the necessities of life cannot be obtained.

The fact that Germany cannot entirely feed herself adds to the difficulty, as the food that must be bought from outside is very high at the present rate of exchange. But in spite of this life is bearable, if not comfortable, owing to the willingness and desire of the people to work and to produce. And some shop managers state that labor is ten per cent more efficient than before the war.

Machine Tool Shops

Machine tool and other machine shops are busy. Plants are being well equipped to produce all sorts of goods, because it is realized that only by exchanging manufactured products can business be returned to normal. Some exporting is being done, the rate of exchange aiding in this but hindering in the purchase of raw materials or machinery from outside countries.

Germans are naturally frugal and hard-working and the necessity of the present situation is making these traits even more of a national habit. Economy and efficiency are the watchwords and the results should be evident in the years to come. But after one has lived in Germany for a few months, he stops trying to prophesy or even speculate on the future. The natives have learned to live each day unto itself, almost without thought for the morrow, as there seems to be little or nothing on which to base one's judgment.

Desire to Trade with the United States

One great desire of Germany at present is to get back to doing business with the United States. Her goods of many kinds are coming to this country in increasing quantities. But Germany realizes that in the long run all business comes down to an exchange of commodities, and she cannot buy our machinery at the present rate of exchange. She can and does take our money because it can be used in exchange with other countries, but to take our machinery and commodities is quite another matter.

The whole problem of exchange is decidedly puzzling. The bankers do not attempt to explain it much more than do the common people. Here is a land with practically no gold and business going at top speed; while the countries with gold, and particularly the United States with the bulk of the world's gold, have unprecedented idleness.

United States Notes More Desired Than Gold

An unusual experience in the summer of 1921 may be of interest. Wishing to secure some German marks, I went to Cook's Agency and asked the value of $10 American money in marks. The answer was 840, but when I produced a $10 gold piece, the rate rose to only 720 marks for $10. The paper money of the United States would buy over 16 per cent more marks than a gold piece. This is because gold cannot be exported from the country on account of the treaty.

Except for the occupied districts there is no evidence of revengeful or warlike feelings on the part of the people. The war is over, and the people are working to forget it as much as possible. The occupied areas are no more quiet than they would be elsewhere under similar conditions, and the American and English troops get on well with the natives.

For geographical and other reasons, Germany seems destined to secure a large part of the trade with Russia. The International Harvester plant at Moscow is at work and while not up to capacity, is turning out some agricultural machinery. All this is being used in Russia but she needs still more, which Germany is likely to supply.

What the future of Germany will be no one can tell, but if hard work, economy and the desire to again do business with the United States count for anything, she will work her way out in time. And perhaps sooner than some think.

Standardizing in Japan and Norway

Standardization work in Japan has recently been given a great impetus by the organization of the Japanese Engineering Standards Committee. The main function of this committee is to serve as a bureau for solving and initiating problems involving engineering standardization. The committee consists of seventy members presided over by the minister of the Department of Agriculture and Commerce, acting as president. The details of the work are handled by seven secretaries who are engineers in the government service. The work is being pushed with vigor, investigations already being under way on metals, woods, brick, screws, electric wires and electric motors.

In Norway a national standardization committee has been organized by the Federation of Norwegian Industries. One of the first projects which is being taken up by the new committee is the standardization of ship machinery and ship details.

There are now national standardizing bodies in the following fourteen countries: Austria, Belgium, Canada, Czecho-Slovakia, France, Germany, Great Britain, Holland, Italy, Japan, Norway, Sweden, Switzerland and the United States.

How Some of the Cincinnati Shops Are Getting Ready for Business

The Lodge & Shipley Machine Tool Co.

The Lodge & Shipley Machine Tool Co. is making no special changes in equipment as replacement has been going on during the past five years. Old machines were weeded out and sold when the price of used machines was high. As a result nearly all of the equipment is modern.

The company is, however, shifting machines to meet present and future requirements, utilizing its newer and modern buildings so as to secure better light, ventilation, etc. Line shafts, jack shafts and many machines have been equipped with ball bearings. Grinding and polishing heads, outboard bearings of motors, snagging grinders and tumblers all have all bearings. Shut downs and expensive delays have been eliminated. The bearings are thoroughly cleaned out once a year, using benzine or gasoline to cut out the old grease. They are repacked with a light grease—not too full—and are promptly forgotten for another year.

Another noticeable feature is the large amount of room allowed to each machine in the new shop. The output has, in several cases, been increased by reducing the number of machines and allowing more room for the man and his work. And there is no question as to its making a better looking shop in every way.

Cutting oil also receives careful attention. It is filtered and cleaned before being used again. The company's experience indicates that it is far more important than many realize to keep the oil clean and free from chips and fine particles. So doing makes possible more accurate work and less scrap.

The Acme Machine Tool Co.

The Acme Machine Tool Co. is also an example of gathering several branches of the industry under its roof, for example, the Champion lathe, which is built in four sizes, 13 in., 15 in., 17 in., and 19 in. and the Super-Matic, which is a machine distinctive in design, fully automatic, and with greater production possibilities in the manufacture of small parts for automobiles, cash registers, adding machines, electrical work, etc.

This company has taken advantage of the depression to put everything in first class shape both as to building and equipment. In common with others it has replaced some of its machines with newer models, thoroughly overhauling and conditioning the old machines before selling them.

Niles-Bement-Pond Shows Deficit

A recent report issued by Niles-Bement-Pond Co., New York, machine tool manufacturers, shows a deficit of $2,737,434 for the year ending Dec. 3, as compared with a net income of $1,031,522 for the previous year.

After deducting dividends amounting to $620,925 there is a deficit of $3,358,359 for the year. That deficit applied to the previous profit and loss surplus made that account $12,649,923 at the close of the year.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York

Some one suggested that last week should be called "Smile Week" and that we should all observe it by looking pleasant and being cheerful. The newspapers took the idea up but everyone treated it as a joke. This induced the smiles desired and a willingness to look on the bright side of things.

So subtle is the relation between the popular mood and the markets that it is quite possible that the higher prices generally recorded may be in part due to Smile Week. But whatever the cause prices are up and nearly every one seems more optimistic. Wheat has had a substantial gain. Corn has advanced. Hogs and hog products are firmer. Cattle are slightly higher. Cotton refuses to decline. Wool continues to improve. Rubber is in better demand. Sterling exchange advanced, while those vultures of hard times, the bucketshops, are failing or running to cover. What is called an "old fashioned bull market" is developing on the Stock Exchange, though just why it should be described as old fashioned no one knows.

The improvement in sterling has naturally made London more cheerful and there as here a distinct revival of the speculative spirit is noticeable. A recovery so general and all embracing must, however, have something more behind it than a jocular suggestion that we should all take laughing gas and those who look deeper for its cause are coming to agree with the writer that it is the inevitable result of the inflation in progress and in prospect.

Bonus Means Inflation

In a circular issued last week the Baltimore bankers, Nelson Cook & Co., express the view now generally accepted among financiers in saying "The distribution of a bonus averaging only $300 to each soldier would mean another era of inflation shorter and sharper than before, but far more serious in its effects. There would at once be a decided increase in the cost of living, food, clothing, and commodities would advance sharply as the demand for them progressed, and we would have a brief anti-climax which would leave the commercial world in a more prostrate condition after this second spending period than was the case after the orgy of extravagance which followed the Armistice."

This prognosis is one which every intelligent student of economics and financial history will endorse and while experts may differ as to the duration of the inflationary period they all admit its imminence and the importance of knowing when we ought to get off a train whose speed is now increasing day by day.

As yet the movement has hardly started, but it is developing according to precedent. Agricultural products, which were the first to decline when deflation started have been the first to advance. The stock market has followed, and there has been a distinct improvement in the demand for low-priced shares, especially railway shares, upon the theory that an increase in the purchasing power of the masses means more travel and more freight traffic.

But the markets through which the manufactured products of the country are distributed have hardly moved. The dry goods trade is still slack. The grocery markets are quiet. With a few bright exceptions, automobiles are hard to sell. The leather trade is dull, though it is improving. The mail order houses are not increasing their sales. The steel makers continue to whistle cheerfully for wind and the demand for copper has been checked by the figures of the Geological Survey which show stocks substantially in excess of the current demand despite a reduced production.

All this is as might have been expected. A change will be seen just as soon as the proceeds of the bonds now issued and to be issued get into circulation.

A Buyers' Market

That retail dealers appreciate conditions and are preparing for them is indicated by a statement published in the *Daily News Record* on Feb. 7, in which it was asserted that 876 buyers were listed in that paper as having just arrived in New York the day before and that this number was largely in excess of any previous record. It is therefore logical to expect an early increase of activity in the jobbing and retail trades and a continuation of the upward movement on the Stock Exchange until the entire gamut has been run and a reduction in bank reserves again indicates the approach of the necessary and inevitable contraction.

Just when this reverse movement will commence no one can say. It will depend upon the rapidity of the expansion, which has hardly commenced as yet, for the weekly statement of the Federal Reserve System shows a reserve ratio that is practically unchanged at 76.1 per cent because a further gain of $10,000,000 in gold holdings about offsets an increase of $25,000,000 in deposits.

The upward movement which seems to be in prospect will of course be punctuated by reactions that will be temporarily depressing, but there is every indication of a broad and general advance in prices that will not be halted until bank credit becomes scarcer unless we encounter some national or international cataclysm that cannot be foreseen.

These are the probabilities as I see them, but it must be admitted that there are many reasons why the predicted inflation may be prevented or fail to produce the result expected.

One is that both its imminence and effect are obvious and the obvious is often discounted before it occurs. Another is that there is so much opposition to the Federal Bonus bill and the additional taxation that it will involve that there is a bare possibility of its defeat. This is, however, very unlikely.

A third is the impecuniosity of the farmers, who do more than half the buying in the twenty-nine "best business States" of the country. The Senate has passed the bill legalizing agricultural co-operation, but helpful as it will be the effect cannot be immediately felt.

Then there is the coal strike so widely advertised for April 1, and the threatened extension of the strike among the textile workers of New England. They may breed trouble if they occur, though it is true that the expected rarely happens.

The possible postponement of the Genoa Conference if the United States refuses to be represented is another disturbing factor and in Europe as well as here many minor difficulties are to be discerned. They need not be catalogued. There are always difficulties to be seen if we look for them. The question is will their influence restrain or prevent the commercial and financial distention that will follow the expenditure of the two or three billion dollars that Congress and the other legislative bodies of the country seem bent upon distributing among the people in the near future.

Every one must answer this question for himself. It cannot be evaded for it is a condition rather than a theory that confronts us and whether we like it or not we must be prepared for heavier taxes and intelligent in appraising their effect.

Southern Committee to Equalize Freight Rates

At a recent meeting of the Southern Freight Rate Committee in Atlanta a promise was made to representative business interests of the ports of the South Atlantic that these ports will be placed on an equitable basis with the Gulf ports, through the abolishment of preferential railroad rates on shipments to the west coast. At present Gulf coast ports of the South enjoy an advantage, for port charges at South Atlantic ports are assessed by the carriers in addition to the freight rates, and not absorbed as they are at the Gulf ports. The committee also promised that it would either also absorb port charges at Gulf ports or abolish them. Either of these changes in tariff would place South Atlantic ports on an equal footing with Gulf ports in bidding for the rapidly growing trade Southern industry is experiencing with the Pacific coast.

On iron and steel articles, particularly on cast-iron pipe which forms a large part of the commerce with the Pacific coast, the charges assessed at South Atlantic ports add a rate cost of a few cents per hundred pounds as compared with Gulf ports, and therefore prohibits the handling of any of this business.

The Trend of Business Improvement—Plants Resuming

The Pennsylvania Pump and Compressor Co., Easton, Pa., has adopted a full time operating schedule at its plant, following partial time operations for some weeks past.

The Pennsylvania Railroad Co., is increasing operations at its car shops at Logansport, Ind., and about 250 men were added to the working force.

Pusey & Jones, Wilmington, Del., have resumed operations at their local shipyard, following a suspension for more than a year. The company has taken contracts for the construction of two vessels for the Seaboard Bay Line, Baltimore, Md., a subsidiary of the Sea board Air Line Railway Co.

The New Haven Clock Co., New Haven, Conn., has resumed manufacture at its plant, giving employment to about 1,500 operatives. The factory has been closed for several weeks past.

The Grand Trunk Railroad has reopened its car shops at Battle Creek, Mich., and will give employment to over 550 men.

The Slatington Iron and Steel Co., Slatington, Pa., has resumed operations in a number of departments at its local mill, following a shut down for many months past.

Creasy & Wells, Bloomsburg, Pa., have commenced production at their new local planing mill, and plan for immediate increase in operations. Additional machinery will be installed and new workers added to the force.

The New York Central Railroad Co. will increase operations immediately at its shops at Oswego, N. Y., adding about 100 men to the present working force.

The W. & B. Douglas Co. Middl town, Conn., manufacturer of pumps, hydraulic rams, etc., is increasing production at its plant and has adopted a five-day working schedule in the several departments; the foundry is working on a four-day operating basis, following a curtailment for some time past.

The American Car and Foundry Co., 165 Broadway, New York, is arranging for increased operations at its plant at Terre Haute, Ind., which for a considerable time past has been running at about 50 per cent of normal. New forge and machine shops are being completed, replacing structures destroyed by fire several months ago, and the buildings will be placed in service as soon as available, with increase in working force. The company has orders on hand for about 900 railroad cars.

The International Harvester Co., Chicago, Ill., has resumed operations at its works at Milwaukee, Wis., following a suspension for some time past. The plant is devoted to the manufacture of farm tractors, farm engines, cream separators and other agricultural products.

The Western Maryland Railroad Co., Baltimore, Md., has leased its car and locomotive shops at Elkins, W. Va., to W. K. Hosier, private contractor, who will operate the plant for contract work for the railroad, giving employment to about 100 men.

The Automotive Foundry Co., Freeland, Pa., manufacturer of automobile parts, etc., has resumed operations with a full working force, under normal schedule. A number of improvements have been made at the works for increased efficiency.

The Grant Lees Gear Co., 2365 East 69th St., Cleveland, Ohio, manufacturer of automobile gears and transmissions, is arranging for an immediate increase in working force to about 600 men, or more than 300 additional employees. A night working shift will be placed in effect at once. The company is said to have orders on hand to insure capacity production throughout the present year.

The L. C. Smith & Brothers Type writer Co., Syracuse, N. Y., has increased operations to a five-day week schedule, following a four-day week basis since last June.

The General American Tank Car Corporation, Chicago, Ill., is arranging for immediate increase in production at its different plants, which have been running at about 75 per cent capacity for some time past. The works are located at East Chicago, Ind.; Warren, Ohio; and Sand Springs, Okla.

The Seminole Construction Co., Buffalo, N. Y., has reopened the local car repair shops of the Erie Railroad, recently secured under lease, and will operate the plant for contract work for the road. Immediate employment will be given to about 350 men and this force will be increased at an early date.

The Standard Parts Co., Cleveland, Ohio, has taken an order from the Wills-Sainte Claire Co., Detroit, Mich., manufacturer of automobiles, for axles to an amount approximating $1,000,000. The contract will insure capacity production at the local Eaton axle works of the company throughout the year. Shipments will be commenced in March.

The Cleveland, Cincinnati, Chicago & St. Louis Railway Co. has resumed operations at its shops at Beech Grove, Ind., following a shut down for several weeks. Employment will be given to about 900 men.

The Cadillac Motor Car Co., Detroit, Mich., is operating at its new plant in that city at capacity, with normal working force. A regular production schedule is being maintained.

The Southbridge Foundry Co., Southbridge, Mass., recently organized, has commenced operations at a one-story plant on Worcester St., and will give employment to about thirty molders and other operatives. Frank S. Mills is president and general manager.

The Phoenix Iron Works, Meadville, Pa., has adopted a daily working schedule of three 8-hour shifts, and will maintain this capacity output for an indefinite period. Work is being concentrated on steel tank manufacture for oil storage service.

The Columbia Malleable Castings Co., Columbia, Pa., resumed operations at its plant on Feb. 6, following a period of idleness of several months. The working force will be increased gradually until normal is reached.

The Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa., announces a marked increase in the sale of large power apparatus in 1922, with January sales of $1,500,000 in turbine-generators and condensers. Some of the companies purchasing this apparatus were Pennsylvania Edison Company of Easton, Pa.; the Madison (Wisconsin) Gas and Electric Co.; the North Carolina Light and Power Co. The Takata & Co., of Japan, has ordered another large turbine-generator for one of its new plants. Fifty steam auxiliary units were sold during the month for a wide range of applications, many of the purchasers being industrial power plants.

W. N. Durbin, head of the Anderson Foundry and Machine Works, Anderson, Ind., reports that business continues good and that the factory is working full time. The testing room is being operated days, nights and Sundays.

The U. S. Radiator Co., which has headquarters in Detroit, Mich., has taken a lease on the Bryant Building in Columbus, Ohio. A force of workmen is making the necessary alterations. A large stock of radiators and all kinds of heating equipment will be carried in the Columbus branch.

The Boston & Albany Railroad Shops at West Springfield, Mass., resumed work last week after a shut-down. Four hundred employees returned to work.

W. H. Morsches, superintendent of the Nicholson File Works, Anderson, Ind., stated recently that the plant was gradually taking on some of its former employees as business warranted, and that the business outlook for the coming year was good.

Indication of better progress in the metal-working industries in the Cleveland, Ohio, district, is shown in the increase of employment in plants in that city. The Clarkwood plant of the Steel Products Company employed 100 additional men last week, bringing the total up to 750 men, officials announce. In the Detroit plant 200 out of 350 of the normal number now are employed. January business was 50 per cent greater than December, the company's figures show, and February promises to pass January by a like gain. The company manufactures automobile parts, principally bolts and valves.

The Fafnir Bearing Co., New Britain, Conn., reports that orders are coming in and that the shop is now running on full-time with as many of the old hands as conditions will permit.

Idle Freight Cars Drop 38,000 in One Week

Reports from the railroads of the country to the car service division of the American Railway Association show that 555,353 freight cars were idle on Jan. 23. This is a reduction of 37,945, compared with the total on Jan. 15.

The report states that 396,192 of these were surplus freight cars, that is, cars in good repair and immediately available for service if traffic demands warranted, which was a reduction of 43,790 cars compared with the number of such cars at the middle of the month. The remaining 159,161 were idle freight cars in need of repairs, in excess of the number normally regarded as being in bad order.

Surplus box cars totaled 159,109 or a reduction within a week of 31,071; surplus coal cars amounted to 183,999, or a reduction within the same period of 11,285. Coke cars showed a reduction of 283 which brought the total to 4,542, while stock cars totaled 20,679 or 949 less than on Jan. 15.

Tabulations showed 319,512 freight cars in need of repairs on American railroads on Jan. 15, which was 13.9 per cent of the cars on line. On Jan. 1, there were 313,190 or 13.7 per cent. Allowing 7 per cent of the cars on line as being normally in need of repairs would leave 159,161 as representing the number of bad order cars which were idle on Jan. 15 because of business conditions.

New England Letter

During the long and tedious period of inactivity through which the machine tool and allied industries have passed and the end of which we hope we can now see, few New England shops have been altogether idle. When customers declined to order more machinery at any price, and shops found that they could not go on building indefinitely without reaching the limit either of storage space or capital, or both, there were just about two things that could be done: to take stock of their physical condition and put it in shape to handle new business to advantage when it finally arrived, or, to develop new machines or lines of machinery that would enable the users to get out work faster, cheaper, or better than they had heretofore done.

Many New England shops did one or other of these two things; not a few did both. Lathes, planers, drilling and milling machines, etc., were overhauled; bearings were taken up or new ones fitted; new spindles made in some cases, and sliding surfaces scraped and realigned.

The reconstruction included the cutting of new gears where the old ones showed signs of wear, replacing lead- and feed-screws with new ones, replaning the tables and scraping the beds of planers as well as the replaning and realignment of housings, crossrails, etc. All the belts were removed, new joints made, and the belts slushed with hot tallow and rolled up; each ready to go back into its respective place at a moment's notice and to perform its allotted service for a long time before requiring the services of a belt doctor.

Line shafts were polished, oiled and put into perfect alignment, new bearings being placed wherever the condition of the old ones indicated that replacment might become necessary within a reasonable time. Overhead carrier systems were inspected, strengthened and extended to cover points not hitherto reached by them but which might possibly be served to better advantage in the future by having them.

Trolley, chain blocks, air hoists and all other mechanisms connected with the carrier system were carefully inspected and any apparent weaknesses remedied. Electric wiring, switch boards, motors, etc., were also carefully gone over as well as the various pipe lines that enter into modern machine shop equipment.

To give the drafting office a chance, charts of all wiring and piping were prepared so that when trouble develops in the future—as trouble surely will—the man in the office can tell by a reference to his chart what valve to close or switch to open in less time than the electrician or plumber could trace the defective wire or pipe back to the next department.

One shop, at least, is trying the experiment of enameling all its machinery white, and the effect in the way of lightening up the interior is surprising.

Repairs to buildings also come within the province of slack time work. Windows are fixed and cleaned, roofs mended, floors relaid and partitions moved or built.

The guarding of heavy belts, gears, and other moving machinery, that are or may become a source of danger to operatives, is another way of utilizing the surplus time to advantage.

All these schemes mean more than the mere making of work to keep otherwise idle hands busy. It is work that will have to be done eventually, anyway, and the doing now is a practical form of insurance against the future piling up of that insidious item of expense known as "overhead."

In the development of new machines the New England shops are by no means behind their contemporaries. Not so many have appeared on the market as yet, but in more than a few shops there are machines under construction or already completed that are destined to make changes in some of our methods of production. To mention these by name would be to release prematurely the secrets that some of the builders are carefully keeping up their sleeves, but they will all be heard from in due course.

The market for used machinery, though far from what we are pleased to call normal, is still away out of proportion to the demand for new. Some of the builders of the heavier machines are taking advantage of this condition and are selling as second-hand their own used machines taken from the shop floor, replacing them with new product of the same or improved types, thus creating a certain volume of business that they otherwise would not have, and at the same time putting their shops into the best possible shape for the handling of new work.

Taken altogether, this business depression, without doubt the most general and far reaching of any in our history, has not been altogether without compensation. It should, among other things, teach the value of a reasonable amount of conservatism. As there is danger in being too cautious, there is also danger in not being cautious enough. Rapid expansion is reasonably sure to be the forerunner of equally rapid deflation.

We have paid too much attention to production and not enough to the foundation upon which production is built. In rearing the new structure of business prosperity that is before us, let us give a due proportion of our attention to the minuter detail, and not put off until tomorrow the things that ought to have been done yesterday.

Cincinnati Letter

While conditions in the Cincinnati district are generally spotty there is discernible a distinct improvement both in inquiries and in orders. As yet, the improvement is not greatly reflected in increases in number of men employed or in hours work.

One lathe builder doubled his October business in November and doubled this again in December. His January sales held up well. Another concern reports sales of forty-two lathes during the first week in February, thirty-seven of them on one order to one of the big automobile companies in Flint, Mich. Cincinnati seems to be getting her share of the little railroad business that is being placed, and the outlook for more orders in this field is good.

Progress continues in the preparation of shops and equipment for economical production when prosperity returns. At the American Tool Works Co., for example, the whole equipment of twenty-four radial drills has been disposed of to be replaced by eighteen of the latest type which will have a greater total capacity than the ones replaced.

Chicago Letter

Inquiries for machinery are slowly but steadily growing more plentiful, especially from garages and service stations. The inquiries as a whole are coming from local concerns and are for second-hand and miscellaneous equipment. It is admitted that auction sales, scalpers, and sales of second-hand equipment at cut-throat prices are interfering with the regular business, but several manufacturers who have purchased machines at auction sales, have discovered that it is better, and perhaps more economical, to obtain equipment from dependable sources. Along this line comes a report from a local second-hand dealer, who has been a steady customer at numerous auction sales, that he has done 100 per cent more business during the last month than he did in any month in 1921.

As has been stated, the manufacturers of garage and repair shop equipment are doing a wonderful business. A local concern, manufacturers of a medium weight lathe suitable for use in garages, is working full force and is well supplied with orders for immediate delivery. Furthermore, these orders are increasing, due to the fact that the manufacturer has reduced prices to a point where he must rely upon output to carry him through. Another reason for these orders is that a large nationally known automobile accessories jobbing house has recently looked upon the machine tool and the garage man in a very optimistic light, and is endeavoring to interest the garage man in equipping his service station with the proper machine tools.

This jobbing house has interested a large local taxicab company in this idea, and in all probability will equip a new plant which the taxicab company is about to purchase. This will mean a sale of many thousands of dollars.

The railroads are quiet, as usual. The Sante Fe has made additional purchases, and at the present time is inquiring for a 10-ft. gate shear with a 20-in. stroke, capacity to cut ⅜-in. metal.

To add to the outlook toward a good year in the machine tool and machinery field, a large number of repair shops, foundries and factories will be erected this summer. R. Johnstone, 1,553 Burchwood Ave., will award a contract soon for the erection of a two-story automobile repair shop to cost about $25,000.

Limitation of Armaments Causes Lay-off in Navy Yards

Furlough by the Government of 1,350 Navy yard employees and of 1,500 employees of the South Charleston, W. Va., armor plate plant, due to a suspension of warship construction pending action by Congress on the proposed treaties limiting armament, has caused labor leaders to appeal to the Government to provide work for the men thus thrown out of employment. Representatives of the International Association of Machinists will confer with Navy officials Wednesday to determine whether the Government can provide some work for the men at the Washington Navy Yard. It will be pointed out that the Government is unfair in letting out its Navy yard employees, while at the same time giving government work out under private contract.

Otis Zone Managers See New Machines

The several zone managers of the Otis Elevator Company met in the main office, New York City, on January 23, for a three-day series of lectures and inspections of the latest types of Otis elevator apparatus. The meeting was held under the personal supervision of the president, F. C. Furlow, and was attended by the managers from all over the United States, Canada, South America and Europe.

One of the main features of the meeting was a visit to the Otis plant at Yonkers, where the managers inspected the latest machine designed by Otis engineers. The machine, with its component installations, was set up for operation in the plant. Edward A. Fitch, superintendent of the plant, supervised the exhibition. Every phase of construction and operation of the mechanism was fully explained to the managers. The special manufacturing machines, jigs and fixtures, cars and parts also were shown. Otis chemists had arranged a separate display, showing how the metals put into the machines are tested and analyzed in the laboratories before going to the shops.

The zone managers present at the conference were: G. Beardsley, New York; R. W. Charles, San Francisco; H. S. Wells, St. Louis; C. J. Comstock, Cleveland; G. R. Rebmann and E. W. Deacon, Philadelphia; R. H. Carter, Boston; S. Cronk, Omaha; Mr. Zeeryp, Houston; M. D. Hoffman, Atlanta; C. Clarke and Mr. Scott, of London, England; S. Jacquet, of Paris, France; C. T. Furlow, Jr., of Argentina; Messrs. Black, McLoughlin and Burgis, of Canada.

Drives 1,544 Rivets a Day for a Month

L. M. McNeil, a Pennsylvania Railroad mechanic, employed in the railroad car shops at the Altoona works, in Pennsylvania, drove an average of over fifteen hundred rivets a day for a period of one month. McNeil, with his two assistants, is employed in repairing locomotives and steel freight cars.

During the month of December, 1921, McNeil, with the two other members of his riveting gang, drove an average of 1,544 rivets a day of eight hours. The maximum number driven in any one day was 1,981 (nine hours).

The gang, which consisted of the riveter (L. M. McNeil, car builder), a holder-on (R. W. Ray, helper) and a heater (R. C. Yingling, helper), averaged on the day of maximum output practically four rivets per minute throughout the day. They averaged three and two-tenths rivets for every minute they worked during the month of December, 1921.

More Census Figures

Texas had 11,893 machinists and toolmakers when the 1920 census was taken. This compares with 5,756 in 1910. The census report for Florida shows that that state had 4,054 machinists in 1920, as compared with 1,475 in 1910. The number of machinists in Buffalo in 1920 was 10,501. While the 1910 returns showed 6,856 machinists in Buffalo. In 1920 Buffalo had 504 mechanical engineers, as compared with 156 in 1910.

Hiram Percy Maxim Addresses Waterbury Engineers

Hiram Percy Maxim gave an interesting talk to the members of the Waterbury branch, American Society of Mechanical Engineers, on the evening of Tuesday Feb. 7. His subject was the "Silencing of Industrial Noises."

Mr. Maxim prefaced his talk with an explanation of the natural action of gases escaping from an orifice under pressure, and gave a brief summary of the experiments along other lines that led up to the invention of the Maxim silencer. He then explained how sound waves could be photographed by means of special apparatus in such a manner as to leave a visual record of their behavior in confined spaces and under the influence of various baffle plates or deflectors, and showed lantern slides displaying their actual movements in the various experimental devices.

He then told of the application of the principles involved to objectionable noises common to industry, such as gas and oil engine exhaust, high pressure steam discharge, safety valves, air compressor intakes, etc., and showed pictures of successful installations.

Service Session of S. A. E.

The mid-winter session of the Society of Automotive Engineers was held on Feb. 1, in the rooms of the Western Society of Engineers, Monadnock Bldg., Chicago.

This meeting was given over to a discussion of the engineering phases of the service problem, and due to the large attendance and the spirit in which the problems of service were received, it is planned to make this Chicago meeting a service meeting every year.

Papers read at the meeting were as follows: "A Service Man's Critical Estimate of Automotive Engineering," by B. M. Ikert; "The Car Owner and the Service Man," by J. F. Page; "Commercial Body Supply and Service," by C. M. Manly and C. B. Veal; "The Progress Made in Garage Equipment," by H. C. Buffington; "Service As It Isn't," by Howard Campbell.

A dinner was given at the Drake Hotel in the evening, at which Col. H. M. Byllesby, of H. M. Byllesby & Co., bankers, of Chicago, and R. H. Grant, general manager, Delco-Light Co., were the speakers.

Shipping Board Selling $10,000,000 Yard at Bristol

The entire complement of buildings, machinery and equipment of the Merchants Shipbuilding Corporation Yard at Bristol, Pa., is being dismantled and sold by the United States Shipping Board. W. P. Willetts, of the Emergency Fleet Corporation, is in charge of the sales. The yard was one of the best equipped during the war and its selling price is only a fraction of the original cost of construction. About ten million dollars worth of machinery, tools, cranes, building materials, iron and steel, electrical apparatus and miscellaneous supplies are still to be disposed of. Bids are open during this month and next. A circular giving complete information and details of the sales can be had from Mr. Willetts.

Printing Office Needs New Machinery

Installation of needed machinery in the Government Printing Office has been deferred until prices decline, according to a statement of Public Printer Carter before the House Appropriations Committee. "A plant the size of the printing office with its machinery and equipment costing about two million dollars is constantly in need of new machinery and equipment," said Mr. Carter. "I have felt however that it is inadvisable to buy new machinery until normal conditions are restored in the manufacture of printing machinery, the price of which has been up fully 100 per cent and sometimes as much as 200 per cent over what it was before the war. As soon as conditions become normal the printing office will have to replace much of the machinery that is now almost worn out." He said $200,000 could be spent now for new machinery. One press at the office had been running for thirty-six years, one twenty-seven and one nineteen years. The office now has a press that prints sixty-four pages and two others printing thirty-two pages each. He favored a ninety-six-page press which would cost $50,000.

With increased printing for the Patent Office due to enlargement of the patent office under pending legislation, he said the printing office should have from ten to twenty additional typesetting machines, costing about $4,000 each.

Engineers Discuss Power-Plant Development

Nationwide power plant changes would largely remedy the present industrial depression, John S. Griggs, Jr., consulting engineer of New York City, asserted at a forum of New York, Philadelphia and Schenectady engineers on "Industrial Power" held Jan. 27 in the Engineering Societies Building, New York City. Mr. Griggs stated in a speech, in which he outlined the power changes in the last twenty-five years, that the possible coal saving in this country through power plant changes would fill two million 45-ton cars.

David Rushmore, of Schenectady, presided at the meeting which was under the auspices of the Metropolitan Section of the American Society of Mechanical Engineers and the New York Section of the American Institute of Electrical Engineers. Harold Goodwin, Jr., of Philadelphia, spoke on "Steam Electric Power for the Industries," and prominent engineers took part in the discussion following the two principal addresses.

Rivers and Harbors Meeting at Washington in March

On March 1 and 2 the National Rivers and Harbors Congress will hold its seventeenth convention in the New Willard Hotel. Secretary Weeks has designated Maj. Gen. Lansing H. Beach, chief of engineers, U. S. Army, to speak as the representative of the War Department. The evening session on Wednesday, March 1, is to be devoted to a discussion of the proposed St. Lawrence River Ship Channel.

Rail Engineers and Steel Makers Join A.E.S.C.

Beginning with 1922, the Engineering Division of the American Railway Association and the Association of American Steel Manufacturers became member-bodies of the American Engineering Standards Committee.

The Association of American Steel Manufacturers is an organization of forty iron and steel manufacturing companies. Its activities are limited to the standardization of rolling mill practices and to the standardization and inspection of iron and steel products. The association was organized in 1895. Its official representative on the standards committee has not yet been designated.

The Engineering Division, which is intimately connected with the American Railway Engineering Association, the two organizations having the same officers, covers broadly the civil engineering activities of the railways. E. A. Frink, of the Seaboard Air Line Railway, represents the American Railway Association (Engineering Division) upon the standards committee.

These two new member-bodies bring the total number of national organizations represented upon the American Engineering Standards Committee up to twenty-eight, and of representatives to fifty-two.

Calendars Received

The AMERICAN MACHINIST acknowledges with thanks the receipt of 1922 calendars from the following firms:

Long & Allstatter Co., Hamilton, Ohio; Charles A. Schieren Co., Inc., Dallas, Texas; Philadelphia Gear Works, Philadelphia, Pa.; Columbian Rope Co., Auburn, N. Y.

Automotive Production Lower in 1921

It is estimated by the National Automobile Chamber of Commerce, that automotive production in 1921 amounted to 1,680,000 cars and trucks, a decrease of 24 per cent from the previous year. Of this total 1,535,000 are automobiles, and 145,000, trucks. The wholesale value of cars and trucks, factory price, was $1,222,350,000, or 45 per cent less than 1920 production. The average wholesale price of motor cars in 1921 was $702, against an average of $897 the previous year. The average wholesale price of motor trucks in 1921 was $968, against an average for 1920 of $1,273.

December shipments, partially estimated by the National Automobile Chamber of Commerce show increase over the previous year of 5 per cent, but a decrease of 19 per cent compared with the previous month. Tabulation of factory shipments for the last two years follows:

	Carloads		Driveaways		Boat	
	1921	1920	1921	1920	1921	1920
January	6,485	25,057	3,185	29,283	93	.....
February	9,986	25,505	7,507	43,719	99	.....
March	16,287	29,326	9,939	55,273	75	.....
April	20,187	17,147	14,197	64,634	1,619	.....
May	18,608	21,977	15,193	74,286	2,381	.....
June	20,269	22,516	18,834	60,746	3,947	8,350
July	19,514	23,082	15,533	52,342	3,726	8,702
August	20,758	23,386	15,218	34,060	3,595	7,095
September	19,002	20,804	13,840	24,431	2,959	5,469
October	17,717	17,209	12,926	14,127	2,214	2,519
November	14,240	13,253	10,505	9,497	1,402	659
December	*12,100	11,802	*7,500	6,469	134	89
Total	195,153	251,064	144,377	470,867	22,244	32,883

*December 1921 partly estimated.

Welding Society Issues Monthly Bulletin

The first issue of the *Proceedings of the American Welding Society* appeared last month. The journal is made up of forty-five pages of interesting reading matter for welding engineers and others engaged in welding processes. The proceedings of the society, its committees and sections in all parts of the country are given in full. Technical papers on welding operations are printed, as well as news items and personal notes.

The journal is published in New York City, at the headquarters of the society, 33 West 39th Street.

Business Items

The Chillingworth Engineering Corporation has opened offices at 143 Liberty St., New York City. Frank H. Plum, Herbert Pluemer, G. E. Mellin and H. Von Shaden, formerly of the C. W. Hunt Engineering Corporation, have associated themselves with the Chillingworth organization, which will engage in the manufacture of conveyors and hoisting machinery.

The Philadelphia office of the Hauck Manufacturing Co., manufacturer of portable oil burners, furnaces, etc., has been moved to 1726 Sansom St. Herbert Vogelsang is in charge.

The Colonial Metal Products Co. has been organized at Syracuse, N. Y., as a consolidation of the Colonial Machine Co. and the Syracuse Metal Products Co. The new company will manufacture tools and special machinery at its plant on Edison St. The following officers have been elected: E. A. Klein, president; first vice-president M. H. McCarthy; second vice-president, W. F. O'Donnell; treasurer, J. F. Moran; secretary, D. O. Macken. Other directors are A. Vandecar, J. Barrett and Alexander Meldrum.

The plant of the Syracuse Twist Drill Co., at Syracuse, N. Y., was almost destroyed by fire on Feb. 1. Machinery and stocks of tools were damaged, the loss being estimated at about $20,000.

The new plant of the Kelsey Motor Co., at Newark, N. J., was opened on Feb. 6. A production of five to six thousand Kelsey friction-drive cars is expected the first year. E. B. Slade is president; C. W. Kelsey, who perfected the friction-drive, is general manager.

At the annual meeting of the Sheet Metal Employers Association, Cleveland, Ohio, the following officers were elected: President, F. B. Hiller; vice-president, W. F. Seiten; secretary, J. M. Saunders; treasurer, W. J. Birmingham. The board of trustees includes George F. Thesmacher, O. A. Mannen and William Barger.

The Wright & Querie Manufacturing Co., Meriden, Conn., has recently been organized and incorporated under the laws of Connecticut to manufacture and sell machine and wood screws, hardware, etc. The capital is $10,000. The incorporators are H. H. Wright, 909 North Colony St., Meriden; O. J. Querie, Meriden; and C. W. Wright, New Bedford, Mass.

Edmund S. Wolfe, president of the First National Bank, Bridgeport, and Col. Elmer H. Havens, president of the company, have been appointed receivers of the Locomobile Company of America, Bridgeport, Conn., automobile manufacturers, by Judge Edwin S. Thomas of the United States District Court. Col. Havens states that the move is a mutual step toward the proper reorganization of the company on a sound financial basis. He also states the company is doing a very good business.

The W. F. Concannon Shear Co., 42 Depot St., Milford, Conn., has just been organized and incorporated with $20,000 capital stock, to engage in the manufacture of steel shears and scissors. W. F. Concannon, Bridgeport, is the president; and Edwin L. Oviatt, Milford, is the treasurer.

The Efficiency Auto-Engineering Co., Inc., Bridgeport, Conn., recently filed a certificate of incorporation under the laws of Connecticut, to manufacture and sell metal goods and machinery. The capital stock will be $50,000. The incorporators are: Jesse B. Woodhull, 526 Water St., Myron E. Baker, Thomas Martin and Alexander L. Delaney, all of Bridgeport, Conn.

W. H. Turner was re-elected president of the Superior Machine and Tool Co., Kokomo, Ind., at the annual meeting of stockholders held recently. Other officers elected were: Charles H. Hummel, vice-president; A. B. Armstrong, treasurer; E. S. Moore, secretary. The board of directors elected comprises: A. B. Armstrong, E. S. Moore, G. W. Charles, W. H. Turner, C. L. Hummel, E. Simmons and S. Frank.

The Borg & Berg Co., manufacturers of steel explosive shells, with a plant at Davenport, Iowa, has reduced its capital stock from $5,000,000 to $1,500,000.

The Kihm-Bowen Machine Co., Irvington, N. J., has gone into the hands of a receiver. The attorney for the company states that a reorganization will take place and business will be resumed as soon as conditions permit.

The United States Hoffman Machinery Co. has been merged with the United States Hoffman Machinery Corporation, under the latter name. The company's factory has been moved from Syracuse, N. Y., to 105 Fourth Ave., New York City. The combined capitalization is stated to be $11,250,000.

The Superior Roller Bearing Co., Canton, Ohio, has been absorbed by the Vervoort Ball Bearing Co., Cleveland, Ohio. The former company was owned by H. G. Tremmel and H. C. Boester. Operations are being carried on in the Cleveland plant, and there is sufficient business to keep the plant going for the next six months, according to Mr. Tremmel who is secretary and general manager. The company is building a new factory in the east end of Cleveland, which it expects to occupy next spring.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Jig, Drilling, Automatic, Caulking.

E. L. Krag & Co., 50 W. Randolph St., Chicago, Ill.

"American Machinist," September 22, 1921.



The device is intended for mounting on the table of a sensitive drilling machine employed on parts made in large quantities. Its purpose is to leave the hands free to manipulate the work that is being put into the machine, the operator controlling the clamping, drilling and discharging of the piece by a pedal. The clamping of the work and the tripping of the feed are done automatically. An automatic lubrication system can also be supplied.

Reclaiming Outfit, Oil.

S. F. Bowser & Co., Inc., Fort Wayne, Ind.

"American Machinist," September 22, 1921.



The apparatus can be adapted to the reclaiming of different sorts of lubricating oils, but it is especially intended for use on oils employed in internal-combustion engines. It is said to restore the oil to its original condition as to viscosity, flashpoint and purity. The reclaimer is ordinarily manufactured in two sizes, one having a capacity of 50 and the other of 100 gal. per 24 hours. The reclaimer proper is the large tank shown at the center. The two rectangular tanks at the right are for the clean oil and dirty oil, respectively. The apparatus at the left is a still and condenser, which takes care of the fumes.

Lathe, "Utility."

Electric Motor Manufacturing Co., Ludington, Mich.

"American Machinist," September 22, 1921.



This outfit is for use where a small machining unit is required. It consists of a lathe, drill press, and grinding wheel, all driven by one electric motor, and intended for bench use. The grinding wheel is mounted directly on the motor shaft, and the spindle of the lathe is driven through covered gears. The position of the tail-stock is adjustable, and work 12 in. long and 4 in. in diameter can be handled. The motor can be furnished either for 32-volt., d.c. or 110-volt, a.c. circuits. Where only a grinder is required, the motor with an abrasive wheel and toolrest can be supplied.

Inclinometer

Young-Fischer Co., Milwaukee, Wis.

"American Machinist," September 22, 1921.

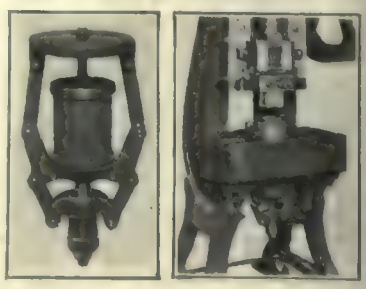


This instrument is intended to take the place of the plumb, level, or protractor in mechanical laboratories and machine shops where angles are to be detemined, and especially where accuracy is required. It consists of a machined case of cast metal containing a gear train driven by gravity impulse. The hand on the degree dial moves in unison with the impulse, while the hand of the minute dial makes 36 rev. while the degree hand is making one. For the accurate inspection of angles it is claimed to be superior to the sine-bar, as no calculations are necessary.

Attachment, Combination Die, Spring Pressure.

E. W. Bliss Co., Brooklyn, N. Y.

"American Machinist," September 22, 1921



This attachment is for use on small punch presses equipped with combination dies, being shown on the right of the illustration mounted on the No. 20 press. A toggle motion is used to give a uniform pressure on the blank during the entire draw, thus reducing the total rubber or spring compression. The attachment is regularly made in four sizes, the depth of the draw obtainable varying from 1½ to 2½ in. The attachment does not interfere with the operator, and the dies can be easily removed.

Elevator, Portable, "Little Lifter."

Economy Engineering Co., 2635 W. Van Buren St., Chicago, Ill.

"American Machinist," September 22, 1921.



The elevator is intended for lifting and tiering materials, and is operated by an electric motor, deriving current from the ordinary 660-watt lighting socket. The speed of the platform varies from 7 ft. per minute in the 1,000-lb. capacity machine to 12 ft. per minute for the 500-lb. capacity machine. The hand crank can be used when desired. An automatic adjustable stop for the platform and a hand brake for holding the load at any point are provided.

Torch, Oxy-Acetylene, "Cut-Weld"

Alexander Milburn Co., 1420 W. Baltimore St., Baltimore, Md.

"American Machinist," September 22, 1921.



The chief feature of the torch is in the design of the tip, which is so constructed as to give a triplicate means of mixing the oxygen and acetylene. The torch is 19 in. long and provided with three welding and three cutting tips. A tip can be furnished for cutting steel 18 in. thick. The torch is made of brass and all parts are accessible. The method of seating the tip is said to prevent breakage, as well as splitting and cracking of the tip and head. The tip is placed at an angle of 60 deg. to the torch, and is made of bronze having a high copper content. The change from welding to cutting can be made by merely changing the tip.

Drill, Portable, Electric.

Cincinnati Electrical Tool Co., Cincinnati, Ohio.

"American Machinist," September 22, 1921.



The drill has a pistol grip and is light, high-speed, and has a capacity of ⅜ in. It is especially adapted for work on automobile bodies and in car building. The drill is equipped with a universal motor, for use on direct and alternating current of the same voltage. The motor housing, end caps and handle are made of aluminum. The armature and gear studs are mounted on ball bearings. The switch is of the quick make-and-break type, and is entirely enclosed in the handle and operated by a button.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

LOUIS ILLMER of Lansdowne, Pa., who for some time has been engaged in private practice as oil engine expert and also in marketing his patented impulsion fuel pump, has been retained by the Brown-Ferrier Co., Philadelphia, as consulting engineer in connection with the further development of fuel pump work.

E. E. CREED, of the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., has recently been assigned to the San Francisco office of the company, to have charge of the Western field.

GEORGE W. CRAVENS, formerly with the General Electric Co., American Motors Co. and the Elkhart Motor Car Co., has been elected president of the Climax Engineering Co., Clinton, Iowa. Other officers elected were: C. B. Stebbins, vice-president; R. D. Upton, treasurer; J. M. Thomsen, secretary. G. W. Dulany Jr. is chairman of the board of directors.

WILLIAM F. PARISH has established himself in the Peoples Gas Bldg., Chicago, Ill., as a consulting lubrication engineer. He will conduct a petroleum analytical and experimental laboratory.

W. H. SACKMAN has resigned as chief engineer of the Light Manufacturing and Foundry Co., Pottstown, Pa.

ALFRED C. RANTSCH has been appointed sales manager of the Eastern territory for the Soss Manufacturing Co., Brooklyn, N. Y., manufacturers of castings and alloys. Mr. Rantsch was formerly connected with the Doehler Die Casting Co.

FRED W. RAMSEY has resigned as president of the Cleveland Metal Products Co., Cleveland, Ohio. Mr. Ramsey will devote his entire time to civic and philanthropic activities in Cleveland, where he is prominently identified with social and community affairs. He will become a director of the company and will retain an office at the plant. He has been succeeded as president by L. S. Chadwick, chief engineer of the company.

Obituary

CHARLES LEWIS TAYLOR, prominent Pittsburgh steel operator and president of the Carnegie Hero Fund Commission, died at his winter home in Santa Barbara, Cal., on Feb. 3. He was sixty-five years old.

GEORGE A. OHL, SR., veteran machinery manufacturer of East Orange, N. J., died at his home in that city on Feb. 8. Mr. Ohl was the holder of fifty-two patents on his own inventions of machinery. He was eighty-five years old.

HUBERT P. RICHARDS, for many years connected with the Stanley Rule and Level Co., New Britain, Conn., in the capacity of machine designer and engineer, and in earlier life associated with Sterling Elliot at Newton, Mass., died at his home in New Britain, Conn., on Jan. 29. He was sixty-nine years old. Mr. Richards was a brother of Francis Richards, the well-known inventor of New York City.

Book Reviews

A Life of George Westinghouse. By Henry G. Prout, C. E., A. M., Ll. D. For a committee of the American Society of Mechanical Engineers. 375 pp., 6 x 9 in. Illustrated. Published by Charles Scribner's Sons. New York. Price $2.50.

"And there were giants in those days." And in our day as well, and one of the greatest was George Westinghouse. His name is known over the civilized world, but to most of us for only one or two of the many big things he accomplished. Some men knew of him through his work in the field of electricity, others for his development of the air brake and the friction draft gear, still others for his exploitation of natural gas, but few have any conception of the many and varied practically successful inventions which stand to his credit and which have contributed so much to the advancement of civilization. It seems almost inconceivable that any one man could take out four hundred patents even in forty-eight years, and average of one patent every month and a half of his working life. His first patent was granted when he was nineteen and he was still inventing when death overtook him. The noteworthy characteristic of these many inventions was that no one of them was evolved to sell or as a speculation, each was calculated to meet a practical situation encountered in his own work.

The book is so arranged that a chapter is given over to each of the major branches in which George Westinghouse made his influence felt, one to the air brake, one to the friction draft gear, one to the rotary converter, etc. The material for each technical chapter was prepared by some expert who was close to Westinghouse and could speak authoritatively on the subject, and the whole was gathered together by Col. Prout and digested and edited to make a homogeneous whole. These chapters are interesting in the complete picture they give of the genius of the man for effective work in widely different fields, but it is likely that the concluding chapters on the "Personality of George Westinghouse" and the "Meaning of George Westinghouse" will be the most fascinating even to the engineering reader.

In these chapters the wonderful character of a really great man is described. His interest in his men his tremendous driving power which swept away all obstacles, his steady cheerfulness in the face of adversity and disappointment shine forth as an inspiration to every one of us. His powers of concentration, his mechanical genius and his energy are given to few men, but his high character is an example which can be emulated by anyone.

The thanks of the engineering profession are due the committee of the mechanical engineers under whose direction the book was prepared, but the greatest credit should go to Col. Prout who brought to his task an intimate acquaintance with Mr. Westinghouse and the artistic skill of his many years as editor of the *Railway Gazette*. The members of the committee were Charles A. Terry, chairman; Paul D. Cravath, Alexander C. Humphries, James H. McGraw, Charles F. Scott, Lewis B. Stillwell and Ambrose Swasey, with Henry Herman Westinghouse always in consultation.

Essentials of Industrial Costing. By George S. Armstrong, consulting industrial engineer, A.S.M.S and A.S.C.E Dark red cloth-board covers, 6 x 9 in., 297 pages, 80 illustrations. Published by D. Appleton and Co., New York, N. Y. Price $5.

The volume treats in a very concise and comprehensive manner the finding of the cost of production. It should serve as an aid to industrial administration, as the text is concerned solely with the principles and methods by which the cost of production may be derived. Being based on experiences in many and diverse industries, the practical side is never lost sight of nor considered secondary to theory. Most of the theory in the book is presented on the clinic or case system, so as to prevent speculative discussion on concrete issues. In developing the theory, suggestions are given to apply to exigencies that may arise. The book stays very close to essential principles, not being concerned with irrelevant matters or theory not related closely to the problem. It is concise in style and well organized, with each aspect of the subject treated so as to give a balanced whole. After the theory of the system has been developed, a complete working model of a cost system is given, its purpose being to show the mechanism of costing and to serve as a guide in the preparation of similar systems.

In order to give an idea of the scope of the volume, the list of chapter headings is herewith given: Economic Development and Necessity of Costing; The Purpose and Function of Costing; The Mechanism of Costing; Elements of Costing and Sources of Costing Data; The Costing of Material; The Costing of Labor; The Collection of Expense in Costing; The Costing of Depreciation, Interest and Power; The Distribution and Application of Expense in Costing; Final Costing; The Connection of Costing with the General Books and the Preparation of Monthly Statements Therefrom.

Pamphlets Received

Heat-Treatment of Springs with Stationary and Continuous Furnaces: W. S. Rockwell Co., 50 Church St., New York City. A technical treatise on the fundamental principles of heating and handling springs, with illustrations of these principles as applied to the manufacture of a variety of springs. It is intended to show a method of improving the quality and decreasing the cost of the product.

Metal Polishing: The Norton Company, Worcester, Mass. A thirty-page booklet containing some valuable information on metal polishing with alundum abrasive. Interesting comparisons with other methods are shown.

Trade Catalogs

Hydraulic Valves and Fittings. The Hydraulic Press Manufacturing Co., Mount Gilead, Ohio. Catalog No. 43-B, sixty-five pages, finely bound and engraved, describing a complete line of H-P-M high pressure valves and fittings. The pages are profusely illustrated, each type being shown in detail, together with operating charts and specifications.

Abrasive Discs. Gardner Machine Co., Beloit, Wis. A sixteen-page booklet containing complete instructions on the proper setting and handling of abrasive disks. Another circular treats of the heavy abrasive disk made by the same company.

Air Compressors. Pennsylvania Pump and Compressor Co., Easton, Pa. Bulletin No. 102, describing a line of single stage, straight line air compressors and vacuum pumps, in both the belt and steam-driven types. The special features of Pennsylvania machines are described.

Eck Motors. Eck Dynamo and Motor Co., Belleville, N. J. A series of four bulletins, Nos. 1300, 1500, 1600 and 1900. They cover a comprehensive line of direct current vertical, back-geared and polyphase induction motors. Each type is fully illustrated and described.

Rockford Tools. Rockford Milling Machine Co., Rockford, Ill. A ten-page circular describing and illustrating a line of cutters, arbors, collets and small tools for use with Rockford milling machines.

Waterhouse Pistons. Waterhouse Welding Co., 15 Pelham St., Boston, 18, Mass. A sixty-five page booklet giving specifications and prices of a line of pistons, pistonpins and rings for pleasure cars, trucks, motorcycles and motors.

Saw-Sharpening Tools. The Wardwell Manufacturing Co., Cleveland, Ohio. A twenty-page catalog illustrating and describing a comprehensive line of saw filing and grinding machines.

Forthcoming Meetings

American Institute of Electrical Engineers: Mid-winter meeting Feb. 15, 16 and 17. Engineering Societies Building, New York City, F. L. Hutchinson, secretary.

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3, Hotel McAlpin, 34th St. & Broadway. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Metal, Light, "Magna-Metal"

Magna Metal Corporation, 227 High St., Newark, N. J.

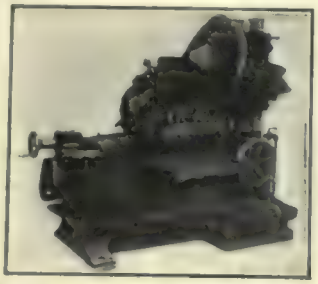
"American Machinist," Sept. 22, 1921.

The metal is for mechanical purposes where strength and lightness are essential. The base is metallic magnesium, which forms over 90 per cent of the alloy. It can be used as castings and forgings, or it can be rolled. The specific gravity is given as 1,742 and the weight per cubic foot as 108.8 lb. The tensile strength is 19,300 lb. for castings; 27,600 lb. for rolled; and 31,900 lb. for forgings. The metal can be machined without lubricant, and leaves a clean cut surface in threading and similar operations.

Grinding Machine, Gear, Generating, No. 10

Lees-Bradner Co., Cleveland, Ohio.

"American Machinist," Sept. 29, 1921

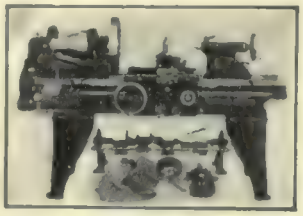


The machine is intended for grinding the faces of involute spur-gear teeth, being capable of working on gears having pressure angles of from 14½ to 24 deg., diametral pitches from 12 to 3, and pitch diameters from 2 to 12 in. The abrasive wheel used is 30 in. in diameter, being supported on a stationary column, and the work traversed past it on a slide having a reciprocating action. Besides the linear motion, the work is given the correct rotary motion, so as to obtain the desired profile on the tooth face. In this way the tooth surface is generated. The work can be held between centers, or supported on a mandrel having a taper shank to fit the spindle.

Lathe, Geared, Quick-Change

South Bend Lathe Works, South Bend, Ind.

"American Machinist," Sept. 29, 1921

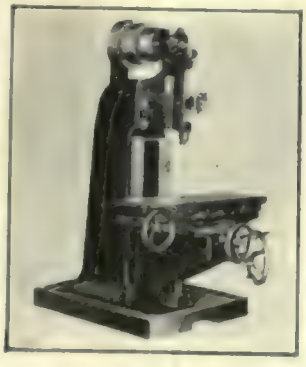


The machine is similar in general construction to the plain type of change-gear lathe made previously by the concern. The feed box that has been added is of the type used on the Flather lathe. Forty-eight changes of feeds and threads are provided, these changes applying also to the cross-feed. The lathe is made in sizes of 9, 11, 13, 15, 16, 18, 21 and 24 in., with either straight or gap bed. All of the feeds are controlled from the front of the apron, and are so interlocked that only one feed can be engaged at a time.

Milling Machine, Vertical-Spindle, Nos. 5-A and 6-A

Jackson Machine Tool Co., Jackson, Mich.

"American Machinist," Sept. 29, 1921

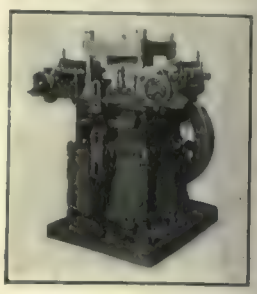


The machine is made for such work as on drop-forging dies where a cherrying operation is not required. The spindle has a vertical movement manipulated by hand through a mechanism which permits of both slow feed and rapid traverse. The weight of the spindle and housing is counterbalanced. The machine is made either with or without power table feed. The spindle has speeds of 200, 325 and 520 r.p.m. The table is 13 x 40 in. on the No. 5-A machine, and 13 x 48 in. on the No. 6-A machine, the longitudinal travels being 32 and 40 in., respectively.

Dieing Machine, Sheet-Metal

Henry & Wright Manufacturing Co., Hartford, Conn.

"American Machinist," Sept. 29, 1921.

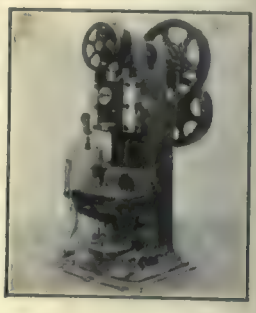


This machine is intended for piercing, blanking, forming and stamping sheet-metal. It embodies a departure from the usual punch-press construction, the mechanism being inverted. The heavy fly-wheel is placed on the back side near the floor, and the moving parts except the tools themselves are enclosed within a cabinet base. The crankshaft passes transversely through the base at the junction of the upper and lower sections, so that the crankshaft with all attached working parts may be removed. The machine is made in three sizes, 10, 25 and 50 ton capacity. The largest machine stands 64 in. high and occupies a floor space approximately 5 ft. square. It weighs 5,400 pounds.

Punch Press, Adjustable-Bed

Ferracute Machine Co., Bridgeton, N. J.

"American Machinist," Sept. 29, 1921

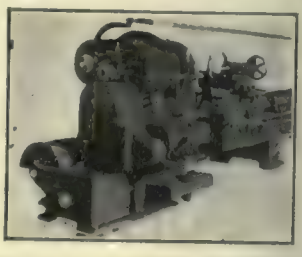


The press is for work requiring a long stroke and unusual height between the bed and ram. The bed has a vertical adjustment, by means of which the distance between the bed and the ram may be varied. The connection between the bed and frame is made by heavy bolts, and the 4-in. adjusting screw supports the bed solidly. The ram has 3 in. adjustment, and the bed 9 in. A maximum distance of 30 in. is given between the bed and the ram. The stroke of the ram is 8 in. The press exerts a pressure of 70 tons and weighs 13,200 pounds.

Lathe, Geared-Head, Quick-Change

Bradford Machine Tool Co., 8th and Evans Sts., Cincinnati, Ohio.

"American Machinist," Sept. 29, 1921.

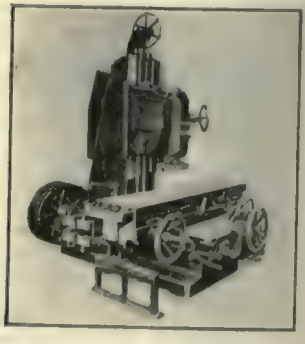


The machine is very similar in general characteristics to one formerly made by the concern, the principal difference being in the use of the double back-gears. The lathe is made in swings of 26, 28, 30 and 32 in. It is intended for either single-pulley or direct motor drive. A locking arrangement permits of shifting the gears only when they are free from the driving action. Eighteen speeds are provided, varying from 6.7 to 282.5 r.p.m. The back-gear ratios are 12.57 to 1, and 3.55 to 1. By means of the two shifting levers, 16 changes of feed are provided without the changing of any removable gears.

Milling Machine, Vertical-Spindle, No. 10

Jackson Machine Tool Co., Jackson, Mich.

"American Machinist," Sept. 29, 1921



The machine is intended for production work on die-sinking, the head carrying a heavy vertical spindle. The No. 10-A machine has table and cross-rail feeds ranging from 0.001 to 0.015 in. per revolution of the spindle, while the No. 10-B machine has a range of feeds from ⅛ to 6 in. per minute, regardless of the speed of the spindle. Inside of the head, gears provide thirteen changes of spindle speed ranging from 8½ to 310 r.p.m. A circular table 36 in. in diameter may be provided for circular and continuous milling. The head has a vertical movement of 24 in. The driving pulley runs at 300 r.p.m., a 10 to 15-hp. motor being required.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Fla., Sumica—The Florinda Mill & Planing Co., W. J. Fink, Mgr.—planers, saws, matchers, etc.

Ill., Chicago—The Atchinson, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt.—one 10 ft. gate shear with 20 in. stroke, capacity to cut ⅜ in. metal, motor driven, 230 volts; 3 motor driven internal and external tool post grinders.

Ill., Chicago—The Arctic Cabinet Co., 2237 Archer Ave., E. Bourdon, Purch. Agt.—square shears 48 in. or larger, (used).

Ill., Chicago—The Chicago Casket Co., 7029 Stony Island Ave.—One 20 in. drill press; one No. 1 stamping press; portable Fairbanks platform scales.

Ill., Chicago—The Glass Novelty Co., 1919 West 19th St.—one self feeding rip saw and two 6 in. stickers.

Ill., Chicago—E. Hooson, 6247 South St. Louis Ave.—one bench lathe, one polishing lathe and one 36 in. foot power square shear and blower for small furnace.

Ill., Chicago—Johnson & Horner, 1347 Belmont Ave., A. Horner, Purch. Agt.—one No. 5 back geared press, 4 in. stroke, or screw press 12 in. stroke.

Ill., Chicago—Leitelt Bros., 7731 South Chicago Ave.—one 72 in. double crank press suitable for 20 gauge sheet metal.

Ill., Chicago—The Monarch Tool & Machine Co., 522 South Clinton St.—one 10 K. W. Taylor spot welder.

Ill., Chicago—A. D. White Mchy. Co., 108 North Jefferson St., A. P. White, Purch. Agt.—one No. 5 geared back press, 4 in. stroke.

Ill., Galesburg—The Rowe Mfg. Co., Holton and West 3rd Sts.—geared punch press, 50 to 100 ton capacity (used).

Ill., St. Charles—The Faultless Iron Wks.—one power press, 8 ft. for 2 breaks of 18 gauge soft steel, similar to Ohl geared press, (used); one power squaring shear, 8 ft. for 16 gauge steel; one electric spot welder with adjustable lower arm and 24 in. reach or more.

Mich., Ferndale—A. O. Le Grande, 393 Woodland Ave.—sheet metal working machinery (used).

Miss., Gulfport — The Mississippi Cane Syrup Co., A. L. Byrd, Purch. Agt.—cold storage plant sufficient in size to freeze about 10 ton of ice per day and to cool a room about 50 ft. sq.

Mo., North Kansas City (Kansas City P. O.)—The Standard Steel Wks., 1722 Tracy St.—one air compressor, capacity four riveting hammers (used).

Neb., Imperial—The Bd. Educ., J. Burke Pres.—equipment for manual training and domestic science departments of high school.

N. J., Trenton—The Trenton Rough Dry Laundry, 927 East State St.—machinery for proposed laundry on East State St.

N. Y., Kingston—Terry Bros., North St.—small standard gage bucket and operating locomotive crane.

N. Y., New York—Kleinert & Sons, 920 Brook Ave.—one punch press and screw machine.

N. C., Hamlet—J. C. Brittingham—machinery for knitting mill.

N. C., Magnolia—R. D. Carr—shingle mill machinery.

O., Cincinnati—The Clifton-Pratt Co., 1224 West 8th St., A. B. Clifton, Purch Agt.—four tumbling mills for foundry, 20 or 36 in. with or without exhaust. (used); one 36 in. or 42 in. cupola, 5 or 7 ton per hour; one sand blast outfit, New Haven or equal.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., S. L. Jones, Purch. Agt.—one 1½ in. and one 2 in. bolt cutter, Atlee, National or Landis; one double crank geared press, 40 ton capacity, similar to Bliss No. 2½; one small quick change lathe, 14 on 16 in.; one No. 12 Barber Coleman gear hubber.

O., Cleveland—A. C. Bishop & Co., 426 Guardian Bldg.—complete line of machinery for ice plant of the Mutual Ice Co., Erie, Pa.

O., Columbus—The city Ice Supply & Coal Co., 38 Mithoff St.—$65,000 worth of machinery and equipment for proposed ice plant on 22nd St.

Pa., Brackenridge—The West Penn Steel Co.—two keyseating machines.

Pa., Pittsburgh—The American Bridge Co., Frick Bldg.—one 24 in. shaper.

Pa., Pittsburgh — H. R. Elcher, House Bldg.—one 10 ton locomotive crane traction or standard gage with 30 ft. boom and ¾ yd. clam shell bucket.

Pa., Washington—G. Kestrick, 988 Bruce St.—lathe, drill press and shaper.

Tenn., Knoxville—The Keller Fdry., Willow St.—one 20 in. drill press and band saw.

Va., Boone Mill—The Boone Mill Mfg. Co., J. Garet, Pres.—will receive bids until May 1 for planing mill machinery, engine and boiler for woodworking plant, dry kiln equipment and barrel heading machinery (used-rebuilt).

Va., Denbigh—J. W. Hoopes & Co., manufacturer of chemicals, J. W. Hoopes, Pres.—powder mixing machine; powder sifter machine; tablet machine; emulsifier; liquid and paste filling machine (new or used).

Va., Norfolk—The Sykes Bros. Lumber Co., 45th St. and Colley Ave., W. W. Sykes, Purch. Agt.—combination wood working machine with rip saw and jointer combined. (used).

Va., Radford—F. L. Foster—small lathe, grinder, small air compressor and miscellaneous garage equipment and small tools (new or used).

W. Va., Harrisville—The Bd. Educ., S. O. Prunty, Pres.—equipment for vocational department of new school.

W. Va., Logan — The Guyan Machine Shops—gear cutter for spur and bevel gear up to 30 in. in diameter; electric furnace for melting brass; shear and punch for ½ in. plate.

Wis., Madison—The Harcum Fuel Co., 35 West 1st St., C. R. Burnton, Pres.—elevating and conveying machinery for fuel storage plant.

Wis., Manitowoc—The Republic Chemical Co., E. H. Koehneke, Pres.—machinery and equipment for new chemical plant also laboratory equipment.

Ont., St. Thomas—The Council, A. Curtis, Chn.—two vertical retorts, coal and coke handling equipment, etc., for civic gas plant.

Metal Working Shops

Cal., San Bernardina — The Atchinson, Topeka & Santa Fe Ry., Kerckoff Bldg., Los Angeles, has awarded the contract for the construction of a 1 story, 65 x 510 ft. addition to its machine shop, here. Estimated cost, $250,000. Noted Jan. 26.

Cal., Stockton—H. S. Dawson, 630 California St., is having preliminary plans prepared for the construction of a 1 story garage on Oak St. between California and American Sts. Estimated cost, $45,000. G. Allen, 37 South Aurora St., Archt.

Conn., Hartford—J. Reibert, Mountain Rd., West Hartford, has awarded the contract for the construction of a 1 story, 52 x 220 ft. garage and repair shop on Park St., here. Estimated cost, $50,000. Noted Jan. 26.

Conn., Springdale—(Stamford P. O.)—The Segal Lock Co. has awarded the contract for the construction of a 1 story, 40 x 85 ft. factory for the manufacture of locks and hardware.

Ill., Chicago—O. Van Gunter, Archt., 800 North Clark St., is receiving bids for the construction of a 2 story, 42 x 82 ft. auto repair shop on Clark and Howard Sts., for R. Johnstone, care of architect. Estimated cost, $20,000.

Ill., Morris—The Chicago, Rock Island & Pacific R.R., La Salle St. Sta., Chicago, is having plans prepared for the construction of 1 story car shops, here. Estimated cost, $50,000. Private plans.

Ill., Peoria—The Peoria Auto Parts Co., 817 South Adams St., has awarded the contract for the construction of a 2 story, 60 x 100 ft. garage and repair shop. Estimated cost, $120,000. Noted Feb. 9.

Ind., Bloomington — The Bloomington Nash Motor Co. has awarded the contract for the construction of a 2 story, 85 x 130 ft., service and repair works. Estimated cost $80,000.

Ind., Indianapolis—R. Miller, c/o City Trust Co., Market and Delaware Sts., is having plans prepared for the construciton of a 5 story, automobile service and repair plant on Hilnois St. Estimated cost $750,000. Bass, Knowlton & Co., 801 Hume-Mansur Bldg., Archts.

Kan., Columbus—The Baldwin Garage Co. is having plans prepared for the construction of a 1 story, 120 x 156 ft. garage. Estimated cost, $50,000. Private plans.

Kan., Wichita—W. P. Innes, 1112 Lawrence Ave., has awarded the contract for the construction of a 1 story, 85 x 147 ft. garage on Douglas and Indiana Sts. Estimated cost, $50,000. Noted Jan. 26.

Mo., Jefferson City—W. B. Haarstick and R. Knox, Vandalia, plans to build a 2 story auto chain factory. Estimated cost, $70,000. Architect not selected.

Mo., St. Louis—D. F. McCabe, 6407 Ridge Ave., is having plans prepared for the construction of a 1 story, 75 x 95 ft. garage. Estimated cost, $40,000. Bonsack & Pearce, Laclede Gas Bldg., Archts.

Neb., Lincoln—The Bd. Educ. plans to build a 1 story high school shop. Estimated cost, $125,000. Fiske & Meginnis, 533 Bankers Life Bldg., Engrs.

The Weekly Price Guide

THIS WEEK'S MARKET

REDUCTIONS averaging $1@$2 per gross ton on pig iron quoted in the principal markets. Soft steel bars quoted at $1.40@$1.50, Pittsburgh; shapes and plates at $1.40 for large tonnages and $1.50 per 100 lb. for smaller lots. Mill shipments, New York, of structural shapes, plates and bars are quoted at $1.78@$1.88 per 100 lb.

Electrolytic copper is quoted in New York warehouses at 14c. as against 14¼c.; tin reduced to 32c. from 32½c. and spelter at 5¼c. as compared with last week's quotation of 5¼c. per lb. Little interest in copper is shown on the part of the consumer but lead market shows considerable firmness. Tin somewhat weaker. Babbitt metal, best grade, quoted at 32c. as against 31c. and commercial grade at 16½c. as compared with 16c. per lb. one week ago.

Linseed oil, raw, quoted in New York at 83c. as against 79c. per gal. in 5 bbl lots.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.76
Virginia No. 2	27.74
Basic	19.84
Grey Forge	21.50
CHICAGO	
No. 2 Foundry local	19.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	4.00	3.75	4.15
Nos. 12 and 14.	3.10	4.10	3.85	4.25
Nos. 17 and 21.	3.40	4.40	4.15	4.55
Nos. 22 and 24.	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods(base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			32.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	22.00	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	24.00	19.50
Copper tubing (100-lb lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.25
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.00	11.00	11.00
Copper, heavy, and wire	10.75	10.50	10.00
Copper, light, and bottoms	8.75	9.00	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	6.00	6.50
Brass, light	4.25	4.25	5.00
No. 1 yellow brass turnings	5.50	5.00	5.75
Zinc	2.75	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	2.50	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.83	.80	.84
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$2.75@$3.00	
Coke, prompt foundry, Connellsville	per net ton	3.75@ 4.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3 50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Square and hex., head cap screws	75—10%	....	.....
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.43
Cone heads, ditto (net)	3.60	3.35	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.85	$0.90
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

N. J., Merchantsville—The Norton Mfg. Co. has awarded the contract for the construction of a 1 story, 60 x 175 ft. factory for the manufacture of metal products. Estimated cost, $15,000.

N. C., High Point—The Wilson Motor Co. plans to build a 3 story, 75 x 100 ft. addition to its garage. Estimated cost, $75,000. Architect not selected.

O., Cincinnati—The Federal Garage Co. has awarded the contract for the construction of a 5 story, 60 x 239 ft. garage at 417 Sycamore St. Estimated cost, $145,000.

O., Cleveland—The Winters Garage Co., 1381 West 117th St., is receiving bids for the construction of a 1 story, 42 x 100 ft. garage on West 117th St. near the Clifton Bldg. Estimated cost, $40,000. Private plans.

Pa., Butler—The Butler Buick Co., Main St., is having plans prepared for the construction of a 3 story, 85 x 110 ft. sales and service station. Estimated cost, $150,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts.

Pa., Carbondale—J. H. Paul has awarded the contract for the construction of a 1 story, 80 x 150 ft. garage. Estimated cost, $50,000.

Pa., Pittsburgh—The Martin Hardsogg Co., 922 South Ave., manufacturer of mill and mine supplies, is having plans prepared for improving present buildings and constructing top additions to various sections of plant. A. M. Trimble, Ferguson Bldg., Archt.

Pa., Summit Hill—J. Breslin has awarded the contract for the construction of a 2 story, 50 x 175 ft. garage. Estimated cost, $75,000.

R. I., Providence—Jenks & Ballou, Engrs., 10 Weybosset St., will receive bids about March 1, for the construction of a service station for the Narragansett Electric Lighting Co., Turks Head Bldg., including a 4 story, 42 x 154 ft. office building with 42 x 70 ft. wing, 3 story, 101 x 223 ft. light storage building and a 1 story, 120 x 223 ft. heavy storage building, a 1 and 2 story, 115 x 173 ft. garage, a 1 and 2 story, 45 x 56 ft. power plant, a 1 story, 28 x 93 ft. oil house with 17 x 22 ft. ell, 2 story, 10 x 17 ft. gate house, two 10 ton traveling cranes and three 1 ton cranes, etc.

R. I., Providence—The Textile Finishing Mchy. Co., 171 Westminister Ave., has awarded the contract for the construction of a 1 story, 200 x 250 ft. machine shop and a 2 story, 45 x 99 ft. office. Estimated cost, $225,000. Noted Dec. 15.

General Manufacturing

Cal., Los Angeles—The Angeles Furniture Co., 931 East Peco St., has awarded the contract for the construction of a 2 story, 123 x 138 ft. factory on Pico St. near Stanford St. Estimated cost, $50,000.

Cal., San Diego—The Bureau of Yards and Docks, Navy Dept., Wash., D. C., will soon award the contract for the construction of a refrigerating and cold storage plant here.

Conn., Boardman—The New England Lime Co., 226 Main St., Danbury, will build a lime plant here, to replace the one which was recently destroyed by fire. Estimated cost, $100,000. Noted Jan. 12.

Conn., New Haven—The Seamless Rubber Co., Inc., Hallock St., has awarded the contract for the construction of a 1 story, 140 x 160 ft. addition to its rubber plant. Estimated cost, $100,000. Noted Jan. 12.

Conn., South Norwalk—Harris & Gans, 70 Water St., are having plans prepared for the construction of a 2 story, 36 x 70 ft. wood plant on Water St. A. S. Meloy, 2965 Main St., Stratford, Archt.

Conn., South Norwalk—H. Jacobs & Sons, Day St., are receiving bids for the construction of a 2 story, 60 x 120 ft. addition to their shoe factory. Estimated cost, $65,000. A. S. Meloy, 2965 Main St., Stratford, Archt.

Del., Lewes—The Lewes Fertilizer Co. has awarded the contract for the construction of a fertilizer plant. Estimated cost, $45,000.

Fla., Sumica—The Florinda Mill & Planing Co. has had plans prepared for the construction of a new factory to replace the one which was recently destroyed by fire. W. J. Fink, Mgr.

Ill., Beardstown—The Gorman Ice & Coal Co. plans to build a 1 story, 30 x 42 ft. addition to its ice plant. Estimated cost, $25,000. Architect not selected.

Ill., Chicago—The Oetting Ice & Coal Co., 1725 West 15th St., has awarded the contract for the construction of a 1 and 2 story, 83 x 156 ft. ice factory at 1717-29 West 15th St. Estimated cost, $35,000.

Ill., Morrison—The Illinois Refrigerator Co. plans to build a 1 story addition to its refrigerator and furniture factory. Estimated cost, $40,000. Private plans.

Ill., Rockford—The Old Colony Chair Co., 1109 Seminary St., has awarded the contract for the construction of a 3 story, 65 x 68 ft. addition to its factory. Estimated cost, $35,000. L. Carlson, Secy.

Still Growing

Last July we published the names, addresses and requirements of 133 concerns in the market for

Machine Tools and Machinery

In November the number of these items had risen to 189 for the month.

In January, 1922, we published 248 machinery items, with an additional 202 items on the construction of new manufactories.

American Machinist

offers the best machinery market in America.

Are you using it to full advantage?

Ind., Ft. Wayne—The Craig Biscuit Co., 115 Montgomery St., plans to build a 4 story baking plant. Estimated cost, $150,000. McCormick Co., 41 Park Row, New York, Archts.

Ind., Michigan City — The Haskell & Barker Car Co. plans to biuld a 2 story paint shop. Estimated cost, $150,000. H. Shaw, 39 South State St., Chicago, Archt.

Ind., South Bend — The South Bend Brewing Co., 1702 Lincoln Way, is building 1 story, 90 x 90 ft., ice manufacturing plant. Estimated cost including equipment $60,000.

Minn., St. Paul—The Daily News Publishing Co., 94 East 4th St., will receive bids about March 1 for the construction of a 6 story, 75 x 135 ft. newspaper plant and office building on 4th St. between Cedar and Minnesota Sts. Estimated cost, $225,000. Toltz, King & Day, 1410 Pioneer Bldg., Engrs.

Mo., Jefferson City—The Standard Crate & Filler Co. is having plans prepared for the construction of a 2 story, 100 x 220 ft. crate and straw board factory. Estimated cost, $200,000. W. F. Winkleman, Treas. Private plans.

Mo., Leeds—The Wilson Slaughtering Device Co., 511 Amer. Bank Bldg., Kansas City, is having plans prepared for the construction of a 2 story, 30 x 140 ft. serum plant. Estimated cost, $50,000. Private plans.

N. J., Trenton—The Trenton Rough Dry Laundry, 927 East State St., is having plans prepared for the construction of a 2 story, 30 x 75 ft. laundry on East State St. Estimated cost, $10,000. J. O. Hunt, East Hanover St., Archt.

N. J., Union Hill (Weehawken P. O.)—The Pioneer Braid Mfg. Co., c/o A. Adelman, 429 6th Ave., New York, is receiving bids for the construction of a 2 story, 50 x 102 ft. factory on Park Ave. and Bloom St., here. G. Willaredt, 411 West 23rd St., New York, Archt.

N. Y., New York—The Fleischmann Co., 701 Washington St., will soon award the contract for the construction of a 3 story yeast laboratory on Mott Ave. Estimated cost, $200,000. A. B. Heaton, Maryland Bldg., Wash., D. C., Archt. and Engr.

O., Cleveland—J. Rosicka, 3726 East 71st St., has had plans prepared for the construction of a 1 story, 38 x 40 ft. paint shop at 3723 East 71st St. Estimated cost, $40,000. H. T. Jeffrey, 437 The Arcade, Archt.

O., Cleveland—The Ward Baking Co., c/o J. B. Arthur, East 143rd St. and Southern Blvd., New York, has had plans prepared for the construction of a 4 story baking plant on East 45th Pl. and Perkins Ave., here. Estimated cost, $300,000. C. B. Comstock, 110 West 40th St., New York, Archt.

O., Columbus—The City Ice Supply & Coal Co., 38 Mithoff St., is having plans prepared for the construction of an ice plant on 22nd St. Estimated cost, $35,000. Private plans.

Pa., Phila.—A. Elchhorn & Sons, Palethrop and Turner Sts., have awarded the contract for the construction of a 3 story, 80 x 82 ft. addition to their box factory on Hancock and Tuner Sts. Estimated cost, $14,000.

R. I., Woonsocket — The Lafayette Worsted Co., Hamlet Ave., will build a 3 story, 70 x 200 ft. addition to its mill.

Tenn., Johnson City—The Southern Refrigeration Co., Unika Bank Bldg., is having preliminary plans prepared for the construction of a 3 story, 100 x 100 ft. ice manufacturing and cold storage plant. Estimated cost including machinery $200,000.

Va., Danville — Register Publishing Co., 115 South Union St., is receiving bids for the construction of a 50 x 100 ft. printing plant and office building on Union and Patton Sts. Estimated cost, $55,000. Private plans.

Va., Kimballton—R. K. Meade & Co., Archts. and Engrs., 11 East Fayette St., Baltimore, Md., is receiving bids for the construction of a 2 story lime plant, here, along tracks of the Norfolk & Western R.R., for the Kimballton Lime Co. Estimated cost, $85,000. W. T. Doosing, Shawsville, Pres.

W. Va., Bluefield—The Bluefield Ice & Cold Storage Co. has awarded the contract for the construction of an ice plant on Bluefield Ave. and Poplar St. Estimated cost, $60,000.

Wis., Clinton Junction—The Bowman Dairy Co., 140 West Ontario St., Chicago, is having plans prepared for the construction of a 1 story, 57 x 200 ft. bottling plant. Estimated cost, $60,000. A Peck, Mgr., F. B. Gray, 844 1st Natl. Bank Bldg., Aurora, Ill., Archt.

Wis., Sheboygan — The Amer. Hide & Leather Co., 1102 Wisconsin Ave., is having preliminary plans prepared for the construction of a steam ash chute and conveyor system. Estimated cost, $25,000. Address E. A. Juul, 805 North 8th St., Engr.

Ont., St. Thomas—The Council is having plans prepared for improvements to the civic gas plant, including erection of new retort house. Estimated cost, $175,000. A. Curtis, Chn. W. N. Miller, City Hall, Engr.

American Machinist

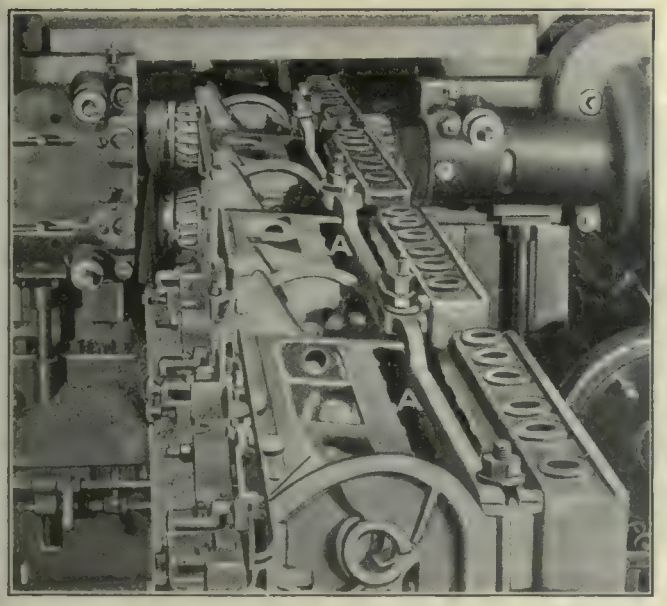
Volume 56 NEW YORK, FEBRUARY 23, 1922 Number 8

Cylinder Methods in the Reo Plant

Unusual Valve Combination Requires Special Tools — Combustion Chamber Counterbored to Secure Uniform Compression Space—Milling Machine with Chip Exhauster

By FRED H. COLVIN
Editor, American Machinist

THERE is much of interest in the plant of the Reo Motor Car Co., Lansing, Mich. It must be remembered that this is an old company which has had a steady growth; it has never been spectacular, either in car design or in phenomenal increase of plant, but there are few shops where one feels the same atmosphere of harmony and co-operation, where a real interest in the work is everywhere so apparent.



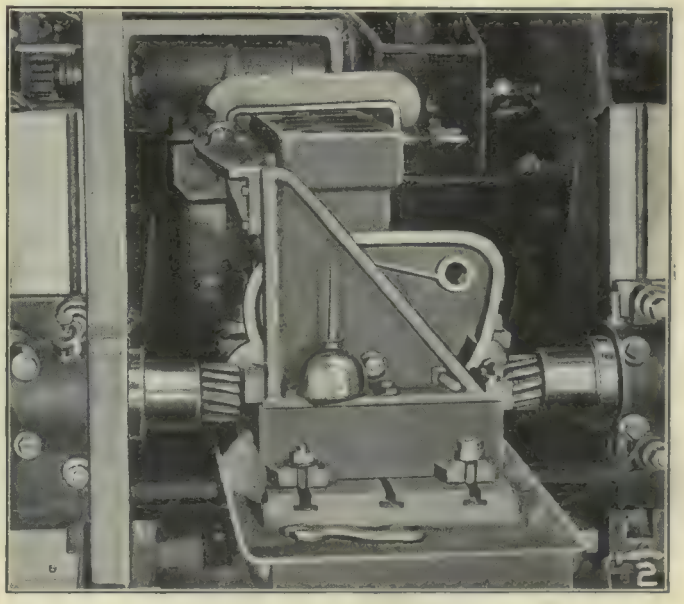


FIG. 1. MILLING TOP AND BOTTOM OF CYLINDERS. FIG. 2. MILLING ENDS OF SUPPORTING ARMS

The Reo six-cylinder motor has a valve combination which is unusual. The intake valve is in a removable head and the exhaust valve is in the L-head of the cylinder casting. This arrangement will be noted in connection with the work to be described. After the usual chipping, snagging and cleaning, the core holes are drilled, tapped and plugged. Then the cylinder block goes to the Ingersoll milling machine, shown in Fig. 1, where the two smaller cutters at the left mill the bottom face and the larger cutter at the right, mills the upper face to receive the removable head. The block is easily clamped by the bars *A*, being carefully lined up and supported by simple fixtures.

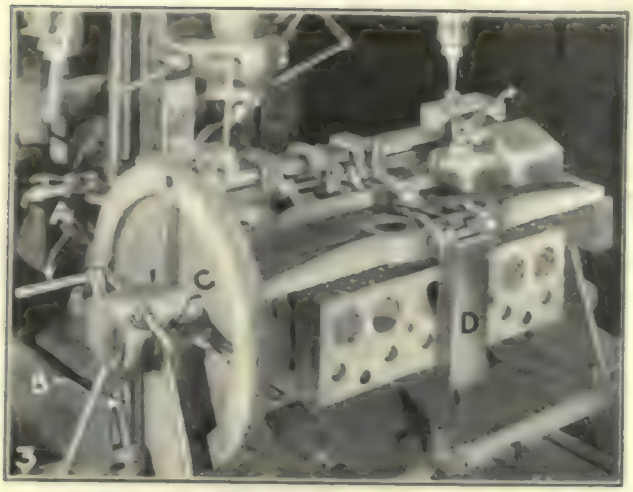
Working from the bottom face, the arms which support the motor in the chassis are then milled on the double head machine in Fig. 2. Great care is taken to have these arms milled in their proper relation to the cylinder block and this operation receives most careful attention.

The block then goes to the trunnion drilling-fixture, shown in Fig. 3, which has several interesting features. The locking pin is operated by the handle *A*, through the rod *B*, while the handle *C* clamps the fixture in any desired position for inspection or other purposes. One of the holes in the arm is being drilled and the two large water pipe holes near the top of the cylinder are also drilled at this setting. Numerous other holes are also drilled, including those for the magneto and water pump. When rolled over in the opposite position the block can be easily removed by releasing the swinging clamp *D*.

A simple but substantial milling head for straddle milling the four main bearings is shown in Fig. 4. The cutters are spaced by fixed collars but provision is made for end adjustment of the pairs of cutters should this be necessary. This view shows the arms milled for supporting the motor and the holes drilled for bolting in place.

Boring, Reaming and Grinding Cylinders

The cylinder barrels are next bored (Fig. 5) in two operations, roughing and finishing, and numerous drillings take place, including the holes for the main bearing studs. After assembling the main bearing caps the block is ready for the boring of the main bearings and the camshaft holes, as in Fig. 6. The boring bars are well supported in long bushings and the work is easily handled. The bearings are then line-reamed with both roughing and finishing reamers and the caps removed. Oil grooves are cut, tappet and push rod guide-holes



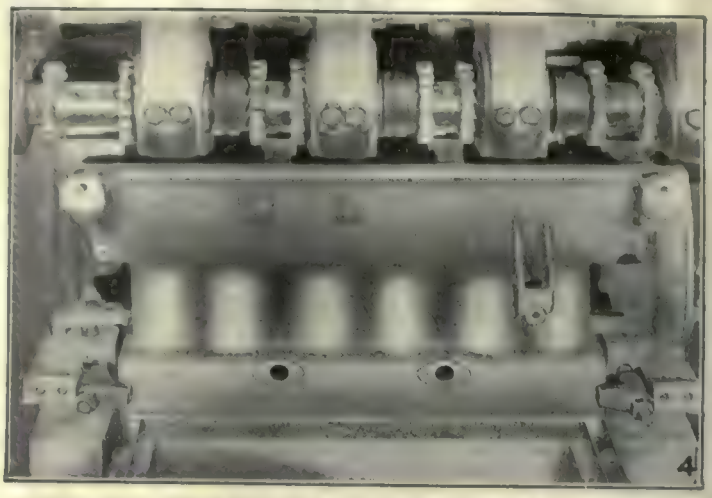
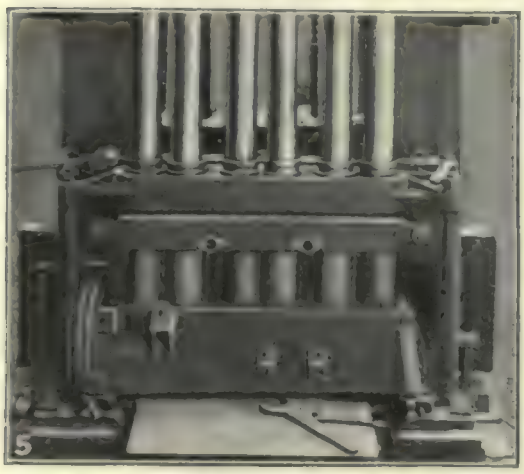


FIG. 3. ROLL-OVER FIXTURE FOR DRILL ARMS. FIG. 4. STRADDLE MILLING BEARINGS

are bored and reamed, after which the cylinder bore is carefully reamed with a single tool in a special machine as shown in Fig. 7.

It will be noted that the lower flange of the cylinder block rests on sliding ways so that the whole block can be readily moved from one bore to the next. These sliding ways extend to the next machine so that the cylinder blocks come in a steady stream and the operator does not have to lift or carry them.

A special fixture for water testing is shown in Fig. 8. Here the top plate is held by ten swinging bolts and the two sides of the fixture are tied together by the bars and pins *A* and *B*. The handwheels and thumbscrews hold covers over the openings while the water is



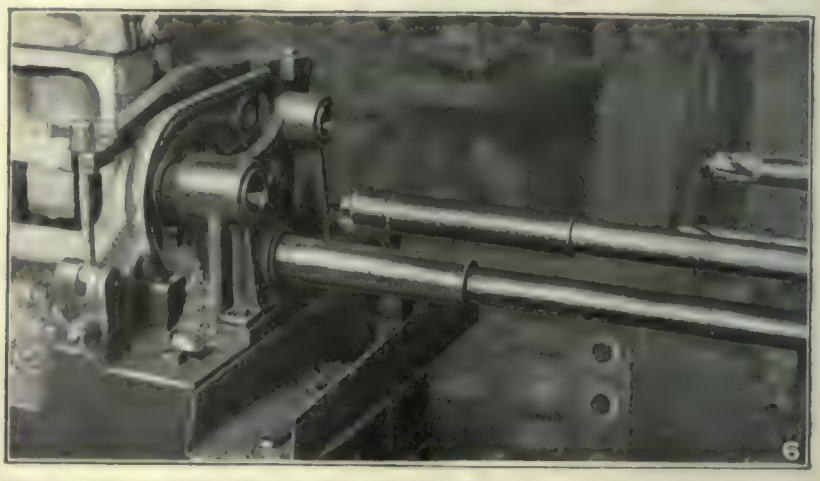
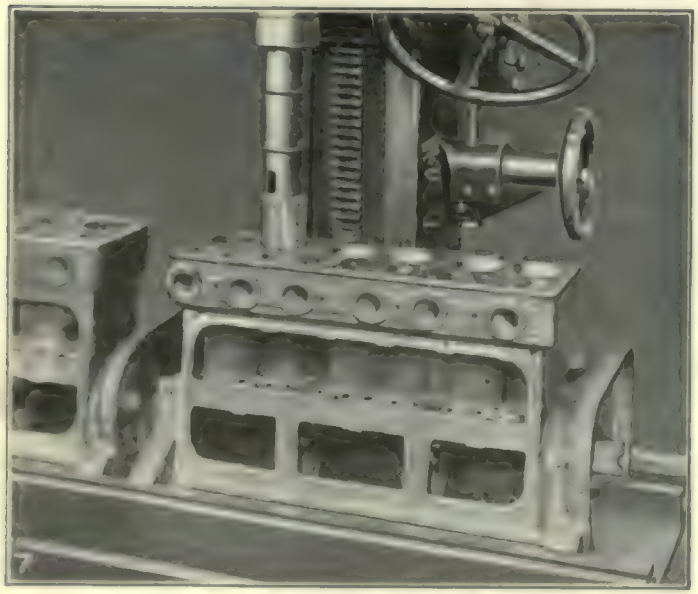


FIG. 5. BORING THE CYLINDERS. FIG. 6. BORING CRANKSHAFT AND CAMSHAFT BEARINGS



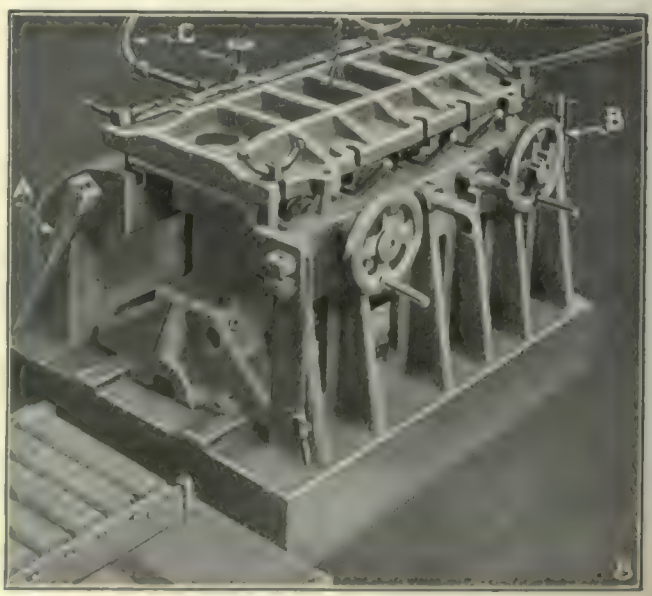
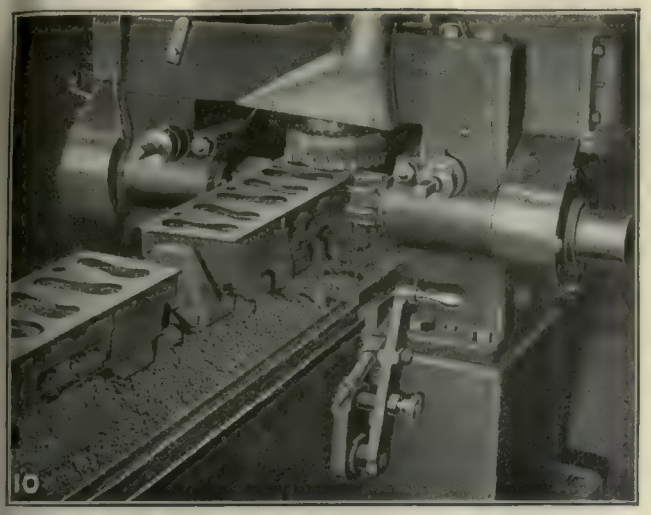


FIG. 7. FINAL REAMING BEFORE GRINDING. FIG. 8. THE WATER TESTING FIXTURE



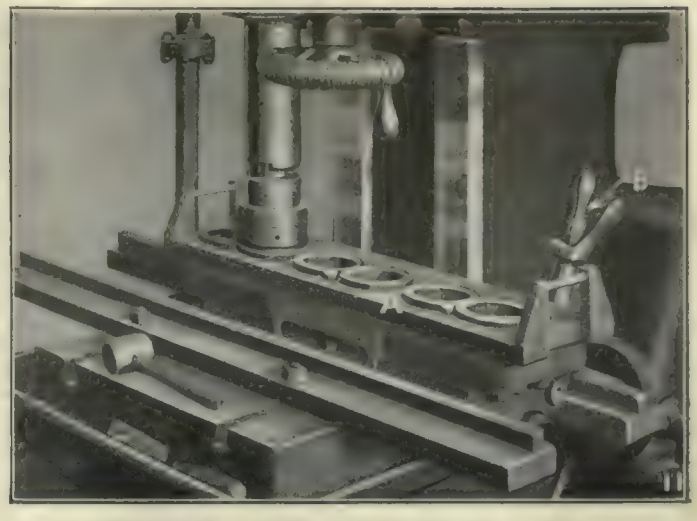


FIG. 10. MILLING THE CYLINDER HEADS. FIG. 11. COUNTERBORING THE COMBUSTION CHAMBER

admitted by hose *C*. Oil pipe holes and pockets are carefully cleaned out, main bearings put in place and finish line-reamed, valve seats are reamed and ground, camshaft bearings are hand reamed and the cylinders are ready for assembly.

A convenient assembling stand is used, as shown in Fig. 9. It is not unusual except that the rings have fittings which match the arms in the cylinder block and represent the frame in the final assembly. The rotating rings can be clamped in any desired position by the handle *A*. The large casters make it easy to roll the motor to the next point in the assembly line.

The Cylinder Head

The cylinder head, which carries the intake valve, is somewhat different from a head which simply covers the top of the cylinders, and requires different handling. The first machining operation is to grind the top after which the bottom and both sides are milled, as in Fig. 10, on a small special Ingersoll machine provided with an exhaust system for keeping the work clear of chips.

After numerous drilling operations, hollow-milling for valve spring clearance and finish-milling the bottom to insure a tight joint, the combustion chamber is counterbored to secure uniform compression space. This is shown in Fig. 11. The guide plate *A* and the cylinder head are indexed by the lever *B* in each of the six positions. The plate is easily handled by the attachments at the ends.

Water testing the head and finishing the valve seats is then done and finally the head goes to the assembly department.

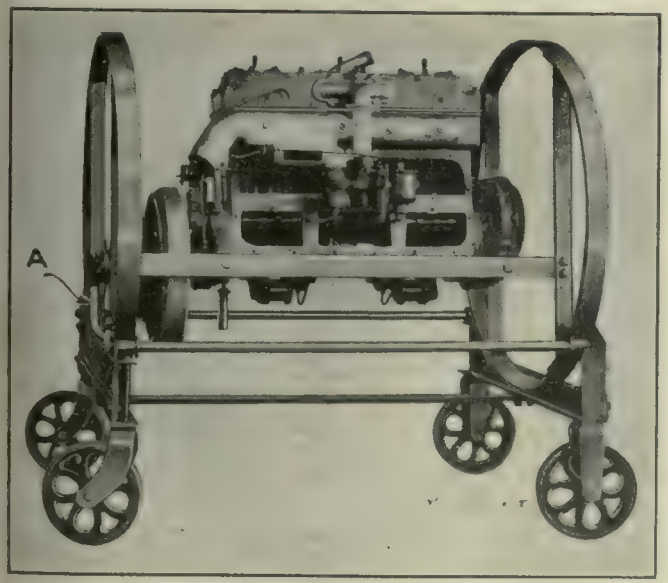


FIG. 9. THE ASSEMBLING STAND

Painting Machine Tools White

By Ellsworth Sheldon

In one of our old-time stage "dramas" the funny boy advises the farmer that "if you want your house yaller, put on yaller paint." D. A. Nevin, on page 166 of American Machinist, evidently believes that I am putting forward the same axiom with respect to white machine tools.

A machine tool painted with ordinary white paint will soon become "yaller" without further attention, especially if much oil is used around it. In my previous letter I stated that the machines in question were coated with a hard surfaced enamel paint that is impervious to oil. Several of the machines in the shop mentioned were thus treated more than a year ago and are still white.

It takes no more time to keep a white machine *clean* than it does a black one; but the black machine may be far from clean without the fact being evident to casual inspection.

Wage Scale in Southern Shops

A schedule of the average wages paid by the foundries and machine shops of the South has recently been compiled by the Southern Metal Trades Association. The schedule is based on an investigation of the wage scales in use in more than seventy of the leading foundries and shops of the Southern territory.

The average minimum and maximum wages per hour of the various trades is as follows: Coremakers, 0.495 to 0.586; moulders, 0.507 to 0.654; moulder's helpers, 0.232 to 0.286; machinists, 0.527 to 0.677; apprentices, 0.259 to 0.35; patternmakers, 0.624 to 0.71; blacksmiths, 0.654 to 0.698; boilermakers, 0.586 to 0.689; colored labor, 0.207 to 0.263; electricians, 0.558 to 0.611; welders, 0.614 to 0.632; pipe fitters, 0.511 to 0.589; sheet-metal workers, 0.515 to 0.653; carpenters, 0.471 to 0.573; cupola tenders, 0.342 to 0.345; millwrights, 0.567 to 0.644.

Mounting Ball Bearings

Undue Pressure in Mounting Deforms the Bearings and Renders Them Noisy in Operation —Maximum, Minimum and Average Safe Allowances for Fits

By T. C. DELAVAL-CROW

THE ball bearing trade has adopted tolerances on the bore, outside diameter and assembled width of bearings as standardized by the Society of Automotive Engineers; but considerable difference in opinion seems to exist among the users of ball bearings as to the fits allowable on shafts and in housings, the tolerances varying with the different users from a press fit to a light push fit, even though the bearing installation is of the same nature. In view of the fact that a bearing can have imposed on it an initial load caused by the expansion of the cone race or deformation of the cup race due to excessive press fits in or on their respective carriers, also that in the complaints by automobile transmission makers as to noise, it has been proved in nearly all cases that this noise can be traced to the use of excessive press fits for mounting cup or cone and that this noise can be reduced by reduction of the fits used or the use of a looser bearing which will allow for the expansion caused by the excessive press fits. Noise is vibration and it is readily seen that the higher the tension of the parts, the higher the vibration, which will cause a higher pitch or shriller tone to the noise produced. This is the effect which is produced in a ball bearing when the parts are assembled under tension. No maker of machine parts would think of pressing a bushing into a hole or on a shaft without either making the running clearance large enough to take care of the contraction or expansion, or perhaps use the better practice of reaming out or machining the bushing after assembly. But the same user will probably press a ball bearing onto the shaft or in the housing with a relatively large press fit and yet expect the bearing to function without failure and lack of noise.

With these points in mind, an investigation was undertaken to determine the expansion of the cone ball race due to mounting fits. In running this test, average size cones of the light, medium and heavy series were used, the sizes being as follows: No. 5, bore 0.9843 in.; No. 7, bore 1.3780 in.; No. 10, bore 1.9685 in.; No. 17, bore 3.3465 in.

The method used to obtain the expansion was to have hardened and ground taper arbors, the change in diameter being 0.0005 in. per inch, rings being ground on the arbor every inch for the convenience of measuring. Cones were then ground whose bore had the same amount of taper in order to obtain equal expansion on all parts of the cone, the arbor being lubricated with a light oil and the cone pressed on by hand until slight resistance was felt. The diameter of the ball race was then measured with an amplifying gage reading to 0.0001 in. and the diameter noted. The cone was then pressed on the arbor under an Olsen testing machine for a distance of 1 in., or change in arbor diameter of 0.0005 in. and the increase in diameter measured on ball race, record also being taken of the pounds pressure required to press arbor in cone. The point at which the diameter was measured was marked so that all measurements might be taken at the same position and thus eliminate any out-of-roundness or false readings that might occur. This operation was repeated as far as it was thought wise without causing the cone to fracture. The same method was followed on pressing the cone off the arbor but the readings were so near those obtained by pressing on that they were ignored. It is interesting to note that the highest expansion obtained did not cause the cone to fracture or produce any permanent set provided the cone was immediately pressed off, but if the cone was left on the arbor for twenty-four hours at its point of highest expansion, it was found that the cone in most cases was split in half.

Charts Nos. 1, 2, 3 and 4 show the expansion for the

TABLE I. SHAFT-DIAMETER, SHAFT STATIONARY

Bearing Bore No.	Bearing Bore M/M	Bearing Bore Inches	Shaft Diameter Max.	Shaft Diameter Min.	Fit Obtained
0	10	0.3937	0.3934	0.3931	
1	12	0.4724	0.4721	0.4718	Maximum 0.0008 loose
2	15	0.5906	0.5903	0.5900	Minimum 0.0001 tight
3	17	0.6693	0.6690	0.6687	Average 0.0002 loose
4	20	0.7874	0.7871	0.7868	
5	25	0.9843	0.9840	0.9835	
6	30	1.1811	1.1808	1.1803	
7	35	1.3780	1.3777	1.3772	Maximum 0.0010 loose
8	40	1.5748	1.5745	1.5740	Minimum 0.0001 tight
9	45	1.7717	1.7714	1.7709	Average 0.0003 loose
10	50	1.9685	1.9682	1.9677	
11	55	2.1654	2.1649	2.1644	
12	60	2.3622	2.3617	2.3612	Maximum 0.0012 loose
13	65	2.5591	2.5586	2.5581	Minimum 0.0000 loose
14	70	2.7559	2.7554	2.7549	Average 0.0005 loose
15	75	2.9528	2.9523	2.9518	
16	80	3.1496	3.1489	3.1483	
17	85	3.3465	3.3458	3.3452	
18	90	3.5433	3.5426	3.5420	Maximum 0.0015 loose
19	95	3.7402	3.7395	3.7389	Minimum 0.0001 loose
20	100	3.9370	3.9363	3.9357	Average 0.0008 loose
21	105	4.1339	4.1332	4.1326	
22	110	4.3307	4.3300	4.3294	

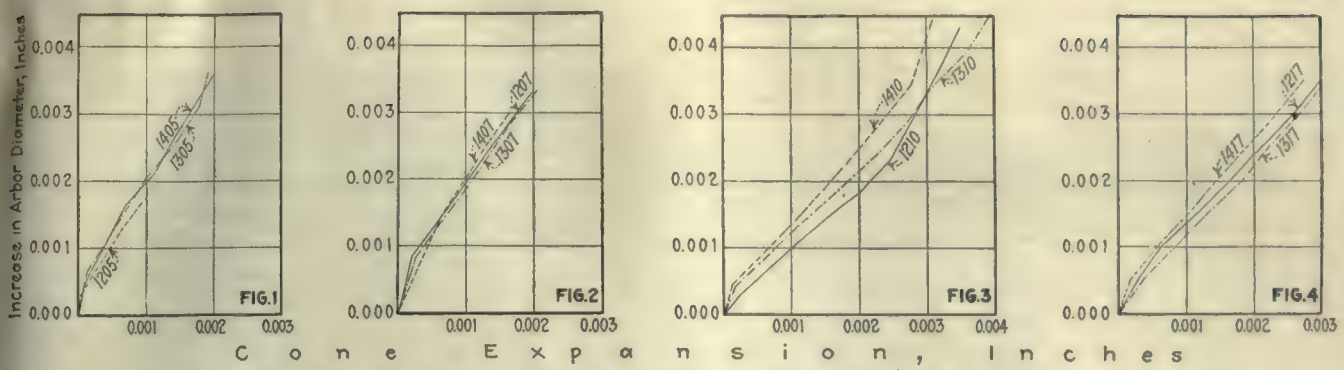
light, medium and heavy series of the various bore sizes tested in comparison to the change in arbor diameter.

Chart No. 5 shows the average expansion obtained on the various bores; also, the average pounds pressure

TABLE II. SHAFT-DIAMETER, SHAFT ROTATING

Bearing Bore No.	Bearing Bore M/M	Bearing Bore Inches	Shaft Diameter Max.	Shaft Diameter Min.	Fit Obtained
0	10	0.3937	0.3940	0.3937	
1	12	0.4724	0.4727	0.4724	Maximum 0.0007 press
2	15	0.5906	0.5909	0.5906	Minimum 0.0002 loose
3	17	0.6693	0.6696	0.6693	Average 0.0004 press
4	20	0.7874	0.7877	0.7874	
5	25	0.9843	0.9848	0.9843	
6	30	1.1811	1.1816	1.1811	
7	35	1.3780	1.3785	1.3780	Maximum 0.0009 press
8	40	1.5748	1.5753	1.5748	Minimum 0.0009 loose
9	45	1.7717	1.7722	1.7717	Average 0.0005 press
10	50	1.9685	1.9690	1.9685	
11	55	2.1654	2.1658	2.1653	
12	60	2.3622	2.3626	2.3621	Maximum 0.0009 press
13	65	2.5591	2.5595	2.5590	Minimum 0.0003 loose
14	70	2.7559	2.7563	2.7558	Average 0.0004 press
15	75	2.9528	2.9532	2.9527	
16	80	3.1496	3.1499	3.1493	
17	85	3.3465	3.3468	3.3462	
18	90	3.5433	3.5436	3.5430	Maximum 0.0009 press
19	95	3.7402	3.7405	3.7399	Minimum 0.0005 loose
20	100	3.9370	3.9373	3.9367	Average 0.0003 press
21	105	4.1339	4.1342	4.1336	
22	110	4.3307	4.3310	4.3304	

required to force the arbor in the cone and produce this expansion. On examination of these charts, it will at first appear strange that the larger diameter cones show the greatest expansion for a given change in arbor diameter, but when the fact is considered that the relation of wall thickness of cone to arbor diameter is smaller the large the cone, it will be readily seen that this is true, as naturally a very thin ring with a given



FIGS. 1, 2, 3 AND 4. EXPANSION OF CONES WHEN PRESSED ON TAPER ARBOR

bore diameter would expand more for a given change in arbor diameter than a thicker ring would. The reason that the expansion on the seventeen bore cone is less than the ten bore is due to the change in relation of the thickness of the cone between the bottom of the ball race and the bore compared with arbor diameter.

Concerning the possible contraction of cup due to mounting, it was found very hard to measure the change in diameter due to out-of-roundness produced; also, it is much harder to compress a ring than expand it due to its shape. Again, it is very seldom that cups are mounted under a press fit condition and it is thought, bearing this fact in mind and the unreliability of the reading obtained, that the results would be of no value. It is well to note, however, that especially on the lighter cup if a press fit is deemed necessary due to shock loads or other conditions, this fit should be of as light a nature as possible as the housing is very seldom ground and is probably of an irregular shape, this shape being transmitted to the ball race under a press fit condition, causing high and low points which might result in failure due to an excessive initial load, and also be productive of noise because of the change in vibration set up as the balls enter under these high and low points.

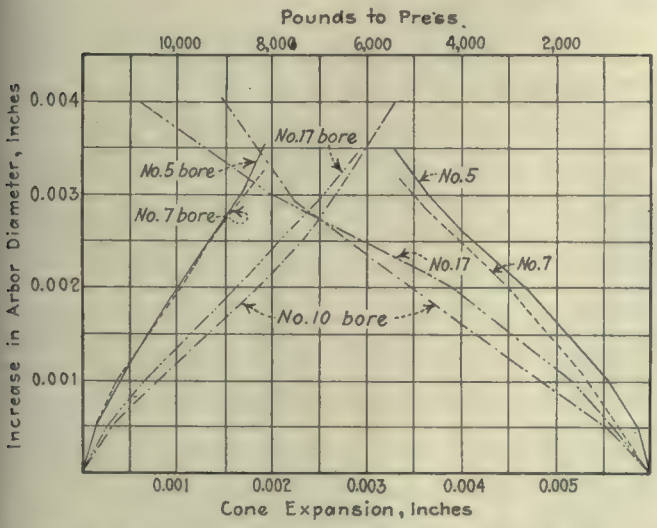


FIG. 5. COMPARISON OF AVERAGE VALUES OF CHARTS 1, 2, 3 AND 4

Having established the effect of press fit on the ball races, we can now determine a set of mounting limits that will cause the least trouble due to expansion and enable the bearings to be assembled with the correct amount of radial play to produce long life and a noiseless bearing.

Charts 8, 9, 10 and 11, and Tables I, II, III and IV give the limits recommended for shafts and housings, also the maximum, minimum and average fits obtained, and on charts compared to the limits established by the Society of Automotive Engineers on bore and outside diameter. It is well to note that contrary to most recommendations the maximum press fit decreases as the diameter increases. This is correct considering the fact that the more surface in contact the greater the friction and, therefore, the less fit required to hold the cup or cone in place, or a larger clearance required if a push fit is desired. This is also in accordance with the theory that a small fit is required on the larger sizes to prevent excessive expansion or contraction.

Whereas the maximum press and loose fits shown may appear excessive, it is true that according to the law of probability perhaps not more than 5 per cent of the extreme manufacturing allowances will ever be as-

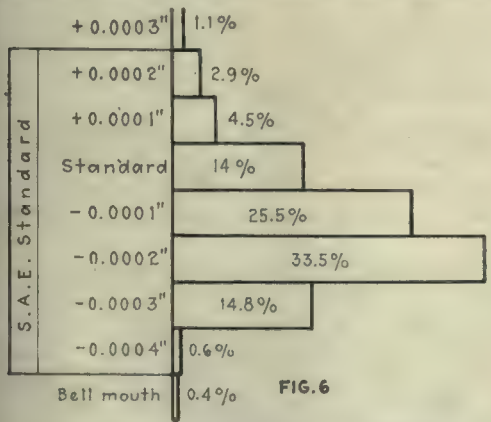


FIG. 6

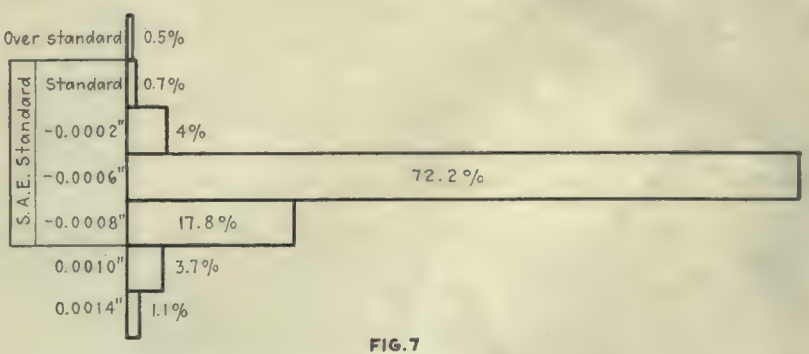
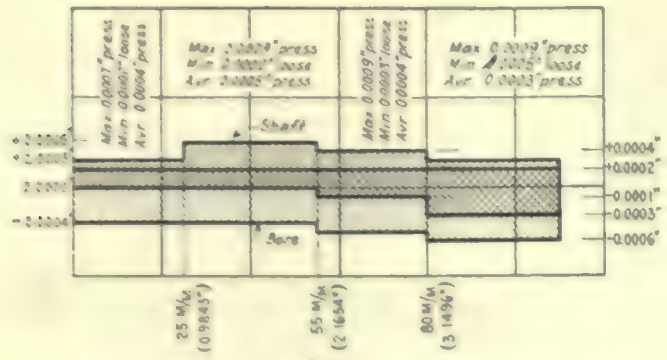


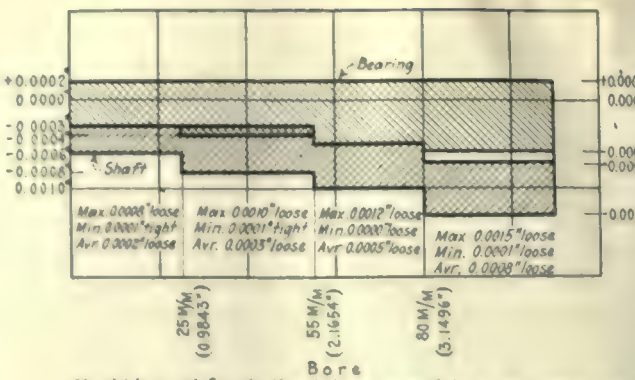
FIG. 7

FIG. 6. ACTUAL BORE DIAMETERS OF SINGLE ROW CONES IN COMPARISON WITH S. A. E. STANDARDS. FIG. 7. ACTUAL OUTSIDE DIAMETER OF SINGLE ROW BEARINGS IN COMPARISON WITH S. A. E. STANDARDS



Cones mounted on soft shafts must be held by lock nuts. Cones mounted on hardened shafts need not be held by lock nuts, excepting light series, and where sustaining end thrust in two directions on bores smaller than 25 M/M (0.9843") a press fit of 0.0003" is preferable and should be obtained by selective assembly.

FIG. 8



Should be used for shafts stationary or rotating cone, where cone is moved for adjustment

FIG. 9

FIG. 8. BEARING FITS ON SHAFTS (SHAFTS ROTATING). FIG. 9. BEARING FITS ON SHAFTS (SHAFTS STATIONARY)

sembled together. Again, bear in mind that under average manufacturing conditions the operator intends to play safe and will grind shafts nearer the high limit and bore housings nearer the low limit so that in the event of his making an error he will still have stock enough left to remove and save the part. This is borne out by Charts Nos. 6 and 7 that show in grinding bores, 73 per cent of the New Departure bearings are from standard to minus 0.0002 in. and 15 per cent from standard to minus 0.0002 to 0.0003 in. on the outside diameter, 77 per cent of the bearings being ground from standard to minus 0.0006 in. and 18 per cent from minus 0.0006 to 0.0008 in.

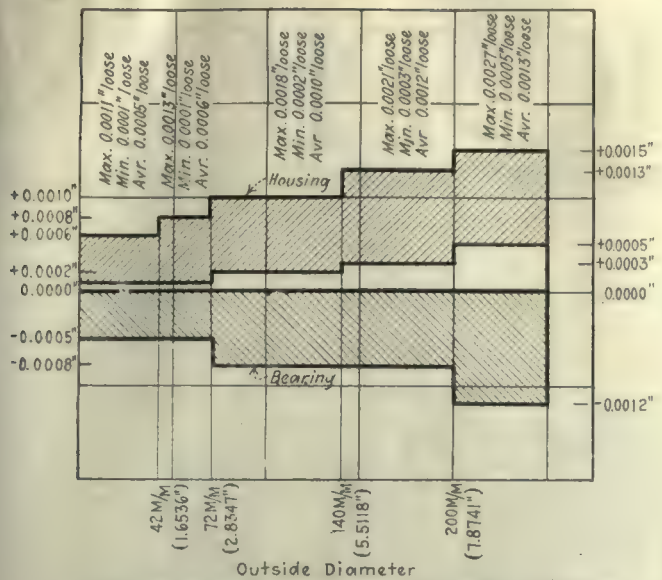
Using this information it is very easy to determine average fits obtained which are those shown on Charts 8, 9, 10 and 11.

TABLE III. HOUSING-BORE, HOUSING STATIONARY

Bearings No.	Brg. Out. Dia. M/M	Brg. Out. Dia. Inches	Housing Bore Max.	Housing Bore Min.	Fit Obtained
1200–200	30	1.1811	1.1817	1.1812	
1201–201	32	1.2598	1.2604	1.2599	
1202–202	35	1.3780	1.3786	1.3781	Max. 0.0011 loose Min. 0.0001 loose Avr. 0.0005 loose
1300–300					
1301–301	37	1.4567	1.4573	1.4568	
1203–203	40	1.5748	1.5754	1.5749	
1302–302	42	1.6536	1.6544	1.6537	
1204–204	47	1.8504	1.8512	1.8505	
1303–303					Max. 0.0013 loose Min. 0.0001 loose Avr. 0.0006 loose
1205–205–0205	52	2.0473	2.0481	2.0474	
1304–304–0304					
1206–206–0206	62	2.4410	2.4418	2.4411	
1305–305–0305					
1207–207–0207					
1306–306–0306	72	2.8347	2.8357	2.8349	
1404–404–0404					
1208–208–0208					
1307–307–0307	80	3.1496	3.1506	3.1498	
1405–405–0405					
1209–209–0209	85	3.3465	3.3475	3.3467	
1210–210–0210					
1308–308–0308	90	3.5433	3.5443	3.5435	
1406–406–0406					
1211–211–0211					
1309–309–0309	100	3.9370	3.9380	3.9372	Max. 0.0018 loose Min. 0.0002 loose Avr. 0.0010 loose
1407–407–0407					
1212–212–0212					
1310–310–0310	110	4.3307	4.3317	4.3309	
1408–408–0408					
1213–213–0213					
1311–311–0311	120	4.7244	4.7254	4.7246	
1409–409					
1214–214–0214	125	4.9213	4.9223	4.9215	
1215–215–0215					
1312–512	130	5.1181	5.1191	5.1183	
1410–410					
1216–216–0216					
1313–313	140	5.5118	5.5131	5.5121	
1411–411					
1217–217–0217					
1314–314	150	5.9055	5.9068	5.9058	
1412–412					
1218–218–0218					Max. 0.0021 loose
1315–315	160	6.2992	6.3005	6.2995	Min. 0.0003 loose
1413–413					Avr. 0.0012 loose
1219–219–0219	170	6.6929	6.6942	6.6932	
1316–316					
1220–220–0220					
1317–317	180	7.0866	7.0879	7.0869	
1414–414					
1221					
1318–318	190	7.4804	7.4817	7.4807	
1415					
1222					
1319–319	200	7.8741	7.8756	7.8746	
1416					
1417	210	8.2678	8.2693	8.2683	Max. 0.0027 loose
1320–320	215	8.4646	8.4661	8.4651	Min. 0.0005 loose
1321–321	225	8.8583	8.8598	8.8588	Avr. 0.0013 loose
1418					
1322–322	240	9.4489	9.4504	9.4494	
1419	250	9.8426	9.8441	9.8431	
1420	265	10.4331	10.4346	10.4336	

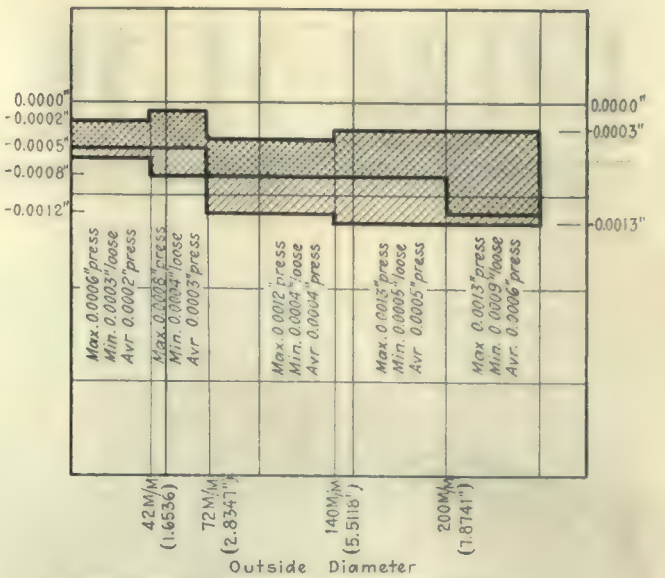
TABLE IV. HOUSING-BORE, HOUSING REVOLVING

Bearings No.	Brg. Out. Dia. M/M	Brg. Out. Dia. Inches	Housing Bore Max.	Housing Bore Min.	Fit Obtained
1200–200	30	1.1811	1.1809	1.1805	
1201–201	32	1.2598	1.2596	1.2592	Max. 0.0006 press
1202–202	35	1.3780	1.3778	1.3774	Min. 0.0003 loose
1300–300					Avr. 0.0002 press
1301–301	37	1.4567	1.4565	1.4561	
1203–203	40	1.5748	1.5746	1.5742	
1302–302	42	1.6536	1.6535	1.6528	
1204–204	47	1.8504	1.8503	1.8496	
1303–303					Max. 0.0008 press
1205–205–0205	52	2.0473	2.0472	2.0465	Min. 0.0004 loose
1304–304–0304					Avr. 0.0003 press
1206–206–0206	62	2.4410	2.4409	2.4402	
1305–305–0305					
1207–207–0207					
1306–306–0306	72	2.8347	2.8343	2.8335	
1404–404–0404					
1208–208–0208					
1307–307–0307	80	3.1496	3.1492	3.1484	
1405–405–0405					
1209–209–0209	85	3.3465	3.3461	3.3453	
1210–210–0210					
1308–308–0308	90	3.5433	3.5429	3.5421	Max. 0.0012 press
1406–406–0406					Min. 0.0004 loose
1211–211–0211					Avr. 0.0004 press
1309–309–0309	100	3.9370	3.9364	3.9358	
1407–407–0407					
1212–212–0212					
1310–310–0310	110	4.3307	4.3303	4.3295	
1408–408–0408					
1213–213–0213					
1311–311–0311	120	4.7244	4.7240	4.7232	
1409–409					
1214–214–0214	125	4.9213	4.9209	4.9201	
1215–215–0215					
1312–312	130	5.1181	5.1177	5.1169	
1410–410					
1216–216–0216					
1313–313	140	5.5118	5.5115	5.5105	
1411–411					
1217–217–0217					
1314–314	150	5.9055	5.9052	5.9042	
1412–412					
1218–218–0218					Max. 0.0013 press
1315–315	160	6.2992	6.2989	6.2979	Min. 0.0005 loose
1413–413					Avr. 0.0005 press
1219–219–0219	170	6.6929	6.6926	6.6916	
1316–316					
1220–220–0220					
1317–317	180	7.0866	7.0863	7.0853	
1414–414					
1221					
1318–318	190	7.4804	7.4801	7.4791	
1415					
1222					
1319–319	200	7.8741	7.8738	7.8728	
1416					
1417	210	8.2678	8.2675	8.2665	Max. 0.0013 press
1320–320	215	8.4646	8.4643	8.4633	Min. 0.0004 loose
1321–321	225	8.8583	8.8580	8.8570	Avr. 0.0006 press
1418					
1322–322	240	9.4489	9.4486	9.4476	
1419	250	9.8426	9.8423	9.8413	
1420	265	10.4331	10.4328	10.4318	



Should not be used for double row or soft metal housings, cup not clamped on outside diam. of less than 42 M/M (1.6536") a loose fit of 0.0003" is preferable and should be obtained by selective assembly.

FIG. 10



Should be used for double row or soft metal housing, cup not clamped

FIG. 11

FIG. 10. BEARING FITS IN HOUSINGS (HOUSINGS STATIONARY). FIG. 11. BEARING FITS IN HOUSINGS (HOUSINGS REVOLVING)

In mounting cones on soft shafts, it has been found by experience that the cones must be securely clamped by locknuts in order to prevent peening in of the cone on the shaft due to the concentrated load on the short shaft length corresponding to the bearing width. In cones mounted on hardened shafts the parts need not be held by locknuts except the light series and where sustaining end thrust in two directions, or, in the case of their being subjected to very excessive shock loads. In the event of the shaft being stationary, the light push fit shown in Chart 9 should be used in order to allow a slow intermittent creep which will allow the cone to present a different portion of its surface to load and so obtain equal wear. The outer race with housing stationary should be a loose push fit as shown in Chart 10 for the same reasons given as for a non-rotating cone. Also, it is impossible in assembly to be sure that the parts are not assembled out of line due to the narrow width of the bearing compared to the diameter as it is a certainty that the outer race will be cramped if assembled with a press fit and without special aligning fixtures. Cups mounted in soft metal housings, if not clamped endwise, should use fits given on Chart 11 to prevent peening of the housing. Chart II is also for fits of cups in housing with the housing revolving.

Enlarging Gas Engine Pistons by Plating Them

BY DAVID TYKE

Some time ago the writer was called upon to fit new pistons to an automobile of uncertain years and origin, but when the question of cost entered into the conversation the owner, comparing the figure with the price of standard oversize pistons of regular manufacture, thought we were robbers.

I tried to explain to him the necessity for a pattern, the slower methods of machining and other elements of the strictly special job as compared with a regular manufacturing proposition on a production basis, but the most he would do was to "think it over."

While he was thinking I conceived the idea of giving those pistons, which were only about 0.006 in. too small, a heavy coat of nickel and thus increase their diameter by the desired amount. To this experiment the owner consented and the pistons were accordingly thoroughly cleaned and put into the copper-plating bath.

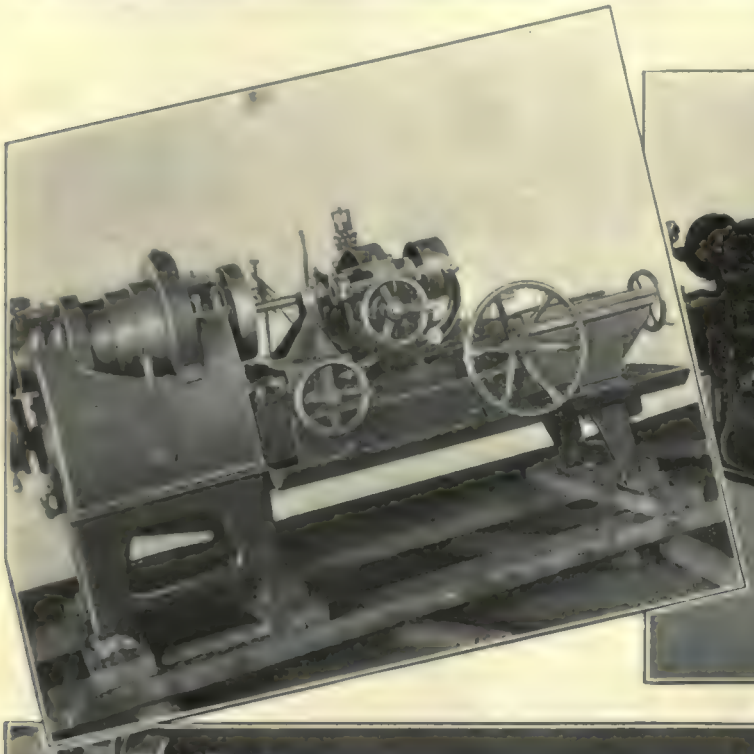
The copper was applied by electrical deposition, and the process was allowed to proceed very slowly, as this was considered advisable, until about half the necessary thickness was obtained. They were then transferred to the nickel bath and a sufficient amount of that metal added by the same process to build them up the required 0.006 in. in diameter.

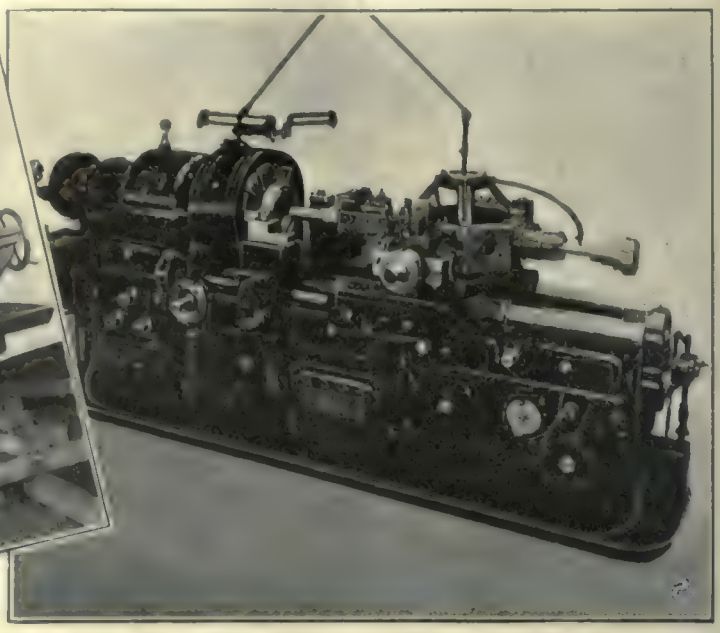
The plated pistons were then touched up on a buffing wheel and put into place in the engine. The time of the repair had not exceeded 24 hours altogether, and the owner expressed himself as well satisfied.

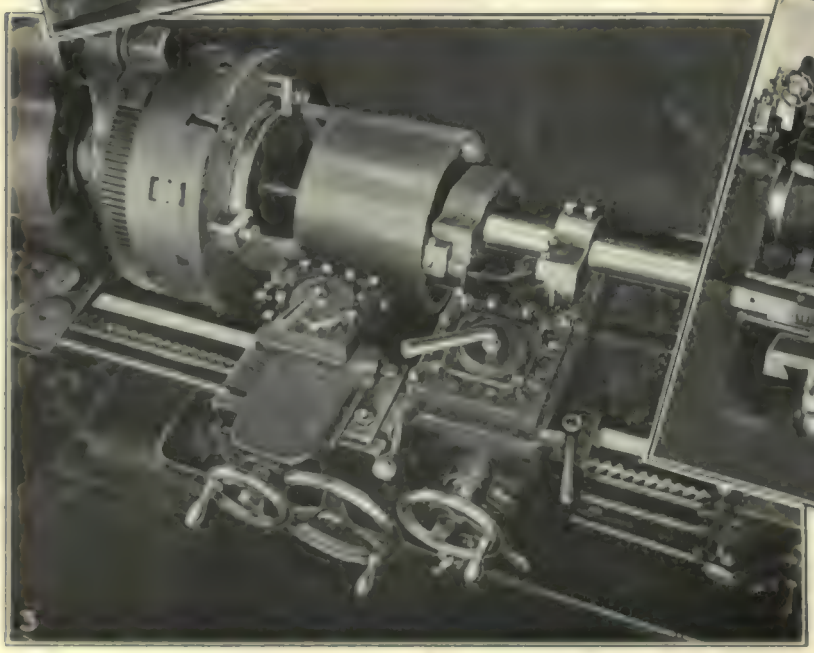
In view of the fact that there are tens of thousands of pistons deposited yearly in the scrap pile because they are four or five thousandths under size, would it not be a good idea to investigate this method of salvaging them?

[We frankly admit that this application of the "putting on" process is an entirely new one to us and we are not yet quite ready to order the pistons of our car nickel-plated, but—you never can tell! Who knows any more about it?—EDITOR.]

PRODUCTION







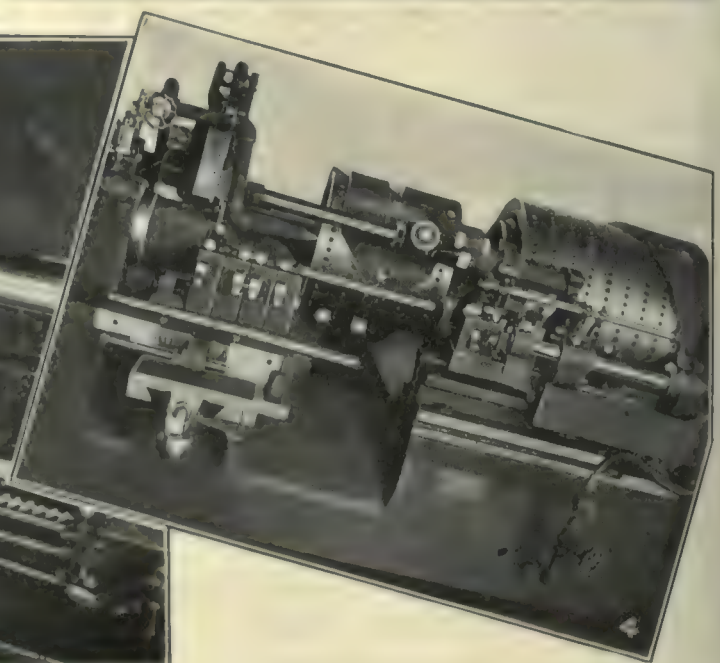


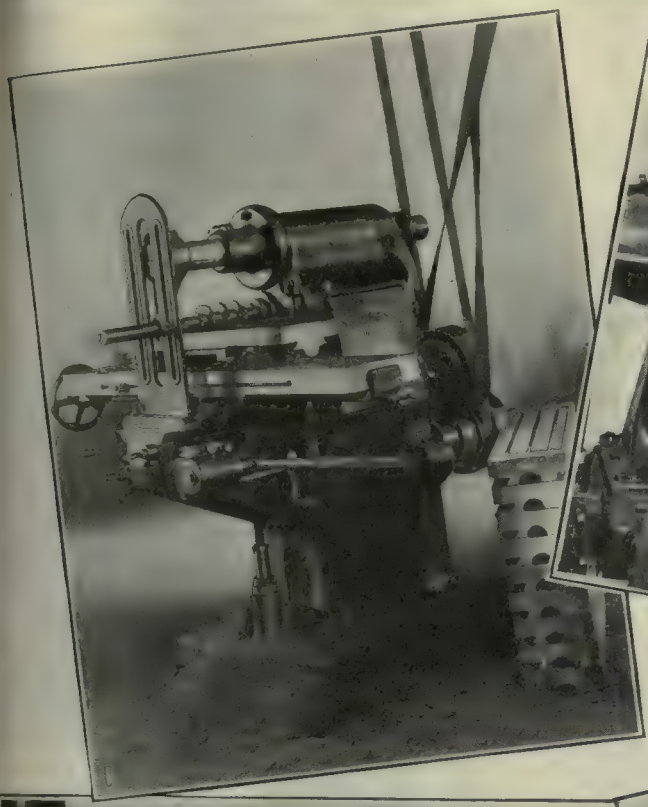
Fig. 1. For some kinds of work both the bolt cutting machine and the screw-cutting lathe have been superseded by the thread-milling machine. The Smalley thread-milling machine shown in the accompanying illustration is of a type that uses a hob instead of a disk cutter. The hob has no lead and is slightly longer than the thread to be milled. In machines of this type, threads are completed in one revolution of the work.

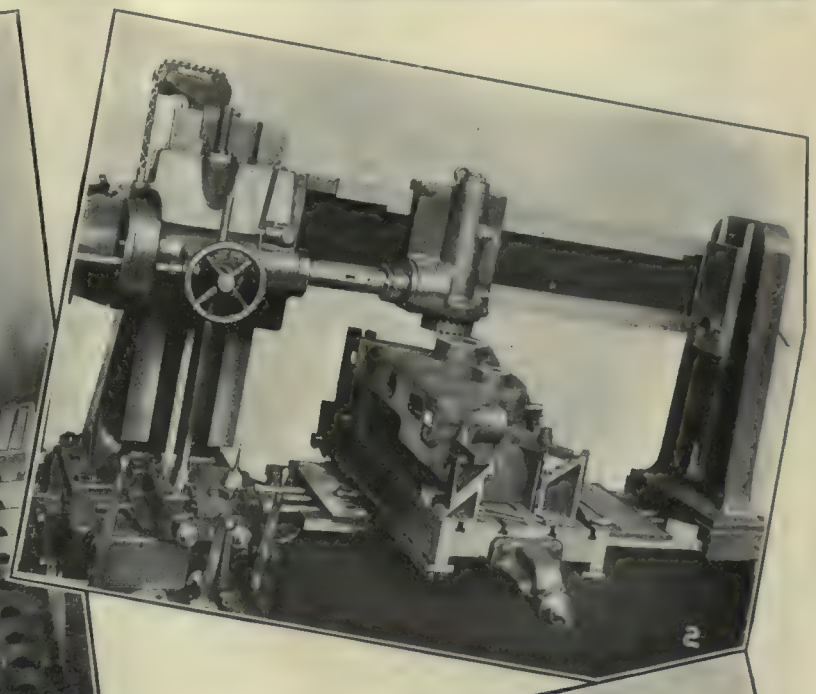
Fig. 2. Automatic turret lathes have reached a development never dreamed of by Spencer when he invented the automatic screw machine. The illustration herewith is of a Gisholt 20-in. automatic turret lathe, machining cast-steel commutator caps nearly 11 in. in diameter. The caps are finished all over in two operations and two chuckings in from 30 to 35 min. each.

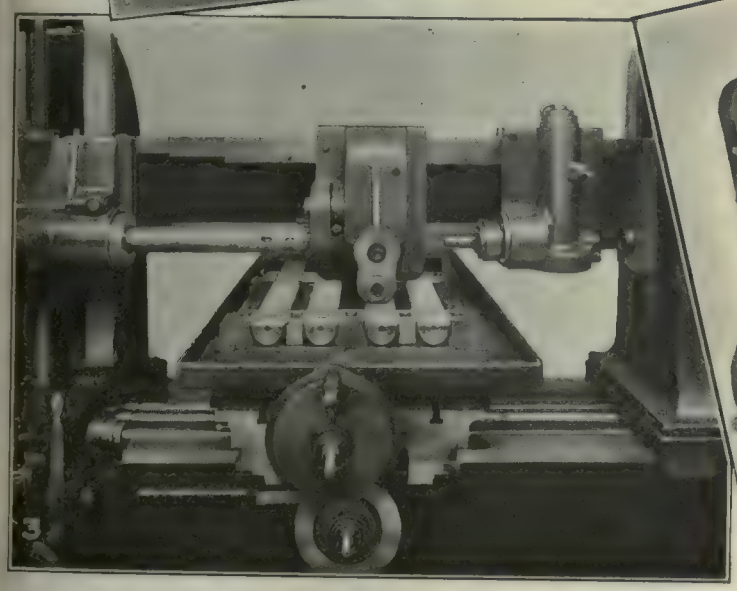
Fig. 3. The 24-in. Gisholt turret-lathe shown here is machining cast-steel motor frames. The work is 15⅝ in. in diameter and 17½ in. in length. The operations include the use of tools in both regular turret and turret toolpost. Machining is completed in 1 hr. 57 minutes.

Fig. 4. This automatic machine for turning shafts, built by the Cleveland Automatic Machine Co., is shown turning a 1 x 17-in. shaft having nine shoulders. The production is fifteen shafts per hour. The same machine was shown on page 92 of the current volume where the production was erroneously stated as four shafts per hour.

IN PICTURES







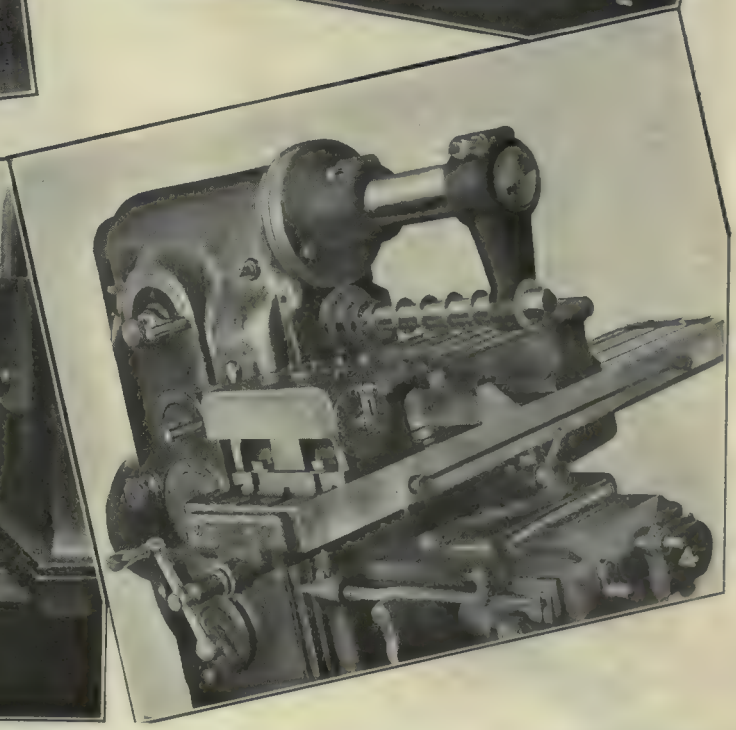


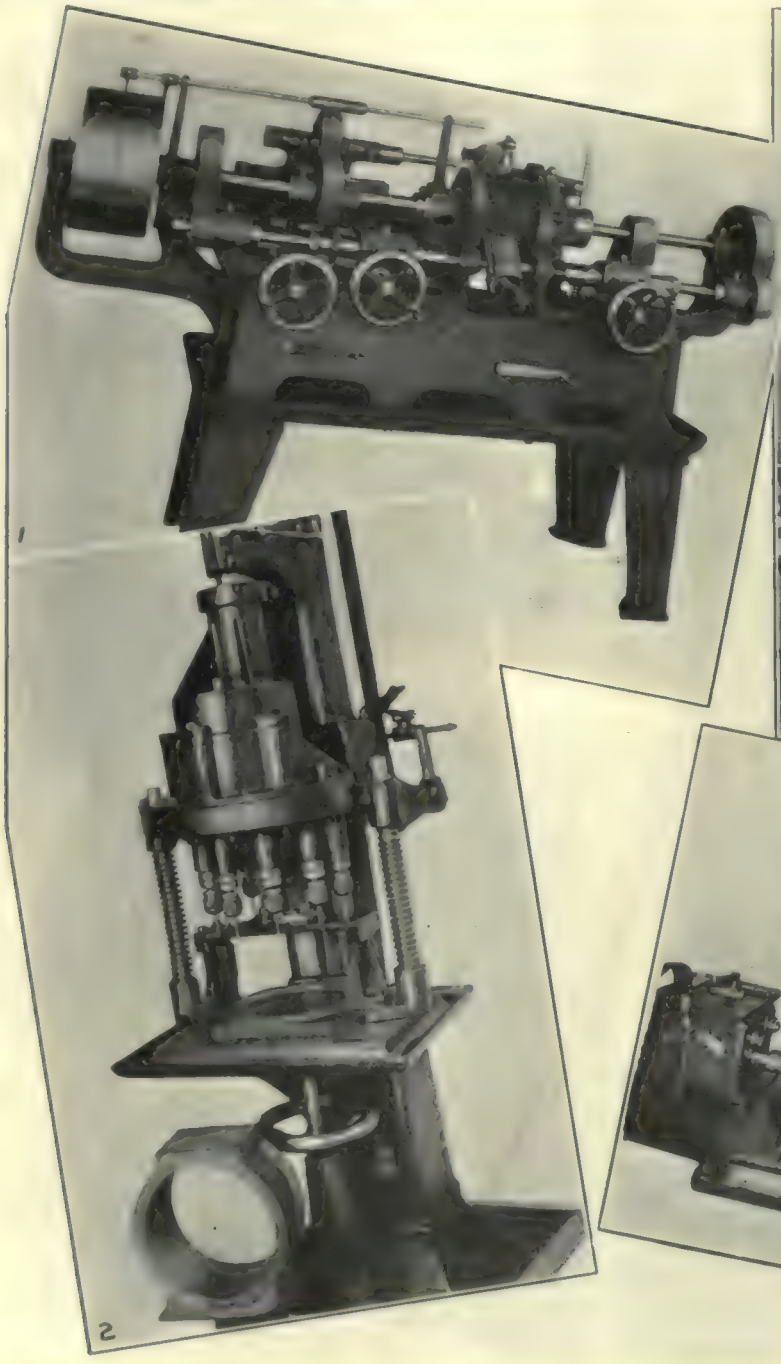
Fig. 1. The knee-type milling machine has come into its own for work that was considered too heavy for it a few years ago. The No. 2 Rockford milling machine shown in the accompanying illustration, mills three $\frac{9}{16}$-in. slots and two oil grooves 39 in. long in milling machine tables at the rate of twenty in 10 hours.

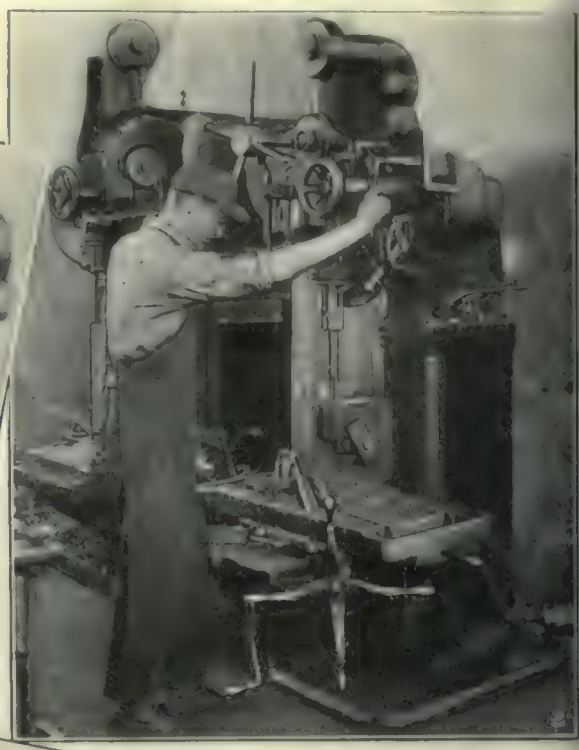
Fig. 2. The horizontal boring mill is capable of doing work other than that for which it was designed. Here is a Lucas boring mill equipped for milling. The heavy rail between the spindle head and the outer support, and the saddle with its vertical spindle are substantial affairs capable of withstanding heavy cuts.

Fig. 3. But few shops have enough rack cutting to employ a machine for that purpose alone. The Lucas horizontal boring mill shown in this illustration, besides being arranged with a vertical spindle for milling, has been fitted with a horizontal spindle and a special table for cutting racks in multiple. An index plate is, of course, part of the equipment.

Fig. 4. The Rockford milling machine to be seen in this illustration is equipped with a plain multiple-spindle indexing head having five spindles. The head swings 10½ in. and the center distance between spindles is 2⅜ in. The pieces of work shown in the machine are having keyways $\frac{3}{16}$ x $\frac{5}{32}$ x 22 in. cut in them. Production, 300 in ten hours.

PRODUCTION





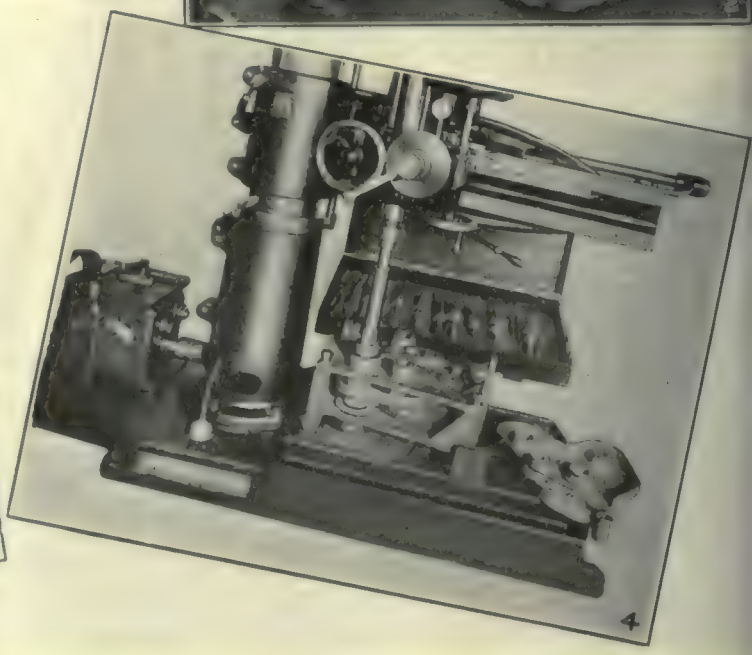


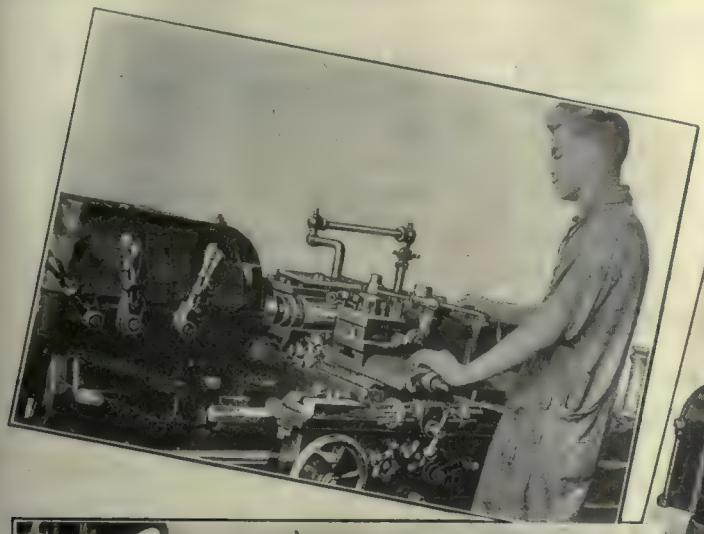
Fig. 1. The Hoefer horizontal drilling and reaming machine shown in this illustration was designed for drilling and reaming pin holes in automotive pistons. When the first piston has been drilled, the fixture is indexed to bring it to the reaming station and another piston put in place for drilling. From this time on both drilling and reaming are carried on simultaneously. The production is one piston per minute.

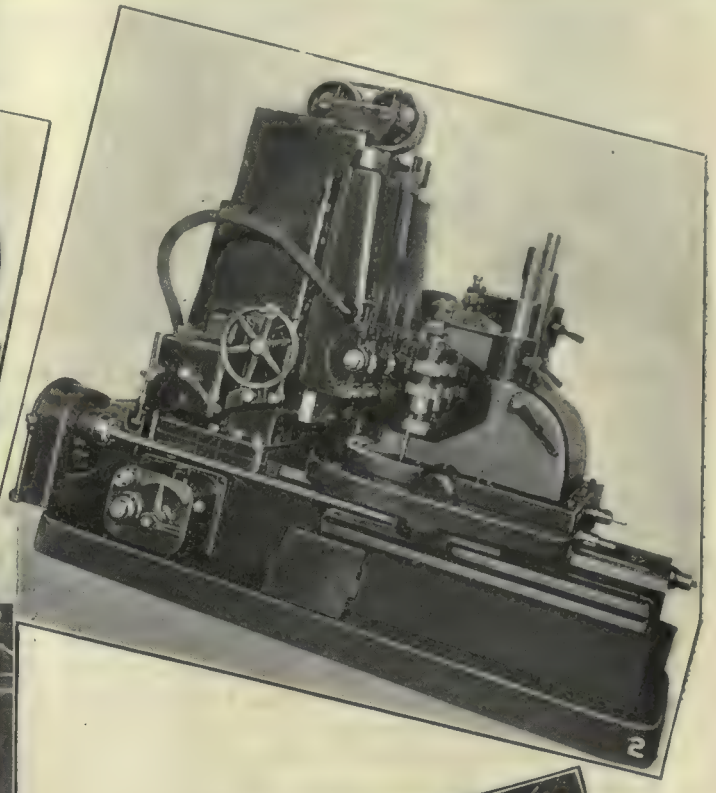
Fig. 2. This Colburn No. 14 high-speed drilling machine is tapping a 1⅝-in. Acme thread in a nut for an elevating screw. The production is six per hour, including drilling the hole and putting through three taps.

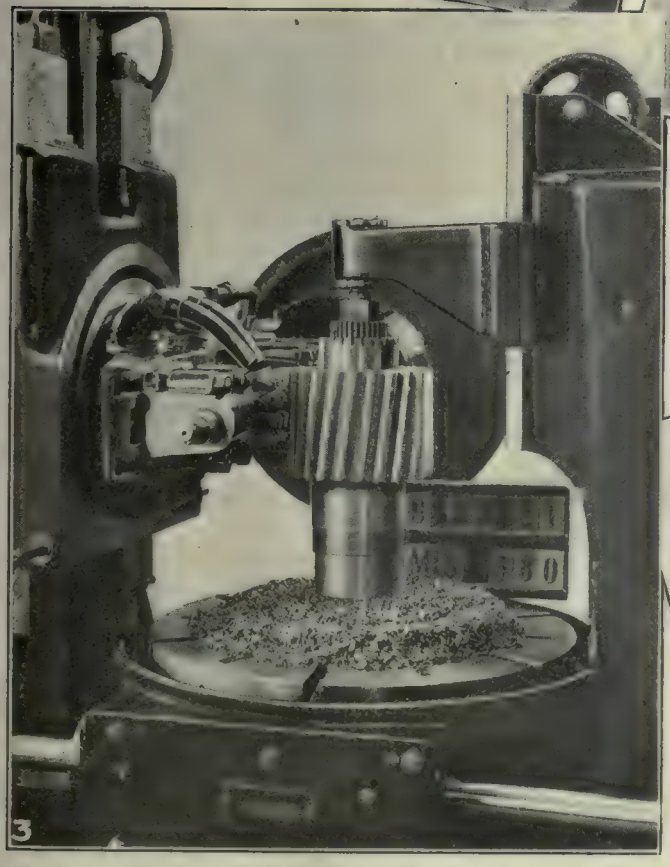
Fig. 3. Tapping by machine is done at a speed that would have been considered unbelievable a few years ago. Here is a Hoefer high-speed multi-spindle tapping machine arranged for tapping holes in the meter case to be seen at the base of the machine. Eleven holes are tapped in 15 seconds.

Fig. 4. The Morris radial drilling machine shown in the accompanying illustration is at work on a column cap for one of its brothers. Three $\frac{11}{16}$-in. holes are drilled and the bosses faced. Four holes varying from $\frac{11}{16}$ to 2 in. in diameter are drilled, reamed and the bosses faced. The time in lots of thirty pieces is one hour each. The different tools used on the work may be seen in the wooden case.

IN PICTURES







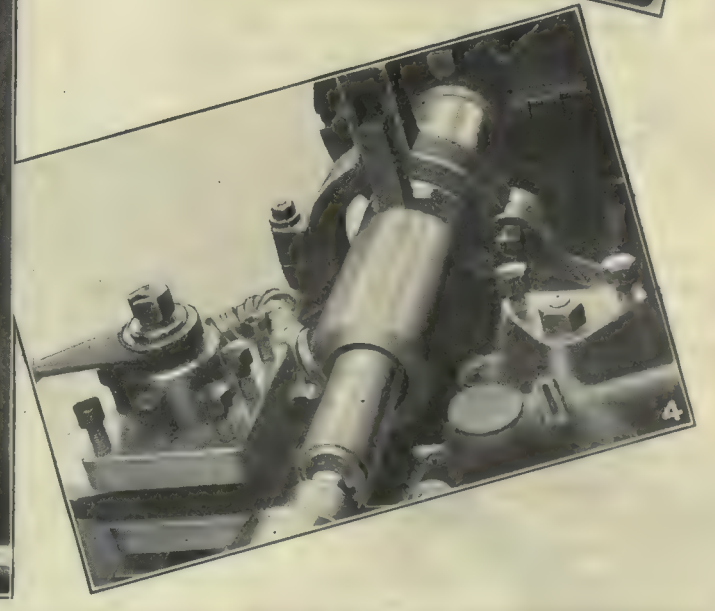
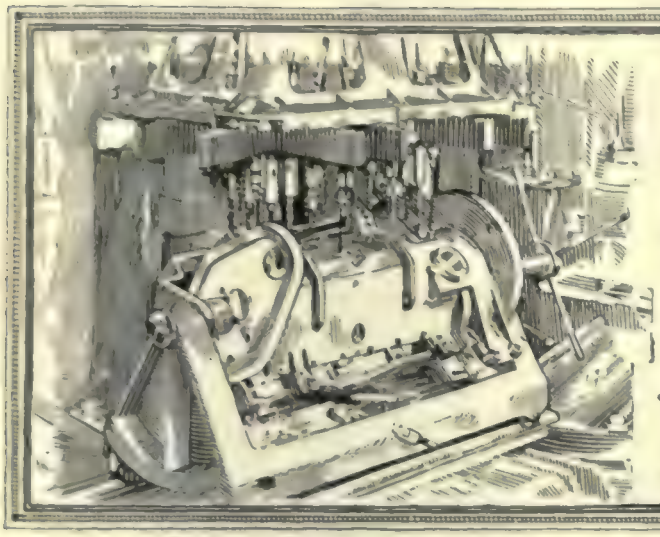


Fig. 1. The engine lathe of yesteryear has no place in production. The Lodge & Shipley "selective head" manufacturing lathe shown here is turning double-bevel gear blanks for 18-in. lathes. In this operation 13 lb. of metal is removed in 6 minutes.

Fig. 2. Gear cutting machines arranged with multiple work spindles and cutters are the result of intensive production methods. The Gould & Eberhardt No. 60-SM gear cutting machine to be seen in this illustration is cutting transmission gears. Each work spindle is independently adjustable so that gears on all three spindles can be cut to the same depth. This adjustable feature makes provision for using cutters having unequal diameters.

Fig. 3. Fast work can be done on the hobbing machine because the heat generated by cutting is well diffused. This Gould & Eberhardt No. 36-H hobbing machine is hobbing a chrome-nickel steel pinion of 3-diametral pitch. The face is 5 in. and the helix angle 7½ deg. The work is completed in one cut and the time is 30 minutes.

Fig. 4. Here is another Lodge & Shipley lathe of the same type as that shown in Fig. 1. The lathe is turning driving-shaft bearing nuts for machines of its own type from a solid bar. The tool set-up includes four tools in the turret toolblock and one in the high-duty toolblock.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Recessing Tools for Turret Lathes—Points of Importance in Design of Recesses and Tools—Recessing Tools Operated by Cams, Gears and Cross-slide

THE cutting of a recess in a hole is one of the most difficult operations for which a tool designer is required to design tools. It makes a great difference what kind of a recess is to be cut; the general shape of it, the width and the depth all have an effect on the design of tools for the work. The size of the hole in which the recess is cut also has a pronounced effect upon the method used, as it is obvious that a recessing tool for a small hole is so restricted in size that it necessarily must be small and delicate.

A recess may be required narrow and deep, or it may be wide and shallow; it may be cut in a piece of work of small size, or of large diameter; it may be close to the front end of the work, or it may be quite a distance inside the hole. All of these conditions influence the design, and may perhaps require entirely different methods of handling, due to the difference in sizes or shapes.

Important Points in Design

The following points are of importance in designing recessing tools:

1. The material which is to be cut may be hard or soft, and may be a casting, forging or bar stock. Tools used on cast iron are made differently from those used on steel, and the cutting action is also markedly different. If the work consists of a casting in which a cored recess has been made, and this recess is to be finished by a recessing tool, two cuts will usually be necessary on account of the scale in the casting. If a single tool is used, it will dull quickly and lose its shape very rapidly, so that it cannot be depended upon to produce accurate work. Fortunately, however, the majority of recess cuts are not held to a very close degree of accuracy. If the material is of steel or any other metal which requires a lubricant, it may be necessary to provide a means of supplying this lubricant to the cutting point.

2. The width and depth of the cut are important because of the rigidity required for a tool on this kind of work. A deep recess which is at the same time narrow apparently would not require the tool to be supported as rigidly as if the cut were wide; yet a tool for a recess of this kind cannot deflect much without breaking, so that it is essential to make the construction as rigid as possible.

3. The diameter of the tool determines the size of the bar which can be put into it, and therefore it is often difficult to machine a deep recess in a small hole. It is evident that the size of the cutting tools and other details of construction are limited by the diameter of the bar. When extraordinarily deep recesses are specified on a blueprint, it is advisable to discuss the situation with the engineer who is responsible for the design, and see if it is not possible to revise the drawing in such a way as to make the operation easier. This can often be done, providing the difficulty is found in the early stages of the work and before production is started. The shape of the recess and the permissible tolerances can also be modified to some extent, as a general thing. The greatest care is necessary in the design of recessing tools to make sure that the tool has sufficient clearance, so it will enter the hole without interference of any kind.

4. The position of the recess with respect to the face of the work makes a considerable difference in the design of the tooling. It is often difficult to machine a recess which is located some distance from the face of the work. When the diameter is small a condition of this sort becomes serious, and it may be necessary to revise the method used entirely, and even in some cases to cut the recess in a separate operation, or otherwise change the method of handling so as to do the work from the other end. Under certain conditions a piloted tool may be used, thus giving support where needed, but this is not always possible.

5. The rigidity of a recessing tool is very important, as any "chatter" is fatal to good results. If a long bar is used, it should be supported either by a pilot in a bushing, or by means of a special support on the cross-slide or the ways of the machine.

6. Adjustment of the tool should be provided for, not only in relation to the depth of the cut, but also for longitudinal position. There are occasional cases when the size of the hole is so small that there is very little opportunity to provide adjustment; but the matter should always be carefully thought of and everything possible done to take care of wear in the tool or changes

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in the longitudinal position caused by slight errors in grinding. The longitudinal depth may be determined either by an adjustment of the turret stops, or by collars which strike the face of the work or some portion of the fixture or pilot bushing. Ordinarily, a recessing tool is not required to work on the scale of the casting, although in some cases it is necessary. In such an event, both roughing and finishing tools will be required if accurate work is to be obtained.

7. Recessing tools which are operated and controlled mechanically so as to have a positive action are to be preferred to those operated by springs. It is not always possible to control the tools in both directions by a positive movement, so that springs are often used. The designer should bear in mind that springs are not infallible, and endeavor to make his designs positive in their action.

Kinds of Recesses

A number of examples of work requiring recessing operations are shown in Fig. 319. There are doubtless many other forms which could be illustrated, but those shown cover the general requirements for this class of work. In the example *A* the work has a recess or pocket at *B*; and a piece of this kind is usually machined by a single-point tool either in a boring bar or in the cross-slide of the machine. It is possible to do the work with a sliding tool on the turret, using either hand or power feed, depending considerably upon the depth and diameter of the recess. Cases may be found where a piece of work like this will actually require a special tool mounted on the turret. For example, if the work were of large diameter and made of high-carbon steel, it might be difficult to machine it in any other way than by means of a single-point tool, in which case something special would need to be designed.

In the example *C* the recess *D* is rather deep and close to the front end of the work. If the diameter of the hole is large, no difficulty will be experienced in machining the groove. If the work is small, however, particular attention must be paid to the design so as to avoid "chatter." In the example *E*, the diameters *F* and *G* are bored and reamed, and the recess is cut at *H*. It is highly desirable to machine this recess in the same setting as that in which the holes *F* and *G* are machined. A piloted bar having a sliding recessing tool in it would probably be necessary for this piece of work.

Another condition is seen in the example *K*, in which the recess *L* is wide but very shallow. It would not be good practice to attempt to machine this surface with a tool the full width of the recess. It would be much better to use a boring tool which could be set over sufficiently to give the additional depth required. The turret could then be fed along to bore the diameter *L*, after which the tool could be set back again and removed from the work. The example at *M* shows a very common type of recess at *N*, the purpose of this groove being to allow clearance when cutting the threads indicated. No great accuracy is required for work of this kind, and any of the simpler types of tools can be used. In the case O an angular recess is cut at *P*, this groove being used for packing. Its dimensions are not, therefore, of the greatest importance, except that the depth should be approximately correct. The angular portion does not require great accuracy.

The work shown at *Q* has a recess cut at *R* at 45 deg. to the center line of the work. The purpose of this relief is to allow clearance for the tools used in finishing the tapered surface. It is only necessary to provide sufficient clearance for this purpose and the angularity is not particularly important. The work shown at *S* has a dovetailed groove at *T*. This is a very difficult piece of work, as the tool must be first fed in to the proper depth and then carried longitudinally backwards and forwards to remove the angular portion. Two methods are in use for work of this kind. The tool may be shaped to the form of the dovetail but narrow enough so that it will cut a little smaller than the narrowest width of the groove; then the tool can be fed backwards and forwards to produce the angle. The other way is to use two recessing tools, one of which cuts a square groove and the other machines the dovetail.

In the example *U* there are two recesses placed close together as shown at *V*. There is no particular difficulty in machining work of this sort, but it may be done in two ways: either by a single tool with adjustable stops or by two tools at the same time. A simple type of recessing tool will give good results if each groove is handled separately, but a special form will be necessary if both are done at one time.

In the example *W* there are two parts of a housing, and in each of these parts there is a recess, as shown at *X* and *Y*. The two halves are bolted together, with a gasket at *Z*, and the recesses are cut after assembly. There is a large hole in one side of the housing so that the tools are easily accessible. The spacing between the two recesses *X* and *Y* is very important, and in order to insure accuracy, a special finishing tool which cuts both recesses at the same time was found to be necessary.

Simple Recessing Tools

In considering the design of tools for recessing work, we shall take up the simplest forms first. Several of them are shown in Fig. 320. The work *A* has a recess at *B* close to the end of the work. The piece is held in chuck jaws, and a special holder *C* is mounted on the turret of the machine. This holder has a hole *D* in which the eccentric stem of the toolhead is carried. The stem is a running fit in the hole and is held in place by means of a nut and washer at *E*. The end of the toolhead is provided with a cutter at *F*, held in place by two setscrews at *G*, as shown in the cross-sectional view. Accurate adjustments are provided by means of the backing-up screw at *H*. This tool is designed to be fed by hand by means of the lever *K*, and suitable stops are provided to limit the movement, the stops being made adjustable if required.

It is sometimes necessary to chamfer the rear end of a hole, and the tool shown at *L* is designed for this purpose. It is automatic in its action, and is not intended to do anything more than break the inside corner of the hole. A tool of similar kind can be furnished with a cutter, to cut a recess when great accuracy is not required. The bar *M* is slotted at the end for a block *N*, which holds the cutter *O*. The block is pivoted at *P*, and provided with a coil spring to keep the cutter away from the work when not in use. A stop pin is inserted in the face of the chuck or faceplate, as shown at *Q*, and the cutter block *N* strikes this stop pin as the turret is moved forward, thus causing the tool to pivot and "break the corner," as indicated. The pivot point *P* must be far enough off center so that the pressure applied will cause the block to move easily. Applications of a tool like this can be made for many operations which do not require great accuracy.

Another simple form of a recessing tool which is likewise automatic in its action is shown at *R*. The bar *S* is mounted in some convenient way in a holder on the turret. The sliding collar *T* is slotted to receive the toolblock *U*. The end of the collar has in it a stop pin *V*, which strikes the bottom of the hole and gives the correct location. The toolblock has a pin at *W*, and the bar is slotted on an angle at *X*. When the tool is moved forward, the stop pin *V* strikes the bottom of the hole and the collar remains in position while the bar continues to move forward, thus compressing the coil spring *Y*, which holds the collar firmly against the bottom of the hole. The slot in the bar causes the tool to move outward radially and gradually cuts the recess. After the cut has been finished, the coil spring causes the tool to recede from the groove, so that it comes out of the work freely and without interference.

Applications of this same principle are frequently made on recessing tools. Care must be taken not to make the angle of the slot too great, as too much friction might be caused and the tool would fail to operate. In some cases it may be better to slot the tool block, while in others the bar itself may be slotted. The end of the collar may be provided with a revolving bushing of approximately the diameter of the work, to assist in supporting the tool when cutting a recess in a deep hole.

In Fig. 321 is illustrated an application of a form of recessing tool having a sliding member operated by a rack and pinion. The work has a recess *A* which is cut by means of a tool in the bar *B*. The bar is mounted in a sliding member *C*, dovetailed and gibbed at *D*. The body of the tool *E* has a shank *F*, which fits the turret. An adjustable stop is provided, so that the depth of the recess can be controlled. The operation is by means of a handle *G*, which moves a pinion meshing with a rack *H* on the side of the slide. Tools of this kind are useful for light cutting operations, and they may be standardized in such a way that they will cover a considerable range of work. It is only necessary to provide a bar and a suitable tool for any piece of work within the capacity of the device.

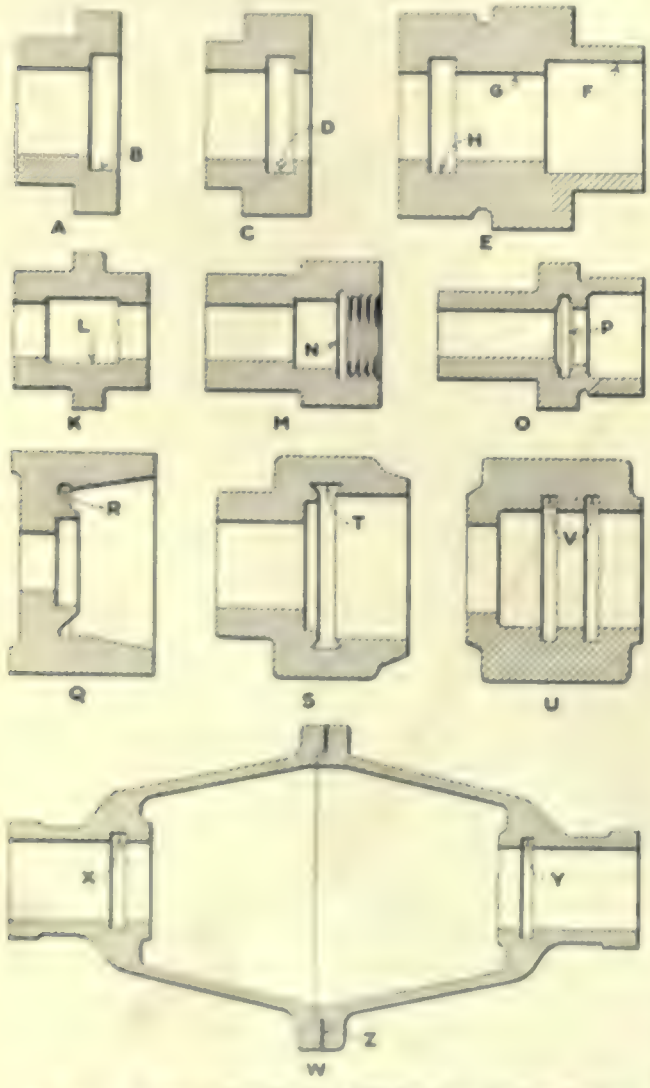


FIG. 319. WORK REQUIRING RECESSING OPERATIONS

Cam-Operated Recessing Tool

In Fig. 322 is shown a very good type of recessing tool which can be made cheaply and adapted to various kinds of recessing work. The body of the tool *A* is of cast iron, well ribbed up as indicated and fastened to the turret face. To this body a dovetailed slide *B* is fitted. A tapered gib, shown at *C*, is provided for adjustment. The sliding member contains a lug at *D* in which the tool *E* is held by means of setscrews, shown at *F*. The operation of the device is by means of a handle *G*, which revolves the cam *H*. This part acts against hardened plates at *K* and *L*, thus controlling the movement of the slide. Adjustment for depth is obtained by setting the screw *M*.

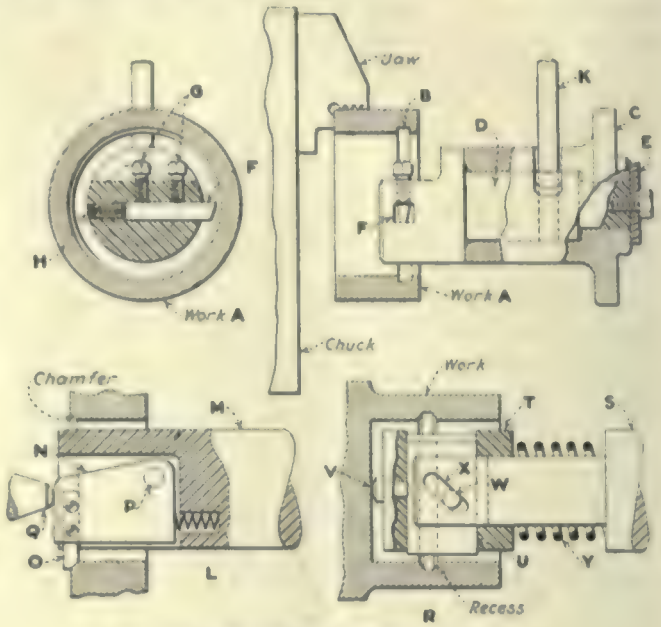


FIG. 320. SIMPLE RECESSING TOOLS

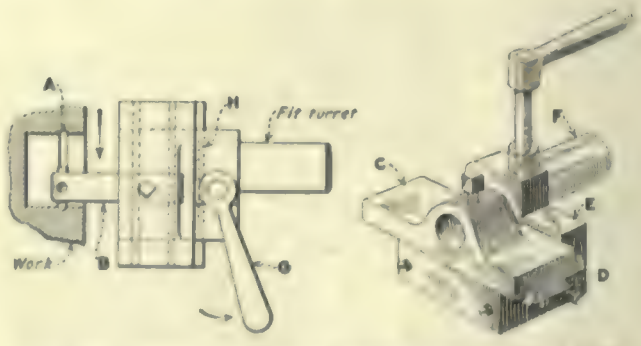


FIG. 321. RECESSING TOOL WITH DOVETAIL SLIDE

This tool is easily operated, and can be adapted to shallow recessing cuts which are close to the end of the work. By using a special design of tool, considerable latitude is possible. A design of this sort can be made with a considerable overhang from the turret if the tool is placed in the other side of the holder, so that the cutting action is downward instead of upward. A support can be provided on the cross-slide or the ways of the machine to assist in taking the thrust of the cut, thus making the mechanism considerably more rigid and capable of handling a heavier class of work.

The work shown at *A* in Fig. 323 has a recess cut

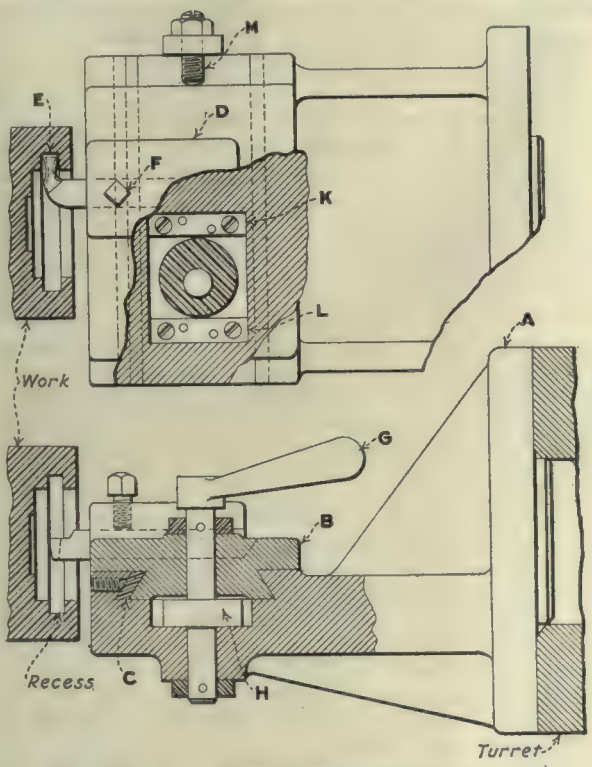


FIG. 322. CAM-OPERATED RECESSING TOOL

deeply in it a considerable distance from the face. This piece can be cut very satisfactorily by use of the cross-slide for support and feed. In the example shown, the work has been faced by tools on the front of the cross-slide, and there are other tools in the turret previously used for boring the hole. The recessing tool is simple in design; it works easily and produces excellent results. The turret is equipped with a casting *B* on which a dovetail is cut, as shown at *C*. The bar *D* is held on a sliding member *E*, which is fitted to the dovetail and provided with a tapered gib to permit adjustment for wear.

The cutter for the recess is shown at *F*, being of suitable shape for the form of the recess and being fitted to the bar *D*. Adjustment is provided by means of a backing-up screw in the ordinary way. The member *B* which fits the turret has a lug on it in which a setscrew is arranged at *G*, which allows a setting to

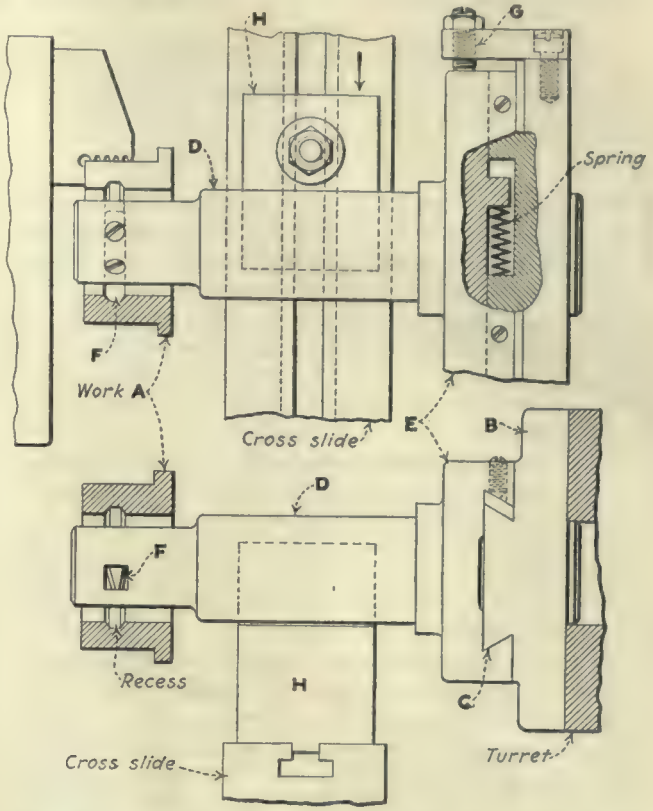
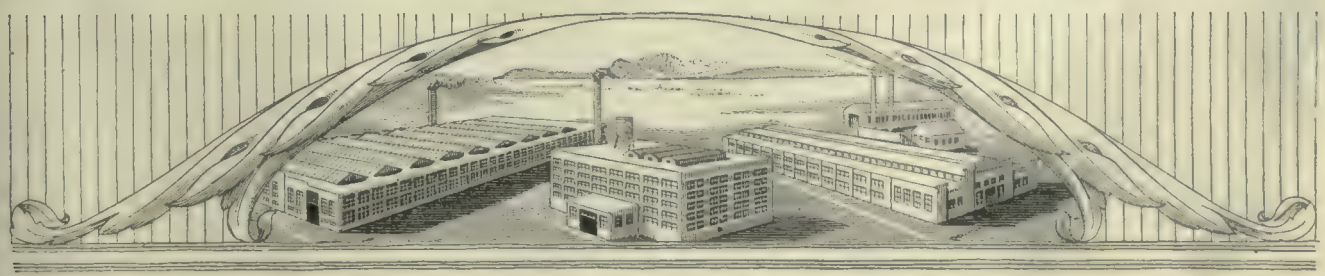


FIG. 323. RECESSING TOOL OPERATED BY CROSS-SLIDE

be made so that the bar will clear the work when passing in and out of the hole. The bar extends a considerable distance from the face of the turret, and would undoubtedly "chatter" if unsupported. Therefore a special block *H* is placed on the rear of the cross-slide, as indicated. This block is cut out in L-shape and on it the bar is supported. The operator brings up the turret and enters the tool ready for work, the correct distance from the face being determined by the turret stops. The cross-slide is then moved in the direction of the arrow until the bar rests on the block, after which slow hand feed is used to force the tool in to the correct depth. A stiff coil spring between the fixed member and the slide causes the latter to recede after the recess has been cut and the pressure removed.

An opportunity is often found for using a tool of this kind, particularly when it is desirable to use the cross-slide in connection with other turret tools. It is possible to design it in such a way that tools may be used at both front and rear slides, although the method of support may be slightly different from that shown, depending on the work.



The Open Price Association and the Sherman Anti-Trust Act

An Analysis of the Decision of the Supreme Court in the Case of the American Hardwood Manufacturers' Association

By A. H. STOCKDER
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EVER since the enactment of the now famous Sherman Anti-Trust Act by Congress, in 1890, American business men have sought some means whereby they might lawfully combine in order to eliminate or moderate what, to their mind, is the undesirable effect of unrestricted competition. The records of court decisions under the Sherman Act show that these efforts at combination have followed three distinct lines.

The first was based on the exercise of control through the ownership of plant and equipment or of the securities of other concerns. This line of procedure resulted in such combinations as the Standard Oil trust, the old American Tobacco Co. and other combines that were in restraint of interstate commerce, though not necessarily monopolistic in character.

The second line of approach was based on contractual arrangements between seller and buyer whereby the seller sought to retain control over the commodity until it reached the ultimate consumer, all through the ordinary channels of trade. The Sherman Act was felt to be inadequate to cover all of these practices and was, in 1914, strengthened through the passage of the Clayton Act and the Federal Trade Commission Act, directed particularly against unfair trade practices.

The third plan was based upon the formation of trade federations, commonly known as "pools," whereby the combining business establishments create some central administrative organization, vested with more or less disciplinary power, to carry out their purposes. And now, through the recent decision handed down by the United States Supreme Court, October Term, 1921, in the case of the American Column and Lumber Co., et al, Appellants vs. United States, the "open price association" has been added to the list of devices more or less specifically under the ban of the courts.

Co-operative Competition

The open price association is an institution devised by a Chicago attorney, the late A. J. Eddy, to put into effect what he chose to call "co-operative competition." In a book entitled "The New Competition," published in 1909, he goes into minute detail as to the operation of his plan. This book, through the tireless efforts of its author, became the keystone of the arch of a vast business system that soon found favor with men engaged in practically every important industry.

After attacking competition largely from its more sordid side — the so-called "cutthroat competition" which aims to ruin or drive out weaker competitors in the field, Mr. Eddy set forth his plan for substituting co-operative competition in its place. He had made a careful study of all court decisions interpreting the various anti-trust laws and had come to the conclusion that an association which avoided the exercise of a coercive discipline upon its members did not constitute a violation of the Sherman Law. The next step was to devise some method of inducing the members of such an association to accept a given range of prices as standards without committing themselves to adhere to them either through an actual or an implied agreement. To accomplish this, Mr. Eddy developed the "open price" idea.

The "open price," as defined by its inventor, is "a price that is open and above board, that is known both to competitors and customers, that is marked wherever practicable in plain figures on every article produced, that is accurately printed in every price list issued—a price about which there is no secrecy, no evasion, no preferences."

How this price is to be used is set forth as follows:

(1) When men meet and each says, "My price is so-and-so," and all say the same, a promise to maintain that price may, perhaps, be inferred from subsequent events; but no such promise can be inferred from frank statements of past transactions; and yet more in the way of stability of prices will result from the mere interchange of information than from an agreement to maintain prices. Knowledge regarding bids and prices actually made is all that is necessary to keep prices at reasonably stable and normal levels. No agreements to maintain prices are necessary.

(2) Do nothing you are afraid to record; record everything you do, and keep your records where any public official in the performance of his duties may have easy access to them. In short, preserve so carefully all evidence regarding intentions, acts and results that there will be no room for inference or argument that anything else was intended, done or achieved.

The recent decision of the Supreme Court gives a picture of the machinery employed to reduce competition through the medium of the "open price." This machinery, which is referred to in the decision as the "paper plan," is characterized by the court as "a system of co-operation among the members, and consists of the interchange of reports of sales, prices, production and practices, and in meetings of the members for discussion for the avowed purpose of substituting 'co-operative competition' for 'cutthroat competition,' of keeping 'prices at reasonably stable and normal levels,' and of improving the 'human relations' among the members." A detailed outline of the plan follows:

First: Each member to make six reports to the secretary, viz:

(1) A daily report of all sales actually made, with the name and address of the purchaser, the kind, grade and quality of lumber sold and all special agreements of every kind, verbal or written, with respect thereto. The reports to be exact copies of orders taken.

(2) A daily shipping report, with exact copies of the invoices, all special agreements as to terms, grade, etc. The classification shall be the same as with sales.

(3) A monthly production report, showing the production of the member reporting during the previous month, with the grades and thickness classified as prescribed.

(4) A monthly stock report by each member, showing the stock on hand on the first day of the month, sold and unsold, green and dry, with the total of each kind, grade and thickness.

(5) Price-lists: Members must file at the beginning of each month price-lists showing prices f.o.b. shipping point, which shall be stated. New prices must be filed with the association as soon as made.

(6) Inspection reports: These reports are to be made to the association by a service of its own, established for the purpose of checking up grades of the various members and the plan provides for a chief inspector and sufficient assistants to inspect the stocks of all members from time to time.

Second: The secretary is required to send to each member:

(1) A monthly summary showing the production of each member for the previous month, "sub-divided as to grade, kind, thickness, etc."

(2) A weekly report, not later than Saturday, of all sales, to and including the preceding Tuesday, giving each sale and the price, and the name of the purchaser.

(3) On Tuesday of each week the secretary must send to each member a report of each shipment by each member, complete up to the evening of the preceding Thursday.

(4) He must send a monthly report, showing the individual stock on hand of each member and a summary of all stocks, green and dry, sold and unsold. This report is very aptly referred to by the managing statistician as a monthly inventory of the stock of each member.

(5) Not later than the tenth of each month the secretary shall send a summary of the price-lists furnished by members, showing the prices asked by each, and any changes made therein must be immediately transmitted to all the members.

(6) A market report letter shall be sent to each member of the association (whether participating in the plan or not) pointing out changes in conditions both in the producing and consuming sections, giving a comparison of production and sales and in general an analysis of the market conditions.

Third: Meetings shall be held once a month at Cincinnati or at points to be agreed upon by the members. It is intended that the regular meetings shall afford opportunity for the discussion of all subjects of interest to the members.

Plan in Practice

The Supreme Court does not appear to have considered the "Plan," as such, a violation of the anti-trust laws, but to have looked to the purpose desired to be accomplished through it. The court, in its decision, went into some detail to indicate that this plan was not closely adhered to in practice with the obvious intent of making its purpose more easily attainable. Thus, it is brought out that "three important additions" were made to the plan.

In the first place, instead of holding one meeting per month, as provided for, the association met approximately once each week for over forty weeks in the Southwestern territory.

In the second place, before each of these meetings a questionnaire was sent out to the members, and from the replies received, supplementing the other reports, the statistician compiled an estimate of the condition of the market, actual and prospective, which was distributed to the members attending each meeting, and was mailed to those not present. There were eleven questions on this list of which the most important were:

(4) What was your total production of hardwood during the last month? What do you estimate your production will probably be for the next two months?

(10) Do you expect to shut down within the next few months on account of shortage of logs or for any other reason? If so, please state how long you will be idle.

(11) What is your view of market conditions for the next few months and what is the general outlook for business? State the reasons for your conclusion.

The plan on paper provided only for reports of past transactions and much is made of this in the record and in argument—that reporting to one another past transactions cannot fix prices for the future. But each of these three questions plainly invited an estimate and discussion of future market conditions by each member, and a co-ordination of them by an expert analyst could readily evolve an attractive basis for co-operative, even if unexpressed, harmony with respect to future prices.

In the third place, the court pointed out that the plan provided for a monthly market report letter to go to all members of the association. In practice this market report letter was prepared by F. R. Gadd, manager of statistics, but his review of the market and forecast for the future were contained, almost from the beginning, not only in these market letters but also in the weekly sales reports, so that they were sent out to all of the members nineteen times between Feb. 1 and Dec. 6, 1919, and they were discussed at all but one or two of the forty-nine meetings which were held. All the activities of the plan plainly culminated in the counsels contained in these letters and reports.

Price Maintenance

In addition to these three points of departure, the court showed that the plan resulted in the maintenance of high prices in the face of a falling market. This is illustrated by excerpts from letters of members to the secretary which are contained in the court's opinion. One member says: "All who have access to your report bring their prices to the top." Another: "There seems to be a friendly rivalry among members to see who can get the best prices, whereas under the old plan it was cutthroat competition." Still another says: "Since we became members we have been selling our lumber at several dollars per thousand more than formerly and we are perfectly satisfied with the plan."

In the opinion of the court, given by Justice Clarke, the open price association is a combination or conspiracy in restraint of trade and, as such, a violation of the Sherman Anti-Trust Act. The court says "The plan is, essentially, simply an expression of the gentlemen's agreement of former days, skillfully devised to evade the law. To call it open competition because the meetings were nominally open to the public, or because some voluminous reports were transmitted to the Department of Justice, or because no specific agreement to restrict trade or fix prices is proved, cannot conceal the fact that the fundamental purpose of the plan was to procure harmonious individual action among a large number of naturally competing dealers with respect to the volume of production and prices, without having any specific agreement with respect to them, and to rely for maintenance of concerted action in both respects, not upon fines or forfeitures, as in earlier days, but upon what experience has shown to be the more potent and dependable restraints, of business honor and social penalties—cautiously reinforced by many and elaborate reports, which would promptly expose to his associates any disposition in any member to deviate from the tacit understanding that all were to act together under the subtle direction of a single interpreter of their common purpose, as evidenced in the minute reports of what they had done and in their expressed purposes as to what they intended to do.

The court, however, seemed to imply that it might make some difference if the reports were sent out to

both sellers and buyers and were free from analyses by a skillful interpreter of data in such a way as to recommend harmony of action, for it goes on to say: "In the presence of this record it is futile to argue that the purpose of the plan was simply to furnish those engaged in this industry, with widely scattered units, the equivalent of such information as is contained in the newspapers and government publications with respect to the market for commodities sold on boards of trade or stock exchanges. One distinguishing and sufficient difference is that the published reports go to both seller and buyer, but these reports go to the seller only; and another is that there is no skilled interpreter of the published reports, such as we have in this case, to insistently recommend harmony of action likely to prove profitable in proportion as it is unitedly pursued."

Dissenting Opinions of Justices

The decision of the Supreme Court, cited here, was not, however, unanimous. Three justices, Holmes, McKenna and Brandeis, dissented. As affecting the practical situation this of itself means little. Nevertheless, the opinions of these eminent jurists merit consideration.

Justice Holmes says: "A combination to get and distribute such knowledge, notwithstanding its tendency to equalize, not necessarily to raise, prices, is far from a combination in unreasonable restraint of trade. It is true that it is a combination of sellers only, but the knowledge acquired is not secret, it is public, and the buyers, I think I may assume, are not less active in their efforts to know the facts. A combination in unreasonable restraint of trade imports an attempt to over-ride normal market conditions." This, it is evident, is an application of the rule of reason which was first applied to anti-trust cases during the presidency of Theodore Roosevelt.

Justice Brandeis and McKenna hold that the Government has failed to prove that coercion was used to maintain prices or to restrict production. In their opinion, "The illegality of a combination under the Sherman Law lies not in its effect upon the price level, but in the coercion thereby effected. It is the limitation of freedom, by agreements which narrow the market or by the coercive power of rebates which constitutes the unlawful restraint."

They look upon the collection and dissemination of information pertaining to prices, sales, stocks on hand, etc., as an exercise of the constitutional right of free speech.

Furthermore, they cannot reconcile the opinion of the court in declaring illegal a combination of this type, comprised of about 5 per cent of all hardwood manufacturers who produce about 30 per cent of the total annual production, with other opinions which gave a clean bill of health to the United States Steel Corporation controlling 50 per cent of the country's steel industry, and to the United Shoe Machinery Co. which enjoys a practical monopoly of the production of shoe manufacturing machinery. And Justice Holmes concurs with them on these points.

An analysis of the decision of the Supreme Court in this case leaves no doubt as to the illegality of such open-price associations as gather data on prices, sales, stock on hand and market conditions and use this information as described above. There remains but to point out the probable effect that this decision will have upon the organization and conduct of business.

In the first place, the court appears to suggest that it might make some difference if the data were sent to both sellers and buyers, provided, however, that such information be kept free from recommendations seeking to bring about a uniformity of action to control or influence prices. If this assumption is correct, it would still be feasible to continue the open-price associations now in existence. However, certain radical changes would have to be made in their method of operation. But these changes would probably not have to be as radical as those exacted by Samuel Untermeyer of the price associations in the building industry, which according to reports, were required to pledge themselves to cease gathering statistics of prices, and similar data, to escape prosecution as combinations in restraint of trade. Under the court's decision the mere act of gathering information does not of itself seem to constitute a violation of the law. The purpose to which the information is put is the significant point.

How Far May Open Price Associations Go?

The Federal Trade Commission will probably be called upon to define how far open-price associations may go in carrying out the purposes set forth in their "paper plans" to be within the law. It is to be hoped that the members of such associations will find it possible to continue their organizations for the sake of the benefit that the industries affected will derive therefrom. Stability in industry is desirable. Wasteful cutthroat competition, the aim of which is to destroy competitors, is undesirable from the general economic standpoint. In the long run goods will not be produced to be sold at a price which does not cover the costs of production and marketing plus a normal return on the capital involved. If these associations should concentrate their efforts upon the problem of securing better methods of production with a view to reducing wastes, instead of attempting to maintain high prices to cover these wastes, the results might be highly gratifying.

In the second place, to maintain a healthy condition in industry demands a more complete knowledge of production, stocks on hand, movement of goods, and prices, than has heretofore been generally available to the business public as well as to the consumer. There is an opportunity for this phase of the activities of open-price associations to be taken up by independent statistical service bureaus that supply a regular information service to one or more industries. It will probably also stimulate the Department of Commerce to greater activity along these lines.

In the third place, greater activity in the formation of combinations through the medium of the holding corporation may be anticipated. If a corporation, such as the United States Steel Corporation, which controls about one hundred and fifty subsidiaries and through them about 50 per cent of the steel industry of the country, is within the law, many of these open-price associations whose members control a much smaller share of their respective industries might well assume the holding company form of organization and be on the safe side. Of course, it must be borne in mind that, because of practical difficulties of an economic nature, this form of combination is not suited to some of the industries that now maintain open-price associations. Nevertheless, there are many industries in which the movement toward combination will be stimulated as a result of the decision of the Supreme Court in this case.

Methods and Operations in a Filter Plant

The Construction of Filters—Some Interesting Machine Operations—Standards for Limits for Drive, Tight, Keyed and Running Fits

By FRANK A. STANLEY

THE illustrations in the accompanying article show some of the tools and methods used in the Oakland shops of the Oliver Continuous Filter Co., San Francisco, Cal. The continuous filters manufactured by this company were originally developed for the filtration of slime in cyanide plants. They have

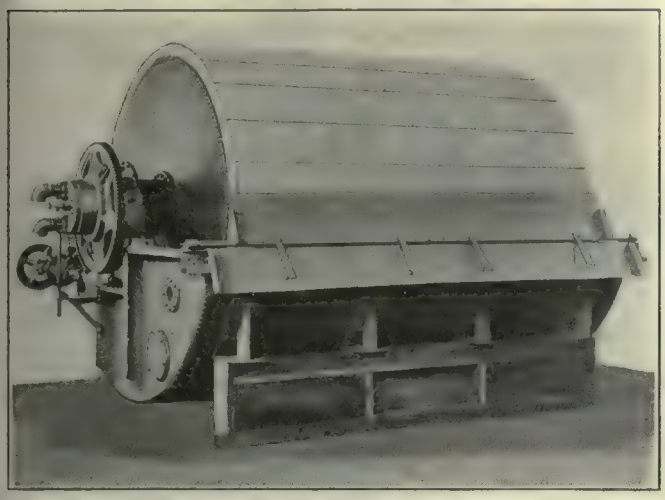


FIG. 1. CONTINUOUS FILTER

since been extended rapidly to the chemical and industrial fields. They are applied to dewatering concentrate as produced by the oil flotation process; and in the chemical industry they are used in the manufacture of paints, dyes, caustic alkalis, nitrate of soda, phosphates, and many other chemical precipitates. Newer applications are in the manufacture of starch and glucose, and in the sugar industry they are used for the filtration of saturated lime in beet sugar factories and are further applied to the purposes of cane sugar refineries. These are a few of the lines of manufacture in which this make of filter is employed.

One of the many types of filters built by this company is illustrated by Fig. 1. Without going too fully into details of design and construction, some interesting principles may be briefly pointed out in order that the shop operations on certain members may be more readily understood.

This continuous filter consists of a cylinder or drum which in operation revolves partly submerged in an open tank containing the material to be filtered. The drum surface is divided into shallow compartments supported underneath by a screen and protected by wire winding to prevent wear. Each section of the cylinder is provided with a pipe connection, which passes through a hollow trunnion to a valve which is automatic in its action. This controls the vacuum application for forming and washing the cake, and also controls the admission of air for the discharge of the cake and for the cleansing of the filter medium. A scraper fits across the tank in such a manner that the cake can be entirely removed after it has been released by air.

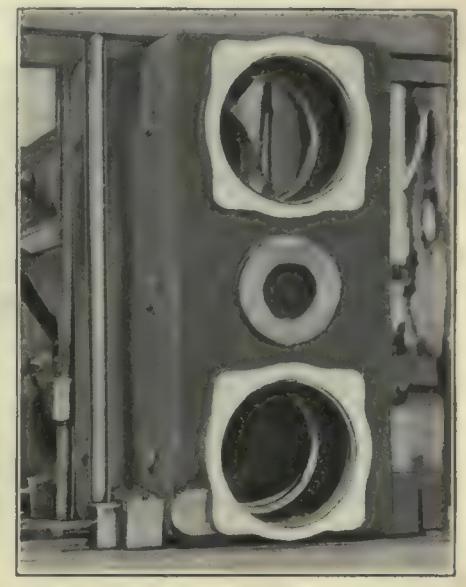


FIG. 4. PUMP CYLINDER IN PLACE FOR BORING

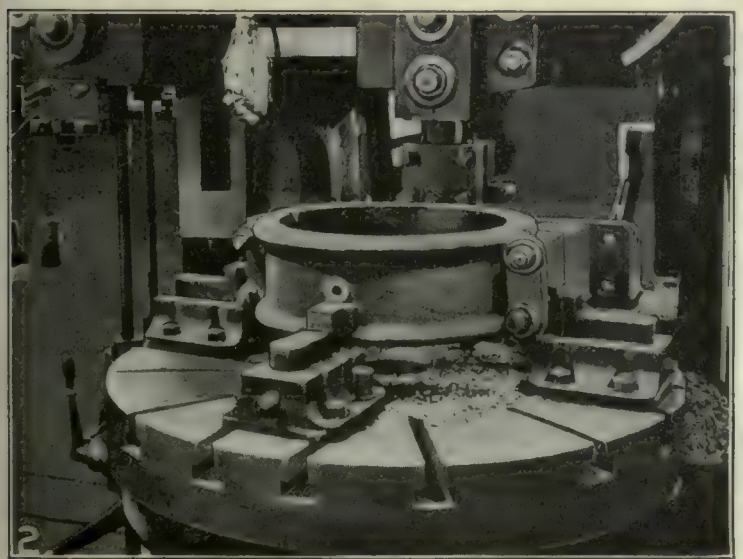




FIG. 2. BORING A TRUNNION BEARING IN THE VERTICAL MILL. FIG. 3. TURNING A BEARING IN THE VERTICAL MILL

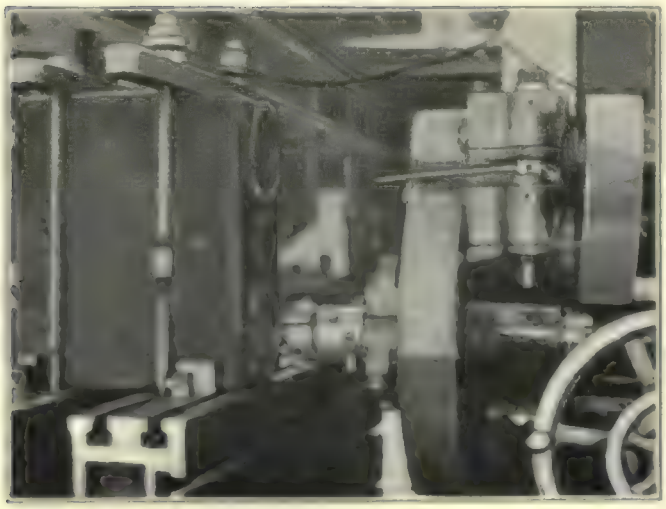


FIG. 5. PUMP CYLINDER

boring machine are presented in Figs. 4 and 5. The first of these photographs is reproduced to show the character of the opening to be bored out, and the shoulder and flange surfaces to be machined. This also illustrates clearly the method of securing the casting upon the work table by means of stop screws at the sides and long heavy straps drawn down by square-head bolts from the table T-slots. In Fig. 5 the work is seen more from the side where the boring head is shown in position for entering the lower of the two cylinder openings. This boring head is made up with inserted cutters for roughing and finishing the bore and for surfacing the joint face outside the casting, as well as for cutting the shoulders and counterbored seats around the chamber. The work remains fixed during the boring of both cylinders, the machine head being elevated for the second operation to bring the spindle to the right height for the upper opening.

A considerable number of pump frames of various

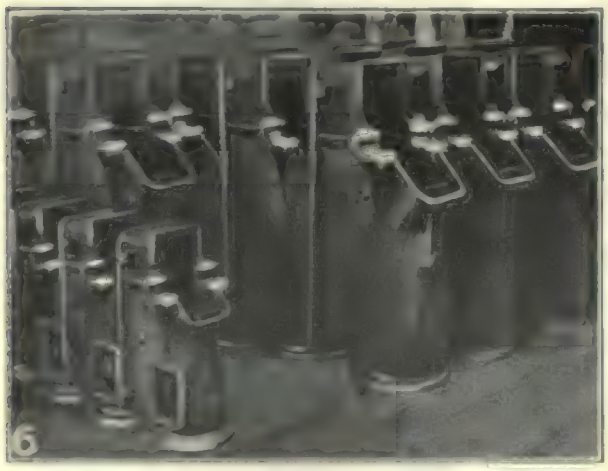




FIG. 6. PUMP FRAMES. FIG. 7. CORNER OF ERECTING DEPARTMENT

Both horizontal and vertical boring mills are used for various classes of work in the production of these filters. There are pump cylinders to be bored, trunnion bearings to be bored out, trunnions to be machined externally and numerous other members where boring and turning operations are carried on advantageously. In Fig. 2 a typical operation is illustrated; the boring of a big trunnion bearing which, when finished, will be mounted at one end of the continuous filter to carry the trunnion, through which are connected the series of pipes which lead from the various drum sections to the automatic valve referred to above. The method of boring this trunnion bearing is shown clearly in the illustration, where it is seen held between the jaws on the table of a vertical boring mill. The bearing proper and the cap have already been planed and fitted across the joint surfaces, the stud holes drilled and tapped, the studs put in place, and the cap firmly secured in position by the nuts on the studs. The assembled bearing is then brought to the boring mill where it is set up square and gripped in the jaws for the boring of the hole to the necessary diameter.

In Fig. 3 is shown the operation of turning a big hub or trunnion on the vertical boring mill with the flanged head of the work seated over the table jaws and held internally by these jaws, while turning is accomplished with a tool carried in one of the regular boring mill heads.

Two views of a pump cylinder casting on a horizontal

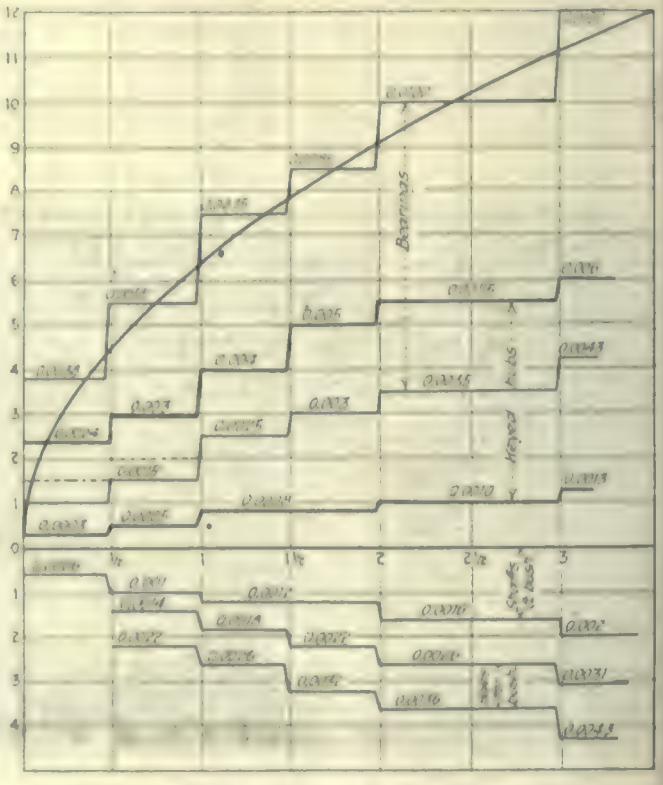


FIG. 8. CHART OF LIMITS AND TOLERANCES

kinds are shown in the group illustrated by Fig. 6. These castings are bored out for the cylinders on a lathe by means of special attachments in the form of a big boring bar, which is mounted in supporting brackets on the carriage of the lathe and fed along to carry the cutters through the work. The drilling of the bolt and stud holes around the flanges and for the shaft caps is accomplished in special jigs under upright and radial drills. The main jig takes care of practically all the holes in the casting except those located at an angle for the cap bearing studs. For the drilling of these stud holes the pump base is mounted at an angle under the drill press to bring the surface to be drilled into correct position horizontally.

The filters are made in a wide range of sizes which add much to the interest of the work going through the plant. For example, the sizes most commonly used range from a diameter of 3 ft., a length of 6 in., and an area of 4 square feet up to a diameter of 14 ft., a length of 24 ft. and an area of 1,056 sq.ft. The drums or cylinders and tanks, particularly for the larger sizes, constitute some striking examples of big work on sheet metal and other parts. One view is here reproduced in Fig. 7, showing a corner in the department where different sizes of filter parts are undergoing the erecting process.

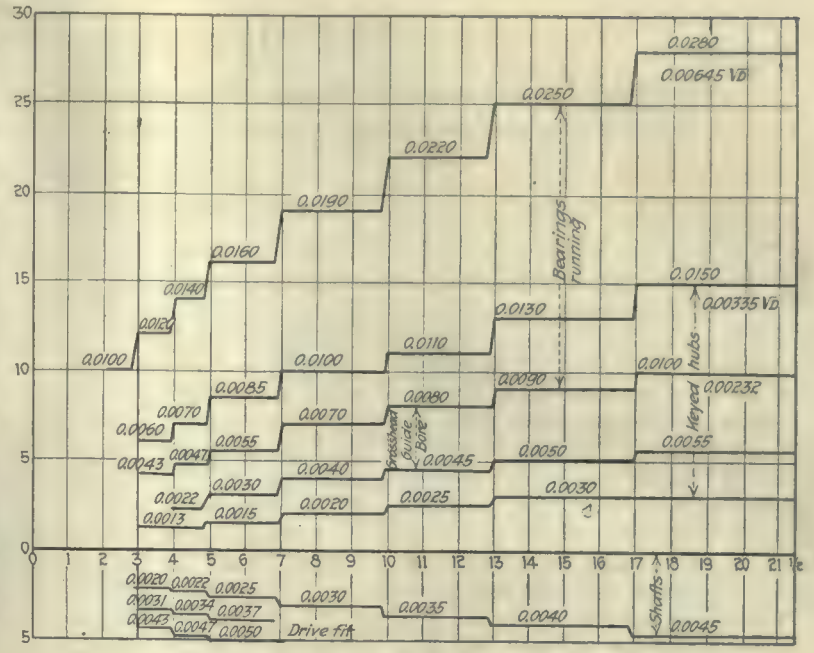


FIG. 9. CHART OF LIMITS AND TOLERANCES

Shop Allowances

This plant has done some most progressive work in establishing definite limits and tolerances for all classes and all sizes of fits on the various parts produced. The two charts in Figs. 8 and 9 show the high and low limits for drive, tight, keyed and running fits. Fig. 8 shows sizes up to 3 in.; Fig. 9 carries the diameters up to 21½ in. The latter diagram includes also the diameters of crosshead guide bores.

In explanation of the charts it may be pointed out that the nominal diameters of the shafts and bores will be found on the horizontal line extending across the sheet and marked with divisions ½, 1, 1½, 2, 2½, 3 in Fig. 8; and 3 to 21½ in Fig. 9. The vertical lines at the right and left of the charts marked respectively 0, 1, 2, 3, and 0, 5, 10, 15, etc., represent allowances in thousandths of an inch. For example referring to Fig. 8, taking a 2-in. diameter on the horizontal line, we find that keyed hubs, say, are bored 2.0055 to 2.0010 in. For the same size the shaft is held between 2 and 1.9984 inches.

Special Reaming Fixture for Main Bearings

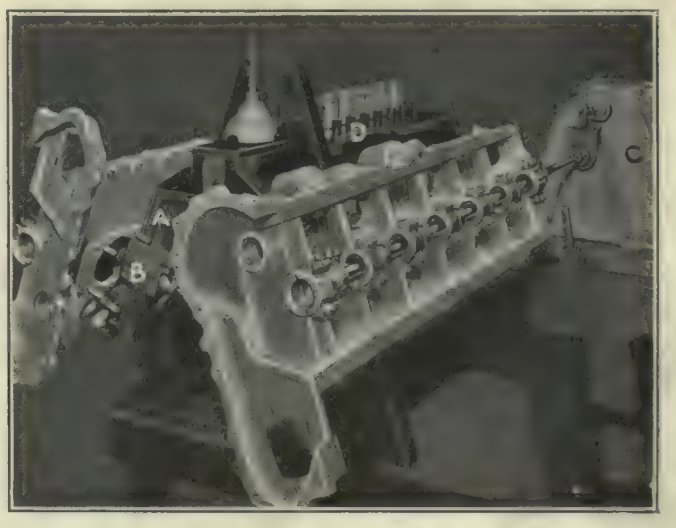
Special Correspondence

Instead of scraping and fitting the motor crankshaft bearings by hand the Franklin Motor Co. believes in modern machining methods which consist of very careful boring and line reaming, followed by the Martell system of reaming. The seven bearings for the crankshaft make it quite a problem to secure the desired accuracy in a commercial scale of production and at a reasonable cost.

Two crankcases are bolted to the stand *A*, being held down in position by hook bolts and the easily handled spoked nuts as at *B*. An electric motor enclosed in the head *C* drives the reamer through suitable reduction gears. Some of the reamers are shown at *D*.

As is common with most high-grade motors, selective assembly is used within comparatively narrow limits. Each bearing of the crankshaft is carefully measured and its diameter noted. When all the bearings have been measured, a reamer is selected for each bearing which will give just the desired allowance for an oil film.

These reamers are put on the reamer bar in their proper sequence and the crankcase reamed as shown in the illustration. This method allows just the right clearance for oil in each bearing, eliminates the unsatisfactory scraping operation and secures a uniformity of motor bearing conditions which insures satisfactory service to the user.



SPECIAL FIXTURE FOR DRIVING MARTELL REAMER

By using the double stand shown one man can be selecting the reamers for the next crankcase while the first is being reamed, thus securing double work from one reaming head and materially increasing the output per square foot of floor space.

Service As It Isn't

How the Manufacturer Makes His Service Plant Efficient—Variety of Repair Methods, Tools and Costs—Why Service Reputation Influences Sales

By HOWARD CAMPBELL
Western Editor, American Machinist

ONE of the peculiarities of the American people is their knack of isolating some one word of our fast-developing "American" language, and using it for every legitimate and illegitimate purpose until it is worn to a frazzle. The words "efficiency," "camouflage" and "sell" afford examples of what may happen to an otherwise perfectly good word when the public fastens onto it. This is especially true of the word "service," which has always covered a multitude of sins, becoming more and more indefinite, and unless something is done to rescue it, it will lose its original meaning and some other word must be provided to fill the place for which this one was intended.

The purchaser of an automotive unit buys his car, truck or tractor, as the case may be, with a vague understanding that his purchase entitles him to something known as service. In an effort to make this service effective, the various manufacturers have organized service departments, which most of them regard as a necessary evil—and with most of them, that is as far as their interest goes. It is true that some manufacturers have their own distributing stations where the customers are to come for the necessary repairs. Such manufacturers usually have at least one man in the repair shop who has been through the factory "service school," such as it is, and is presumably capable of doing any job required, in what is supposed to be a standardized manner.

Lack of Equipment Hinders Work

But even then, the chances are that he has to do the work with tools that either he or the service manager has devised, with the result that the job may be done correctly—that is to say, in approximately the condition in which it was turned out of the factory, and in a reasonable length of time, or it may not. I understand that the manufacturers of what is probably the most popular car in the world require only that the dealer or service station manager purchase his parts from the factory, and that he keep his prices within a certain limit, in order to obtain the right to use a sign which reads "AUTHORIZED SERVICE STATION." So far as I have been able to learn, all that is authorized are the parts that he uses. He may use any kind of machinery he likes, or any kind of tools he has or may devise, and may turn out the work in any length of time he requires. Of course, the price factor limits the time to a certain extent, but it has nothing to do with the quality, and so far as I can learn, this is the only automobile manufacturing firm in existence that attempts to regulate the prices charged.

It should be obvious to even the most casual observer that a job done with poor tools is going to take a far longer time than the same job done with tools designed for that express purpose. Not only that, but a job done with poor tools is often a poor job. So under the present system, where each service station manager or garage foreman buys just such tools as he has to have and can't make, and makes all the rest out of such materials as he happens to have at hand, it is obvious that "service," as exemplified by a dozen different service stations, means a dozen different things.

Long Island Service Efficiency

I do not think there is any question but that the largest automotive service stations in the world are on Long Island, New York. Long Island City is just across the river, only a few minutes from "automobile row" on upper Broadway, easily accessible and yet out of the crowded section. The Packard Motor Car Co. has a six-story service plant there, the Pierce-Arrow Co. maintains a plant there, as do the White Motor Co., the Rolls-Royce Co., and several others, including the Hellman Motor Co. which is a Ford "authorized service station."

Here, also, the New York Telephone Co. has its own service plant, by far the most complete of them all. This company owns more than a thousand motor cars and trucks, including nearly 700 Fords, practically all of which are kept busy ironing out the troubles in the communication system of New York City and vicinity.

Last summer I spent some time in each of these several service plants gathering material for a series of articles since published in American Machinist, and had an opportunity to observe the manner in which different organizations went about the job of repairing motor cars and trucks. I discovered, among other things, that not only did these different service managers employ different tools and methods for performing approximately the same operation, but that different kinds of tools and methods were employed for performing the same repair operation on the same kind of car or truck.

Five different service plants had five different methods of align-reaming the main bearings. They all had different ideas and tools for reaming and facing connecting rods, and one plant had two types of fixtures for performing this operation. Practically all these pieces of equipment were designed by the shop foreman or superintendent and were made in their own shops. One plant uses an electric hoist on an overhead trolley to lift the motor from the chassis; another uses a chain hoist, and another uses a floor crane which operates with a crank.

For re-boring the cylinder blocks, one plant uses a certain type of reamer, another uses a different kind, still another uses a patent cylinder re-boring tool, while yet another grinds the bores. The chances are that four car-owners will pay four widely different prices for having approximately the same type of job done.

The New York Telephone Co. is one firm that does not hesitate to make any equipment necessary to keep its cars and trucks in operation. It is servicing its own units, which is considerably different from servicing that of a customer who will pay whatever the bill comes to with little, if any, protest. Consequently, the New York Telephone Co. has tools for removing bearing caps, for pulling out camshafts, for removing clutches from

Read before Chicago meeting of S. A. E., Feb. 1, 1921.

their shafts, for removing drive shaft sleeves from Ford motors, for holding bearings while reaming, for compressing the packing in a rear bearing case, for testing magnets, and for doing all kinds of jobs, which, without special equipment, would require a great deal more time than the telephone company thinks necessary. It makes every piece of equipment, whether tool, jig, or templet, that is required to expedite repairs, and the service manager claims that enough is saved in a short time to pay for the tool many times over. Those of our factory service managers who are looking for ideas would undoubtedly find some good ones there.

Repair Ideas Not Distributed

Some years ago, the designers of a certain well-known make of car constructed a steering gear in which no provision was made for taking up the wear. It is possible that they were designing a car which was never to wear out, but unfortunately, their plans miscarried. In due time, numbers of these cars showed up at the Long Island service station for steering gear repairs. So some one there devised a method of repairing this part which made it practically as good as new and also made possible take-up for wear. But do you suppose that any of the others of this company's service plants know how to do this? I doubt if the home plant ever heard of the idea.

Let us suppose, then, that a man owning one of these cars was to take it into the Long Island service station to have the play in the steering gear taken up. He would have his car back in a comparatively short time. would pay a reasonable price for the job, and would probably feel perfectly satisfied. But suppose another man who owned the same type of car took his car into the Detroit or Chicago service plant for a similar purpose. The chances are that he would either have to buy a new steering gear, or would get a job that would wear loose again in a short time.

The foreman in the machine shop of the Long Island service plant of another well-known company has devised a method of testing valve-springs, so that he knows that every spring used is of the proper tension. The fact that he finds some weak ones is proof that such an operation is necessary. But do you suppose that the rest of this company's distributors have similar testing devices? I doubt it very much.

The same foreman invented a gage for testing the grinding of valve heads. The gage is bell-shaped, with a hole down through the handle for the valve stem, and with the inside of the bell ground to the exact angle that the valve seat was intended to have. The gage is, of course, hardened and ground. The operator grinds the angle of the valve until he has a seat, then he puts a bit of Prussian blue in the bell of the gage and rubs it around. Then he inserts the valve and turns it around in the gage while the valve seat rubs against the blue. An examination of the seat will show whether the angle is perfect and whether the valve is seating all the way round or not. If the seat is not perfect, he changes the set-up of the machine until the desired results are obtained. Such accuracy as is obtained by this means would not be possible in the use of the ordinary bevel protractor such as the average machinist uses, and certainly the job would take much more time if the operator had to try the valves in a cylinder block. Why doesn't the company furnish each one of its service stations with one of these gages?

Contrast the methods in use in these service plants, which are supposed to be the best in the world, with the methods in use at the factories in which the cars were made. The Packard Motor Car Co., the Pierce-Arrow Motor Car Co., the Hudson Motor Car Co., the International Motor Truck Co.—practically all of the nine service plants that I visited—were operated by manufacturers who pride themselves that the methods in use in their factories are the best to be obtained or devised. Their manufacturing methods are standardized—their tools and gages are standardized—their inspection methods are standardized—everything in their shops that can be, is standardized, so that all parts will be alike and every car turned out will be exactly like every other one.

But when the man who has bought one of these cars needs some repair work done, what does he find? If he takes his car to one shop, he gets one kind of a job done and has the car back in three days, while it costs him, perhaps, $45. If he takes it to another shop, he gets it back in six hours, and they charge him $12. And the worst of it is that the shop where he got the poorer job and paid the more money may be the distributor's own service station.

It was told to me recently that a new manager was sent out to a certain Western city to take charge of a sales and service organization for the makers of a very prominent, high-grade car. After he had been on the job for some time, he discovered that the amount of service work done by his establishment was comparatively small. Upon looking up the records of owners in his district, he found that very few of them ever came near his place.

So he walked down the street, looking for a car of the brand that he was dispensing. He found one and immediately stationed himself where he could intercept the driver when he returned. The driver came along a few minutes later, and the distributor broached the subject of service and asked the driver where he had his repair work done. The man told him, and then the distributor asked, "Why don't you take your car to the local service station to get your work done?" The car owner said that there they didn't have any equipment to do a decent job with, consequently it took them three times as long as it should and when they finished it wasn't any good. So the dealer went back to his service station and looked it over. He found that the machine shop equipment consisted of two vises, one broken, a post drill, and an arbor press.

The time is coming when a sign "Authorized Service Station" will mean that the operators of that shop are using equipment approved by the manufacturers of the car whose name appears on the sign, that the work done will be done according to approved, and as far as possible, standardized, methods, and that the price charged will be standard except for such variations as are necessitated by the differences in overhead expense and wage scales in the different localities.

Then such a sign will mean that the factory is standing back of its service plants with a guaranty both as to quality and price. I predict that under those conditions, the automobile owner would no sooner turn his car over to an irresponsible mechanic who is operating a one-horse garage, than you would take your typewriter or dictaphone to a machine shop to have it repaired.

When that time comes, the word "Service" will have a definite meaning, both to the manufacturer and to the purchaser of the unit.

Bevel and Spiral Bevel Gear Practice

Standard Tooth Design for Straight and Spiral-Tooth Bevel Gears as Recommended by a Committee of the American Gear Manufacturers Association

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE American Gear Manufacturers Association is endeavoring to determine standards that shall be of real value both to the users of gears and to those who manufacture them. With this in view it issues from time to time standards of recommended practice, and will appreciate suggestions, constructive criticisms and recommendations of all kinds. These should be sent to the office of the secretary, 4401 Germantown Ave., Phila., Pa. Users of gears should co-operate in every way possible. The practice recommended herewith was adopted in April, 1921. If anyone has suggestions or improvements to offer, now is the time to do so.

It is the aim to standardize on the tooth design of

Table I. Maximum Theoretical Addendum of Bevel Gear
Pinion Back Cone Radius = 1 In.

Ratio	14½ Deg.	20 Deg.	25 Deg.	30 Deg. Spiral
1-1	0.2679"	0.1763"	0.1192"	0.0774"
2-1	0.0981"	0.0795"	0.0606"	0.0455"
3-1	0.0561"	0.0476"	0.0369"	0.0277"
4-1	0.0384"	0.0331"	0.0258"	0.0194"
5-1	0.0288"	0.0249"	0.0194"	0.0146"
6-1	0.0230"	0.0199"	0.0155"	0.0117"
7-1	0.0192"	0.0166"	0.0129"	0.0097"
8-1	0.0165"	0.0142"	0.0111"	0.0083"

Table II. Straight Bevel Gear Tooth Proportions
Pressure Angle 14½ Deg. Ratio 3-1 to 8-1
Tabular values are for 1 D.P. for any other pitch divide by diam. pitch used

No. of Teeth in Pinion	Addendum		Full Depth	Circular Thickness for case hardened bevel gears	
	Gear	Pinion		Gear	Pinion
14	0.560"	1.440"	2.157"	1.186"	1.955"
15	0.600"	1.400"	2.157"	1.221"	1.920"
16	0.640"	1.360"	2.157"	1.256"	1.885"
17	0.680"	1.320"	2.157"	1.291"	1.850"
18	0.720"	1.280"	2.157"	1.326"	1.815"
19	0.760"	1.240"	2.157"	1.361"	1.780"
20	0.800"	1.200"	2.157"	1.396"	1.745"
21	0.840"	1.160"	2.157"	1.431"	1.710"
22	0.880"	1.120"	2.157"	1.466"	1.675"
23	0.920"	1.080"	2.157"	1.501"	1.640"
24	0.960"	1.040"	2.157"	1.536"	1.605"
25	1.000"	1.000"	2.157"	1.571"	1.570"

Table III. Spiral Bevel Gear Tooth Proportions
Pressure Angle 14½ Deg. Ratio 3-1 to 8-1
Tabular values are for 1 D.P. for any other pitch divide by diam. pitch used

No. of Teeth in Pinion	Addendum		Dedendum		Full Depth	Circular Thickness for case hardened gears	
	Gear	Pinion	Gear	Pinion		Gear	Pinion
10	0.500"	1.200"	1.420"	0.720"	1.920"	1.2000"	1.9416"
11	0.550"	1.150"	1.370"	0.770"	1.920"	1.2500"	1.8916"
12	0.600"	1.100"	1.320"	0.820"	1.920"	1.3000"	1.8416"
13	0.650"	1.050"	1.270"	0.870"	1.920"	1.3500"	1.7916"
14	0.700"	1.000"	1.220"	0.920"	1.920"	1.4000"	1.7416"
15	0.750"	0.950"	1.170"	0.970"	1.920"	1.4500"	1.6916"
16	0.800"	0.900"	1.120"	1.020"	1.920"	1.5000"	1.6416"
17 or over	0.850"	0.850"	1.070"	1.070"	1.920"	1.5500"	1.5946"



FIG. 1

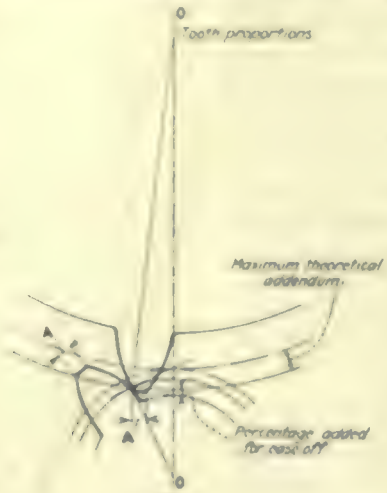
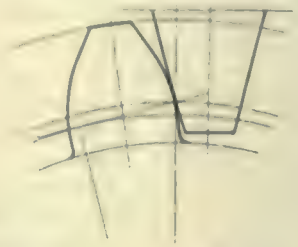


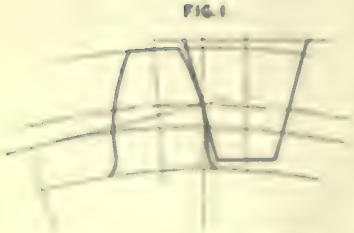
FIG. 2



	Gear	Pinion
Pitch depth	0.560"	1.440"
Full depth	2.157"	2.157"
Circ. thickness	1.186"	1.955"

Pressure angle 14½ deg.
14 Tooth Pinion Straight Bevel 3-1 Ratio or Greater

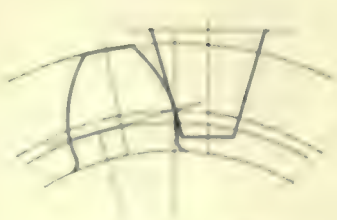
FIG. 3



	Gear	Pinion
Pitch depth	1.000"	1.000"
Full depth	2.157"	2.157"
Circ. thickness	1.571"	1.570"

Pressure angle 14½ deg.
25 Tooth Pinion Straight 3-1 Ratio or Greater

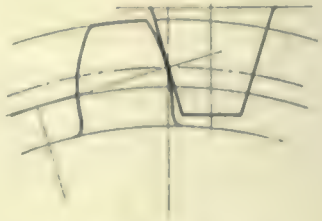
FIG. 4



	Gear	Pinion
Pitch depth	0.5000"	1.2000"
Full depth	1.9200"	1.9200"
Circ. thickness	1.2000"	1.9416"

Pressure angle 14½ deg.
10 Tooth Pinion Spiral 3-1 Ratio or Greater

FIG. 5



	Gear	Pinion
Pitch depth	0.8500"	0.8500"
Full depth	1.9200"	1.9200"
Circ. thickness	1.5500"	1.5946"

Pressure Angle 14½ deg.
17 Tooth Pinion Spiral 3-1 Ratio or Greater

FIG. 6

FIG. 1. MAXIMUM THEORETICAL ADDENDUM. FIG. 2. PERCENTAGE TO BE EASED OFF. FIG. 3. PROPORTIONS OF STRAIGHT TEETH. FIG. 4. STRAIGHT TOOTH PROPORTIONS. FIG. 5. SPECIMEN TOOTH SHAPES. FIG. 6. SPECIMEN TOOTH SHAPES

both bevel and spiral bevel gears and this first recommendation is for ratios between 3-1 and 8-1 for the 14½-deg. pressure angle with a detailed explanation of the steps taken to determine the recommended values.

Bevel gear teeth are considered as being on a pitch radius equal to the back cone radius of the particular gear or pinion. In Fig. 1, the pitch circles of the gear and pinion are drawn together at the base circle of the pinion determined by the pressure angle *A*. Involute tooth contact cannot take place below the base circle since the involute curve has its inception at the base circle and any projection of the gear or pinion beyond the base circle of the pinion at the beginning and end of the theoretical arc of action is useless in so far as the tooth action is concerned.

The problem is first to find the gear addendum, which at the beginning of the arc of approach extends to the base circle of the pinion, labeled in Fig. 1, the maximum theoretical addendum. The values in Table I were obtained on this basis by solving the oblique triangle for the various ratios and pressure angles. An examination of this table will show that the tabular values between ratios 3-1 and 8-1 do not change greatly and in preparing the bevel gear tooth proportion tables, we have assumed that there is no change.

A percentage has been added to the theoretical values, the purpose of which is to provide an ease-off. Reference to Fig. 2 will show graphically that unless this percentage is added the tooth load on the gear at the beginning of approach will lie along the very top edge of the tooth, a condition to be avoided.

The specimen shapes of the teeth specified in Table II of 14½-deg. straight tooth gear proportions are shown in Figs. 3 and 4. The circular thicknesses given in the table were obtained from these layouts by giving consideration not only to strength but also to the width of the top land and insure a width sufficient to prevent a complete carbonization with a consequent brittleness in case hardening.

The values given in Tables II and III are for 1 D.P. throughout. For any other pitch, it is necessary to divide the tabular values by the given diametral pitch.

For ratios below 3-1 it is purposed to provide additional tables. The range covered by these tables will necessarily be smaller than that covered by the present table as the change in the maximum theoretical addendum is more pronounced among the lower ratios as will be noted in an examination of Table I.

Spiral Bevel Gears

Table III shows the tooth proportions for 14½-deg. spiral bevel gears for ratios between 3-1 and 8-1. The values are obtained in the same manner as for the straight tooth gears with two modifications. The working depth of the spiral bevels is 85 per cent of that of straight tooth gears or approximate standard depth for the normal pitch. The bottom clearance is 0.07 of the circular pitch instead of the usual standard of 0.05 of the circular pitch.

Figs. 5 and 6 show specimen tooth shapes based on the proportions given in Table III. All tables shown cover only hardened gears.

A different proportion of circular thickness will be required for unhardened gear teeth. The 20-deg. pressure angle bevel and spiral bevel gears are under consideration and tooth proportion tables similar to those shown for the 14½-deg. will be offered in the near future.

The Bugaboo of Production Costs

By Harry Senior

From every side there is continually being dinned into our ears or flashed on our vision the command to "Cut Production Costs." Every advertiser of machinery seeks to impress upon our minds the idea that he can supply us with a machine that will "produce at lower cost," or a device that will "lessen the cost of production" to an extent that will pay the cost of installation in an incredibly short space of time. Emblazoned upon the bill-boards, embellished in the flood of gaudy advertising literature that reaches our desks, even staring us in the face from each alternate page top of American Machinist, is the constantly recurring admonition to "cut the cost of production."

In view of the fact our manufacturing costs are but about 10 per cent, in many cases even less, of our selling prices, is it not about time we began to talk about cutting something else? The best brains of the machine industry have been for years wrestling with the problems of developing new machinery or new methods of turning out more work in less time until it would seem that, instead of waiting to see if we are really going to get our shop work done for nothing, we might at least make the attempt to discover some way in which contributory costs can be made to follow the downward trend instead of continually going in the other direction.

The two most conspicuous items that may be classed as contributory cost are "overhead" and "selling expense." During the last twenty years, and with startlingly increased rapidity for the last five, these items have been mounting out of all proportion to production costs which, had until 1914 been going the other way.

Some few months ago I had occasion to call upon a concern having offices in a neighboring city with a view to purchasing additional equipment for our factory. I found upon arrival a splendid suite of offices with president, vice-president, works manager, and engineer, each installed in a sumptuously furnished private room surrounded with all the time and labor saving appliances for office use that there are on the market.

They had a good machine; just the thing I wanted and that "would cut my production costs enormously" (they all told me so), but the price was too high.

I expressed a desire to see the shop where the machine was made, thinking that I might perhaps find an example of how to do good work cheaply that would more than offset the cost of my trip to the city. This desire met with instant endorsement by the assembled officials and I was forthwith transported (in a high-powered car) to the outskirts of the city, where I found a little 7 x 9 factory, housing not more than ten people all told. Not even the Connecticut chap who, seeking a position as production manager, advertised his ability to "cut production costs 125 per cent," could have paid the rent on the downtown offices with this shop at anything like a fair selling price for the machine.

The "greedy worker" is often accused of getting more than his share of the profits of industry; but if 90 per cent of these profits go elsewhere than to the shop it would seem that he who works in a shop has at least a good alibi. If the published statements be true that the time-keeping mechanism of a high-grade watch costs the factory around 49 cents, or that the "works" of a tin Lizzie involve an expenditure of $69 (or is it 69 cents?), where would the dear consuming public get off if the shop man did his part of the work for fun?

Making Use of Tables

Some Quick Methods of Figuring—Using Tables of Squares and Cubes—Various Ways in Which Tables of Logarithms Can Be Used

BY WILLIAM S. AYARS

MEN who do much computing use calculating machines or tables to a great extent. Those who do it only occasionally do not usually have these aids, and their work is not such that it would pay either them or their employers to purchase elaborate books of tables or expensive adding machines. The slide rule is quick and accurate enough when not more than three significant figures are wanted, and five or six place logarithms are both handy and quick when one is familiar with their use. But many men are called upon to do close figuring from time to time who do not own a slide rule and could not use one if they did; who have no access to either calculating machines or complete sets of tables.

Almost any handbook, however, has tables of squares from 1 to 999 and it is both easy and accurate to use such a table for multiplying together any two numbers whose mean or average is less than 1,000. The rule is as follows: Add the two numbers and divide by 2, thus getting the average; then take the square of the average from the table of squares, subtract the average from the large number and take the square of this number from the table of squares; subtract this latter square from the former and the difference is the product of the two numbers. For example: Find the product of 937×685:

$$\frac{937 + 685}{2} = 811;\ 811^2 = 657{,}721 \text{ (table)}$$
$$937 - 811 = 126;\ 126^2 = 15{,}876 \text{ (table)}$$
$$657{,}721 - 15{,}876 = 641{,}845$$

To use a table of squares for the square of a number beyond the range of the table. This is easy for any number not a prime number, especially if it be divisible by 2, 3, 5, 7, 11, etc. Divide the number by a factor that will make the quotient come under 1,000. Look up the square of the quotient and multiply it by the square of the factor, and the result is the square of the original number. To illustrate this, take the number 2,127. This will divide by 3, and the quotient $2{,}127 \div 3 = 709$. From the table,

$$709^2 = 502{,}681$$
$$3^2 = 9$$
$$9 \times 502{,}681 = 4{,}524{,}129, \text{ which is } 2{,}127^2.$$

It may be argued that some of these methods may take more time than doing the work direct. They will at first, but the advantage is that the number of multiplications is less, and therefore the chances of error are lessened. There are also cases where they do not apply easily, as where the mean between two numbers is fractional, thus

$$\frac{683 + 276}{2} = \frac{959}{2} = 474.5.$$

But the square of 474.5 is ¼ of the square of 2×474.5 or $\frac{959^2}{4}$.

Many tables of squares include square roots, but sometimes squares only are found. To use such a table to find square roots is easy, but care is needed. Take the number 374.544 whose square root is wanted. Now the number 374,544 is a perfect square—the square of 612. But 612 is certainly not the square root of 374.544 nor is 61.2 nor 6.12. You must work in *twos* each way from the decimal point. If we could find a square equal to 374, or 37,454, it could be used. We can find 37,249 and 37,636, the squares of 193 and 194 respectively. Now two places in the square is equal to one in the root; so if the square root of 37,249 is 193, the square root of 372.49 is 19.3 By simple interpolation, if needed, two more figures are *53* hence the square root of 374.544 is 19.353 to three places of decimals. This checks up with the actual calculation of $\sqrt{374.544}$.

Standard shafting sizes run ¼ under even quarter inches and the writer once had to work out some problems on the strength of shafting. The task resolved itself into finding the proper size of standard shafting to carry a certain horsepower at a certain r.p.m. A very convenient formula is

$$\text{Horsepower of shafting} = \frac{d^3 f N}{321{,}000}$$

Here d is the diameter of shafting in inches; f is fiber stress allowed pound per square inch; and N = r.p.m. It was necessary to have the cubes of shafting diameters for quick work and on a rainy Sunday I worked them out for the common range of sizes. Take for example 3 13/16—what is its cube? I did it by changing 3 13/16 to the improper fraction 63-16. I took the cube of 63 and that of 16 from a table of cubes equal to: $63^3 = 250{,}047$; $16^3 = 4{,}096$. Then I used logs:

$$\log 250{,}047 = 5.398022$$
$$\log \quad 4{,}096 = 3.612360$$
$$\log x = \text{diff.} = 1.785662$$
$$x = 61.05, \text{ aprx.}, = (3\tfrac{13}{16})^3.$$

By a special table this is given as 61.04663. A value of 61 should have been close enough.

For finding a cube root when no table of cube roots is available, a table of cubes can be used in the same way as the table of squares previously explained. But here even more care is needed, because a move of one place in the root moves the decimal three places in the cube. Thus the cube of 12.1 is 1,771.561; of 121 it is 1,771,561. What then would be the approximate cube root of 17,715.61? We find in the table of cubes 17,779,581, the cube of 261. The cube of 26.1 would then be 17,779.581 which is quite close enough for most purposes. If it is necessary to compute a cube root, the easiest way is to look up the logarithm of the cube and divide it by 3. The result is the log of the root. This need not be very close for good results. It is always easy to get the log of a 4-figure number without interpolation. Take the number above, 17,715.61 call it 17,716.

$$\text{Log} \quad 17{,}710 = 4.248219$$
$$\text{Add for} \quad 6 = \quad 147$$
$$\text{Log} \quad 17{,}716 = 4.248366$$
$$\tfrac{1}{3} \log 17{,}716 = 1.416122;\ \text{antilog} = 26.07$$

This is quite close enough for all ordinary uses.

It is sometimes necessary in marine work to get the ⅔ power of the displacement, the D^2 of the so-called

Admiralty Constant. It can be obtained by squaring the displacement in tons, and then taking the cube root of the square. Displacements usually run well over 1,000 tons, and have not the habit of coming out in easy figures. Thus take one of 4,725 tons. Its square is a big number and the cube root of that square none too easy to find. But it is very simple with logs:

$$\begin{aligned} \text{Log } 4{,}725 &= 3.674402 \\ &\quad \times 2 \\ \tfrac{2}{3} \text{ of it} &= 3\overline{)7.348804} \\ &\quad 2.449601 \\ \log^{-1} 2.449601 &= 281.6, \text{ aprx.} \end{aligned}$$

Every bit of work necessary is shown as no interpolation was done. The log 0.449601 was not in the table, but the log of 281.6 is 0.449633 and that is close enough. The use of logarithms is simple and easy for any man who has a knowledge of arithmetic through fractions and decimals, and it has always been a surprise to the writer that so many men of intelligence are not only ignorant of their use, but look upon them as mysterious and impractical. Get any engineers' pocketbook and learn how to use them. The best explanation of them I have seen is in the cheap little pocketbook published by the I. C. S. of Scranton, called "Mechanics Pocket Memoranda."

Romances of Metal Working—The Myth of Hephaistos

By H. H. Manchester

BESIDES the more prosaic facts in the history of metal working which the writer included in previous articles on the evolution of the workshop, published in the American Machinist, there are many myths, traditions, romances, and personal anecdotes of metal working and metal workers which are even more interesting, if not so reliable, as the better authenticated history of



THETIS VISITS HEPHAISTOS' WORKSHOP

the subject. Such legends and stories are, moreover, of genuine importance, because in addition to their human interest, they disclose the atmosphere and conditions of the period to which they belong. Some of them are allegorical, while many of them are more likely a vivid coloring of historic facts. But even though it may be hard to tell how much of such tales is true and how much fancy, their fascination is proved by the fact that they have been preserved through years, and perhaps through centuries.

The Myth of Hephaistos

While everybody knows something of Hephaistos, or Vulcan, few machinists have delved deeply enough into classic lore to have heard of more than one or two of his exploits. According to the old Greek myths, he was the son of Zeus and Hera, a king and queen of the gods. He was born lame, which so incensed Hera that she threw him down from Olympus into the ocean, where he was nurtured by Thetis, who afterwards became the mother of Achilles.

While still a youth, he beat out a magic golden throne, which he presented to his mother in revenge for her cruelty toward him. When she sat down in this it seized her automatically, and held her until Dionysus persuaded him through many potations of grape juice to let her go.

Later he became reconciled to his mother, and passed around a cup of peace to the gods, who, however, burst into unquenchable laughter when they saw him hobbling around on the golden crutches which he had made.

Though the only deformed one among the gods, he was wedded to Aphrodite, or Venus the goddess of beauty. Venus, however, became enamoured of Mars; whereupon Hephaistos forged invisible chains with which he captured the goddess and her lover. After showing them to the other gods, he demanded back the dowry he had paid for her and let her go.

He was the artificer of the gods, forging alike their golden furniture, and the thunderbolts hurled by Zeus.

He was supposed to have his own castle, which included a workshop on Olympus, but also to do much of his work under the earth. In fact the fire of the volcanoes was supposed to come from his forge.

To assist him in his work, he had formed golden maid servants, which automatically helped to blow the bellows and do his errands.

He is worshipped in the Homeric Hymns as one who "taught glorious works to men upon the earth, who previously dwelt in the caves of the mountains like wild beasts, but now instructed in works by Hephaistos, the renowned artificer, they pass their life in each the whole year through in their houses."

Among the mighty works which he was supposed to have wrought for men, were brass footed, fire breathing bulls for King Aetes of Colchis, gold and silver water dogs for Alcinoos, king of the Phaeacians, and the brazen man Talor for King Minos of Crete, which protected the island by walking around it three times a day.

When the armor of Achilles was lost by Patroclus, the mother of Achilles, Thetis, hurried to Hephaistos to ask him to make a new set of armor. As she had protected him when he was abandoned by his mother, Hera, he was glad to do it. As part of this armor he made a wonderful shield on which he forged in minute detail a great number of scenes. In doing this he used twenty bellows, all of which worked automatically.

What does this myth mean? By some Hephaistos is considered as a personification of fire as exhibited in volcanoes. Certainly it illustrates the importance which was then attached to the smith, and emphasizes the power which skill in metal working gave. The automatic inventions ascribed to him, represent of course nothing in existence at the time, but unfulfilled ideas, some of which, like the bellows not worked by human power, were realized in a later period.

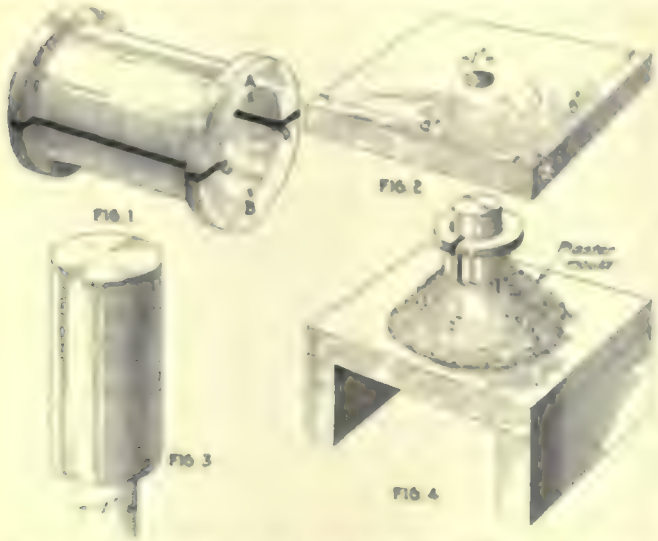
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Babbitting Bearing Shells

By L. C. Fox

It frequently happens that a motor comes into a service station for which duplicate parts cannot be easily or promptly secured, and it becomes necessary to re-



NO. 1. THE SHELL TO BE BABBITTED. NO. 2. THE BABBITTING BASE. NO. 3. THE CORE. NO. 4. THE SHELL READY FOR POURING

babbitt bearing shells in order to avoid tying up a business car for an indefinite period. It is first necessary to melt out the old babbit in the easiest way possible, according to the equipment of the shop. This can be done with a blow torch, a bunsen burner, or over a small blacksmith's fire. The inside of the shell should then be cleaned perfectly and dipped in any good soldering acid, after which it should be carefully tinned, including the fillets.

Make shims the width of the shell and of such thickness as will hold the two halves apart from $\frac{1}{8}$ to $\frac{1}{4}$ in. more than the distance across the shell. This is shown in Fig. 1, the distance *A B* being at least $\frac{1}{8}$ in. greater that *C D*. This allows more bearing metal in the crown of the bearings than on the sides.

With the shims in place, wire the two halves together so that the bearing can be easily handled for babbitting and turning.

Take a cast-iron plate of any convenient size, such as 6 or 8 in. square and 1 in. thick, and flat on one side to be used as a surface plate. Drill a 1-in. hole in the center to be used in locating and holding a wooden core. The plate is shown in Fig. 2 and the core in Fig. 3. Make a wooden core, as shown in Fig. 3, with the end turned down to fit the hole in the plate, and the body about $\frac{1}{8}$ in. smaller than the diameter of the crankshaft. It should be about an inch longer than the bearing itself. Place the core in position in the plate, center the bearing around the core, and make a plaster paris mold around the bearing, as shown in Fig. 4. The plate should be raised off the bench two to four inches. With the shell held in place by the plaster mold, heat it with a blow torch until the tin starts to melt. Have the babbitt close by and have it hot.

It is quite important that the blow torch give a clean flame for, if the surfaces to be tinned are not clean, the tin will not stick. If a clean flame is impossible, get a piece of round iron or steel, a little smaller than the inside diameter of the shell, and heat it red-hot. This can be used in heating the shell in place of the blow torch when necessary.

Pour the babbitt quickly, so as to secure a complete union with the shell. The core should either be greased or wrapped with a piece of paper so that it can be easily removed. When the bearing has cooled, the plaster paris mold can be broken away and the bearing put in the lathe and held in a four-jawed independent chuck. Bore the hole and finish it smoothly.

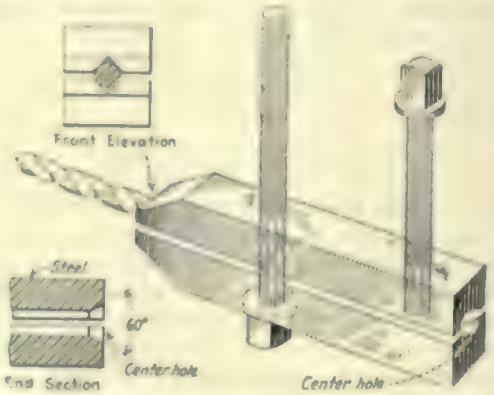
If there are a number of bearings to be made time can be saved by making a wooden mandrel to fit the bore, holding the mandrel in the chuck and forcing the bearing on the end. After the lathe work has been done the bearing can be cut in half with a hacksaw and the edges finished.

Parallel Clamp as Drill Holder

By Charles E. Frank

A parallel clamp may be made to serve as a holder for small twist drills when using them to drill holes in work that is mounted upon the faceplate or in the chuck of a lathe.

When using a drill in this manner it is essential that the operator be able to "feel" the cut in order to avoid



HOLDING SMALL DRILL IN PARALLEL CLAMP

breaking the drill, and a drill chuck held in the tail spindle will not permit this, even when a chuck with suitable shank is available; while holding the chuck in the hand with the end of the shank on the point of the tail center is a clumsy method at best, and often defeats its purpose by reason of the weight and the compara-

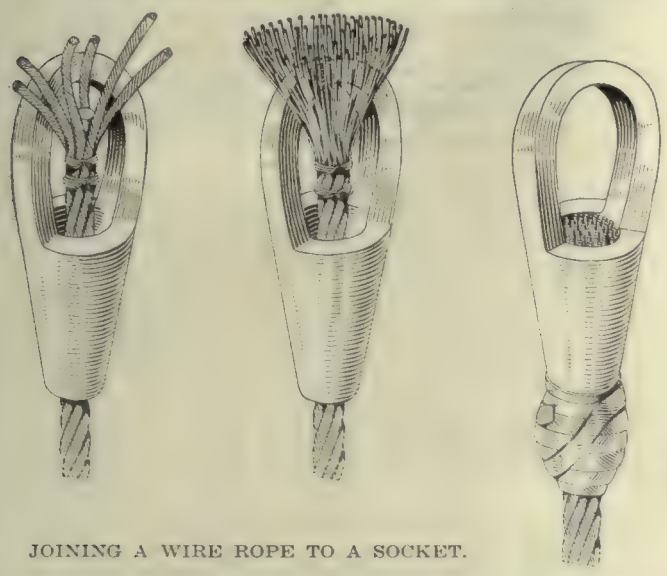
tively long distance between the center and the point of the drill.

The clamp should be taken apart and a small V-groove cut or ground lengthwise of each jaw, care being taken to make the groove of accurate shape and exactly central. With the clamp again assembled a center reamer may then be used to make a suitable center hole at the square ends of the jaws so that the tool will not slip off the center when drilling. If the jaws are hard, this part of the work may be done with a suitably shaped grinding wheel before the clamp is reassembled.

Attaching a Wire Rope to a Socket

By E. J. Edwards

When wire rope is used in connection with a socket it is important that the socket be attached in such a manner that the full strength of the rope may be depended upon. It is common practice in factories where there is not enough work of this kind to employ an experienced hand on cables, to have the engineer or repair man do the best he knows how. I have seen lead, solder, soft babbitt, etc., used for the purpose of attaching these sockets, by men who were good mechanics but who had no idea as to what material should be used or what should be done to prepare the cables for the operation.



JOINING A WIRE ROPE TO A SOCKET.

The ordinary way of doing the work is to bend back the wires upon themselves, draw them into the basket of the socket, and fill the latter with lead or babbitt. Sockets attached in this manner should never under any circumstances be used on elevators, cranes, or other hoisting machinery, as the socket may pull away from the rope and cause damage to person or property. The reason for this is that the wires are not all engaged and some of them creep into the rope, thereby preventing a perfect contact between rope and socket.

I think one of the most important operations in attaching a wire rope to a socket is to clean thoroughly with gasoline or kerosene, both socket and that part of the rope that is to be in contact with it. The rope is then served at the end with fine wire or strong cord and pushed through the socket; the hole in the latter being large enough to allow the serving to pass.

I use a strong cord for the serving but would recommend a fine, strong wire about $\frac{1}{32}$ in. in diameter to the man who is not accustomed to handling wire rope, as it is less apt to be cut when passing through the socket. It is well to put on three independent servings, so that if one of them should come loose the others will hold.

After the socket is on the rope the latter is opened, the hemp center cut away for a distance equal to the length of the socket, and the wires in the strands separated. This can best be done by using a piece of small pipe or a marlinspike. It is very important that the lay of the rope does not open beyond the basket as this would cause some of the strands to have more strain on them than others.

After the wires and socket have been well cleaned with the gasoline, they should be allowed to soak for five minutes in a solution composed of one-half muriatic acid and one-half water, then rinsed in a similar solution weakened by the addition of one-half more water. Do not use stronger solutions than these. After wiping dry, push the socket over the wires until the latter are even with the top of the basket. Now wrap friction tape around the bottom of the basket and adjacent rope, and fill the basket with melted zinc.

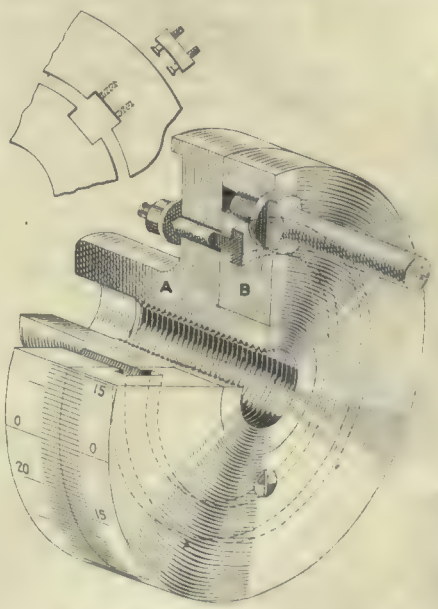
The steps are clearly shown in the illustration. If they are followed out properly there should be no trouble from the rope pulling out of the socket or from undue stresses on individual strands.

Indexing Faceplate for the Lathe

By William F. Datisman

I wish to submit to readers of the American Machinist a drawing and description of an indexing faceplate which I have fitted to an 18-in. toolroom lathe. I have never seen anything like it and, as I find it useful for many purposes, I am passing the idea along in the hope that someone else may be benefitted by it.

The hub of the member *A* should be nicely fitted to the spindle nose in the usual way, having a shoulder projecting from the face that forms a stud or bearing upon which the member *B* rotates. An annular T-slot in the back of member *B* provides for clamping the two members together by means of three T-head bolts spaced 120 deg. apart in member *A*.



AN INDEXING FACEPLATE

The cut out space in the T-slot for the introduction of the bolt heads must be closed after the bolts are put in, by means of small steel plates let into the opening and fastened with machine screws, as shown in the smaller sketch. This is to prevent the bolt heads from catching in the opening and causing annoyance to the operator when rotating the outer member.

Two threaded holes are provided in the face of the outer member to accommodate the driving stud to either large or small diameters; the extra hole being closed with a suitable fillister head screw to keep out chips.

Member *A* is graduated to 360 divisions and numbered at each tenth line. Member *B* is graduated to sixty-one spaces either side of the zero line; the sixty-one spaces corresponding to sixty spaces on the opposite member, thus providing a vernier from which minutes are easily read.

This tool was made entirely upon the lathe with the exception of graduating, which was done upon a Farwell gear hobber provided with a special attachment for that purpose. It is very useful in cutting multiple threads or for resetting a thread tool after regrinding.

It also renders valuable assistance in laying out round work that must be accurately divided, or it may be used to index small reamers, taps, etc., by means of a tool held flatwise in the toolpost while the carriage is traversed by hand.

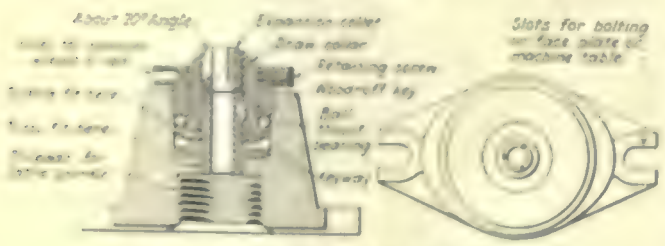
A Multi-Purpose Draw-In Chuck

BY E. E. LAKSO

The construction of the chuck should be quite clear from the sketch and I need not go into a description of it, but will endeavor to show some of the uses to which it may be put.

In turning small eccentric pins it has no equal. The chuck is bolted to the faceplate of a lathe at the required distance off center, and stock of the size of the larger diameter is used. By using a stop, or a collet with a shoulder at the inner end, all pieces can be made of the same length. For holding small round pieces on the milling machine for milling flats or slots on them it is very convenient. A key in the base is made to fit the T-slot in the table of the milling machine to hold the chuck in position without depending upon the holding bolts.

For turning or cutting off small stock in the lathe



MULTI-PURPOSE DRAW-IN CHUCK

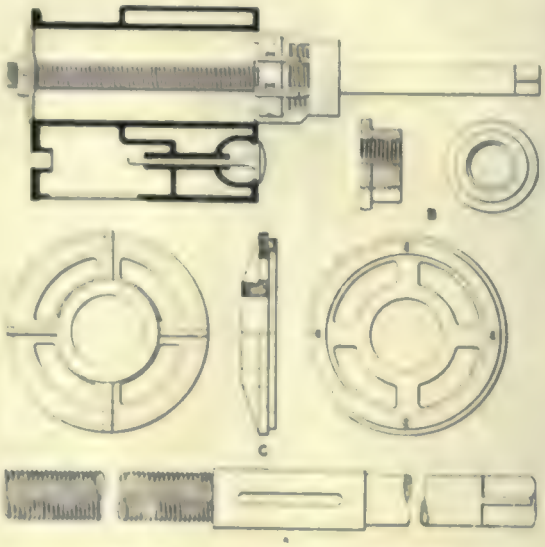
the chuck may be screwed to the spindle nose like any lathe chuck and will hold long rods that may pass through the hollow spindle of the lathe. For cutting pieces to a definite length the collet with the shoulder, or a stop, is again brought into service, allowing the carriage to be clamped in a fixed position.

It comes in handy for holding small round pieces on the drill press and does not bruise the stock as would a vise. In drilling links, wherein there are two holes that must be located at exact distance from each other and all alike, the chuck is fitted with a plug of the proper size and is clamped to the table of the drill press. One hole drilled in all the links, the chuck with the locating plug is now brought into use and with the already drilled hole placed over the plug the other hole is drilled in all the links as accurately as if a jig were used.

Reamer for Refinishing Worn Cylinder Bores of Automobile Engines

BY FRED S. HARGER

The writer has recently constructed a very satisfactory tool for reaming worn or scored cylinder bores in automobile engines. The construction is such that the



REAMER FOR CYLINDER BORES

reamer is held central and guided in its passage through the bore, while at the same time it is drawn to the cut without the necessity for applying external feeding pressure. The sketch shows the tool in detail as well as its application.

The bar *A* is of machine steel. The pilot portion of the bar is threaded over its full length and is fitted to the flanged nut *B*, which in turn fits the central opening of the lower centering spider *C*. The shoulder at the middle of the bar is made a press fit for the shell of the reamer, which is of the usual expansion design with blades of high-speed steel and may be fastened to the bar with a feather key, a taper pin, or with headless setscrews as desired.

The centering spider has a shoulder ⅜ in. long which is made a tight fit for the lower end of the old bore. As the reamer is turned into the work the threaded pilot draws it forward and at the same time steadies and guides it in a straight line to the opposite end of the bore. When the reamer reaches the spider the latter is pushed out and the small remaining portion of the bore completed by a slight additional pressure upon the upper end of the bar.

Though the tool shown is designed to be operated by hand, and the upper end of the bar is squared for the purpose of applying a wrench, it is a simple matter to fit it with a floating connection that will allow the tool to be driven by a drill press or other convenient machine.

EDITORIALS

Finish the Work of the Arms Conference

SUCCESSFUL beyond the expectations of the men who called it, the Conference on Limitation of Armament has adjourned. There is little doubt that the agreements arrived at, together with the better feeling which has resulted from the gathering around the council table, have definitely postponed, if they have not entirely removed, the danger of war in the East.

There remains the ratification of the various treaties. It is up to the Senate, and the eyes of the country and of the world are upon them. If the treaties are not ratified the evidence will be conclusive that our form of government is no longer capable of functioning in a world where cordial diplomatic and commercial relations between the nations are essential to the progress of civilization.

The Romance of Metal Working

MOST of us in the metal-working industry are so close to our jobs that we have little opportunity to grasp the fascinating romance of man's progress in the fashioning of metal. Perhaps one reason for this lack of imagination is the magnitude of the strides that have been made in the last generation. Epoch-making achievements have followed one another in such rapid succession that we seem to have lost our power to be impressed, and we take them simply as a matter of course.

The niche in the history of the human race which the metal worker is carving out for himself is no unimportant one. Man must eat and must provide clothing and shelter for himself above all else, but in our modern form of life he would have a desperate job in providing these necessities without the aid of the metal worker and his products.

There was a time when the head of the family could sally forth with his bow and bring down a deer with a flint-headed arrow, or knock over a rabbit with his club. With a few nuts and berries to piece out the menu he then had plenty to eat and could fashion clothing from the pelt of his kill. Men were few then, however, and animals were many. The case is different now and the farmer must till and sow and reap for all of us with some of the most complicated of the metal worker's contrivances. Similarly with our garments—carding, spinning and weaving machinery form a vital link in the chain between the raw wool or cotton and the back of the wearer.

And then transportation—without it in its present high state of development the evolution of our modern civilization would be impossible. The railroads, the motor trucks, even horse-drawn vehicles would never have existed without the metal worker's skill and vision. And now we have left the ground and are transporting passengers and goods by airplane and airship, thanks once more to the metal worker.

These are but a few of the many activities of present-day civilization which depend upon the work of the molder of metal but if there were no others his place would be secure. Too little attention is paid to the romance of his achievements, but then we are not living in a romantic age. They thought more of this phase in past generations and have handed down many myths, sagas and legends of the marvelous deeds of the metal workers of old for us to smile at, perhaps, but to ponder over at the same time. A few of these old tales have been collected for the AMERICAN MACHINIST and will appear from time to time. They will be very short. The first is printed on another page of this issue and tells of the magical deeds of Hephaistos, armorer of the gods upon Olympus.

Another Reason Why Commercial Aviation Languishes

PEOPLE are just beginning to wake up to the major importance of adequate terminal facilities for any transportation system. The more advanced the means of transportation and the greater the value of speed, the more important becomes this factor. Consequently when we get to aerial travel where speed is the first consideration, the location and adequacy of the terminal facilities determine the commercial feasibility of the whole scheme.

Henry M. Crane, the engineer whose eminence in his chosen work led to his selection as the man to put the Hispano-Suiza airplane engine into production in this country, in making his report to the S. A. E. on the development of aviation during 1921, told a story which emphasizes the point we are trying to make.

A business man who wanted to decide for himself whether transportation by air was a commercial possibility made a trip to Atlantic City. He left his office on Forty-second Street, New York City, and made a run in a taxi up Riverside Drive for about forty blocks. Here he had to walk down a long flight of dirty steps, cross the railroad tracks and pick his way through a dark, riverside yacht club to a dingy rowboat with an inch of water slopping around the bottom. He was rowed out to the seaplane only to find that the pilot had not finished taking on gasoline. More delay.

Flying time to Atlantic City was two hours as the result of the head wind prevailing at the time of year when the trip was made. A good landing was made in the inlet and then the voyager sat and fumed while the pilot signaled for a rowboat to come out from shore. The boat finally arrived and after a tedious trip deposited the passenger on shore at a point where no taxicabs were in evidence and the trolley cars ran about once in every so often.

He reached his hotel some four hours after leaving his office. By railroad it would have taken him three and a half and with less discomfort and annoyance. As a result of the trip our friend is not convinced that the dawn of universal commercial aeronautics is imminent. And all because the terminal facilities were inadequate.

Publicity for Trade Data

MR. HOOVER has performed another act of real service to business in general by his painstaking work regarding the attitude of the Attorney General as to trade associations of various kinds. The so-called "Hardwood decision" has caused much uneasiness in many quarters. As pointed out by the Attorney General in his reply to Mr. Hoover's concise questioning, the unlawful part of the work of the association named was in confining the information to the members of the association.

The whole decision is a victory for those who advocate more publicity in all business dealings. With data as to business conditions available to consumers, as well as to manufacturers and to dealers, a more stable condition of the market could, in the opinion of many, be depended upon.

Mr. Hoover favors wider publicity as to business data, believing that by helping both buyer and seller it will aid business in general. The income tax laws have broken the ice and made us a little more accustomed to giving statements of what we formerly thought was secret information. There is every indication that we are to have more publicity and it is believed by many that it will be better so.

Good Material Regulation Makes a Difference

IF THERE is any one item which affects the economical production of machine work most vitally it is probably that of keeping a constant supply of material going through the shop. It is comparatively easy to go over a list of parts and place orders for all the material. And in too many cases so doing is the end of the matter until the shop strikes a snag and is held up because some minor part has not been delivered.

No matter how small the shop, getting stock in on time is of great importance. A simple system can be devised by which the proper person will be notified of expected delivery long enough before the material is needed, to permit reordering or following up the delinquent source of supply.

There is probably no better way to handle this problem than to use a simple chart containing the different items needed. This chart can show the dates on which materials of various kinds are due and whether they have been delivered or not. It can also be arranged to show the production department that everything is ready to go ahead. Either an extension, or another chart, can show the progress of the work through the shop. Such a chart is not only a record of progress, but when posted is an incentive to keep up to schedule.

In this connection we can readily see the effect of good or bad methods of handling material in the shop. With good facilities such as tote-boxes, racks and trucks, the time lost between operations or departments will be slight. Where good handling facilities are not provided, work piles up and prevents that steady movement necessary for uninterrupted production.

Seeing that ordered material is actually delivered on time, and its speedy and economical handling play an important part in production costs. Now is a good time to study these two phases of the system in use in your shop. It is quite possible that a slight change in method may add much to the smoothness with which work will flow through after the orders begin to come in in force.

Inferior Cutting Tools Are Costly

THESE are particularly trying days for the shop man who wishes to practice real economy in making his purchases. He is confronted with the necessity of making every dollar count and yet faced with the danger of losing ten dollars for every dollar he apparently saves.

No better illustration of this can be had than to consider the case of such cutting tools as drills, taps and milling cutters. There is a great temptation to save a few dollars here and there in purchasing these and similar tools. They all look much alike on the outside. But it takes only a little dropping off in production to eat up all the saving on a milling cutter. The nose of the spindle of a milling machine which cost two thousand dollars is a poor place to save a few dollars in inferior cutters.

The purchasing agent who knows only the dollar sign, can do a lot of harm at such a time as this. This is especially true in places where, for some reason or other, the banker may be having a finger in the business. Not realizing the difference in production between medium and first quality cutters, any saving in the first cost appeals to the financial man of the institution. Cutters all look alike to him and he pats himself on the back for the economies effected.

Real production costs, however, tell a very different story. There is no better place to "save at the spigot and waste at the bung" than in the matter of cutting tools. They are the business end of the machine tool and without good cutters there is little chance for economical production.

This is the time when the men responsible for results should protest, loudly if necessary, against this false type of economy. Even if they are overruled they should go on record as protesting against the purchase of inferior tools. Then when they fail they can put the failure squarely up to the management, where it belongs.

It never pays to handicap a good machine with a poor cutting tool!

We Still Have the Small Shop

WE BECOME so accustomed to thinking of large plants with men numbered by thousands, that we somehow get the notion that the small shop is a thing of the past, or at least passing. And then some one trots out some new statistics that wake us up to the fact that after all the big shop is still the exception.

This time it is the National Industrial Conference Board that is responsible for the facts that jar us a bit. According to the board only two per cent of the manufacturing establishments in the country employ one hundred or more men. When it comes to the total number of employees, however, the large shops, that is the shops of one hundred men or more, employ almost two-thirds of the total.

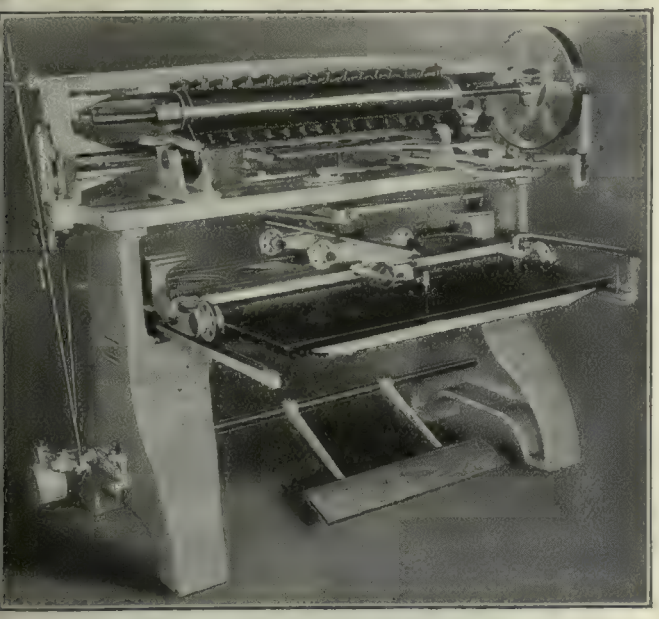
But the fact that ninety-eight per cent of the shops are small indicates clearly that there is still a field for the standard types of machine tools. The engine lathe and planer still have their place and will continue to be used for many years to come.

The figures point out that while we have an increasing number of large shops with their more or less specialized machinery, we must not overlook the fact that the small shop is still a powerful factor in the machinery field.

Shop Equipment News

Dover Pantograph Marking Machine

The pantograph machine shown in the accompanying illustration has recently been placed on the market by George W. Dover, Inc., Eddy St. and Thurbers Ave., Providence, R.I. It is intended primarily for marking in multiple by means of diamond-pointed tools. The design to be reproduced is placed on the table at the front of the machine, and traced by means of the point connected to the pantograph motion. The pantograph operates the arm holding the diamond-pointed tools. The number of these tools can be varied, and as many as thirty-four may be employed. They cut both on the top and on the bottom of the work or roll.



DOVER PANTOGRAPH MARKING MACHINE

The roll shown is of the type usually employed for printing silk and calico, and is made of copper. After being coated with varnish, it is placed in the machine. When the tracing point is run over the design, the diamonds cut through the coating and into the copper. The designs are made in multiple, so that it is possible to cover the entire length of the roll at one time. After the roll has been cut over its entire periphery by indexing it, it is immersed in an acid etching solution.

Another use for the machine is in marking lenses with trade marks that are invisible to the naked eye. A table is mounted on the machine in the position occupied by the roll. The top set of diamonds is set in rotation by individual motors mounted on each spindle, so that from twelve to fifteen lenses per minute are cut simultaneously.

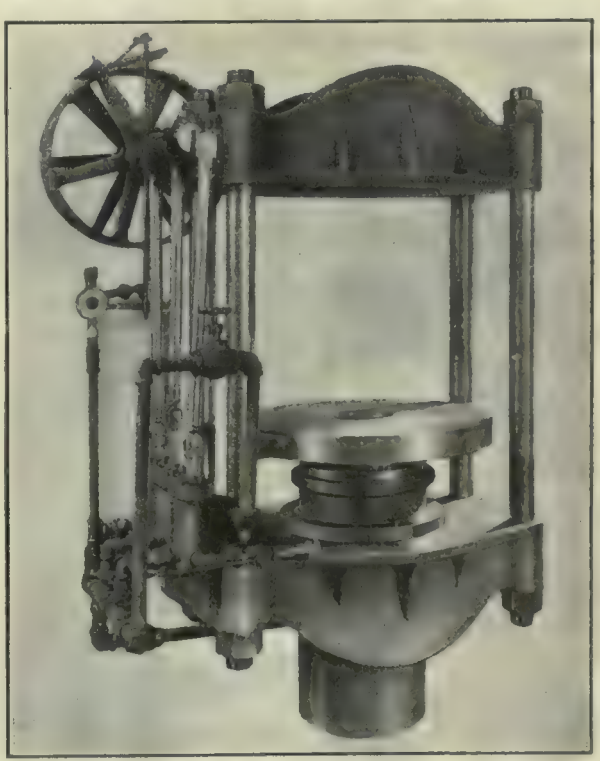
The machine is ordinarily driven without power, the movement of the diamonds being obtained from the pantograph that is driven by hand, while their pressure against the work is controlled by the pedal. The machine is said to be very sensitive in its operation and rigidly constructed. A total of fifty-four ball bearings are used. The machine will handle a roll 60 in. long.

West Hydraulic Tire Press

An hydraulic press for use in pressing solid rubber tires for automobile trucks on and off their wheels, is shown in the accompanying illustration. It has recently been placed on the market by the West Tire Setter Co., Rochester, N. Y. A ram 16 in. in diameter is employed to give a maximum pressure of 250 tons at the platens. The large ram size is stated to have an advantage in that it does not require an excessive initial pressure on the oil used to drive it.

The frame is made of cast steel. The top platen is cast solid with the top resistance piece; the bottom platen is steel and removable from the ram. The construction is intended to prevent the springing that may occur when structural steel beams are employed. The platens are 42 in. in diameter. The maximum vertical distance between them is 37 in., while the stroke of the ram is 33 in. The four vertical strain rods are each 4¼ in. in diameter, and are 43 in. apart.

The press is driven by a belt on a 30-in. pulley running at 175 r.p.m. The pump is located at the side of the lower resistance member. It has three plungers, one large and two small. The larger plunger, 2 in. in diameter, is intended for operation at low pressure only, and is utilized for filling the pipes and cylinder quickly. When a pressure of about 200 lb. per square inch has been reached, the large plunger is automatically cut out by means of a by-pass valve. The two small plungers complete the pressure, so as to build up the required tonnage on the work. The machine has a height over all of 9 ft. 3 in., although the height from the floor line to the top of the driving pulleys is 7 ft. 3 inches.



WEST 250-TON HYDRAULIC TIRE PRESS

Artisan 11 x 24-in. Gap Lathe

The Artisan Manufacturing Co., Cincinnati, Ohio, has lately brought out the gap lathe shown in the accompanying illustrations. The lathe is provided with a



FIG. 1. ARTISAN GAP LATHE (FRONT)

quick-change feed box containing, besides the usual gears, a clutch for engaging and disengaging the feed. The clutch is operated by the lever just below the gap shown in Fig. 1. The double-crank handle at the right of the feed box is for manipulating the feed by hand and may be used either in the position shown or removed and attached to the end of the lead screw. All standard threads from 8 to 224 per inch can be cut, including 11½-in. pipe thread.

FIG. 2. ARTISAN GAP LATHE (REAR)

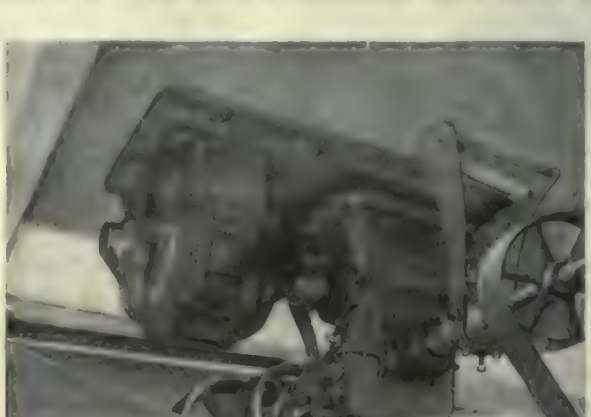
The lathe swings 61 in. over the carriage and 16 in in the gap. An adjustable plug at the left of th apron, bears on the shelf below the gap and support the carriage when it is partly bridging the gap.

The cross-slide can be swiveled for turning angle and when set for straight facing is doweled in position the dowels having squared ends to fit the toolpos wrench. The countershaft is mounted in self-alignin bronze bearings secured to the legs at the rear and ma be driven from a lineshaft or from a ½-hp. moto attached to the bed of the machine, as shown in Fig. 2 In either case the drive is by a friction pulley wit cone-type clutch and operated by the lever to be see at the bottom of the bed in Fig. 1.

The cone pulley on the headstock is geared to th spindle. Sliding back gears together with a three-ste cone pulley give six speeds, which are arranged i geometrical progression. The hole through the spindl is 1⅛ in. in diameter and has a No. 5 Morse taper. Th centers are No. 2 Morse taper and the live center i inserted in a reducing collet in the spindle. A follo rest and steadyrest are included in the regular equip ment.

Cleveland Worm Drive for Line Shaft

An installation of a motor driving a shop line shaf through worm gearing is shown in the accompanyin illustration. This drive arrangement has recently bee



CLEVELAND WORM DRIVE FOR LINE SHAFT

placed on the market by the Cleveland Worm and Gea Co., Cleveland, Ohio. A number of advantages ar claimed for the drive, among which is the ability t transmit power with smoothness and quietness. Th connection between the motor and the shaft throug the worm and worm wheel eliminates fluctuation i speed due to slip, as may occur with a belt. The larg ratio of reduction of the worm makes it possible to us a motor operating at 1,800 r.p.m., even for shafts run ning at low speed. It is claimed that the drive ha an efficiency from 93 to 97 per cent, varying with th ratio of reduction.

In most cases where a steel construction of sufficien strength is available, the reduction unit is mounted o a cast-iron bed plate with the motor, and the whole uni attached to the ceiling. It may be placed in the upright position on a platform. The gearing is rugged an durable, so as to eliminate the necessity for frequen adjustment and replacement. The lower half of th

housing forms an oil bath, providing for the lubrication of the complete unit. The only attention required is the maintaining of the correct amount of lubricant, which action is aided by two petcocks on the side of the housing.

The drive is very compact and, being completely inclosed, requires no safety guards. The fact that it is protected is of special importance in plants, such as those making food products, where extreme cleanliness is desired and where dust is apt to be set in motion by moving belts. It is of importance also, where there are chemicals or abrasive dust that are detrimental to the life of belts.

Sundstrand 14-in. Toolroom Lathe

The Rockford Tool Co., Harrison Ave. and Eleventh St., Rockford, Ill., has added to its line the 14-in. Sundstrand toolroom lathe shown in Fig. 1. The lathe can be furnished with either cone or geared headstocks, that of the former type being similar in general design to the 16-in. Sundstrand lathe described on page 80, Vol. 48, of AMERICAN MACHINIST.

The geared headstock is completely inclosed, with all gears running in oil. Sliding gears are used exclusively. The clutch is of the friction type, and an automatic brake is provided for stopping the spindle when the clutch is disengaged. All speed changes can be made while the machine is in motion. A cover on top of the headstock provides easy access to the gears. The 4-step cone headstock is single back-geared, and takes a 2¼-in. belt. The back-gear ratio is 8½ to 1.

The spindle is made from crucible steel and is provided with taper bearings. The bearings can be easily adjusted by means of a take-up nut at one end of the spindle. They are provided with lamb's-wool felt oilers drawing oil from a reservoir filled from large oil cups.

The bed is well braced and of large depth, to prevent springing. The ways are chilled to increase the wearing quality and finish. The carriage has a full-length bearing surface on the bed. Its ends are provided with bronze wipers with felt inserted, for cleaning and oiling the V's.

The apron is of the box or double-wall construction, as shown in Fig. 2. All gears and studs are supported and the entire mechanism inclosed by the inner plate, which is tongued and fastened to the side walls of the apron. A third or out-board bearing supports the rack pinion at its outer end back of the rack. The construction tends to eliminate binding strains in the apron under heavy cuts. The rack pinion can be drawn out of mesh with the rack when thread cutting. The threading nut and longitudinal feed cannot be engaged at the same time. Three oil cups on the apron are provided for oiling the front and rear bearings and worm. The bronze threading nut is fitted in dove-tailed ways and gibbed on one side for wear adjustment.

The end thrust of the lead screw is taken on ball bearings mounted in a bracket at the tailstock end of the lathe. The action of the carriage is controlled by a handle on the reverse or stop rod at the right side of the apron. When cutting threads, the carriage can be automatically stopped by the use of stop collars on the stop rod. When the position of the handle is reversed, the apron moves back to the stop collar at the opposite side and stops automatically, ready to take another cut.

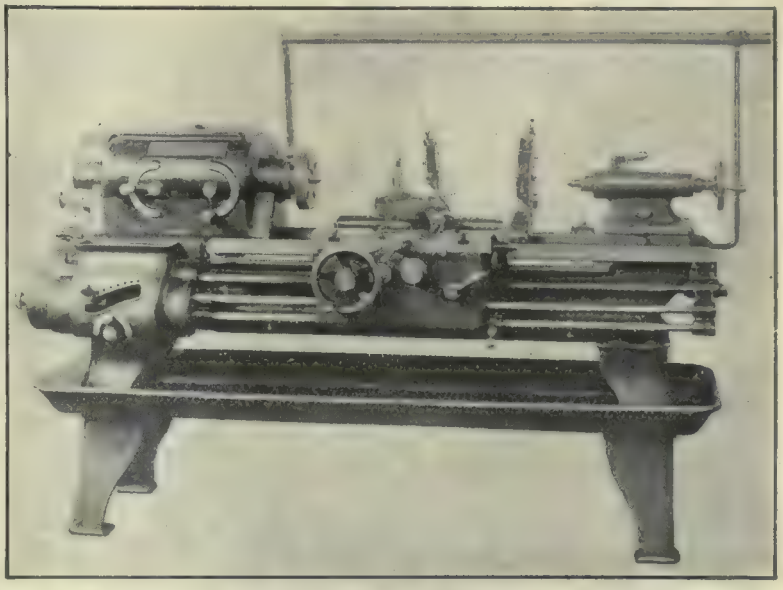


FIG. 1. SUNDSTRAND 14-IN. TOOLROOM LATHE

Specifications—Swing: over bed, 15 in.; over carriage, 8⅜ in. Distance between centers with 6-ft. bed and tailstock flush with end of bed, 34 in. Hole through spindle, 1⅛ in. Taper hole, No. 3 Morse. Travel of tail spindle, 6½ in. Feeds, from 6 to 268 r.p.m per inch. Threads, 1½ to 92. Number of spindle speeds, 12. Cutting tool, 1¼ x 1 in. Approximate weight with 6-ft. bed: net, about 2,150 lb.; domestic shipping, 2,300 lb.; export shipping, 2,500 lb. Floor space of 6-ft. bed plain lathe with oil pan, 27 x 82 in.

When the handle is in the neutral position, all gearing to the gear box is disengaged. A threading dial is furnished to facilitate thread cutting.

The quick-change gear box is arranged for easy operation of the controlling levers. There are eight gears on the cone. Forty-eight thread and feed changes ranging from 1½ to 92 are provided. By an intermediate slip gear beneath the spindle, the gear box can be disconnected.

The tailstock has an eccentric clamping device to lock it to the bed. A graduated collar is provided at the rear of the tailstock spindle. The taper attachment has graduations in both taper per foot and degrees. The relieving attachment is so arranged that external and internal cuts at any angle can be made, and it permits taper and helical relieving at the same setting. The relieving attachment can be used in connection with the taper attachment, which takes the jar of the recoil off the crossfeed screw. A draw-in attachment with collets to take bars up to ⅞-in. round can be furnished, as well as special collets.

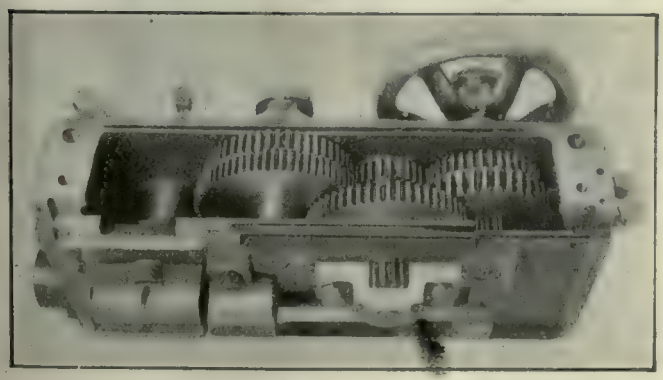


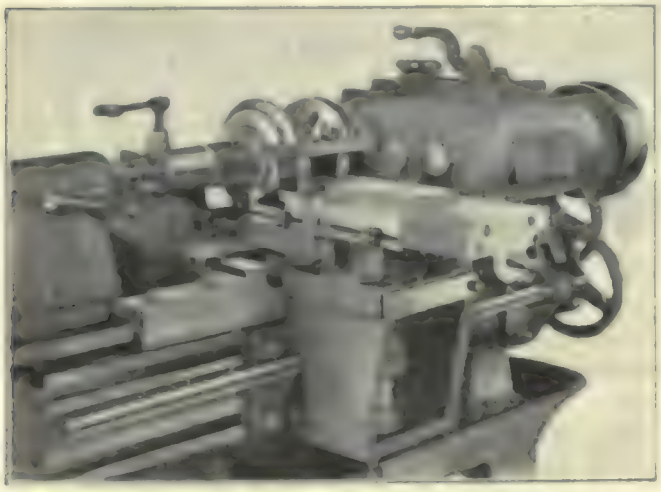
FIG. 2. APRON OF SUNDSTRAND LATHE

Seneca Falls Back-Facing Attachment

The Seneca Falls Mfg. Co., Inc., Seneca Falls, N. Y., has recently placed on the market a universal back-facing attachment for use on the Adams "short-cut" lathe. The device, shown in place on the back of a lathe in the accompanying illustration, is operated by power. It is particularly adapted to such work as bevel gears, the bevel cuts being made at the same time that the shank is being turned. Nine in-feeds ranging from 0.003 to 0.050 in. per revolution of the spindle are procurable. The motion is obtained through a train of gearing from the headstock driving a splined shaft at the rear of the machine.

Reversal is accomplished through sliding positive clutches, operated through worm gearing. Twenty-seven reverse feeds, ranging from three to fifteen times whatever forward feed is engaged, enable the operator to secure the proper timing action necessary for back-facing, necking, under-cutting and grooving.

No cams are used. The in-feed stop is so located and operated that it will reverse automatically, and the out-feed automatically stops at the completion of the cycle. The movement of the back-facing tool is accomplished by means of a screw and nut, thereby giving a smooth, even motion. The relation of the feeds to the turning and facing slides of the



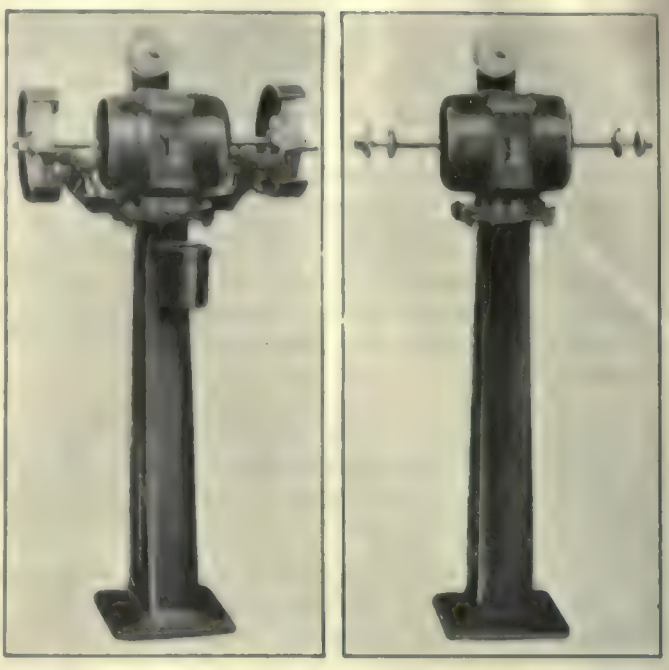
BACK-FACING ATTACHMENT ON ADAMS LATHE

lathe allows of many combinations to suit the work, and makes the lathe a semi-automatic machine. One operator is thus enabled to run several machines.

Columbia Electric Grinder and Buffer

The Columbia Manufacturing Co., Belleville, Ill., has recently placed on the market the grinder shown at the left of the accompanying illustration. The machine is intended for sharpening tools and performing general light grinding in a machine shop or garage. It is driven by a ½-hp. electric motor, operating at 1,800 r.p.m. on single-phase, alternating current of 60 cycles and either 110 or 220 volts. It may take current from a lamp socket. The shaft runs on S. K. F. ball bearings. The motor is completely inclosed, so as to exclude dust.

The grinder can be supplied for bench use, although ordinarily mounted on a pedestal. It is equipped with adjustable toolrests and guards for the wheels, as well as a water pot. Wheels 8 in. in diameter and either 1 or 1½ in. thick are used. The spindle is ¾ in. in diameter and 23 in. long. A switch is mounted on the motor.



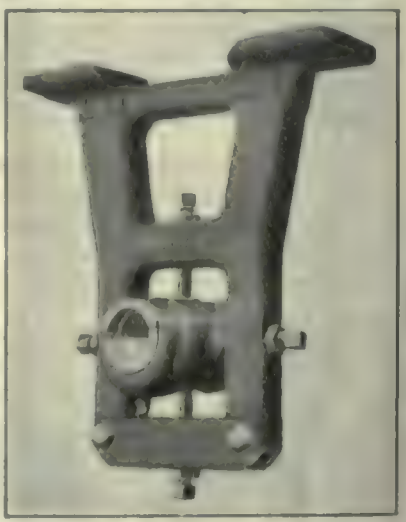
COLUMBIA ELECTRIC GRINDER AND BUFFER

Very little floor space is occupied by the machine. It thus may be conveniently installed near each battery of machines in a shop, so that machine operators need go but a short distance in order to sharpen cutting tools. The spindle is 36½ in. above the floor. The machine weighs 145 lb. complete.

When desired to use the machine for buffing purposes, the guards and other fittings are not necessary. The view on the right of the illustration shows the buffer. The spindle is of sufficient length to permit of moving the work about the polishing wheels.

Dodge Pressed-Steel Hanger

The Dodge Sales and Engineering Co., Mishawaka, Ind., has recently placed on the market the pressed-steel line-shaft hanger shown in the accompanying illustration. The hanger is intended for general use under conditions where extreme vibration is not encountered. It is not adaptable to heavy-duty work, but rather for service under moderate conditions where first cost is of the greatest importance. Its most notable feature is its lightness and strength. The bearing floats in the hanger so as to align itself to the shaft. In addition, by means of the setscrews equipped with locknuts, the bearing can be brought to the proper height and lateral position. The hanger is made of sheet steel, pressed to shape and riveted and bolted together.



DODGE PRESSED-STEEL HANGER



NEWS SECTION

Extent of Recent Sales of Surplus Machinery

The Material Sales Division of the Emergency Fleet Corporation is continuing its sales of surplus machinery, equipment and supplies. Recent sales of machine tools at the Hog Island Yard have amounted to about $75,000, and about $50,000 worth of small tools have been disposed of. The railroads have been consistent buyers and several of the larger roads have their inspectors at Hog Island at the present time.

During the month of December sales amounting to approximately $300,000 were consummated at the yard of the Merchants' Shipbuilding Corporation, Bristol, Pa. Material sold included cranes, air compressors, electric equipment, machine tools, small tools, etc.

Recent sales of machine shop equipment at the Wilson Point Ship Yard, South Norwalk, Conn., amounted to approximately $6,000.

First Aid Course for Industrial Employees

The State Department of Labor, New Jersey, has arranged for a series of lectures on first aid to injured and sick employees at all industrial plants in Newark and vicinity. The course of instruction will extend for a period of six weeks, and local factories have been requested to have at least one representative present for each fifty workers at the plant. At the conclusion of the series, those attending will be examined in elementary first aid and certificates of proficiency will be awarded to those entitled. The lectures are given free of charge and are under the direction of Dr. Edgar Holden.

Steel Treaters Meet Next Week

Plans have been completed for the sectional meeting of the American Society for Steel Treating, which is to be held at the Hotel McAlpin on Friday, March 3. Fourteen New York and New England chapters are expected to send representatives to this meeting. The society also extends an invitation to non-members to attend the sessions.

A program of seven technical papers has been arranged, varied by an informal dinner and get-together meeting. Honorary membership will be conferred on Dr. John A. Matthews. George L. Norris is chairman of the general committee.

Implement and Tractor Manufacturers Organize

The Manufacturers' Tractor and Agricultural Export Club has been organized by manufacturers of farm implements and tractors, with a view to increasing export business and bringing about greater co-operation and helpfulness in the trade. David A. Anderson, Emerson-Brantingham Co., Rockford, Ill., has been elected chairman; N. G. Snyder, Oliver Chilled Plow Co., South Bend, Ind., vice-chairman; and, as members of the executive committee, W. J. Wieland, International Harvester Co., Chicago, Ill.; P. Aubeck, Avery Co., Peoria, Ill.; and H. R. Jahns, Aultman & Taylor Machinery Co., Mansfield, Ohio. Additional companies in the new organization are Lombard Auto Tractor-Truck Corporation, Waterville, Me.; Rock Island Plow Co., Rock Island, Ill.; Cleveland Tractor Co., Cleveland, Ohio; Minneapolis Steel and Machinery Co., Minneapolis, Minn.; A. B. Farquhar & Co., York, Pa.; Bateman & Companies, Inc., New York, N. Y.; and the Parrett Tractor Co., Chicago, Ill.

Automobile Tax Reaches 8 per Cent of Value

The average automobile owner is now paying what is the equivalent to an 8 per cent tax on the assessed value of his car, according to George C. Diehl, president of the American Automobile Association. To tax motor car owners further, as has been proposed in connection with plans for raising the soldier bonus appropriation, would be class legislation of the most pernicious variety, he declared. He pointed out that during 1921 automobile owners paid $120,000,000 for registration fees alone. A fifty-cent horsepower tax would place an additional burden of $150,000,000 a year on car owners. A tax of three cents a gallon on gasoline would cost the motorists of the country $150,000,000. Mr. Diehl analyzes the motorist's 1921 tax bill as follows:

Federal excise tax, passenger cars	$64,388,184
Federal excise tax, motor trucks	11,610,066
Federal excise tax, accessories, parts, tires, etc.	39,518,009
State motor vehicle registration fees (est.)	120,000,000
Personal property taxes (est.)	75,000,000
Gasoline tax in fifteen States, 1 and 2c. per gal., 1922 (est.)	10,500,000
Local motor, franchise, mileage, business, etc. (est.)	10,000,000
Municipal registration and license fees (est.)	1,000,000

Hoover Advocates Aid to Railroads

In treating railroad ills, Secretary of Commerce Hoover advocates the removal of the cause before "aching actually sets up." This is particularly true, he declares, of the matter of equipment. Steps must be taken now if car shortage later on is to be avoided. He compared the railroad situation with that in the agricultural industry. In the latter industry the acuteness of the situation was very apparent, and the Government, through the War Finance Corporation and the Farm Loan Board, placed its credit behind the farmer. The mere fact that many railroad troubles are ones of anticipation, he pointed out, should not interfere with the application of the remedy in time to prevent the ache.

Railroads Increase Employees and Compensation

Additional employees, to the number of 35,806 were employed by the Class I railroads during October, 1921, than were employed in September, figures just made public by the Interstate Commerce Commission show. The increase in compensation was $13,630,137. The 2,528 employees in the Class A professional engineering group received $594,929 in October of 1921; the 3,193 employees in Class B received $584,150, while the 2,622 employees in the subprofessional class received $373,501.

Norton Company Changing N. Y. Salesrooms

The Norton Company, manufacturer of grinding machinery, of Worcester, Mass., will abandon its New York salesrooms on May first. According to plans just announced by S. J. Bell, New York manager, the company will retain sales offices in the Dodge Building, 53 Park Place, but the stock from the old salesrooms on Chambers St. will be carried by Topping Bros., at 122 Chambers St. It is also announced that a sales agency for northern New Jersey will be established with Ludlow & Squier, in Newark, N. J.

Machinists to Meet Miners

The International Association of Machinists has accepted the invitation of the United Mine Workers to participate in the conference on the coal wage agreements.

Attorney General's Tentative Opinion Regarding Trade Associations

The hardwood decision regarding trade associations has caused much uncertainty as to the legality of trade associations in general. With the idea of clearing up the situation as far as possible, Secretary Hoover laid the case before Attorney General Daugherty in his usual direct and concise manner. After outlining the case in general Mr. Hoover said:

"It is with much earnestness that I claim there is propriety, generally speaking, in trade associations. Their lawful field of endeavor is large, and their activities work for promotion and advancement of the public welfare and for progressive economic organization. In making this statement, I am not unmindful of the fact that the impression exists with a small minority that individual prohibited acts may be accomplished by organization under the disguise of a trade association. However, to make my position clear regarding the trade associations, the existence of which I advocate, I desire to say that I have always taken the view that no body of men could combine in the form of a trade organization and do any act or thing forbidden by law, if it was undertaken by them outside of a trade organization. The character of trade organization, the existence of which should be preserved, is one that carries lawful purposes only in its articles of association; its activities must be in harmony with its declared purposes. The articles of association, with their lawful, declared purposes, must not be used as a mask to hide unlawful purposes. In other words, the organization can not be used to conceal or disguise any contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the officers of the organization or on the part of the membership or any part thereof to engage in activities in restraint of trade or otherwise in violation of the anti-trust laws.

"If information regarding production, capacity and distribution by districts, with average prices for grades, brands, sizes, styles, or qualities sold in the respective districts for specified periods of time could be given to the public at the same time that such information is available to the members of an association, in my judgment, great public good would result. With this information available, everyone dealing in the products of a given industry, whether buyer or seller, would have the same information regarding conditions and, in dealing with one another, would have knowledge of the same facts upon which to form their judgments as to the proper course to pursue."

Then follow these specific questions:

(1) May a trade association provide for its members a standard or uniform system of cost accounting and recommend its use, provided that the costs so arrived at by the uniform method are not furnished by the members to each other or by the members to the association and by the latter to the individual members?

(2) May a trade association advocate and provide for uniformity in the use of trade phrases and trade names by its respective members for the purpose of ending confusion in trade expressions and for harmony of construction as to the meaning of trade phrases, names and terms?

(3) May a trade association, in co-operation with its members, advocate and provide for the standardization of quality and grades of product of such members, to the end that the buying public may know what it is to receive when a particular grade or quality is specified; and may such association, after standardizing quality and grade, provide standard form of contract for the purpose of correctly designating the standards of quality and grades of product; and may it standardize technical and scientific terms, its processes in production, and its machinery; and may the association co-operate with its members in determining means for the elimination of wasteful processes in production and distribution and for the raising of ethical standards in trade for the prevention of dishonest practices?

(4) May a trade association collect credit information as to the financial responsibility, business reputation, and standing of those using the products of the industry; and may the association furnish such information to individual members upon request therefor, provided such information is not used by the association or the members for the purpose of unlawfully establishing so-called "black-lists."

(5) May a trade association arrange for the handling of the insurance of its members, including fire, industrial, indemnity, or group insurance. In other words, can the members of an industry, through the agency of a trade association, arrange for or place all of the insurance of the members?

(6) May a trade association, in co-operation with its members, engage in co-operative advertising for the promotion of trade of the members of that association engaged in the particular industry; and may the association engage in such form of promotion by furnishing trade labels, designs, and trade-marks for the use of its individual members?

(7) May a trade association, for and in behalf of its members, engage in the promotion of welfare work in the plants or organizations of its members, which welfare work includes sick benefits and unemployment insurance for employees, uniform arrangements for apprenticeship in trade education, the prevention of accidents and the establishment of an employment department or bureau for co-operation with employees?

(8) May a trade association, in co-operation with its members and acting for and in behalf of its members, handle all legislative questions that may affect the particular industry, regarding factories, trades, tariff, taxes, transportation, employers' liability and workmen's compensation, as well as the handling of rate litigation and railroad transportation questions?

(9) May a trade association, in co-operation with its members and acting for and in their behalf undertake the promotion of closer relations between the particular industry and the federal and the state departments of government which may have administration of laws affecting the particular industry in any form?

(10) a. May a trade association collect statistics from each member showing his volume of production, his capacity to produce, the wages paid, the consumption of his product in domestic or foreign trade, and his distribution thereof, specifying the volume of distribution by districts, together with his stock, wholesale or retail?

b. And may such trade association, on receipt of the individual reports of each member, compile the information in each report into a consolidated statement which shows the total volume of production of the membership, its capacity to produce by districts of production, which, in some instances, include a state or less area, the wages by districts of production, the consumption in foreign or domestic trade by districts, the volume of distribution by districts, and the stocks on hand, wholesale and retail, by districts?

c. And if, after compiling the information as aforesaid, the information received from the members as well as the combined information is not given by the association to any other person, may it then file the combined statement with the Secretary of Commerce for distribution by him to the members of the association through the public press or otherwise and to the public generally and to all persons who may be in any way interested in the product of the industry, it being understood that the individual reports for the members should cover either weekly, monthly, quarterly, or longer periods as may be deemed desirable by the members, and, when a period is adopted, the report for each member shall cover that period, and the combined report shall be for that period?

(11) a. May a trade association, at the time it collects the production and distribution statistics above outlined, at the same time have their members report the prices they have received for the products they have sold during the period taken, specifying the volume of each grade, brand, size, style, or quality, as the case may be, and the price received for the volume so sold in each of the respective districts where the product is sold?

b. And may the association, without making known to any person the individual price reports of any member, consolidate all of the reports into one, and show the average price received for the total volume of each, grade, brand, size, style, or quality, as the case may be, distributed in each district covered by the distribution statistics for the period covered by each individual report?

c. And may the association after making such compilation send the compiled report as to average price, as aforesaid, to the Secretary of Commerce, to be by him distributed to the public and to any or all persons who may be interested in the particular industry making the report?

Except for pointing out different phases of the trade mark situation, No. 6, Mr. Daugherty agreed with Mr. Hoover. And this difference here was due to a misinterpretation of Mr. Hoover's meaning, which meant the using of some such slogan as "Made in Grand Rapids" in connection with distinctive trade marks for each manufacture.

These questions may be studied to advantage by members of various trade associations. Mr. Daugherty's opinions are not final, but merely tentative.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Unquestionably the most important event in the business world last week was the sensational rise in the price of wheat, which sent the May contract in the Chicago market up to $1.41⅞ on Wednesday. It is true that by this time the farmers have sold most of last season's harvest and, therefore, will not be directly benefited until the 1922 crop is marketed, but the advance is nevertheless significant. In connection with the rise in other grains, as well as in pork and cotton, the strength of the stock market and further decided easing in money rates, it tends to confirm the diagnosis previously made in these articles that we are at the beginning of a period of credit expansion induced by the conversion of assets hitherto "fixed" into marketable securities.

Take for instance the sale of $75,000,000 farm loan bonds a few days ago. They are secured by mortgages on farm land worth probably $150,000,000. Until the present credit machinery was provided and as long as the employment of credit was restricted by its high cost most of this capital was static and inert, but half of it is now represented by these bonds which can be used as collateral upon which to borrow at almost any bank.

As for every loan made there must be a corresponding increase in the deposits of the bank where the proceeds of the loan are deposited the result will be a greatly accelerated circulation of the bank check currency used to put this augmented supply of credit at work.

Credit Expansion

This is but one illustration of how in the development of modern credit machinery we have succeeded in making it possible to use the same capital over and over with great rapidity just as in the triple expansion engine the same steam is used over three times before it is condensed into water and has to be returned to the boiler to be again converted into steam.

I stress this point because in attempting to discern the probable course of business it is important to realize the extent of the credit expansion which modern machinery will permit. When this expansion provides a surplus, as at present, interest rates decline until the low cost of borrowing attracts speculative demand for funds to buy bonds, stocks and goods.

It must be admitted, however, that one of the chief propelling forces in this inflationary cycle has been somewhat weakened by the developments of the week. The probability of a Federal soldiers' bonus has been decreased because its proponents are discovering that they cannot pick the funds to pay it out of the air and that it seems impossible to find any new taxes on which general agreement can be reached. The sales tax has been revived despite the improbability that even with President Harding's support it can be put through the House. The obstacles in the way of finding a new source of revenue may lead to a postponement of the entire program until the next fiscal year, and it is not impossible that the bonus scheme will defeat itself because of its inherent impracticability. Appreciation of this caused Liberty bonds to turn upward last week after a steady decline since Jan. 13, the unlucky day on which the Republican leaders decided on the plan.

Prices May Go Up

It is still possible that the present obstacles in the way of increased taxation will be dodged by selling bonds, and even without such a temporary evasion of the issue with the taxpayers new financing in 1922 is likely to be almost as large as in 1921. States and municipalities continue to take advantage of the tax exemption which their obligations enjoy to sell huge amounts of bonds which expand credit in the manner described above, and until their borrowing is checked by rising interest rates the trend of prices is likely to be upward.

There is of course reason for the advance in wheat in the serious condition of the winter crop sown last autumn. An observer just returned from the West told me last week that possibly millions of acres would not produce enough to justify harvesting, and world supply and demand seem to be in just that delicate position of near-equilibrium which makes the market sensitive to crop reports. It is also very unlikely that we shall have another yield as large as those of the past four years, for the same observer tells me that seed merchants report unusually heavy sales of clover, indicating that more ground than usual will be turned under. It is also known that most of the brood sows are being retained on the farms with the expectation of materially increasing the number of hogs raised this year.

Therefore, it is probable that the apparent surplus of corn will take care of itself in the same way that the surpluses of cotton, wool, coffee and other staples have in the past and that the surplus of sugar is likely to in the future — by automatically curtailing production and stimulating the discovery of new outlets for consumption. All this means, as Eugene Meyer, Jr., of the War Finance Corporation said last week in summarizing reports from his agents throughout the country, that "the farmer is being put in position to liquidate his debts gradually and that his normal purchasing power—so vital to the commercial, transportation and industrial interests—is being restored."

Supplementing this statement it may be pointed out that the reserve ratio of the Federal Reserve system increased last week to 76.4 per cent, that $15,000,000 was added to the gold holdings of the banks, and that reports are coming in of steadily increasing movement of freight and of higher railway earnings. As the farmers, banks and railroads improve their condition other industries are likely to be stimulated and so the revival will proceed until the cycle is completed.

Steel buying and mill operations are reported better, though new business is taken at the expense of price concessions. Copper is weaker, but buying of the red metal is generally concentrated in about one or two weeks out of six and the satisfaction of the demand withheld at present will probably be accompanied by another price advance.

Raw silk is also lower. These three commodities virtually exhaust the list of price declines, for the tendency of most other staples is upward, and at a grocers' meeting in New York last week specialists in the trade agreed that there would be an advance in the average price of groceries next month and that the market will be firm to rising during the year.

The automobile industry is reported more active and prices probably have touched bottom unless the competition of Henry Ford in the field of higher priced cars compels some radical cuts. In this connection a reduction in the price of Packards may be significant, and the announcement that the International Harvester Co. will sell a tractor at what is asked for the "Fordson" is another piece of news that has a direct interest for the farmer and is indirectly of great importance to every one in the United States, which, despite the growth of its manufacturing industries, is still a country that is mainly dependent upon agriculture for prosperity.

Austrian Iron and Steel Trade

Sales of iron are very favorable in Austria at present. The Alpin Montan Gesellschaft is about to carry out its big new investment program, enlarging the plant, building workmen's houses, etc.

German competition is not much felt. Inland demand takes up all the iron bars and girders, while tin sheets are being exported. Only a few articles which cannot be manufactured in Austria are imported from Czechoslovakia. At present, exports are specially directed to Rumania, as big investments are being made there which cause a great demand for iron products.

In Vienna the dealer's price for iron is an average of 12,000 crowns (1 crown = $0.0003 at present exchange) per quintal — 220.46 pounds. When sold abroad about 15 per cent more is demanded; some sales are effected against the better foreign currencies. One can say that the price for Styrian rod iron (bar iron) is about 8,100 crowns per quintal, while in October it was only 6,400 crowns.—*Commerce Reports.*

The Trend of Business Improvement—Plants Resuming

The Danville Stove and Manufacturing Co., Danville, Pa., has resumed operations at its plant following an extended shut down.

The Lehigh Stove and Manufacturing Co., Lehighton, Pa., has advanced production to a full-time operating basis, following several weeks of curtailment.

The Truscon Steel Co., Youngstown, Ohio, is arranging for early increase in operations at its plant, which is now running at about 60 per cent of capacity. It is expected to advance production about March 1.

The Pennsylvania Railroad Co. has placed its shops at Sunbury, Pa., on a full-time working basis, following a three-day week schedule for some time past. The plant is giving employment to about 550 men. The company has added about 200 men to the working force at its Renovo, Pa., shops, bringing the quota up to 1,350 operatives now at this plant. At the Logansport, Ind., shops, the operating schedule has been advanced from 37 to 48 hours a week, following a number of weeks of reduced operations, and employment will be given to about 900 men here.

The Danville Structural Tubing Co., Danville, Pa., manufacturer of pipes and tubing, resumed operations at its plant on Feb. 7, after an extended period of curtailment.

C. H. Wills & Co., Marysville, Mich., manufacturer of the Wills-Sainte Claire automobile, is increasing the working force at its plant and about 100 men have been added, making a quota of 1,000 operatives. Arrangements are being made to place the works on a full-time schedule this month.

The American Axe and Tool Co., Charleston, W. Va., is adding to the working force at its local plant, under full-time operating schedule. Capacity production is being maintained.

The Lehigh Valley Railroad Co. has reopened its locomotive shops at Sayre, Pa., which have practically been shut down since last April. The plant will work on a four-day week basis, with plans for early increase. The car shops will operate on a five-day week schedule.

The Scranton Stove Works, Scranton, Pa., has resumed production in the molding department, following an extended shut down. Employment will be given to about fifty molders.

The Hupp Motor Car Co., Detroit, Mich., has arranged a production schedule for the present year calling for twice as many complete automobiles as in 1921. Increased operations are now under way at the plant.

The Ford Motor Co., Detroit, Mich., has adopted a full-time production schedule at its tractor plant at Dearborn, Mich., and will maintain capacity operations with regular working force until further notice.

The American Car and Foundry Co., 165 Broadway, New York, has taken a contract from the Chicago, Burlington & Quincy Railroad Co., for 500 refrigerator cars and 500 cars of other type, and will handle the work at its different plants. An order has also been received for the construction of two marine elevator hulls, and this work will be carried out at the Wilmington, Del., plant. The working force at the last noted plant is being increased and about 100 men have been added during the past fortnight.

The Lincoln Motor Car Co., Detroit, Mich., recently acquired by Henry Ford, has resumed active production in all departments of the plant, and a large working force will be employed.

The Reading Iron Co., Reading, Pa., has adopted a night working schedule at its Danville, Pa., works, devoted to the manufacture of iron and steel bars, etc., in addition to regular daily production.

The El Paso & Southwestern Railroad has reopened its shops at El Paso, Tex., following a shutdown of a number of weeks. Employment will be given to about 275 men.

The Penn Seaboard Steel Co., Philadelphia, Pa., has resumed operations at its Tacony plant, following a complete shutdown for some time past. The company is operating at its steel casting plant at Chester, Pa., and has increased production at the works of the Titusville Forge Co., Titusville, Pa., a subsidiary organization recently acquired. Operations at the latter plant are about 300 per cent greater than the minimum point of last year.

The Keystone Auto Top Co., Philadelphia, Pa., manufacturer of automobile equipment, has adopted a night schedule of operations at its works.

The Pennsylvania Railroad Co., has resumed full-time operations at its Todd Cut shops, Wilmington, Del., at the same time adding about 120 men to the working force, making a total of more than 1,000 operatives now employed.

The General American Tank Car Corporation, Chicago, Ill., has taken an order for the construction of 500 box cars and 400 refrigerator cars for the Chicago, Burlington & Quincy Railroad.

The Cadillac Motor Car Co., Detroit, Mich., is increasing production at its local plants to a high-water mark, and has added to the working force until about 7,000 men are now being employed in the different departments. Current manufacture is about 20 per cent greater than at this season under normal conditions.

The Greenfield Tap and Die Corporation, Greenfield, Mass., is giving employment to about 600 men at its plant, and reports current orders booked as about 50 per cent greater as compared with the same month of a year ago.

The Coxe Traveling Grate Co., Port Carbon, Pa., has resumed full-time operations at its plant, giving employment to about 200 men in the shops. The plant has been idle for several weeks past.

The Mount Vernon Car Manufacturing Co., Mount Vernon, Ill., has taken a contract from the Chicago, Burlington & Quincy Railroad for the construction of 1,000 box cars.

The New York Central Railroad Co. is increasing operations at its car shops at Corning, N. Y., and a larger working force will be employed. About 110 men have been added during the past fortnight.

The American-Swedo Iron Co., Danville, Pa., has resumed operations at its plant, following a shutdown since last June.

The Fisher Body Co., Cleveland, Ohio, manufacturer of automobile bodies, is now operating on a basis of 100 complete bodies per day, and plans to bring manufacture up to a point of double this amount at an early date.

The Baird Machine Co., machinery manufacturer, of Stratford, a suburb of Bridgeport, Conn., recently increased the working day in its shop from eight to nine hours. Several of the old employees were re-employed.

The Bridgeport Manufacturers' Association, of Bridgeport, Conn., announces an increase in the number employed in Bridgeport factories, according to statistics gathered up to Feb. 4. The lists are compiled each week by the association and the records show a gradual increase since the first of the year.

The Acme Wire Co., New Haven, Conn., wire manufacturer, recently received an order from the Ford Motor Co. for one hundred fifty thousand coils of wire.

The Foster Machine Co., Westfield, Mass., has increased its production force, and reports sufficient orders to keep 300 employed. A wage reduction of 10 per cent was lately put into effect.

The Bay State Foundry Co., Westfield, Mass., has resumed operations after being closed for more than a year. T. R. Brien, president, reports large contracts placed with the concern by manufacturers in the Middlewest.

Foreign News Notes

According to an announcement of the Federation of British Industry, Hugo Stinnes has acquired a tract of land in the Dutch East Indies where factories for the manufacture of railway material and rolling stock will be erected.

The largest iron and steel works in Upper Silesia, those of Count Henckel von Donnersmarck, have passed into the hands of a British concern to be known as the Henckel von Donnersmarck Beuthen Estates, Ltd., of London. The capital of the new concern is five million pounds sterling. All the plants of the former Donnersmarck company, situated in Austria, Czecho-Slovakia, Italy and Roumania, will also pass into the hands of the new British organization.

The Argentine railways have ordered steel rails to the value of eight million gold marks in Germany. The rails are to be paid for in Argentine cereals.

A demand for all kinds of machinery exists in the Balkan States. A report from Bucharest is to the effect that all the Balkan States are reconstructing and extending their railway lines and that a large demand exists, not only for railway material, but also for up-to-date machine tools, excavating machinery, road machinery, and especially for agricultural implements.

Nearly all the capital stock of the Bavarian Aeroplane Works (Bayrische Flugzeugwerke A-G.), of Munich, has been acquired by the Italian Castiglioni concern, which intends to manufacture passenger and freight automobiles at those works.

A report from Kieff, Ukrania, states that a large demand for locomotives, railway freight cars, motors, modern workshops, tools and agricultural implements exists in the country.

Sidelights on Discussion of Metric System at National Council Meeting

An interesting discussion preceded the adoption, by the National Council of the Chamber of Commerce of the United States, of the resolution proposing that no referendum be had on the metric system matter at this time. A point that had great influence on the gathering was made by George B. Chandler, of the Connecticut Chamber of Commerce, when he said: "If you will analyze the support of the affirmative on this question, you will find among all those proponents there is only one representative of industry. That is very significant. The others are representative of the theoretical." His inference was, as was that of other speakers, that the support of the metric system comes overwhelmingly from theoretical sources, and in those cases where it has the backing of practical activities there is a special reason as was alleged to be the controling reason for the attitude of the De Laval Separator Co. Howard Richards, secretary of the American Metric Association, was rather surprised when asked if the material that goes into the final assembly of these separators is not shipped from Germany and Sweden. Since these parts are made in metric measurements abroad, the material assembled with them necessarily would be finished in metric.

Edmund D. Fisher, chairman of the Chamber of Commerce committee on the metric system, in explaining that the committee is nearly equally divided on the question, pointed out that the membership was unanimous in its belief that the matter should go to referendum. "If this body should recommend that the subject be dropped," said Mr. Fisher, "you would be taking a step backward. Referendum will mean that the Chambers of Commerce of the country, and the Boards of Trade of the country, would have the opportunity of being educated in this subject and through them the people of the country."

At another point in his remarks, Mr. Fisher said: "On our committee is a man we all love and respect. It is Mr. Towne, of the Yale & Towne Manufacturing Co., who has been constantly opposed to the metric system. Notwithstanding his constant opposition, he takes the ground that it is but fair that the country should have the opportunity of being educated on the subject."

Cost an Obstacle

W. C. Wilson, assistant to the president of the American Institute of Weights and Measures, made the principal anti-metric argument. He read a concise statement from W. R. Ingalls, president of the American Institute of Weights and Measures. Mr. Ingalls said that the greatest obstacle to the adoption of the metric system would be its cost to the people. In the manufacture of metals alone, the cost would be something like half a billion dollars, he said. He calculated this cost on the basis of an investigation which showed that the cost would be around $200 per worker. While he stated that he had not investigated the costs in other fields of industry, he pointed out that there would be a considerable cost per worker and there are 41,000,000 workers engaged in production in the United States.

Continuing, Mr. Wilson said: "If the metric system offers such extraordinary advantages as are claimed for it, is it reasonable to suppose that American manufacturers, who have stood in the forefront of industrial progress and who are thoroughly familiar with the metric system, are so blind to their own interest and so lacking in business intelligence that they must have it crammed down their throats by compulsory legislation? The metric system is used extensively and advantageously by scientists, laboratory chemists and druggists, and it is contended that what is good for the scientist should be of equal advantage to the people. It is upon this fallacy that the metric argument fails.

"Wherever the metric system is in use today, it was adopted by compulsion and is enforced by the police power of the government. There must be something radically wrong with a system of weights and measures that can be enforced only by the imposition of fines and imprisonment. If the metric system cannot win on its merits, it is not entitled to win by compulsion."

C. M. Best, councillor for the Pittsburgh Steel Manufacturers, declared that the manufacturers which he represents ship hundreds of thousands of tons of steel abroad each year. He said it was an insult to the intelligence of these manufacturers to try to cram the metric system down their throats. If it were an advantage to their business they would have adopted it years ago.

England Wants It

George B. Blow, of the Illinois Valley Manufacturers' Association, who is a manufacturer himself, advocated the adoption of the metric system vigorously. "England is very much in the same condition as ourselves," he said. "She is clamoring for metric weights and measures because she has found out that the country is losing foreign business to the metric countries. England is finding out that Germany and other metric countries are getting business from her, particularly in South America. We have no right to vote down a proposition to submit anything to a referendum. This matter should go to referendum as recommended by the committee."

Dr. Charles L. Parsons, secretary of the American Chemical Society, among other things said: "I want to speak for a whole profession. The chemists of America are united in one immense society with 15,000 members. The chemists of America use the metric system daily. They are absolutely united in favor of it. I have no sympathy with the argument of cost. If we followed that argument we would be riding buggies while the rest of the world would be using automobiles."

Machinery for "Leviathan"

In the reconditioning of the "Leviathan" by the Newport News Shipbuilding and Dry Dock Co., $515,000 will be spent for machinery and repairs, which will include its conversion from coal to fuel oil burning, the vessel then being propelled by steam turbine engines which will develop 100,000 shaft horsepower.

Tablets to Ericsson and De Lamater To Be Unveiled in New York

The sixtieth anniversary of the famous battle between the "Monitor" and the "Merrimac", on March 9, is to be commemorated by the unveiling of four bronze tablets. The first is at 2 p.m. at 36 Beach St., New York City, the site of Capt. John Ericsson's residence, by the American Society of Swedish Engineers. An hour later a tablet will be unveiled at 260 West St., the site of the Phœnix Foundry, by the General Society of Mechanics and Tradesmen. Cunard pier No. 54, North River, the site of the well-known DeLamater Iron Works comes next, the Associated Veterans of the DeLamater Iron Works being in charge. The fourth and last tablet is to be unveiled in Brooklyn, at the Continental Iron Works, West and Calyer Sts., by the proprietor, Thomas F. Rowland and staff.

A banquet follows in the evening, simultaneously with a similar celebration in Stockholm, Sweden, which is to be attended by the Royal family and the American Minister and Consul. Communications will be made by cable. The historical significance of the occasion will be best appreciated by those old enough to remember the work of Ericsson and of the others mentioned. The "Monitor" marked an epoch in naval development that has made an impress on the naval and maritime history of all nations.

Harnessing the River Rhone For Electric Power

Detailed information regarding the harnessing of the River Rhone for power, navigation, and irrigation is contained in a report just received at the Department of Commerce from commercial attaché W. C. Huntington, at Paris.

An outline of France's wealth in waterpower is given, with particular reference to the River Rhone as the most important source of potential hydroelectric power in France. The report also includes a history of the utilization of the Rhone and an explanation of a new law applying to the power development of this river. Estimates place the total cost of the proposed developments at 1,848,000,000 francs. The financing of this project will be accomplished by a gradual carrying out of the entire scheme, extending over a period of years.

Of particular interest to American manufacturers is the opportunity afforded for participation of American capital and for the sale of American-made machinery and supplies. Practical steps have already been taken toward the constitution of a great national Rhone development company, and there is little doubt that force of circumstances will compel the development, in one form or another, of this national resource.

Copies of the report and of the law authorizing the power development of the River Rhone, together with an outline of the progressive financing scheme for the project, may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, or from the Bureau's district offices by referring to Exhibit No. 1178.

Cleveland Letter

Prospects for greater need of machinery and equipment in manufacturing establishments in the Cleveland, Ohio, district grow better as the year advances. One of the best indications is the greater use of electric power in the last few weeks. In Ohio only four cities show a decrease in power uses from the same period a year ago, these being Columbus, Lorain, Canton and Akron. In nine other large cities the average increase in power use is 12 per cent, Warren showing the largest gain, with 70 per cent, and Cleveland the least with about 2 per cent.

Definite improvement in orders is reported by such Cleveland firms as the Willard Storage Battery Co., Columbia Axle Co., Interstate Foundry Co., Ferro Machine and Foundry Co., National Acme Manufacturing Co., K-W Ignition Co., Grant-Lees Gear Co., Ohio Body and Blower Co.

Increase in employment in the various industries in the Cleveland district shows a gain of 7 per cent for January over December, or approximately 5,000 persons.

W. C. Sargent Dead

William C. Sargent, for twenty-two years secretary and a director of the Chain Belt Company, Milwaukee, Wis., died suddenly on Feb. 5. He was seventy-three years of age. Mr. Sargent was prominent in industrial circles of Milwaukee and St. Paul and had a wide national acquaintanceship. In 1871 he organized the De Cou, Corliss & Sargent Co., of St. Paul, manufacturers of sash and doors. In 1900 Mr. Sargent went to Milwaukee to become secretary, and later a director, of the Chain Belt Company. He was also a director of the Federal Malleable Company, West Allis, Wis.

Warner & Swasey Company Announces Price Cuts

The Warner & Swasey Co., Cleveland, Ohio, has made public the following comparative figures to show the extent of reductions from peak prices:

Machine	Peak	Present
No. 2A Universal Hollow Hex. Turret Lathe	$2,690 00	$1,695 00
No. 3A Universal Hollow Hex. Turret Lathe	3,900 00	2,450 00
No. 1 Plain Head Turret Lathe	590 00	370 00
No. 2 Plain Head Turret Lathe	815 00	510 00
No. 4 Geared Friction Head Turret Lathe	1,230 00	775 00
No. 6 Double Friction Back Geared Turret Lathe	1,755 00	1,100 00

In explanation of the reductions, the company states that it has carefully analyzed future labor and raw material costs and has brought its prices down on such a basis that there can be no further reductions in prices of the product. This company also says:

"It has been apparent that some of the reluctance in machinery buying is due to lack of confidence, on the part of the buyer, in machine tool prices today. Of course, many industrial companies are not in operation to a sufficient degree to buy machinery at any price, but on the other hand, there are many who should buy to replace inefficient equipment and reduce their production costs to a point where they can secure themselves against competition.

"After all, the buyer of equipment is not pursuing the wisest course unless he picks out the most efficient equipment upon a basis of cost of the piece produced and the reputation of the maker behind it. Putting money into equipment is an investment of the highest order and a manufacturer's profit in the competitive times ahead will depend to a considerable extent upon the efficiency of the equipment selected.

"We believe the first necessity for the machine tool maker is to increase the confidence of the buyer in his product, in his price and in his ability to stay in business. It probably would be well for many of the other machine tool companies to analyze their business and their future and then to tell the world when they have gotten down to bed rock prices. The automobile business at the present time is unsettled because the buyer does not know whether or not he can save money by buying now or waiting a while longer. The machine-tool world and the equipment users should settle among themselves this same question, and until that is done there cannot be a large increase in the buying of equipment, excepting on the part of those buyers who will purchase from the makers who are forced to liquidate at any cost."

The Super-Power System and New England

Professor L. P Breckinridge, of Yale University, addressed the members of the New Britain Branch, Connecticut Section, of the American Society of Mechanical Engineers on Tuesday evening, Jan. 31. His subject was the "Importance of the Super-Power System to New England." This system contemplates the establishment of a zone comprising practically all of New England, New Jersey, eastern Pennsylvania (including the coal mining regions), and a large part of New York State, in which would be built a series of power generating stations that would be linked together by high tension transmission lines in such manner that the energy from all or any number of the stations could be delivered to the system as to a great reservoir, and used wherever and whenever needed.

In this way all available water powers could be utilized to their full capacity all the time, instead of less than one-half the time, as at present. This would relieve the steam stations of a portion of their load. An immense saving would also result from the practicability of operating steam stations to peak load capacity when running, and to shut them down completely when their output was not needed because of power being available from other sources.

Though the water powers within the zone aggregate but an insignificant proportion of the power at present required (less than 20 per cent), by their continuous operation all of their energy could be utilized. This, in conjunction with the concentration of steam generated energy into large and efficient units, would bring about a saving within the zone of fifty million tons of coal annually, besides relieving the railroads of a large part of their coal burden.

Chicago Letter

After a month of very good business the machine tool dealers are rather disappointed with the present trend. The outlook, however, is still very optimistic in a general way. Inquiries as a whole continue to grow more plentiful and buying appears to be steadier.

The railroads are keeping pretty well in the background. The Santa Fe has made additional purchases and inquiries in the past week, one of these calling for a double-end punch and shear, capacity to punch a 4-in. hole in 2-in. plate and shear 12 x 2½-in. flats, 4½-in. rounds and split one 1-in. plate, depth of throat 18-in.; also a 36-in. lathe, 9 ft. between centers, to be used for piston work, both machines to be motor driven, 230 volt D. C. According to W. B. Storey, president of the Sante Fe System, the 1922 budget calls for an expenditure of about $45,000,000 which is about $10,000,000 higher than that of last year. The budget includes an expenditure of $724,281 for shop machines and tools, an outlay of $1,041,350 for shop buildings, and $1,101,868 for rails and other track material.

The Donahue Steel Products Co., 122 So. Michigan Ave., sold an order comprising several machines to the Seyler Manufacturing Co., of Pittsburgh. Many of the sales are for individual machines, viz.; Koehring Machinery Co., Milwaukee, one 72-in. gear cutter; the Brunswick-Balke-Collender Co., a 20-in. crank shaper.

From the crane market, which has been very inactive, comes a report that the Whiting Corporation, Harvey, Ill., received an order from the Aetna Portland Cement Co., Bay City, Mich., for three 100-ft. span cranes, equipped with three-yard buckets.

Curt A. Esser, architect, 38 South Dearborn St., is receiving bids on a three-story factory and boiler house, 80 x 214 ft., to be equipped with a high-pressure boiler, for the Gurinian Candy Co., of St. Joseph, Mich., to cost about $75,000.

W. Gibbons Uffendell, 39 South State St., is making plans for a two-story laundry and powerhouse, 94 x 168 ft., to be erected at 1822 to 1828 South Wabash Ave.

Valparaiso University, Valparaiso, Indiana, is contemplating the opening of a machine repair shop in the University and will evidently be in the market for a few machines. Further information may be had by communicating with Mr. Loob in the Auto School, care of the University.

Motor Transport in Bermuda

A majority in the Bermuda House of Assembly has been won over to the plan that will give the colony motor-transport service throughout the island, under government control and possibly under private ownership. The plan is to use the lighter style of motor buses, with a capacity of about twenty-four persons, and also freight trucks of about the same weight; no other type of vehicles may be used in this service. The leading horse-transport firm is selling out its entire outfit, which may be taken as an indication that the same firm will be in the running for the new method of transport, and that by the end of 1922 Bermuda will have a controlled motor service.—*Commerce Reports.*

Business Items

The Perdieu Tool Manufacturing Co., Milwaukee, Wis., has taken over the Meigs-Powell Co., also of that city. J. D. Powell, sales manager of the combination announces that a line of spring calipers, dividers, etc., will soon be ready for distribution. R. A. Perdieu is president of the concern; J. B. Matthews, secretary-treasurer; Max Kobs, superintendent of the plant.

The Oliver Machinery Co., of Grand Rapids, Mich., has established a branch office in the Lincoln Bank Bldg., Minneapolis, Minn. George C. Ramer has been appointed manager.

The Sundh Engineering and Machine Co., Philadelphia, Pa., manufacturer of brass and copper mill machinery, has closed its New York office and opened a new downtown branch in Philadelphia, at 16th and Sansom Streets.

The Triangle Machine Works has been incorporated at Cincinnati, Ohio. Capital stock, $25,000; directors, S. J. Gish, L. Cohen and George Baker, all of Central City, Ohio.

The Ful-Flo Specialties Co. has acquired the plant and equipment of the Ful-Flo Pump Co., of Blanchester, Ohio. The manufacture of Ful-Flo pumps, coolant and lubricating systems will continue under the new ownership. J. P. Clifton, formerly of the Clifton-Conner Corporation, Buffalo, N. Y., will be the general manager.

The Marion Machine, Foundry and Supply Company, of Marion, Ind., re-elected the same officers and board of directors, as follows: Mrs. C. P. Chamberlain, Washington, Pa., president; Cecil C. Chamberlain, Tulsa, Okla., vice-president; Henry L. Erlewine, of Marion, secretary-treasurer and general manager. Reports of the condition of business at the four plants of the company, which are located in Pennsylvania, Indiana and Oklahoma, were considered satisfactory.

The John Hugo Manufacturing Co., New Haven, Conn., recently filed a certificate with the Secretary of the State of Connecticut, increasing the capital stock of the company from $50,000 to $150,000.

The Merrow Machine Co., Hartford, Conn., machinery manufacturer, held its annual meeting on Feb. 8 and elected the following officers for the ensuing year: J. M. Merrow, president; P. G. Merrow, secretary-treasurer; G. W. Merrow, assistant treasurer. The directors chosen were the three mentioned officers and J. M. Washburn and W. H. Stedman.

The Eastern Manufacturing Co., Norwalk, Conn., has filed a certificate of incorporation under the laws of Connecticut, to manufacture timer protectors, internal combustion engines, tools and equipment for motor vehicles. The capital stock is $50,000. The president and general manager is Philip H. Fielding, 20 Pleasant St., East Norwalk; vice-president and secretary, Frank N. Glover; treasurer, Charles P. Fielding.

The Burke Machine Tool Co., Conneaut, Ohio, has announced a series of dealers' discounts on its products. The reduction amounts to 20 per cent on the entire line of tools and machines, excepting drills which are allowed 30 per cent. The company states that lowered production costs are responsible for this decrease in price.

The Levering-Matthews Co. has been incorporated at Dayton, Ohio, to build special machinery and tools. Incorporators are B. L. Levering, of Boston, W. G. Matthews, J. K. Matthews, J. H. Lukey and W. F. Miller, of Dayton.

The Surface Combustion Co., Inc., of 366 Gerard Ave., New York City, has secured exclusive license for exploiting the Andrews rust proofing process, a British invention. The process is said to form an ebony, rust-proofed finish on ferrous metals.

At the annual meeting of the stockholders of the Youngstown Foundry and Machine Company, Youngstown, Ohio, the following board of directors was re-elected: W. J. Wallis, B. G. Parker, Frank Williams, S. K. Hine, H. T. Parrock, A. E. Adams and Emanuel Hartzell. The board did not reorganize following the meeting. The business of the company the past year was about 35 per cent of capacity, officers reported.

The Youngstown Boiler and Tank Co., Youngstown, Ohio, has elected the following directors: J. P. Keene, R. I. Ingalls, R. D. Patterson, C. R. Vogel and W. H. Heywood. Officers chosen were: President, J. P. Keene; vice-president, R. I. Ingalls; secretary-treasurer, C. R. Vogel. Mr. Ingalls is a resident of Birmingham, Ala.

Fire recently caused considerable damage to the machinery of the McQuay-Norris Engineering Corporation at Connersville, Ind. Several large ovens were made practically useless and several thousand dollars worth of machinery was so crippled as to make it virtually worthless. The plant will be rebuilt as soon as possible.

Articles of dissolution were filed recently by the Winterhoff Tool and Machine Co., of Elkhart, Ind., giving notice of the dissolution of the partnership of Benjamin F. and Henry R. Winterhoff.

Kirkland Bros. Machine Co. has been formed with $250,000 capital to manufacture a machine newly patented for the grinding of cylindrical parts for automobiles and for small tools. The principal incorporators are Arthur Kirkland, of Detroit, and Thomas H. Kirkland of 31 Elm St., Springfield, Mass. It is stated that manufacture of the machine will begin in Detroit at once.

Personals

IWAO NISHI has been appointed by the Japanese government to be commercial attache to its Embassy at Washington. Mr. Nishi also maintains offices at 156 Broadway, New York City.

G. C. MORGAN has been appointed general sales manager of Earl Motors, Inc., Jackson, Mich.

ERNEST F. DU BRUL, general manager of the National Machine Tool Builders' Association, lectured before the Engineers' Club of Cincinnati on Thursday evening, Feb. 16. His subject was "Managing Production According to Business Cycles."

J. A. MCCLURE, president of the Bruun-McClure Company, Columbus, Ohio, distributor of power farming equipment, has sold his interest in that company and has joined the Martin Parry Corporation, York, Pa., automobile body builder, as sales manager of the dump body and accessories division.

WILLIAM W. CASWEL, has been elected secretary-treasurer of the Northway Motors Corporation, Boston, Mass. He takes the place of James F. Finneran, who resigned.

JAMES F. CAVANAUGH, president of the Northway Motors Corporation, Boston, Mass., manufacturer of the Northway trucks, etc., has resigned as president and will become chairman of the board of directors He was succeeded by Ralph E. Northway, former vice-president of the company.

ROY P. MILLS, manager of the cost and estimating department of the Lake Torpedo Boat Company, Bridgeport, Conn., was elected a director of that company at the annual meeting of the stockholders held recently. Mr. Mills succeeds the late Frank Miller, who was also treasurer of the concern.

ALBERT H. WHIPPLE, superintendent of the Whitin Machine Works, textile machinery manufacturer, Whitinsville, Mass., recently completed fifty years of service with the company and in honor of the event he was presented with a fifty-year service pin by E. Kent Swift, general manager of the plant. Mr. Whipple entered the employ of the company in January 1872, as an apprentice, and has worked his way up until he is now superintendent, a position he has held since 1897.

CHARLES A. IRWIN, who until recently was vice-president and general manager of the Canton Sheet Steel Co., Canton, Ohio, has gone to Milwaukee where he will take charge of the Milwaukee Rolling Mill Co. Mr. Irwin will be president and treasurer of the Milwaukee Rolling Mill Co.

J. IRWIN, who has been assistant auditor at the plant of the Canton Sheet Steel Co., Canton, Ohio, will go to Milwaukee where he will be associated with his father, Charles A. Irwin, who recently became president and trasurer of the Milwaukee Rolling Mill Co.

Obituary

RICHARD H. RICE, general manager of the Lynn, Mass. plant of the General Electric Co., died on Feb. 10. He was fifty-eight years old.

WILLIAM H. BARSTOW, president of the Union Tank Car Co., of New York, died on Feb. 10 at his home in West Orange, N. J. He was forty-five years old.

FRANK S. DINSMORE, for the last twenty-four years a member of the staff of *Railway Age*, died in New York on Feb. 15. He was sixty-three years old.

Forthcoming Meetings

American Institute of Mining and Metallurgical Engineers: Annual meeting Feb. 20 to 24, Engineering Societies Building, New York City. B. Staughton, secretary.

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3, Hotel McAlpin, 34th St. & Broadway. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Shears, Rotary, Turret, Gap

Southwark Foundry and Machine Co., Philadelphia, Pa.

"American Machinist," Sept. 29, 1921.



The No. 0 machine is intended for cutting steel of 16-gage or less, and can be mounted on either a bench or a pedestal and controlled by a foot lever. The No. 1 machine is for cutting metal up to 14-gage. The No. 2 machine is for metal up to 8-gage. The illustration shows the No. 3 machine, which differs from the others primarily in the fact that it employs two turrets. It is intended for cutting metal up to ¾ in. in thickness, employing a cutting speed of 10 ft. per minute. The diameter of the cutters is 4 in., the throat depth 3½ in., and 5 hp. is required. Any shape or opening can be cut, with the minimum radius at the corners equal to the radius of the cutters.

Grinding Machine, Ring-Wheel, Knee-Type, No. 41

Graham Manufacturing Co., 71 Willard Ave., Providence, R. I.

"American Machinist," Sept. 29, 1921.



The head of the machine is a separate part, secured on the top of the column. The spindle is mounted in Timken roller bearings, carried in large removable bushings. The rear bushing is fixed in position by a strong helical spring, so that it automatically takes up end motion and wear. Larger adjustments are made by means of a castellated nut. The abrasive ring holder is made of pressed steel. The abrasive ring may be set out as wear occurs. The rings used are 12 in. in outside diameter and either 7 or 8 in. on the inside diameter. The machine has a capacity for grinding surfaces 6 x 12 in. in size. It weights about 2,000 pounds.

Grinder, Motor, A. C.

J. G. Blount Co., Everett, Mass.

"American Machinist," Sept. 29, 1921.

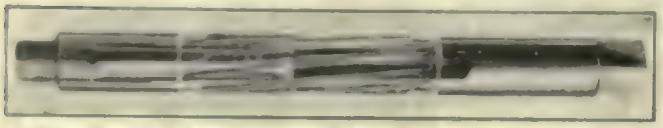


The machine is equipped with SKF ball bearings in dust-proof mountings. The spindles are of high-carbon steel ground to size. Each rest is made in one piece and adjustable. The tool tray and water pot are separate and detachable. The equipment includes two grinding wheels, one coarse and one fine, unless otherwise specified. Motors are of the Westinghouse design, and the starting switch of the textile snap type. The machines are built in the following sizes: ½ hp., 8 x 1-in. wheels; 1 hp., 10 x 1½-in. wheels; and the 2 hp., 12 x 1½-in. wheels.

Reamer, Expansion, Spiral

E. J. Kruce & Co., 322 Harper Ave., Detroit, Mich.

"American Machinist," Sept. 29, 1921.



The tool is intended especially for reaming piston-pin holes. It is said that the adjusting device offers a large range for expansion and gives ease in operation; also that the expansion is consistent, and is not affected by an accumulation of dirt in the slots. Because of the fact that the blades are helical, key-seated or oil-grooved parts can be reamed without chatter. The adjusting screw at the front end is turned by means of a screwdriver, so as to drive forward the expanding roll, which revolves freely on the end of the screw.

Die-Sinking Machines, P. & W., Improvements in

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 29, 1921.



The driving spindle has been provided with a positive pin lock for four positions, so that the chuck or collet can be tightened without holding the driving belt. The spindle pulley has a system of oil grooving opposite to the direction of rotation, so that oil is continually carried upward. A floating babbitt washer takes the thrust of the cut on the spindle. The main drive cone has a hollow spindle with communicating oil holes delivering the oil to a series of felt-packed grooves. To protect the ways from chips and dirt, leather wipers are attached to the knee. The vise capacity has been increased. A telescopic elevating screw is furnished. The outboard bearings for the knee and vise slides have been strengthened.

Grinding Machine, Surface, Vertical, 14-In., Improvements in

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Sept. 29, 1921.



The ball-bearing mounting of the spindle has been redesigned, the weight of the wheel unit being carried on springs set against the upper bearing, providing an automatic take-up. The table drive has been strengthened by the introduction of hardened shafts, gears and clutches, lubricated from sight-feed oilers on the front of the case. Split bearings are used. The idlers over which the main drive belt runs have been equipped with roller bearings. Among other changes, the motor base has been made adjustable. The drive for the rotary tilting chuck is equipped with a flexible coupling.

Level, Machine Aligning, Precision

Universal Boring Machine Co., Hudson, Mass.

"American Machinist," Sept. 29, 1921.



While this level is a general purpose instrument, it is particularly adapted to the leveling of machine tools. The metal frame is 27 in. long, and the base has an accurately scraped bearing. The handle is molded of a heat insulating material. The vial is made of Jena glass, is guaranteed to be accurate to 5 sec. of arc per graduation, and is mounted so that it can be adjusted both in vertical and horizontal planes. A felt-lined mahogany case protects the instrument when not in use.

Boring Machine, (Re), Cylinder, Combination Ford and Fordson, No. 2

Foote-Burte Co., Cleveland, Ohio.

"American Machinist," Oct. 6, 1921



The No. 2 Ford cylinder reboring machine has been adapted to the handling of the cylinders of Fordson tractors. The machine is of the single-spindle type and intended for heavy duty. Quick acting clamps are provided to hold the cylinder block in place. The driving mechanism is enclosed in an oil bath in the head. To provide the feed for the cut, the entire head slides on the column, having a vertical travel of 16 in. The cutter is of the adjustable-size, ten-blade type. The burnishing tool has rollers so mounted that their positions are adjustable.

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Albertville—W. T. Hanes—machinery for proposed plant for the manufacture of broom handles, etc.

Cal., Los Angeles—F. Weinberg, North Gates St.—machinery suitable for the manufacture of bird cages, aquariums, flower pot stands, etc., including one 30 in. squaring shear; one pan brake; one square pan forming machine; one brace and wire bender; one wire straightening machine for No. 16 wire; one electric spot welder for wire works; one enamel paint baking outfit and one pipe bender for conduit pipe and brass tubing.

D. C., Wash.—The Byzantine Mfg. Co., 1303 9th St., N. W., S. C. Height, Pres.—bottling machinery, labeling machinery, vats, etc., for the manufacture of toilet articles, etc.

Ga., Baxley—J. M. Kinard—machinery for the manufacture of corn brooms.

Ga., Decatur—W. S. Ansley—machinery and equipment for canning and dehydrating plant.

Ia., Keokuk—Kollmyer & Talbot—twist drills from ¼ in. to 2 in. x 1/32 in., (used).

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., A. Walker, Purch. Agt.—one 36 in. lathe, 9 ft. between centers to be used for piston work, motor driven 230 volt D.C., taper attached to be filled with four jawed independent steel chucks, double end punch and shear, capacity to punch 4 in. hole in 2 in. plate and shear 12 in. x 2½ in. flat bars, 4½ in. round bars and split 1¾ in. plate, depth of throat 18 in.

Ill., Chicago—Leitelt Bros., 7731 South Chicago Ave.—one 72 in. double crank press suitable for 20 gauge sheet metal, (used preferred).

Ill., Chicago—M. Leonard, 1335 West Washington St.—one double column press equivalent in power to a No. 7 Walch geared press.

Ill., Chicago—J. Loss, 1228 Winamac Ave.—one lathe and one drill press.

Ill., Chicago—The Midwest Die & Stamp Co., 1135 Belmont Ave.—one 1 in. screw machine, single pulley drive.

Ill., Chicago—The Monarch Tool & Machine Co., 522 South Clinton St.—one 3,000-lb. punch press.

Ill., Chicago—The Union Special Machine Co., 400 North Franklin St.—one 60 in. power square shear.

Ill., Chicago—The Vaughn Novelty Mfg. Co., 3209 Carroll Ave.—one routing machine; one punch press, size about American No. 4½ with 2½ in. stroke.

Ill., Galesburg—The Rowe Mfg. Co., Holton and West 3rd Sts.—one 50-100 ton geared punch press.

Ill., Mendota—H. D. Conkey & Co., G. S. Schuller, Eng. Dept.—acetylene cutting equipment complete; electric rivet heating equipment; gas rivet heaters and large punch press.

Ill., Sterling—E. L. Reed Mfg. Co.—motor driven woodworking machinery.

Ind., Angola—The Lampman Tool Co., H. W. Lampman, Mgr.—automatic wire and metal forming machine, capacity equivalent to Baird Four Slide, No. 4; one automatic drilling machine, capacity 5/16 in. drills; one roller feed for punch press for 8 in. stock; barrel plating outfit; tilting tumbling barrel; roll grinder, capacity ¾ in. pins; eye forming machine, capacity 5/16 in., profiling machine.

La., Lake Charles—M. Scimemi, P. O. Box 183-1—complete machinery, equipment and supplies for bottling plant.

Mass., Orange—The Rodney Hunt Machine Co., H. M. Johnson, Purch. Agt.—chain falls of Edwin Harrington type, sizes 4,000 lbs.; 1,500 lbs.; 1,000 lbs.

Mich., Detroit—The Mack Ave. Auto & Eng. Co., 13230 Mack Ave.—miscellaneous repair equipment for service station and garage.

Mich., Detroit—The Mission Bead Co., 2421 Smith Ave.—one 10 x 15 Gordon press.

Minn., Minneapolis—The Merviss Mfg. Co., 116 Washington Ave., N.—power stitching machines for use at Amery, Wis.

Minn., Minneapolis—L. D. Sisson Co., 712 Builders Exchange Bldg., L. D. Sisson, Purch. Agt.—one large structural punch, one air compressor and one motor.

Minn., Minneapolis—The Studebaker Auto Livery Co., 1023 Marquette Ave., C. George, Vice Pres.—one drill press, 18 in. table, and one Weaver hydraulic press.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St.—machinery for proposed paint factory.

Mo., Joplin—The Empire Engineering Service Co., 301 Miners Bank Bldg., R. Camblin, Purch. Agt.—electric power lathe, and a power drill press.

Mo., Kansas City—W. W. Brown, 1831 Grand Ave.—lathe, 18-20 in. and 8-10 ft. breath.

Miss., Vicksburg—The Henegan Mfg. Co., H. J. Henegan, Purch. Agt.—one 36 in sander, double headed sticker, light swinging cut off saw and other woodworking machinery.

N. Y., Adams—The Greenley Machine Co., D. R. Greenley, Purch. Agt.—milling machine and shaper.

N. Y., Oxford—W. W. Butts—cylinder portable reboring machine, one that will work on open or closed end automobile cylinders, (used).

N. J., East Orange—The Simms Magneto Co., North Arlington Ave., C. Jacobson, Purch. Agt.—one No. 11 Hanson & Van Winkle polishing lathe.

N. J., Merchantville—The Norton Mfg. Co.—equipment for sheet metal work including punches, presses, brakes, etc.

N. Y., Buffalo—J. Ingel, 630 Jefferson Ave.—small printing press.

N. Y., Buffalo—C. F. Schubert & Son, 210 Burgard Pl., C. F. Schubert, Purch. Agt.—one 14 in. lathe.

N. Y., Buffalo—The D. H. Stoll Co., 31 Lansing St.—Hardness testing machine, 6 in. to 7 in. diameter.

N. Y., Buffalo—Whistler & Schanland, 1283 Niagara St.—six small power or foot punching presses.

N. Y., Cobleskill—The Harder Mfg. Co.—thread cutting machine, capacity ½ in. to 1 in. for cutting threads on silo rods.

N. Y., Depew—The Gould Coupler Co., W. H. Pattenden, Purch. Agt.—three presses for straightening castings.

N. Y., Lowville—The Atlas Vise Co., Inc.—general machine shop tools and fixtures including special machinery for vise manufacture.

N. Y., New York—The American Gas Improvement Co., 2 Rector St.—machinery for gas plant at Winchester, Va.

N. Y., New York—The New York Central R.R., Grand Central Terminal—one 36 in. American Tool Wks. medium pattern metal planer.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway.—one horizontal floor boring, drilling and milling machine, similar to Niles-Bement-Pond Machine, symbol H. M. 8.

N. Y., Potsdam—The Van Ness Sanford Co., Inc., H. J. Sanford, Purch. Agt.—general machine shop machinery also equipment and special machinery for motor repair.

N. Y., Sacket Harbor—The Weaver Machine Co., W. H. Weaver, Purch. Agt.—power drill press.

N. Y., Syracuse—The United Fertilizer & Lime Co., Merchants Bank Bldg.—rock drilling, handling, screening and crushing machinery for Gouverneur plant.

N. Y., Watertown—The Greene Machine Co., C. H. Greene, Purch. Agt.—special machinery for the repair and manufacture of paper mill machinery.

N. C., Crabtree—C. Von Cannon—saw mill machinery.

N. C., Lexington—G. W. Smith, East Center St.—band saw, jointer, cut off saw, rip saw and sander, (new or used).

N. C., Murfeesboro—M. E. Worrell—brick making machinery, (new or used).

N. C., Rose Hill—The Atlantic Coffin & Casket Co., E. M. Carr, Puch. Agt.—belt driven woodworking machinery consisting of the following: one ¾ in. double spindle shaper, 36 in. band saw, 12 in. moulder, saw table, tilting arbor, sander, jig saw, knife grinder, swing cut-off saw, rip saw, 30 to 36 in. wide cabinet planer, several lumber trucks for use on floor of plant (new or used).

N. C., Wilson—Hackney Bros., T. J. Hackney, Pres.—machinery and equipment for the manufacture of buggies.

O., Cincinnati—The Chamber of Commerce, G. W. Breil, Mgr. Dept. of Civic Affairs—5 ton crane with radius of 95 ft.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., A. Smith, Purch. Agt.—one 12 in., 14 in. or 16 in. lathe with 8-10-12 ft. bed, also small Universal miller No. 2.

O., Columbus—The Osborne & Saxton Mchy. Co., 4th and Russell Sts.—one 100 lb. upright Bradley hammer and one 200 ton wheel press (used).

Ore., Portland—The Consolidated Railway Equipment Co., foot of Knott St.—W. C. Schmitt, Purch. Agt.—one 35 to 40 ton electric overhead traveling crane with a span of 49 ft. and wired for 220 volt, A.C.

Pa., Clearfield—The Clearfield Machine Shops, 4th St.—one No. 3-A Mitts & Merrill Little Giant keyseater, 25 in. stroke, 2 in. wide.

Pa., Cynwyd—The Ayers Mfg. Co., Inc., (yarns) M. J. Ayers, Purch. Agt.—looms, twisters, etc., for new factory.

Pa., Phila.—The Austin Co., Bulletin Bldg.—gasoline and oil tank, air compressor, and general auto repair machinery, for garage owned by J. H. Paul, Carbondale.

The Weekly Price Guide

THIS WEEK'S MARKET

THE Pittsburgh mill price on structural steel shapes, plates and bars continues at $1.40@$1.50 per 100 lb.; the smaller figure applying principally to lots of 100 tons or over. Mill shipments, New York, of shapes, plates and bars are quoted at $1.78@$1.88 per 100 lb.

Tin is quoted in the New York warehouses at 31c. as against 32c. per lb. Solder (½ and ½) is quoted in Chicago at 19c. as compared with 19½c. per lb. last week. Copper and zinc markets show slightly better tone; lead firm. Reductions ranging from ½c. to ¼c. per lb. are quoted on old metals (non-ferrous) in both Cleveland and Chicago.

Linseed oil is quoted in New York at 87c. as against 83c.; in Cleveland at 85c. advanced from 80c. and in Chicago at 89c. as against 84c. per gal (5 bbl. lots) one week ago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21 50
Northern Basic	21 02
Southern Ohio No. 2	22 52
NEW YORK — Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26 26
BIRMINGHAM	
No. 2 Foundry	16 00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21 76
Virginia No. 2	27 74
Basic	19 84
Grey Forge	21 50
CHICAGO	
No. 2 Foundry local	19 70
No. 2 Foundry, Southern, sil 2.25@2.75	22 67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21 96
Basic	19 96
Bessemer	21 46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	4.00	3.75	4.15
Nos. 12 and 14	3.10	4.10	3.85	4.25
Nos. 17 and 21	3.40	4.40	4.15	4.55
Nos. 22 and 24	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.55	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 3½	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66⅔%	53⅓%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
½	8.50		12@13
¼	7.15		11@12
⅛ to ½	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.00
Tin, 5-ton lots, New York			31.00
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	21.25	21.50@22	23.00
Copper wire (carlots)	15@15.25	17.00	16.25
Copper rods (ton lots)	19.75	22.00	19.50
Copper tubing (100-lb. lots)	21.25	24.00	23.00
Brass sheets (100-lb. lots)	16.75	17.00	18.75
Brass tubing (100-lb. lots)	18.50	19.50	20.50
Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	23.50	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.00	10.50	10.50
Copper, heavy, and wire	10.75	10.00	9.50
Copper, light, and bottoms	8.75	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.50	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb.	.055@.09	.09	.11
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lbs	2.10	2.50	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.85	.89
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$3.00
Coke, prompt foundry, Connellsville	per net ton		3.75@4.25

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	....	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3 43
Cone heads, ditto (net)	3.60	3.35	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0 65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.04	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Pa., Phila.—The City Bureau of Highways, City Hall, Room 216, F. H. Caven, Dir.—one saw table, 20 in. swing; one 24 in. panel planer; one 36 in. band saw machine; one tenoning machine; one 16 in. jointer; one swing saw machine, 14 in. saw; one single spindle shaper; one hollow chisel mortiser; one 14-24 x 24 ft. sliding gap engine lathe; one 9 in. x 5 ft. engine lathe; one drill press; one 16 in. shaper; one 6 in. x 6 in. power hack saw and one 6,500 portable floor crane.

Pa., Phila.—A. Eichhorn & Sons, Palethrop and Turner Sts.—box manufacturing equipment also cut off saws and planers.

Pa., Phila.—W. C. Hays, 207 South 60th St.—a number of 40 in. carpet looms.

Pa., Phila.—C. Huth, 13th and Spruce Sts.—small floor lathe for screw cutting.

Pa., Phila.—The Kennedy Creamery Co., 24 South Water St.—large size power driven rotary screen for sifting milk powder and one oat crusher.

Pa., Phila.—The Penn Poster Co., 1320 Vine St.—one cylinder press for large circular work (used).

Pa., Phila.—The Phila. Furniture Co., 420 Green St.—additional woodworking machinery for new addition to factory.

Pa., Phila.—The Pilgrim Laundry Co., Broad St. and Glenwood Ave.—one medium size lathe and one drill press.

Pa., Phila.—A. Pianschinat, 1534 Columbia Ave.—additional dryers, rollers, steam kettles, etc.

Pa., Phila.—The Quaker City Iron Wks., Richmond and Tioga Sts.—one 18 to 20 ft. lathe.

Pa., Phila.—The Superior Knitting Co., Inc., 2504 North 28th St., H. Fischer, Purch. Agt.—knitting machines for new factory.

Pa., Phila.—The Swartz Mfg. Co., 234 Cherry St.—one Fox Universal lathe (used preferred).

Pa., Pittsburgh—The Amer. Bridge Co., Frick Bldg.—one coping machine for Pinecoyd Works.

Pa., Pottstown—W. F. Focht, 157 Hugh St.—one 2 ton ice manufacturing machine.

R. I., Providence—The Apco Mfg. Co., 1200 Eddy St.—one Brown & Sharpe No. 1 Universal milling machine with index centers. (used)

S. C., Greeleyville—The Mallard Lumber Co., T. W. Boyle, 1st Vice Pres.—one trimmer.

Va., Denbeigh—J. W. Hoopes, P. O. Box 45.—small tablet machine to make tablets for drug trade up to ¾ in. (new or used).

Va., North Emporia—J. D. Woodward—machinery for the manufacture of barrel staves for truck barrels.

Va., Pulaski—The Superior Anthracite Coal Corp., C. E. Smith, Pres.—one 80 hp. steam hoist and other mining equipment, (new or used).

Va., Richmond—The Pear Laundry, 12th and Main Sts., J. R. McCauley, Purch. Agt.—complete line of modern machinery to replace that which was destroyed by fire.

Va., Richmond—C. Saunders Printing Co., 12th and Main Sts., C. Saunders, Purch. Agt.—complete line of machinery to replace that which was destroyed by fire.

Va., Stuart—J. D. Blackard Stave & Chair Co., J. D. Blackard, Purch. Agt.—machinery for cutting splints for chair bottoms.

Wash., South Tacoma (Tacoma P. O.)—The Northern Pacific Ry., 522 2nd Ave., S., St. Paul, Minn., plans to improve its shops here. Estimated cost, $350,000. H. E. Stevens, St. Paul, Ch. Engr.

W. Va., Belle—The Belle Alkali Co.—equipment for the manufacture of caustic soda and chlorine.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—about 20 tools for new rod and wire mills at Portsmouth, O., also several tools for plant at Steubenville, O.

Wis., Chippewa Falls—D. Kunsman, 29 West Spring St.—equipment for auto repair work.

Wis., Darlington—E. H. Rodham—equipment for auto repair work.

Wis., Greenville—E. Schroeder—lathe and small tools for auto repair work.

Wis., Menasha—The Menasha Tractor & Mchy. Co., 6th St., J. M. Robinson, Purch. Agt.—foundry equipment and probably a crane.

Wis., Milwaukee—D. D. Green, 675 28th St.—one 8 ft. squaring shear, Niagara preferred.

Wis., Milwaukee—I. Hurwitz, 533 Milwaukee St.—one automatic knitting machine.

Wis., Milwaukee—The Rautbord Mfg. Co., 86 3rd St., Z. Rautbord, Purch. Agt.—one 18 in. lathe, and punch press.

Wis., Sparta—E. J. Sheldon—auto repair shop equipment and press.

Wis., Tomah—The Tomah Iron Wks. & Garage, R. S. Murray, Purch. Agt.—machinery for repair shop.

Wis., Waukesha—The Amer. Chest Co., c/o J. L. Martin, 612 McCall St.—woodworking machinery for the manufacture of tool chests.

Wis., St. Cloud—Abhold & Wagner—medium size drill press.

Wis., Wilton—The Wilton Canning Co., Main St.—canning and power machinery for proposed canning factory.

Ont., Glanworth—The Glanworth Milk Producers Assn., D. MacLachlan, Secy.—modern machinery and equipment for the manufacture of cheese. Estimated cost, $25,000.

Ont., Guelp—The Canada Ingot Iron Co., C. V. Davison, Purch. Agt.—forming roll to handle sheets 120 in. long by 18 in. gauge.

Ont., Windsor — Goyeau Bros., London St.—garage and auto repair shop equipment to replace that which was destroyed by fire. Estimated cost, $75,000.

Germany, Nuremberg—A. F. Mortel, Postcheck-Konto 1551 Postcheckamt—Correspond with firms who can supply machinery for the manufacture of conical chalk crayons.

Metal Working Shops

Cal., Napa—The Napa Union High School Dist. plans to construct a high school including a main building, manual training and domestic science buildings. Estimated cost, $300,000. W. H. Weeks, 369 Pine St., San Francisco, Archt.

Conn., Wallingford—The Wallingford Steel Co., 60 Academy St., plans to build a 1 story, 100 x 130 ft., 1 story, 25 x 100 ft. and 1 story, 40 x 100 ft. factory for the manufacture of metallic goods. Private plans.

Ill., Champaign—The Get-Gas Service Stations, Inc., will receive bids until March 1 for the construction of a 1 story, 40 x 80 ft. and 21 x 21 ft. warehouse and service station. Estimated cost, $40,000. H. F. Downing, Mgr. Private plans.

Ill., Chicago—C. R. Berglund, 2630 Wentworth Ave., manufacturer of auto bodies, is receiving bids for the construction of a 1 story, 100 x 125 ft. factory on 67th St. and Park Ave. Estimated cost, $75,000. A. G. Lund, 449 West 63rd St., Archt.

Ill., Elgin—The Elgin Stove & Oven Co., 14 Chicago St., plans to build a 2 story factory. Estimated cost, $50,000. F. W. Dieterich, Genl. Mgr. Architect not selected.

Md., Ilchester—The Mineral Potash Co., 712 Equitable Bldg., Baltimore, plans to build a 1 story, 50 x 150 ft. factory, here. Estimated cost, $50,000. L. A. Hazard, Pres.

Mich., St. Joseph—Davidson & Weiss, Archts., 53 West Jackson Blvd., Chicago, are receiving bids for the construction of a 1 story addition to the factory of the Auto Specialty Mfg. Co. Estimated cost $100,000. Noted Jan. 6.

Mo., St. Louis—C. Ulman, 4540 Lindell Ave., will build a 1 story garage at 221 York Ave. Estimated cost, $40,000. Noted Dec. 20.

N. J., Fernwood—(Trenton P. O.)—The State Hy. Dept., Trenton, has awarded the contract for the construction of an auto service station, here. Estimated cost, $94,300. Noted Jan. 6.

N. Y., Amboy—(Warner P. O.)—The Syracuse Pottery Co., 711 East Division St., Syracuse, plans to build a 1 story, 25 x 400 ft. pottery, here. Estimated cost, $25,000. J. L. Diesinger, Genl. Mgr.

N. Y., Lawville—The Atlas Vise Co., Inc., plans to build a 2 story factory. Address H. W. Fulton, Pres. Estimated cost, between $25,000 and $30,000.

N. Y., Watertown—The Greene Machine Co. of Watertown plans to build a 2 story machine shop. Address C. H. Greene. Estimated cost between $20,000 and $25,000.

O., Columbus—The Expression Piano Player Co., 1278 West Broad St., is having plans prepared for the construction of a 2 story, 48 x 100 ft. piano player factory on West Broad St. Estimated cost, $40,000.

Pa., Butler—The Hunting-Davis Co., Archts., Century Bldg., Pittsburgh, will receive bids until March 1 for the construction of a 3 story, 88 x 110 ft. garage and sales station on Main St., for the Butler Buick Co., Main St. Noted Feb. 16.

Pa., Phila.—Curtis-Grindrod Co., Engrs., 10 South 18th St., will receive bids until March 1, for the construction of a 1 story, 30 x 164 ft. garage at 877 North 45th St., for T. Aiken, c/o engineers. Estimated cost, $50,000.

Va., Norfolk—The Robertson Chemical Corp., Board of Trade Bldg., plans to rebuild burned building, or remodel and reconstruct the entire plant, at Money Point. Cost, to exceed $40,000.

Va., Richmond—Nolde Bros., Inc., 306 North 26th St., have awarded the contract for the construction of a 2 story, 59 x 84 ft. addition to their bakery at 2510 East Broad St. Estimated cost, $60,000.

W. Va., Charleston—The Mountain State Motor Car Co., 12 McFarland St., is having preliminary plans prepared for the construction of a 2 story, 80 x 220 ft. repair shop and garage. Estimated cost, $100,000. Private plans.

Wis., Chippewa Falls—D. Kunsman, 29 West Spring St., has purchased a site and plans to build a 1 story, 66 x 125 ft. garage. Estimated cost, $45,000. Architect not selected.

Wis., Darlington—E. H. Rodham is having plans prepared for the construction of a 1 story, 90 x 90 ft. garage. Estimated cost, $45,000. Private plans.

Wis., Sparta—E. J. Sheldon is having plans prepared for the construction of a 2 story, 50 x 88 ft. garage on Main St. Estimated cost, $50,000. Private plans.

Wis., St. Cloud—Abhold & Wagner have awarded the contract for the construction of a 1 story, 45 x 85 ft. garage. Estimated cost, $40,000.

Wis., Stevens Point—R. Newby Auto Co., 119 Strongs Ave., is having preliminary plans prepared for the construction of a 2 story, 80 x 135 ft. garage. Estimated cost, $40,000. S. Spalenka, Stevens Point, Archt. Noted Jan. 26.

General Manufacturing

Ill., Chicago—Ronneberg, Pierce & Hauber, Archts., 10 South La Salle St., are receiving bids for the construction of a 1 story, 60 x 152 ft. addition to laundry at 2901-11 Montrose Ave., for the Chicago Wet Wash Laundry. Estimated cost, $15,000.

Mass., Forge Village—The Abbott Worsted Co. has awarded the contract for the construction of a 3 story, 88 x 243 ft. combing plant. Estimated cost, $200,000.

Mich., St. Joseph—C. A. Esser, Archt., 38 South Dearborn St., Chicago, is receiving bids for the construction of a 3 story, 80 x 214 ft, candy factory for the Gurinian Candy Co., c/o architect. Estimated cost, $75,000.

N. J., Camden—Ballinger Co., Archts. and Engrs., 12th and Chestnut Sts., Phila., Pa., will receive bids until March 20 for the construction of a 7 story furniture factory and warehouse on Federal St., for the J. V. Van Scriver Co., c/o D. Jostro, Front and Federal Sts. Estimated cost, $500,000.

N. C., Durham—The city is receiving bids for the installation of a refrigerating plant at the city market. Estimated cost, $15,000. R. W. Rigsby, City Mgr.

O., Cleveland—The Representative Constr. Co., Hanna Bldg., is building a 1 story, 74 x 93 ft. millwork factory at 8120 Brunes Ave. Estimated cost, $40,000.

Pa., Phila.—The Supplee-Wills-Jones Co., 3338 Ludlow St., has awarded the contract for the construction of a 2 story, 55 x 100 ft. ice cream factory. Estimated cost, $20,000.

Wis., Milwaukee—The Amer. Granite Wks., 15th and Cleveland Aves., is receiving bids for the construction of a 1 story, 62 x 354 ft. granite works on 15th Ave. Private plans. Noted Feb. 2.

Wis., Watertown—The Wilton Canning Co., Main St., is having plans prepared for the construction of a 2 story, 60 x 85 ft. canning factory on Main St. Estimated cost, $75,000. Industrial Eng. Co., Laycock Bldg., Eau Claire, Archts.

American Machinist

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Paper Making and Paper Making Machinery

The Forest Is the Principal Source of Raw Material—The Process Is Continuous from Grinding the Wood to Winding the Finished Sheet of Paper

By ELLSWORTH SHELDON

New England Editor, American Machinist

THOUGH paper is made by many processes and of many materials, including cotton, linen, jute, manilla, esparto, etc., by far the larger part of the commoner grades, generally referred to as "newsprint," is made from wood. The preparation of the wood fiber by grinding the billets of wood upon huge grindstones; screening, filtering, pounding, and macerating the pulp; and finally converting the resulting thin, creamy, yellow fluid into a swiftly flowing web of white paper, ready to print upon, is a process that involves a line of highly specialized machinery.



FIG. 1. PARTITIONS OF THE CONVEYORS.

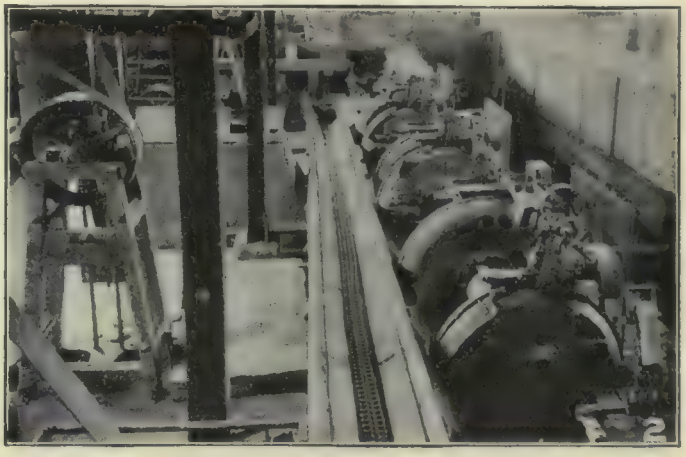


FIG. 2. THE DRY BARKING MACHINES AND CONVEYORS

Chemical and Mechanical Pulp

Paper pulp is made from wood by two distinct methods—the chemical and the mechanical. Of the chemical processes there are two that are commonly used; one in which the reagent is caustic soda while the other uses sulphurous acid; the products are known respectively as "sulphate" and "sulphite" pulp. The reactions are carried out in large iron receptacles, called "digesters," built of boiler iron and lined with brick or cement to resist the action of the acids and capable of withstanding high steam pressures for hours at a time.

In the manufacture of mechanical wood pulp the reduction to fiber is accomplished by the abrasive action of revolving grindstones to which the wood is fed by hydraulic pressure. The ground wood fiber is shorter and less pliable than that produced by chemical means, and for that reason about 20 per cent of sulphite pulp is added at certain stages in the manufacture of newsprint paper to make the product less brittle.

As the production of chemical pulp is a proposition that would be of greater interest to the chemist than to men of a mechanical turn of mind, and makes use of little machinery aside from tanks, valves, piping, etc., it will not be considered in this article beyond the references necessary to explain the presence of sulphite pulp in a ground wood mill, the nature, and the method of using it.

For the production of ground wood pulp in quantity a great deal of power is necessary and for that reason and, further, because of the fact that the stream that supplies the power will also furnish a cheap and effective means of transporting the raw material, mills for the production of ground wood pulp are almost invariably located near a fall in some large river.

Logs from the forest can thus be floated down the river to the forebay of the mill where they can be taken up by conveyors and hauled directly to the saws, barking machines and splitters that prepare them for the grindstones. The logs are first sawed to lengths of about 2 ft. and these billets are stripped of their bark, either by revolving disks into which are set sharp knives of steel, or by being passed through a "barking drum" in which they are rolled about until the bark is loosened and comes off.

The Barking Drum

The barking drum is in effect a large tumbling barrel. It may be 30 ft. long by 10 ft. or more in diameter. It has no central shaft, but is supported in a horizontal plane upon rollers located at intervals throughout its length. The walls are constructed of flat bars of iron so spaced that there is ample room between them for the escape of the comparatively thin pieces of bark but not enough to permit a round billet three or four inches in diameter to get away.

Large openings at the center of each head provide for easy loading and unloading by means of conveyors,



FIG. 2. THE BARKING MILL AND WOOD STACK

and a flood of water is poured over and into the drum as it revolves, carrying away the lighter fragments of bark and discharging the billets into the conveyor that takes them to the grinding room or to the stack.

(though with a great deal more noise) as the quietly flowing streams of water, but they possess the disadvantage of requiring power to operate them, and the cost of their maintenance is much higher. Wherever it is desired to deliver the wood a section of the trough is lifted out, allowing the billets to fall through while the chain or rope passes over the gap without difficulty. A photograph is shown in Fig. 1 of a water conveyor taken at a point where it is delivering its load to the mechanical conveyor at which place the water flows through a coarse screen and disappears to resume its burden at a lower level, leaving the billets to be carried up the incline by the rope, a section of which may be seen at the left.

Another section of mechanical conveyor of a slightly different type is shown in Fig. 2, where it conveys the billets to the dry barking machines. This department is out of service except in emergencies for the reason that all the barking is ordinarily done in the drum. The barking mill where the logs are received and put into shape for the grinding machines may be seen in Fig. 3, which also shows sections of both water and mechanical

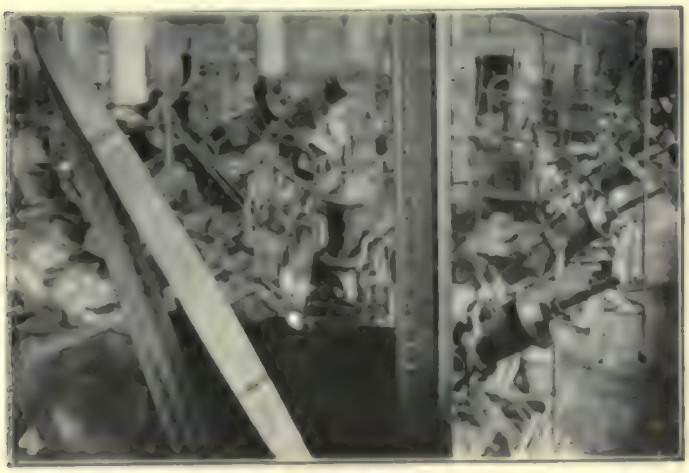




FIG. 4. A VIEW IN THE WOOD GRINDING ROOM. FIG. 5. ONE OF THE GRINDING MACHINES

The dry barking by means of the revolving disks has been practically superseded by the drum method, for, though it performs the operation very quickly, it requires close supervision and attention from the operators and is not unattended by danger from the swiftly moving and necessarily exposed knives as well as from flying chips. The drum, though slower, takes care of itself and presents no dangers.

The water conveyors are simply wooden troughs that conduct water from the forebay to various points at lower levels where the wood is to be delivered, and the inclines are so calculated that the water may travel a distance of a mile or more in accomplishing a descent of 50 ft. It constitutes an inexpensive and convenient means of transport when water is plentiful, as the billets may be dumped in anywhere and will float along without attention until they reach the switch where they are to be diverted.

The water conveyors will not carry the wood up-hill, nor is it desirable to have them enter the mill buildings where there is moving machinery; therefore they are supplemented in places by chain or wire rope conveyors. These are wooden troughs of inverted V-section, lined with iron plates and carrying at the bottom of the "V" a continuous rope or chain to which at intervals suitable dogs are attached to carry the billets.

The dry conveyors carry on with as little attention

conveyors and some of the immense stacks of wood that constitute a part of the reserve supply.

From the barking mill the wood goes in ordinary course to the grinding room, which is partly shown in Fig. 4. In this picture everything appears to be in chaos, though really it is most orderly. In the mill under discussion there are five rows of grinding machines, each row connected directly to the shaft of a huge water turbine. Four of the turbines develop 2,400 hp. each and the fifth 3,500 hp. The one belt in the room drives a pump.



FIG. 6. GRINDING MACHINE OPEN FOR REPAIRS

No moving machinery is to be seen except the small governing machines that regulate the speed of the turbines. The revolving shafts are covered and each stone is completely enclosed. Each power line is continuous, the machines being so spaced that the shaft, or arbor, upon which a stone is mounted is connected by flange couplings directly to the shaft of the machine adjacent, and the first one in line to the flange of the water wheel shaft. An accident necessitating the stoppage of a stone puts out of business all machines in that line that are not between the damaged one and the water wheel; but accidents seldom happen.

It is a difficult matter to get a photograph in this room, so closely spaced is the machinery; and practically all the floor space not covered by the machines themselves is taken up by the little cars that convey the billets from the corner, where the mechanical conveyor delivers them to the machines. An attempt is made in Fig. 5 to show an individual machine, and in Fig. 6 is a machine with the casing swung up and out of the way for changing a stone.

These machines are what is known as the three-pocket machines; each has within its casing three rectangular chambers, or pockets, about 18 in. square, extending across the full width of the stone. Each pocket is fitted with an hydraulically operated plunger by means of which the wood is pressed against the stone.

The pockets are closed by sliding doors through which the wood is charged. Raising the plunger in any one pocket by a movement of the control valves, the operator will lift the door and stack the aperture with all the wood it will hold, the billets lying parallel to the axis of the stone. Closing the door the operator, by a reverse movement of the valves, causes the plunger to push the wood against the stone with a pressure in accordance with the diameter of the hydraulic cylinder and the water pressure. As the cylinder is 14 in. in diameter and the water pressure 60 lb. per square inch, the load from one pocket alone approaches 5 tons.

Jets of water are flowed upon the stone before each point of contact and the heat generated by the friction of the grinding raises the temperature of the liquid pulp that flows from the stone to a temperature of 170 deg. F.; which temperature is purposely maintained by regulating the flow of water.

The stones in these machines are Cleveland stones, 54 in. in diameter with 30-in. face. They are no different, except in size, from ordinary grinding stones, but they must be perfect in order to resist the pressures brought to bear upon them. The life of a stone may run from six months to two years, according to its quality. The stones turn 220 revolutions per minute, and each stone requires upward of 400 hp. to drive it.

The nature of the resultant fiber depends to a surprising extent upon the condition of the surface of the grindstones. They are turned off with a tool that is not unlike the familiar "emery-wheel dresser" of the machine shop except that instead of having a roll built up from a number of thin pieces of very hard steel the "jigger," as it is called in the mill, consists of a single roller about 3 in. in diameter by about the same dimension in length. The face of this roller is cut with a number of parallel serrations or with a double helix like a knurl, according to the character of the fiber the stone is expected to deliver.

The tool is held in the toolpost of an hydraulically-operated slide-rest that is permanently a part of each grinding machine. This slide-rest, called a "lathe" by the men who use it, is located at about floor level in the rear of the machine, within the casing, and covered by a swinging door of metal.

A stone needs to be redressed after about sixteen hours of grinding. One "jigger" (the term applies to the operator as well as to the tool) attends to the "jigging" of all the stones; and his job is no sinecure. He must be a man of experience and sound judgment as well as possessing a knowledge of pulp making.

He does not ordinarily interfere with the progress of the work. When redressing is necessary he lifts the door in the rear of the casing, sets the tool in the toolpost of the slide-rest and by manipulating the valves to direct the water first against one side of the piston and then the other he sends the tool three or four times across the face of the stone.

The operation requires only a moment or two and the grinding pressures on the stone are not released. The work is therefore done under a flood of pulp and comparatively hot water, but the "jigger" is used to that—it is a part of his job.

An operator is required for each of the grinding machines and it keeps him busy loading the pockets with wood as they become exhausted. Helpers are constantly wheeling the little cars loaded with wood to points where the operators can reach them.

The pulp is given a preliminary test at frequent intervals by the man in charge of the grinding department, who will catch some of the liquid pulp as it runs from under a stone and flow it over the bottom of a shallow tray made of blue glass. This is known as the "blue glass" test and for its results depends upon the judgment and power of observation of the individual who makes it. He will observe, perhaps with a microscope, the length and conditions of the fibers as they settle down upon the bottom of the tray, and take note of their felting quality.

The stock may be "free" or "slow," opposed terms that one is apt to hear frequently from the operators of the paper machines, and which denote qualities that affect the running of the pulp upon these machines. It is necessary to maintain a certain standard at all points in the progress of the pulp in order that there may not be constant variation in the weight or quality of the finished product or need for continual manipulation of the controls of the paper machine to prevent it.

There is a much more elaborate test conducted at regular two-hour intervals upon "stock" taken from three separate places in the system—from the grinding stones, from the beaters, and from the paper machines. These three batches are handled separately, though the tester conducts the experiment upon all of them at the same time.

A handful of stock is first placed in a small centrifugal dryer where it is allowed to run for a definite time: one, two, or three minutes for the stock taken from the different places. One ounce is then weighed out and vigorously stirred into a receptacle containing 1,000 c.c. of water. The mixture is then turned into the testing device, which returns a portion of the water and suspended fiber to a graduated glass; allows some to flow to waste; and retains the balance, with most of the pulp, in the container. The amount of fiber and water flowing into the graduated glass and the condition of the pulp in the container are factors which enter into the determination of the quality of the product.

The Training of Workers in Manufacture

III. Apprenticeship Practices Regarding Indenture, Age, Payment and Certificates —Public School Substitutes—Evening, Part-Time and Co-operative Schools

By J. V. L. MORRIS

WHERE well organized apprenticeship is practiced, the usual procedure is to execute an indenture stating the conditions of apprenticeship as to length of service, varieties of experience provided, amount of supplementary instruction, and rates of pay. While there is usually a clause relieving the corporation from full responsibility to execute all provisions, and even to suspend or totally terminate the contract should commercial conditions necessitate such action, observation of the workings of apprenticeship with and without contract leads the writer to believe that the good faith of a responsible corporation is thereby enlisted to insure the satisfactory instruction of the apprentice. It is believed also to act as a moral restraint upon the apprentice against terminating the training program under temporary dissatisfaction with some instructor, a foreman, or certain phases of the work.

The parent, both parents, or in case of their decease, the apprentice's guardian is ordinarily made a party to the contract. While modern social phenomena suggests that the influence of parental authority is much less effective during adolescence than was the case in a more primitive and stable social organization, the practice would seem to have in many cases a wholesome effect.

In the state of Wisconsin the contract is under the supervision of the State Industrial Commission. Such a disinterested authority may be highly useful in insuring the satisfactory working of the indenture plan.

It should be stated that the control of an apprentice agreement is chiefly moral and not ordinarily enforced by legal measures, as the attitude of the company is ordinarily that if an apprentice breaks his contract he is lacking in the moral qualities which they desire. On the other hand, the contract is so loosely framed that it is not enforcible by legal measures if the company is not living up to the implied terms, so that the recourse of the apprentice when dissatisfied is not to the courts but to withdrawal on his part and the seeking of other employment.

Age Limits for Apprenticeship

The general practice seems to be to prefer and in many cases to limit apprenticeship to those boys with an elementary education and sixteen to eighteen years of age at commencement, with a four year period of service. For high-school graduates and in certain trades requiring mature strength, the period is ordinarily three years in length and the age of entrance eighteen or over.

The arguments adduced are that state laws relative to the employment of minors do not permit the employment of boys under sixteen in the handling of machinery, and that it is desirable to commence the apprenticeship directly upon leaving the public school, as the boy under those conditions has not lost the habits of study, regularity and punctuality to which the school has accustomed him, by a period of shifting in the more or less irresponsible casual employment open to juveniles.

For the machinists, patternmakers, and most of the trades of the railroad shops and shipyards also, the work is not too heavy or exacting for these immature workers. That the course should be four years in length for those sixteen years old upon entrance arises from the fact that it is not desirable to promote to journeyman's wages and responsibilities those who have not attained their majority. Moreover, there is sufficient content in the trades considered, both of manipulation skill and of related technical knowledge, if imparted upon the desirable part-time basis, to require the full four years.

Sometimes the period of apprenticeship is shortened several months as a reward for unusual capacity and competency. This is a practice which seems desirable as an encouragement to effort, and offers no radical departure from the standard policy. For high-school graduates the age minimum of eighteen is established, in general, by the fact that such a course can not be completed before reaching that age; and the three-year apprentice period is justified by the same arguments that recommend the four-year course for grammar school graduates.

It seems unfortunate that statutory prohibitions as to the employment of minors in some states prevent the employment of apprentices under eighteen years of age, as these limitations have prevented the normal development of apprenticeship in the trades where the sixteen-year old may safely be employed. The chief difficulty is that in the initial stages of learning a trade the productive worth of the apprentice does not warrant payment of wages over about one-fourth paid the adult mechanic, and a young man who has reached eighteen is usually unwilling to forego the more attractive wages paid the operative specialist. Moreover, he has often been knocking about at various juvenile employments for several years, so that he has lost a desire or willingness to study, some of which is essential for the acquisition of a skilled trade.

Just antedating the recent World War, the prevailing rate of pay for apprentices started at about 12 cents an hour for the first year, and increased to about 20 cents an hour for the fourth year, for a week ranging from 50 to 60 hours. It is now extremely varied, depending upon locality and occupation, but in general it can be said to have increased from 50 to 100 per cent or more, the improvement being most apparent in the third and fourth years. The working week is, however, shorter, varying from 44 to 50 hours, the week being longer than this in but one or two plants visited. There should also be noted the increasing amount of company time, for which regular pay is granted, devoted to related technical instruction in the shop school.

During the war there was much dissatisfaction among the apprentices with the fact that, owing to their indenture agreements, their pay did not advance as rapidly as the corresponding journeymen's wage and the increasing cost of living. A solution, devised by the Mergenthaler Linotype Co., and stipulated in their "condi-

tions of apprenticeship," which may be expected to automatically adjust to changing rates of pay in the plant, is to pay on the basis of a percentage of the prevailing or basic hourly rate paid to the journeymen of the trade involved. One advantage of such a variable rate at the present time is that it would adjust as easily to a decreasing scale of pay, as it would be an undesirable anomaly to find apprentices paid during their fourth year as much as journeymen. Another practice to be commended in some plants is the payment of a premium of 2 to 4 cents for superior work in school and shop.

The Apprenticeship Bonus

It is a tradition of apprenticeship that a bonus is to be paid the apprentice at the conclusion of his term of service. This sets a prize on the completion of the course, which has doubtless been of great value in holding the apprentice, particularly toward the end of his apprenticeship. The traditional amount is $25 for each year of service, being $100 in the four-year course and $75 in the three-year course. Many plants have found it advisable to increase this amount. In one case a second bonus of $100 was paid if the apprentice continued with the company one year after the completion of his apprenticeship with them. The company already referred to carries the percentage policy to this matter of bonuses as well, and pays 10 per cent of all wages received by him during his term of service. At present rates of pay this would be over $400.

Two companies require a deposit, $25 in one case and $50 in the other, as a guarantee that the apprentice will remain throughout the period of apprenticeship. It is, of course, returned with interest when apprenticeship is completed. A company with a long tradition for good apprenticeship may find that this works efficiently in holding their apprentices through the course; but a company just embarking upon apprenticeship will probably find it undesirable, as many capable young men may hesitate to venture even $25 of their funds on an apprentice program of whose merits they are uncertain. There seems no tendency to increase the practice, which in general should be condemned.

The practice seems to be general of conferring a certificate of apprenticeship upon completing the course. As there are, however, no uniform standards, its value depends much on the standing of the company conferring it. Three national organizations have, however, been active in promoting more uniform requirements: The National Metal Trades Association, The National Industrial Conference Board, and the National Association of Corporation Schools.

The American Locomotive Co., in addition to the usual diploma, issues a duplicate of pocket or post-card size, which is intended to be a convenient means of establishing the completion of apprenticeship in seeking a position. Others issue buttons for the coat lapel, which are useful in identifying the apprentice graduates among the working force and, of course, would be an equally useful proof of apprentice training in an employment office of another plant when seeking relocation. In this connection it should be recognized as valuable experience to leave the plant where the apprenticeship was served to learn the practice of other shops and in related industries. Moreover, if all companies in proportion to their force in the skilled trades practiced appenticed-training none would suffer by this practice.

The report of the Federal Board for Vocational Education for 1919 states the following enrollment in Smith-Hughes aided schools: Evening, 42,094; part-time, 17,276; all-day, 15,111; total, 74,481. This includes, of course, the building trades, auto-mechanics and chauffeurs, etc., as well as the metal-working and printing trades.

Considering each of these branches in turn, it is not believed that the night school should be considered as making serious contributions to the manipulative phases of such skilled trade as toolmaking, diemaking, die sinking, patternmaking, the all-around machinist in the maintenance department, and the crafts of the shipyards and railroad shops. Assuming that a workman attended fifty nights for two hours per night, he would have put in at a maximum one hundred hours, the equivalent of two weeks in a shop. This would be largely work of an exercise sort, which would in no sense approach trade mastery. Such shop work may function to some extent for trade extension and trade conversion purposes. Thus it may be possible for a workman to learn enough to become a lathe or milling machine operative, and hence to broaden his adaptibility in a shop, so that it is possible he might become a substitute hand in piece production.

The shop arithmetic and drafting classes may contribute to the technical training of the adult workers as trade extension, but all consulted in the industries are agreed that this should be considered only as crutches to insufficiently prepared mechanics.

Part-Time Schools

The essential condition for effectiveness of the part-time schools in training skilled craftsmen is varied experience at all manipulative phases while at regular shop production. Of course this combination amounts to apprenticeship, even though unorganized; and it should be remarked that there has been established no authority in administration of the law to insure such transfer about the plant as will provide the varied experience, and it is doubtful if there can be except through the cordial co-operation of a plant's management.

The all-day vocational schools scheduled for the fourteen to sixteen age period, if provided with sufficient equipment for experience at all operations and machines utilized in the trade and with a source of production jobs sufficient for experience at all types of practical work, could probably take the place of the separate training shop desirable for the first year or two of the apprenticeship course. Those conditions seem satisfactorily met in the trade school in the Ford plant. There all types of jobs can be secured from the parent plant, and in sufficient quantities so that an average of $80 per month of salable products is made by each of the students in the two-thirds of his time that he is in the shops. This permits the payment of reasonable apprentice wages, which has been attempted in no public trade school.

With, however, the usual inadequate equipment of the machine shop and no attempt at quantity production, the ordinary graduates of the machine shop departments, if they finally enter industry, do so as lathe hands or as other specialists. The management of several companies in stating their attitude toward the vocational school usually mention instances where graduates on applying for a position admitted that their experiences on the milling machine had been confined

to cutting a few notches on a gearwheel. This experience should be compared to the three months of continuous practice at the milling machine for adult learners in the vestibule school of a machinery company. Furthermore, other than the repair and upkeep of the school machines, there can be no experience of the nature of maintenance work.

Another element that should be considered relative to the vocational school is that not sufficient effort is made by it to select the boy with superior mechanical ability. While this may come about to some extent through the working of the inclinations of the boys concerned, it is too often apparent that the vocational schools are largely the dumping ground for the less capable.

About the same discussion holds, however, relative to the printing trades as for metal working. In large printing centers the trade of the all-around printer has ceased to exist, and in its place we have clearly defined definite trades, such as that of the hand compositor, the linotypist, the pressman and feeder, the lithographer and the bookbinder. Some of these are well adapted to apprentice training, of which hand compositing is an oustanding example. Others lend themselves to intensive or to part-time training, depending upon whether the training is for the novice or for one already engaged and seeking training for promotion. All suggest the vocational school closely linked to a friendly large publishing company, or to a co-operating group of associated smaller printing plants.

The plan of education by which the student spends one week in school and one week in the shop is based on the assumption that school progress and shop practice are of exactly equal importance in the acquisition of the trade involved. The modification worked out in the Ford trade school of two weeks in the shop to one in school assumes that for the acquisition of a trade the shop practice is the more important element in attaining trade mastery. This conforms to the experience acquired by the now long developed apprentice schools. It is also believed that a corporation co-operating in maintaining such an institution can afford to pay the same piece price for the production of the training shop as in its regular production departments, as by that means the better class of boys will take the course and the company will benefit in the superior quality of future mechanics graduated and recruited to its force of skilled workmen.

It should be said for the co-operative school that thereby full-time utilization can be made of the expensive equipment of the training shop. This is a matter of no mean economic importance when it is considered that a half million dollar plant is necessary to train three hundred boys for the machinists' and toolmakers' trades.

In many of the larger cities are found well-endowed private institutions, usually designated institutes, or operating under the older name of mechanics' institutes. These in some cases have made marked success in their work, particularly in such vocations as possess large technical elements. In the trades we have here been considering they have been successful in providing usually superior extension instruction in evening departments. They have also been useful to provide the promotion training for superior young men, who had already considerable practical experience and desired by a brief course either to prepare for advancement or to develop from a specialty to the all-around skill of the toolmaker. They would be, probably, the chief reliance for this purpose, if the apprentice method completely disappeared.

In some cases the vocational departments of technical high schools have approximated this service. The unsatisfactory condition in them is that ordinarily, owing to academic restrictions, they have not lent themselves to aid the student who has had considerable practical experience without the required book instruction laid out for entrance and advancement. It is believed that they would function more efficiently if they were organized to operate continuously throughout the year, and if they encouraged, by adjusting their courses for that purpose, the student to utilize one or two terms each year at study and training in their classes and shops, from the time when he graduated from the elementary school until he was twenty, while he put the two or three other terms each year in productive employment.

This work could also be provided on the co-operative basis of a week in school and a week in the shop, which is now being successfully worked in some places. Their marked success has, however, been in preparing for the more technical or engineering employments, such as that of draftsman or electrician.

Probably more men in American industry have gained the technical phases of their trades from correspondence schools than by any other means. Their text books are prepared to be read by the student having a limited knowledge of mathematics, and the lesson sheets provided permit study at any free time. Moreover, the teaching manual in pamphlet form can readily be carried in the pocket and studied in direct relation to the tool or problem to be met. The requirement that all problems must be completely solved is in contrast to the evening school where regularity in attendance is frequently the only check on progress and assimilation.

They, however, lack the contact of teacher and pupil wholly and there is, of course, no organized method to provide the varied experience desirable in the manipulative phases of the trades involved. They should also be condemned for exploiting ignorant laborers who have been induced to purchase the courses by field agents, who have covered the country and painted rosy pictures of munificent engineer's and manager's salaries to those who have not the rudiments of an elementary education. This is, of course, in direct contrast to such work as the University of Wisconsin extension courses, where the texts have been admirably prepared for study and there has been no promotion among those incapable of their use.

The Wills Sainte Claire Transmission Case

Tool for Facing a Surface of Irregular Shape—Special Milling Machine with Four Spindles —A Comprehensive Gage—Machine for Grinding Center Holes

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THIS transmission case is of the "bell" type and bolts direct to the end of the crankcase. After cleaning and inspecting, it is water tested for blow holes or leaks and then spotted in three places for locating in future operations. The primary and secondary shaft holes are then bored and reamed, the flanges rough-turned and the inside front end of the secondary shaft hole is profiled.

The pad on the inside of the front end of the transmission case for the secondary shaft is in somewhat the form of a spherical triangle and, owing to the interference of other parts, cannot be faced with an ordinary single cutter. The operation is performed on a 24-in. Cincinnati drilling machine as shown in Fig. 1. Details of the special facing head designed for this work are shown in Fig. 2. The spindle *A*, which carries the cutter, is driven by a universal joint at *B*, so as to permit it to be moved to reach all parts of the surface to be milled.

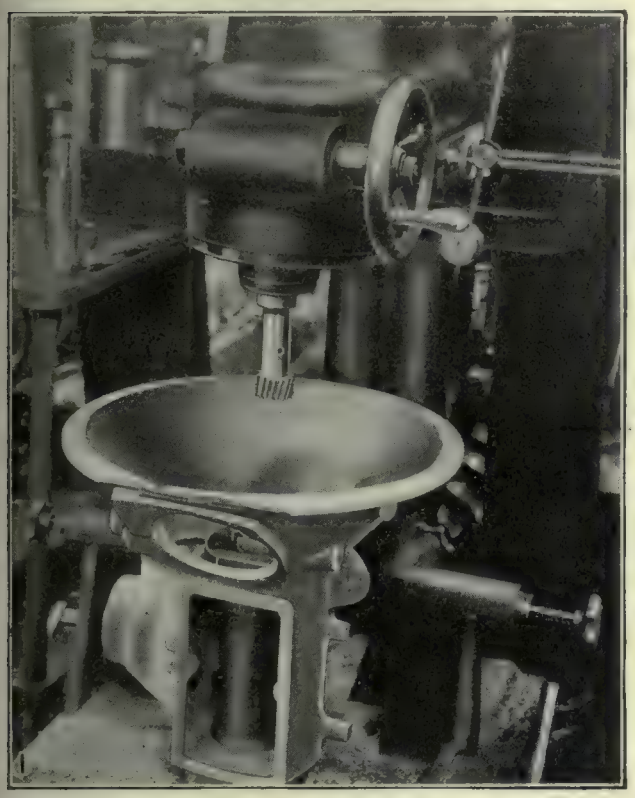


FIG. 1. FACING A TRIANGULAR FLANGE.

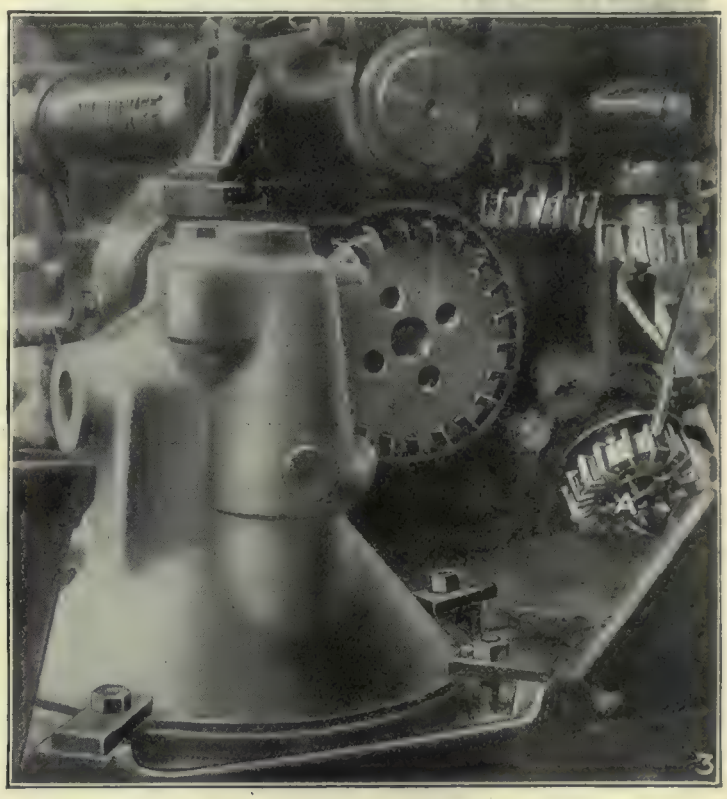


FIG. 3. SPECIAL MILLING MACHINE WITH FOUR SPINDLES

The whole head is mounted in the housing *C* which is fastened to the frame of the drilling machine, on which it is operated. Inside the lower end of the frame *C* is a head *D* which carries the spindle and also the gears shown in the upper view. These gears *E*, *F*

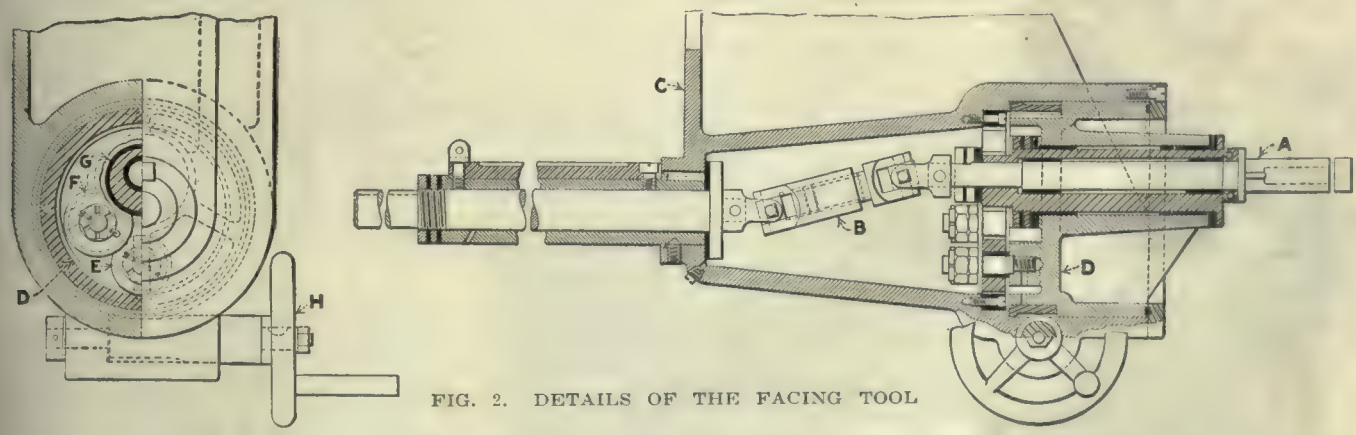


FIG. 2. DETAILS OF THE FACING TOOL



FIG. 4. INSPECTION GAGE FOR CASE.



FIG. 6. INSPECTION GAGE FOR COVER

and *G* in connection with a gear on the outside of *D*, give the desired motion to the milling spindle.

The handle *H* operates a worm which turns the head *D*. An internal gear in *D* operates the pinion *E* which turns *F* and this, in turn, revolves the eccentric gear *G*, which changes the relative position of the center of the milling spindle as the head *D* turns. This combination moves the milling spindle in a triangular path and faces the pad previously referred to, in one revolution of the head *D*. This makes a difficult operation quite simple.

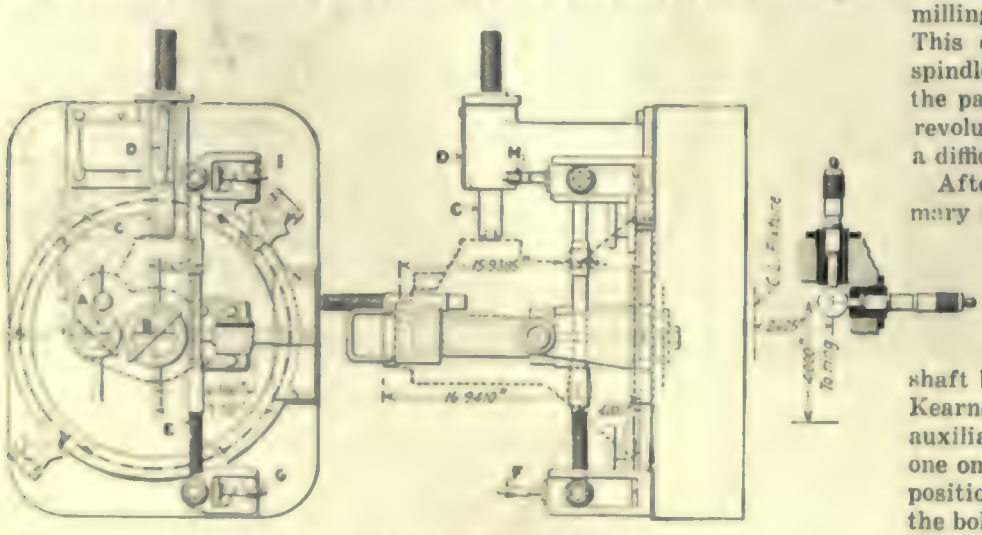


FIG. 5. DETAILS OF THE GAGE

After finishing the face of the primary shaft hole, the flange is drilled, which brings the case to the milling operation shown in Fig. 3. In this operation the top cover-hole pad, hand-hole pad and the rear end of both shaft bosses are surfaced on a special Kearney & Trecker machine with three auxiliary spindles, two vertical and one on an angle as at *A*. The work is positioned by the flange and some of the bolt holes. Then comes boring and reaming the shaft holes, drilling and tapping the many holes that go to make up a transmission case, line reaming and hand reaming the shaft holes, as a quiet running transmission is only secured by extreme care in these details. Finally comes cleaning, washing and inspection. The inspection fixtures are of interest also, two of them being shown in Figs. 4 and 5.

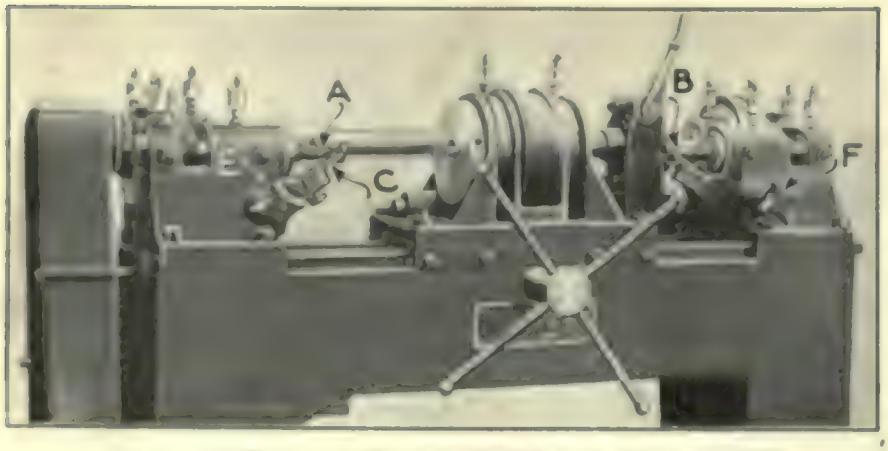


FIG. 3. CENTER GRINDING MACHINE FOR GEAR SHAFTS

The case is put over the two uprights and the caps *A* and *B* slipped in position. The swinging arm *C* tests the side of the case for squareness, the arm revolving to test the opening at various points. The multiplying indicator at *D* gives very close readings at this point. The crosshole for the clutch shaft is tested by the bar *E* which

passes through the hole when the case is in place. The four micrometers, *F*, *G*, *H* and *I* measure the exact position of the bar in both directions. Details of this gage are shown in Fig. 5, which is lettered to match Fig. 4. The plug gages in front of the fixture give some idea of the carefulness of the inspection.

The cover of the transmission case carries the gear-shifting cross shafts and also extends up to support the ball joint of the lever itself. The gage for testing this cover is shown in Fig. 6 and in detail in Fig. 7. The case is positioned by the dowels shown in Fig. 6, two of which are marked *A*. The various shaft-hole openings are tested by the bars shown running in both directions. Handles *B* and *C* control plugs which fit into the upper openings as can be seen in Fig. 7. The construction of the multiplying indicator shown at *A* is given in detail at *B*. The alignment of the two parts is shown on the one needle or pointer.

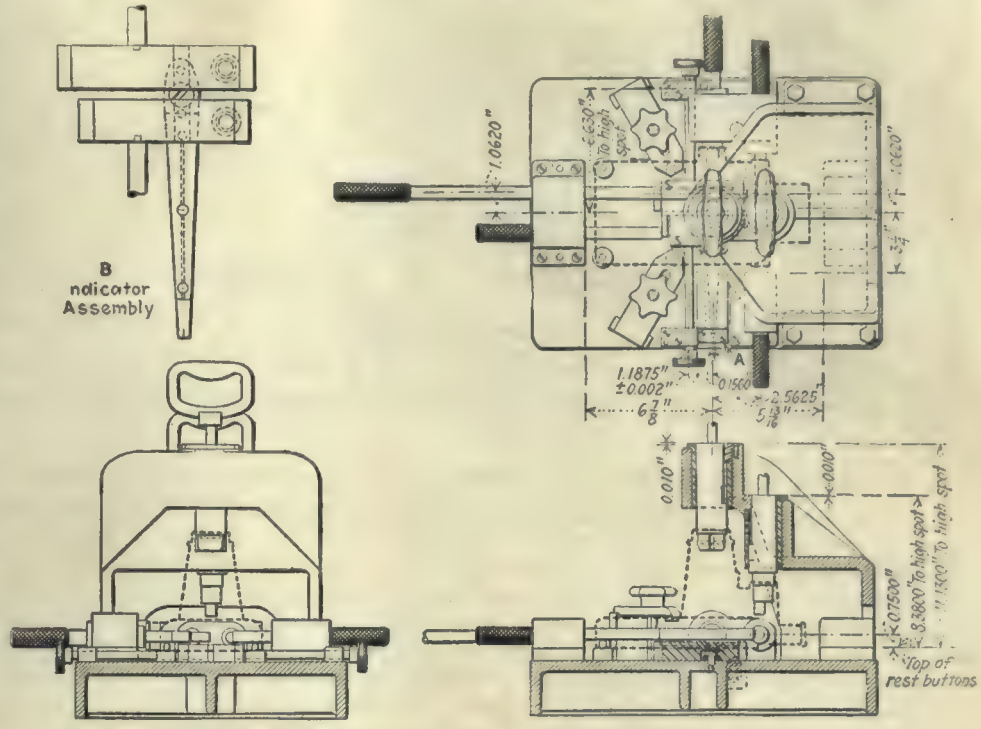


FIG. 7. DETAILS OF COVER INSPECTION GAGE

Although not a part of the transmission case, the secondary gear shaft is closely related to it and the care in securing a perfectly straight shaft is interesting. After the shaft and its gear are heat-treated and hardened, they are put in the central driving head of the special machine shown in Fig. 8, which was built by the Cadillac Tool Co. for this work. The shaft is centered from the pitch line of the gear and the centers in both ends of the shaft are ground true with the gear itself, thus eliminating the errors due to distortion in hardening.

The grinding wheels resemble pointed lead pencils and can be seen at *A* and *B*. Each head carries a diamond tool as can be seen at *C*, so that the wheels can be kept in just the right condition at all times. Movement of the hand knobs *E* and *F* traverses the diamonds past the wheels and trues them. The capstan wheel moves the head carrying the work, first to one wheel and then the other. The results have been very satisfactory in producing quiet running transmissions.

Big Shops Versus Little Shops

By H. C. Clinton

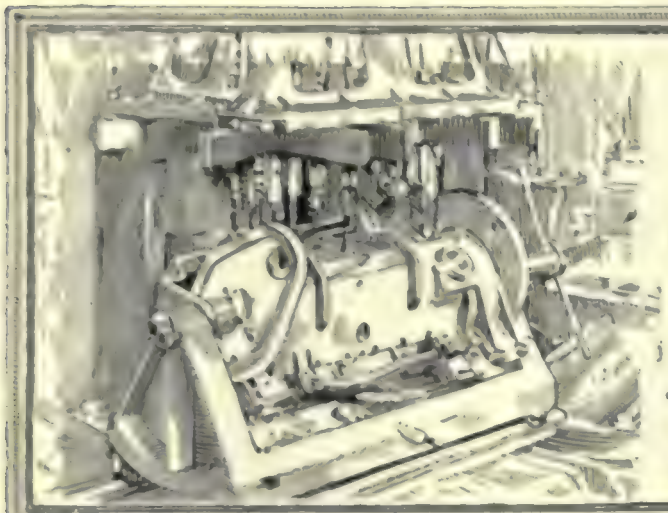
Mr. Forbes' conclusion, on page 99 of American Machinist, that small shops can compete with big ones is certainly true in many cases, especially such a case as he cites.

In at least one large shop his job would be handled as follows: The inquiry is referred to the estimating department, which fixes a price based on the time required and the value of the material used, and reports in writing to the sales department. The sales department acknowledges receipt of the inquiry and quotes the price. When the order is received, if not accompanied by a check, it must be approved by the credit man, then sent to the cost department, which will issue a ticket to the shop authorizing the work and establishing a time charge number against which the time of every person who works on the job must be charged, and perhaps stating the total time allowance as established by the estimating department.

The foreman of the department that is to do the work must now send a written order to the crude stock department for the material, using, of course, the ticket number which identifies the job. In the crude stock department the stock required, in this case tool steel 1⅝ in. in diameter, is cut off to the length specified on the order, weighed, tagged with the ticket number and sent to the department where the work is to be done. The material order with the weight entered on it is sent to the cost department, where its value will be charged against the job.

It is readily seen at this point that quite a lot of time has been consumed, which someone must pay for, before the actual work of making the piece has commenced. In the large shop a certain amount of red tape is absolutely necessary for the orderly and systematic handling of the work; and if the price quoted for one piece, as required in this case, was large enough to actually include a profit, it would certainly appear prohibitive. The preparatory work and accounting required for this one piece would cost very nearly as much as it would for 1,000 or 10,000 pieces, but in these quantities it becomes a small charge "per each."

In regard to reducing the cost of doing this job or altering the procedure, I would suggest that it would be a waste of time to cut off a piece of tubing for supporting the work, if parallels are available, and I would use a combination center drill with a ⅛-in. drill point for the ten ⅛-in. holes, as these combination center drills are so stiff that there is no danger of the points "running off" and spoiling the accuracy of the work.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Recessing Tools for Turret Lathes Continued—Slide Tools, Automatic and Double-Acting Tools —Arrangements for Recessing, Back-Facing and Chamfering

FOR certain kinds of light recessing work, slide tools of various kinds are used successfully. Several of them are shown in Fig. 324. The example at *A* is designed so that it can be attached to the turret of the lathe, and the slide stands in a vertical position. The body of the tool *A* is cut out in dovetail form, and the slide *B* is moved upon it vertically by means of a screw operated by the handle *C*. The slide is provided with two holes at *D* and *E*, in which bars can be placed with cutters suitable to the nature of the work. The slide is capable of adjustment, and the two holes allow for considerable latitude in tool position. For under-cutting, back-chamfering on shallow work, and cutting recesses this type of tool will be found very useful. An application to a recess is shown at *F*, a short bar *G* being used with a cutter at *H*.

Another type of slide tool operating in a horizontal plane is shown at *K*. This example has a stem *L* which fits the turret hole. The casting is dovetailed to receive the slide *M*, which is operated by means of a ball-crank *N*. Adjustable stops are provided at *O* and *P*, so that the depth of cut can be regulated accurately. The slide has two holes at *Q* and *R*, and in either or both of these, tools can be placed for recessing or chamfering. A micrometer collar is applied at *S*, so that accurate readings can be obtained. An application of this device is shown at *T*, a special tool *U* being used for the work. This type of tool is not capable of adjustment, and the size is soon lost in grinding, but for work coming through in small lots it will be found sufficiently good for the purpose.

The matter of gibbing should be carefully attended to in the design of any form of slide tool, in order that adjustment may be provided in the event of wear. A tapered gib is one of the best forms for this class of tool, although it is somewhat more difficult to fit. The adjustment, however, is easy and it is very little trouble to take up wear.

Cutting a Deep Recess

Mention has been made of the desirability of making recessing tools without spring, so that their action is positive. It is not always possible, however, to do this and yet a little ingenuity will often enable the designer to do away with springs and operate the tool by positive mechanical movements. A difficult operation in recessing is shown in Fig. 325, in which the work *A* is a long cast-iron sleeve having a recess cut in it at *B*, a considerable distance from the face of the work *C*. An accurate job was required, not only as to the depth and width of the recess, but also in its position from the face of the work. The design of the tool is one that can be applied to many other recessing operations in more or less modified form.

The bracket *D* is located on the turret and fastened to it by means of screws. The cylindrical portion *E* is bored out through its entire length. It is fitted with a pilot at the forward end *F*, and the pilot is guided in a bushing in the chuck, as shown. The bar *G* is carefully fitted to the hole in the long cylindrical sleeve, so that it can be moved freely in a longitudinal direction. It is cut away at *H* and slotted on a 30-deg. angle at *K*. The toolblock *L* is fitted with an angular tongue which engages with the slot on the bar. The recessing tool is held in the block by means of a screw at *M*, and adjustment is provided by means of a headless setscrew at *N*. The block slides freely through a rectangular slot cut in the outside sleeve.

A rack *O* is fitted to the rear end of the bar, as shown, and the pinion *P* engaging with it is used to

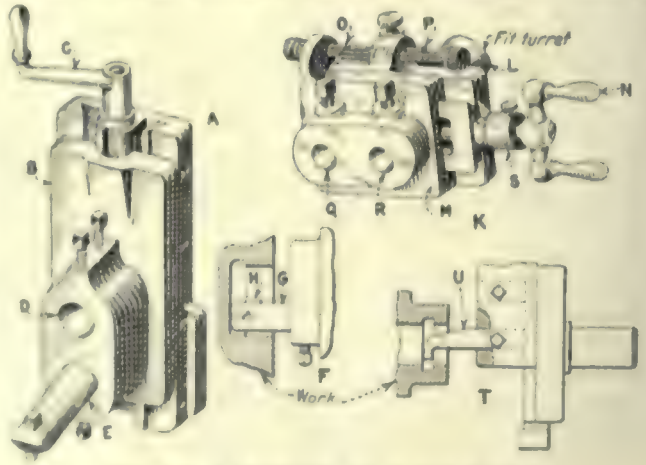


FIG. 324. VARIETIES OF SLIDE TOOLS

For the authors' forthcoming book. All rights reserved.

move the bar forward or backward, as may be required. The pinion is mounted on a shaft *Q*, at the upper end of which there is a graduated handwheel *R*. Accurate readings can be obtained by noting the position of the indicator point *S* in relation to the graduations on the wheel. The movement of the block carrying the cutter is positive in its action, and is controlled by the longitudinal motion of the bar. This is a very excellent type of recessing tool, and it can be depended upon to produce results without chatter, and at the same time rapidly. The exceptional method of support both for the tool and the bar itself gives a rigid construction and permits rapid operation. Care should be taken to provide air holes or vents at any points where there is likely to be a compression of air.

It is easily possible with a design of this kind to cut several recesses at the same time and keep their relations to each other accurately. If a number of recesses were to be cut, it would require only the addition of a suitable number of blocks or a single block with several cutters in it. It would also be possible to cut several recesses in different positions with a single

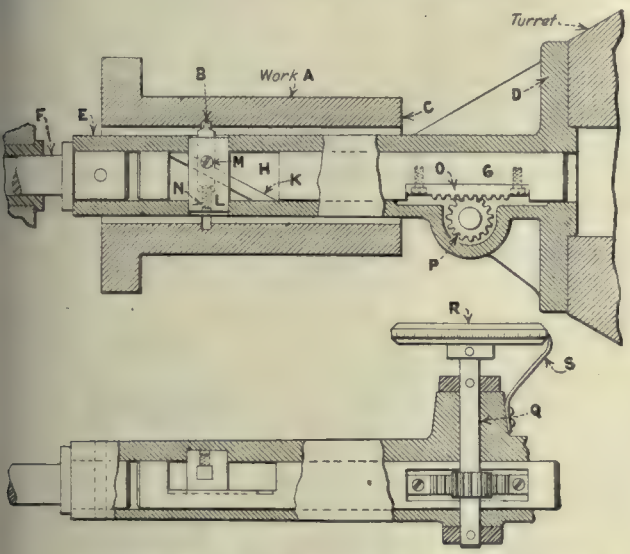


FIG. 325. TOOL FOR CUTTING A DEEP RECESS

cutter by providing suitable stops to obtain the correct spacing.

Automatic Recessing

Another type of tool which is automatic in its action and which is adapted for a small variety of work is shown in Fig. 326. In this example the work *A* has a recess cut in it at *B* a considerable distance from the face of the work. The dimension from the face to the recess is important. The casting *C* is bolted to the face of the turret and carries a bar *D*, which is piloted at the other end in a bushing in the chuck. The collar *E* fits the outside of the bar freely, so that the latter will slide through it easily. The tool is contained in a rectangular block *F*, which fits a corresponding slot in the collar *E*. Provision is made to compensate for wearing of the block by the use of two hardened shoes at *G* and *H*, which shoes can readily be removed and set up by means of paper.

The bar *D* has a straight pin in it at *K*, which acts against an angular slot *L* in the toolblock, thus controlling the movement of the tool. Adjustment for the radial position of the tool is made by the setscrew *M*, and the tool is held in place by two headless screws at *N* and *O*. The sectional view through the pin shows the construction quite clearly. The adjustment from the face of the work to the cutter is obtained by the

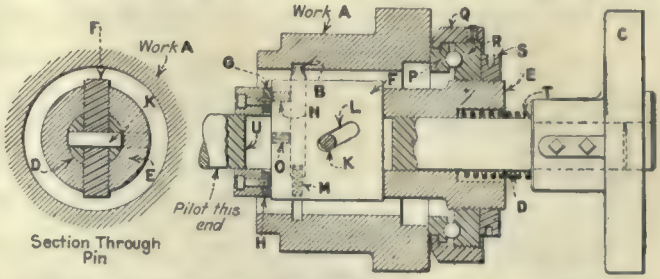


FIG. 326. AUTOMATIC RECESSING TOOL FOR SMALL WORK

position of the thrust bearing *P*, which is held in place by a threaded collar *Q* on the outside of the adjusting nut *R*. The various depths can be obtained by adjustments of the members *R* and *S*, the latter being used as a locknut. A stiff coil spring *T* forces the collar *E* forward until the front end of the sliding block strikes the edge of the slot at *U*, and when in this position the tool is placed in the work or removed from it.

It will be seen that as the turret moves forward with the tool in position, the pressure against the thrust bearing *P* holds the entire mechanism in a fixed position with relation to the work, while the turret carrying the bar *D* continues to travel forward. As it does so, the block *F* is moved outward by the action of the pin *K* in the slot *L*. The depth of the recess can be controlled by an adjustment of the turret stops or by some other convenient means. Unless the depth is particularly important, the turret stop will be found sufficiently accurate.

Recessing tools and those used for back-facing may be somewhat similar in their general construction. It is occasionally necessary to operate a mechanism of this kind automatically, an example being shown in Fig. 327. The work *A* is held in a special fixture mounted on the nose of the spindle. The operation to be done is the back-facing of the surface *B*, and is similar to a recessing job. A cast-iron bracket *C* is fastened to the turret of the machine, and at its forward end a pilot *D* is fitted. This pilot enters the bushing *E* in the spindle of the machine and supports the entire mechanism rigidly.

On the body of the tool a dovetail slide *F* is so mounted that it is free to slide in a longitudinal direction. On the upper part of this slide, the member *G* is mounted and dovetailed to fit another slide. The slide *G* has a transverse movement, and it carries a bar *H*, which contains the facing tool *K*. The bar *L* is fastened to the turret bracket, and is beveled at the forward end where it comes in contact with the upper slide, as shown at *M*. It is backed up to take the thrust by the steel block *N*. The entire mechanism works against the thrust of the heavy coil spring *O*.

In operation the turret moves forward until the stop collar *P* strikes against the end of the bushing in the spindle. Continuation of the turret movement causes the bar *L* to move forward, thus forcing the slide *G* in a transverse direction and causing the tool *K* to face the back of the work. The longitudinal slide naturally remains stationary with respect to the work and the turret bracket really travels under it. The coil spring *O* holds the sliding members *F* firmly against the bushing and prevents any longitudinal movement of it.

As the return movement of the tool would be dependent upon the pressure of the spring *O*, considerable trouble might be caused if this spring failed to act when

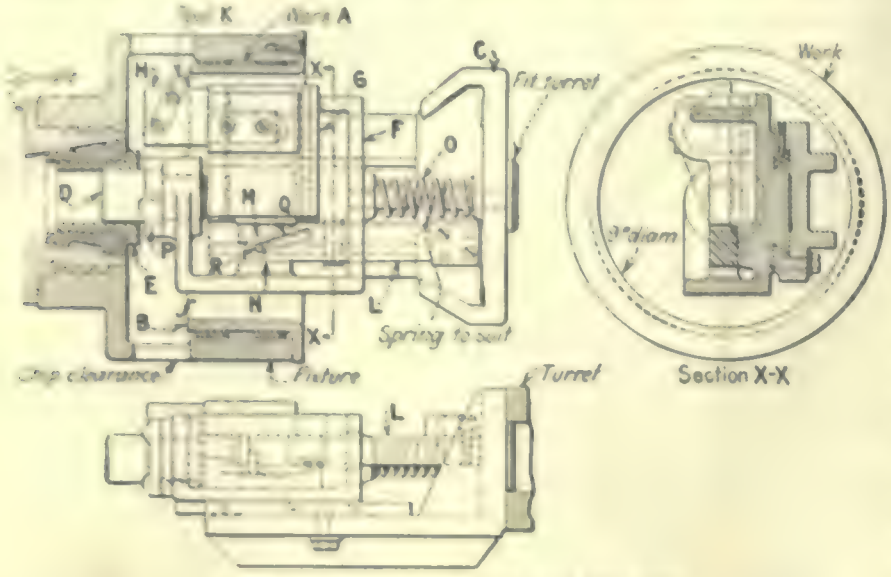


FIG. 327. AUTOMATIC BACK-FACING TOOL

removing the device after the operation. Therefore, as a precautionary measure, the bar *L* is slotted at *Q*, so that the backward movement of the turret acts upon the pin *R*, which is contained in a lug on the slide *G*. If anything were to happen to the spring, the slot and pin would serve to pull the slide back, so that no trouble would be caused.

In designing tools of this kind, great care must be exercised to make sure that all parts are rigidly supported, and precautions must be taken to guard against trouble which might be caused by the sticking of moving parts. The stop collar *P* can be provided with a ball thrust bearing, if this is considered desirable. The dovetail sliding members must be furnished with suitable gibs to take up wear.

Double-Acting Tool

The widths and diameters of recesses are not usually held within very close limits of accuracy, but occasional cases are found where very close tolerances are called for. Such an example is shown in Fig. 328, in which the work *A* is a cylinder having a recess cut at *B* in accurate relation to the end of the casting *C*. Both the depth and width of the recess are important, and it is therefore necessary to design a tool in such a way that these sizes will be machined accurately.

The tool was designed for use on a drilling machine, but the principles illustrated can readily be adapted to tools for use on other machines such as an engine lathe, turret lathe or boring mill. As originally designed, the bar *D* was arranged to fit a quick-change chuck. In using the recessing tool, this chuck was placed in position in the casting on a drill press, the spindle was brought down upon it and a rapid connection made. A sliding type of fixture was employed, in order to avoid very long movements of the drilling machine spindle. The sleeve *E* is a sliding fit on the bar *D*, and both bar and sleeve are slotted to receive the two blocks *F* and *G*, which are controlled and moved readily, but in opposite directions, by means of a pin in the bar and angular slots in the blocks, as shown at *H*. There are two cutters at *K* and *L*, so arranged that each of them cuts one side of the recess, a method employed in order to preserve the width. These cutters are notched at *M*, so that they engage with the sliding blocks mentioned, thus controlling the movement of the tools. The lower part of the sleeve *N* is threaded and fitted with a pilot *O*, which enters the bushing *P* in the fixture. The end of this pilot bar is provided with four bearing shoes *Q*, ground cylindrically so that they fit the inside of the bushing. The space between them allows clearance for any chips which may work down and get into the bushing. In the normal position, a heavy coil spring *R* presses against the end of the bar *D* and forces it upward, so that it draws the cutters inward and away from the work.

The position of the recess is determined by an adjustment of the stop collar *S*, which rests on the finished face of the casting *C*. Adjustment is made by the locknuts at *T* and *U*. A ball thrust bearing is interposed at *V*, as indicated. When in use there is a slight amount of clearance between the bottom of the bushing *S* and the top of the locknuts *T* and *U*, and the bushing does not revolve during the operation. The depth of the recess is controlled by an

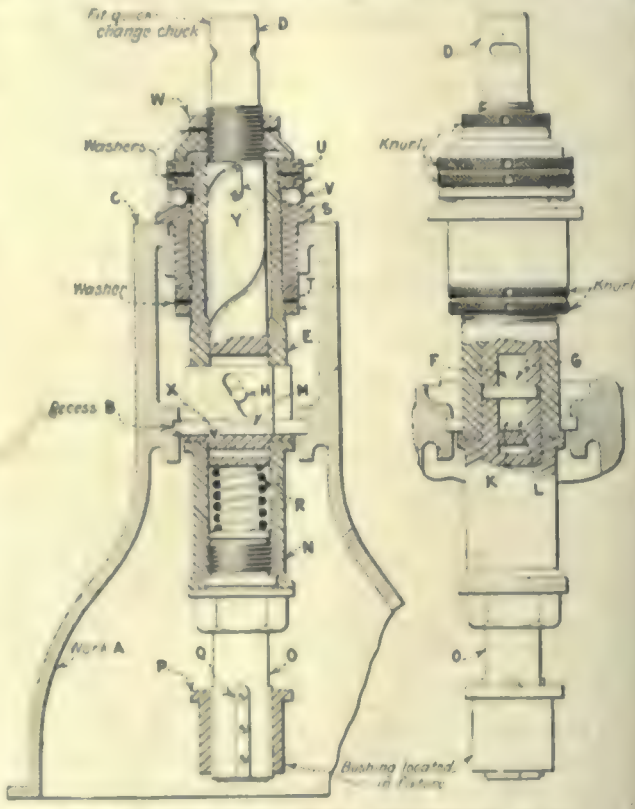


FIG. 328. DOUBLE-ACTING RECESSING TOOL

adjustment of the stop collar and locknut at *W*. This arrangement gives a freely moving tool and no thrust on the end of the casting, as this thrust is taken up by the bearing at *V*. A hardened and ground seat *X* fits in the slot and takes the pressure of the cutters, to avoid wear on the sleeve itself. Note that the sleeve is driven by two keys *Y*, in order to obviate any torsional stresses on the cutter blocks.

Standardization of Herringbone Gears

These Recommendations Are the Result of Careful Investigation by a Committee of the American Gear Manufacturers' Association

THE recommendations herewith submitted for adoption are the result of the majority opinion of the members of the American Gear Manufacturers' Association, as expressed by them in their answers to questionnaires sent out. The first questionnaire was thoroughly discussed at the Detroit meeting and modifications suggested.

The suggestions were considered by the committee, which resulted in a second questionnaire being sent out in June, 1920. This questionnaire was discussed at the general and committee meetings at Lake Mohonk, and further modified and added to. The various questionnaires and discussions have resulted in the herringbone gear recommendations herewith submitted for adoption as recommended practice.

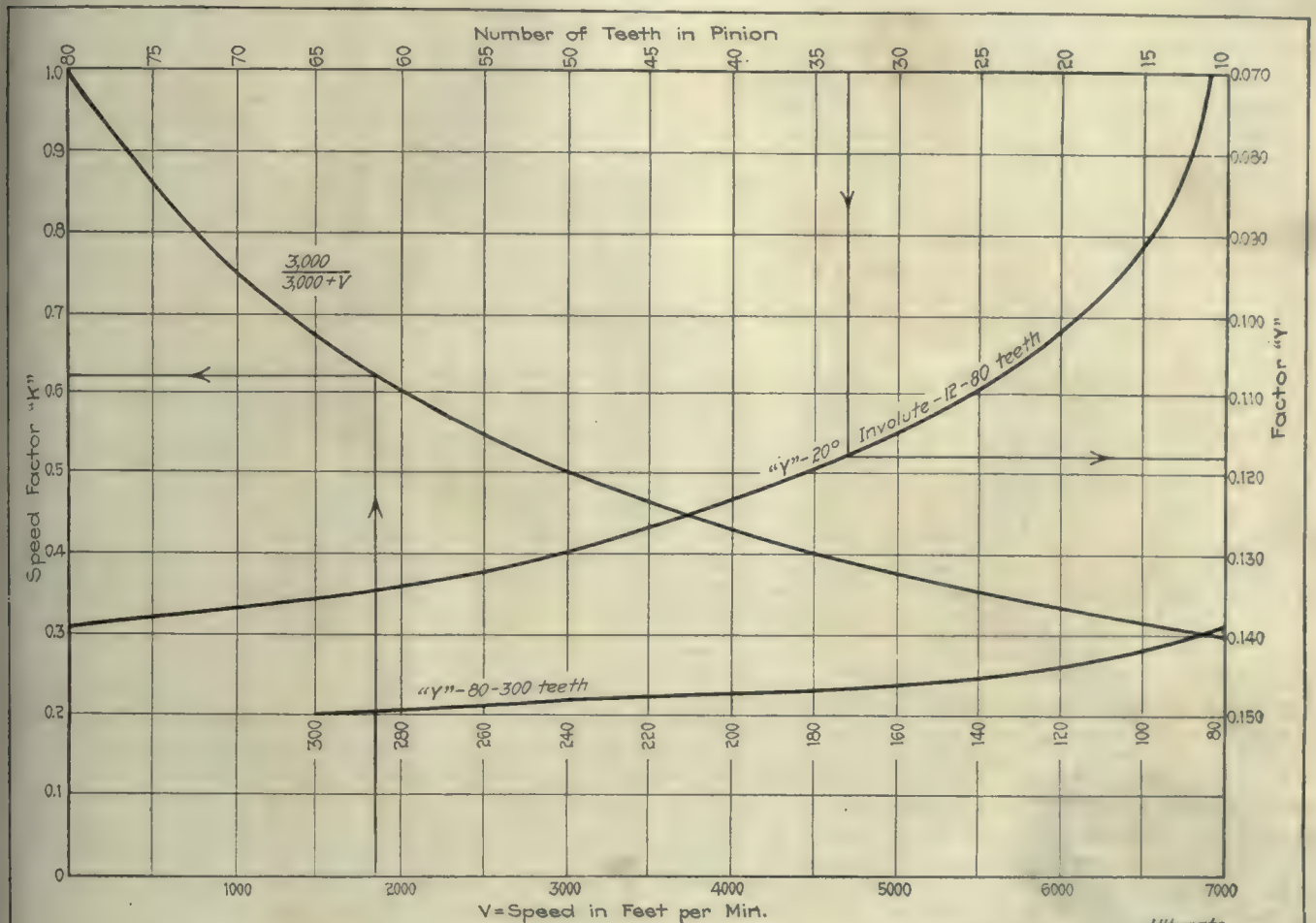
All calculations of pitch, spiral angle, addendum and dedendum are based on diametral pitch in plane of rotation.

(1) The use of diametral pitches only.

(2) Spiral angle (of teeth with axis) 23 deg.

(3) Pressure angle (in plane of rotation of gear) 20 deg.

TABLE I. STRENGTH OF HERRINGBONE GEARS



$W = \frac{S}{P} PFYK$ – (Safe for wear, well oiled) (for grease lubrication)

W = Load in pounds (multiply by 0.8 to 0.62)

S = Working stress (no speed)

P = Circular pitch

Y = Factor (from curve)

F = Face in inches

K = Speed factor (from curve)

VALUES OF S

		Ultimate Tensile
Chrome nickel steel Heat treated	30,000	120,000
Forge steel - 0.50 C.	25,000	100,000
Forge steel - 0.30 C.	20,000	80,000
Cast steel	15,000	60,000
Cast iron	8,000	24,000
Bronze 88-10-2	8,000	24,000

For continuous contact of teeth Min. Face = 6 times C.P.

EQUIVALENT VALUES OF DIAMETRAL PITCHES

D.P.	1¼	1½	1¾	2		2½		3	3½	4	5	6		8
C.P.	2.51	2.09	1.79	1.57		1.25		1.04	0.897	0.785	0.628	0.523		0.392
Min. Face Rec.	15"	12½"	11"	9½"		7½"		6½"	5½"	5"	4"	3½"		2½"

Example: Pin, 33 T., Gear 197 T., 2½ D.P., 28 F., 1860 Ft. per min. Pitch speed

Material: Chrome nickel Heat treated } Steel pinion, rolled steel gear rim

$W = 15{,}000 \times 1.25 \times 28 \times 0.118 \times 0.62 = 38{,}400$ lb. $H.P. = \frac{W \times V}{33{,}000} = \frac{38{,}400 \times 1860}{33{,}000} = 2150$ H.P.

(4) Pitch diameter $= \frac{P}{N}$

(5) Outside diameter $= \frac{N \text{ plus } 1.6}{P}$

(6) Short tooth, with addendum $\frac{0.8}{P}$

(7) Dedendum $\frac{1}{P}$

(8) Total depth $\frac{1.8}{P}$

(9) Minimum width of active face equal to $\frac{16}{P}$

Active face equals sum of right and left helical teeth. Total face equals active face plus width of groove.

(10) Formulas for strength of teeth calculated for wear as well as strength of materials, as per Table I.

(11) Width and depth of groove in center of blank for gears cut with single thread hobs at proper angle with axis of gear—Table II.

TABLE II. HOB SET AT AN ANGLE TO AXIS, HELIX ANGLE MINUS ANGLE OF HOB

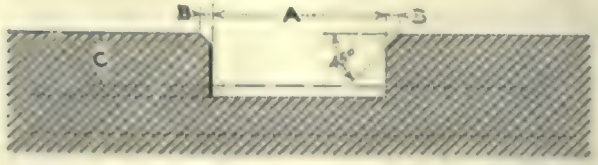
Diametral Pitch	A	B	C	No. of Threads in Hob
8	1/4	1/4	1/4	1
7	1/4	1/4	1/4	1
6	1/4	1/4	1/4	1
5	1/4	1/4	1/4	1
4	1/4	1/4	1/4	1
3½	1/4	1/4	1/4	1
3	1/4	1/4	1/4	1
2½	1/4	1/4	1/4	1
2½	1/4	1/4	1/4	1
2	1/4	1/4	1/4	1
1½	1/4	1/4	1/4	1

(12) Width and depth of groove in center of blank for gears cut by planing or shaping method equal:

Width 1/4 in.—Depth $\frac{1.8}{P}$ plus 0.01 in.

(13) Width and depth of groove in center of blank for gears cut with hobs at right-angles to the axis of gear—Table III.

TABLE III. DIMENSIONS OF GROOVES



Diametral Pitch	A	B	C	No. of Threads in Hob
8	1/4	1/4	1/4	4
7	1/4	1/4	1/4	4
6	1/4	1/4	1/4	4
5	1/4	1/4	1/4	4
4	1/4	1/4	1/4	4
3½	1/4	1/4	1/4	3
3	1/4	1/4	1/4	3
2½	1/4	1/4	1/4	3
2	1/4	1/4	1/4	3
1¾	1/4	1/4	1/4	3
1½	1/4	1/4	1/4	3
1¼	1/4	1/4	1/4	3

(14) Enlargement in outside diameter of pinions with 17 teeth or less and corresponding decrease in outside diameter of gears to produce a full involute tooth, as per Table IV.

TABLE IV. ENLARGEMENT FOR PINIONS WITH 17 TEETH AND LESS

No. of Teeth	Diametrical Pitch											
	10	8	6	5	4	3½	3	2½	2	1¾	1½	1¼	1
7	0.1181	0.1478	0.1976	0.2364	0.2954	0.3382	0.3938	0.4726	0.5906	0.6762	0.7882	0.945	1.181
8	0.1064	0.133	0.1782	0.2128	0.2662	0.3046	0.3548	0.4258	0.5322	0.6094	0.7102	0.8514	1.064
9	0.0947	0.1184	0.1586	0.1894	0.2368	0.2712	0.3158	0.379	0.4736	0.5424	0.6322	0.7578	0.9471
10	0.83	0.1038	0.1392	0.1662	0.2076	0.2378	0.2768	0.3322	0.4152	0.4756	0.5542	0.6642	0.8302
11	0.0713	0.0892	0.1196	0.1428	0.1784	0.2044	0.2378	0.2854	0.3568	0.4088	0.4762	0.5706	0.7132
12	0.0596	0.0746	0.1002	0.1194	0.1492	0.171	0.1988	0.2386	0.2982	0.342	0.3982	0.4772	0.5962
13	0.0479	0.06	0.0806	0.0958	0.12	0.1376	0.1598	0.1918	0.2398	0.2752	0.3202	0.3836	0.4792
14	0.0362	0.0454	0.0612	0.0726	0.0906	0.0142	0.1208	0.0145	0.1812	0.2082	0.2424	0.29	0.3623
15	0.0245	0.0308	0.0416	0.0492	0.0614	0.0708	0.0818	0.0982	0.1228	0.1414	0.1644	0.1964	0.2453
16	0.0128	0.0162	0.0222	0.0258	0.0322	0.0374	0.0428	0.0514	0.0642	0.0746	0.0864	0.1028	0.1283
17	0.0011	0.0016	0.0026	0.0024	0.0028	0.004	0.0038	0.0046	0.0058	0.0078	0.0084	0.0092	0.0113

Calculate the outside diameter as usual, then add the amount of enlargement to the pinion and subtract the same amount from the gear. Use only when the pinion has 17 teeth and less. Whenever two enlarged pinions have to gear together, the center distance must be increased by one-half the sum of the enlargement of the two pinions

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Cut the Force or Reduce Working Hours?

By A. W. Forbes

On page 849, Vol. 54, of American Machinist, under the above title, S. N. Bacon states that it is evident that I am "not familiar with the situation in various cities and in a variety of manufacturing plants." Very true: My experience for the last eight years has been confined to Worcester, Mass., but I do not think the situation is very different here than it is in most cities at the present time.

When Mr. Bacon speaks of "No help wanted" signs hanging out, he certainly is not speaking of Worcester. I do not know what kind of a reception the applicant gets inside the office, but in a recent trip through the manufacturing section I recently encountered fifty-seven signs of industrial companies, and in this list there was but one with a "No help wanted" notice that could be seen without entering the office.

Last Thanksgiving week, we had an unusually large number of applicants for work; about ten boys applied, but no one who appeared to be over twenty-one years of age. We have been averaging about two a week, and of this number I think there are very few who have no previously worked here or known someone who has. The large proportion of boy applicants was probably due to the fact that we employ a larger proportion of boys than most shops, it being my experience that those engaged before their eighteenth year stay longer and become more skilled at the work than those engaged later. I feel quite convinced that very few come looking for work without first finding out something about the place, and the prospects for finding work. Then as many others get the same clues, all the applicants crowd to the same shops.

It would seem as though the situation could be helped somewhat by an employment office that would make thorough examinations and give full data to the prospective employer. The information given by the public employment offices amounts to but little. Such information should include mental and physical tests, a complete record of the individual's experience, and his interests and desires in regard to both work and recreation. The latter often gives more information about a man's ability to work than any records of the work that he has done.

The Machinery Markets of Venezuela

Location of Venezuela—Controlling Agricultural Products—Predominance of Sugar Industries—Influence of Cocoa and Tobacco—Extent of Manufacture

BY HARRY CHAPIN PLUMMER

MISTAKEN ideas unfortunately prevail in our leading centers concerning not only the geographical position, but the social and economic background of the republic of Venezuela, nearest of all South American republics to the mainland of the United States and Canada. Distant 1,940 miles from New York, the capital city, Caracas, and her seaboard gateway, La Guaira, lie about on the parallel of longitude of St. John, New Brunswick, and on the parallel of latitude of the southern boundary of Costa Rica.

"Industrial Venezuela" lies within a broad belt of not more than seventy-five miles depth from the coastline and extending for from three hundred to three hundred and fifty miles from east to west. In this belt are Caracas, La Guaira, Maracay, Valencia, Puerto Cabello, San Felipe, Barquisimeto, all connected by motor-road and by the one thousand miles of railway which is Venezuela's total to date. The motor-road system which extends far beyond this area to such distant cities as San Fernando de Apure, on the headwaters of the Orinoco and to Ciudad Bolivar, the principal river port of the Orinoco system, and which even approaches "Los Andes," like the smaller railway mileage, has its immediate connections by foreign and coastwise navigation lines, maintaining regular schedules with the chief markets abroad and with the coast and interior river ports of the republic.

The agricultural production sustains the principal manufacturing activities, to wit, sugar, cacao (chocolate), cattle, timber, tobacco and cotton. Coffee, one of the basic items of productive wealth, is not subject to any specific manufacturing processes within the country, while Balata (rubber) and cocoanuts, two large agricultural factors of the lowlands, likewise are shipped abroad for industrial processing.

The Importance of Sugar Cane

First among the industries which contribute directly to factory operation is sugar cane, of which 3,000 metric tons is the daily average consumption upon an aggregate manufacturing area of 30,000 acres. The factories represent a total invested capital of $12,500,000. The best and most modern centrifugals from the United States, England and Germany are employed for the making of refined sugar papelon (a brown sugar usually put up in conical form and closely resembling maple-sugar in color and consistency), rum, alcohol and aguardiente, the latter the high-proof, fiery, daily beverage of the peones. The industry is, perhaps, the most highly organized and systematized of any in the republic. Steam is generated by waste portions of the cane stalk and the residue of the crushed cane. The largest and most modern plants, and of greatest production, are at or in the vicinity of Caracas, Maracay, San Mateo (near La Victoria), Tacarigua and Valencia and in the Maracaibo region.

Probably affording one of the best opportunities of any industry for the introduction of new and modern machinery is that of cocoa and chocolate production. Unlike the sugar factories, this does not fall back upon a large and well-distributed home demand and so has not developed its mechanical facilities to anything like the degree that have the sugar producers. By far the major portion of the cacao grown in the country is shipped to England and Europe and to the United States, where it is refined and made up into sweets and drinking chocolate. An excellent brand of eating chocolate has been evolved by the manufacturers at Caracas, but thus far they have not perfected a mechanical means for so preparing the product that it will not discolor and become excessively dry under the average tropical temperature. The machinery used in this industry is relatively old and obsolete, and new and up-to-date chocolate-refining and making apparatus, such as may insure the preservation of quality and appearance should find a market in Venezuela.

Live stock raising provides the fundamental elements for three separate manufactories. The milk production of the cattle furnishes the chief item of supply for the Lactuario de Maracay, a model dairy factory at the capital of the State of Aragua, which has become a national monopoly. There condensed milk and cream, butter and cheese are produced by twentieth century American and European processes and by the use of the newest and most approved machinery from this country, Germany and Holland. The killing center for cattle is at Puerto Cabello, where an English corporation maintains a large slaughter-house and freezing plant, in charge of experts from the packing centers of the United States. Besides there are abattoirs at Caracas, Cuidad Bolivar, Maracaibo and other interior cities.

In the Puerto Cabello plant machinery is not so much a factor in the actual killing and packing operations as it is in the incidental departments, such as the engine room, refrigerating section and rending and bone utilization plants. Power, generated hitherto from steam, has lately been derived from petroleum, which, of course, is one of the most common of Venezuelan resources today. It is obtained in the oil fields of the Maracaibo region and sent for refining to neighboring Curacao and thence re-imported into the country.

Leather Goods and Textiles

There are several old-established and well-equipped leather tanneries at Caracas, La Guaira, Valencia and other points central to the grazing areas and killing points, and an excellent quality and admirably finished stock is produced from cow, sheep and goat hides. All have an abundant outlet in the boot and shoe industry, which is, perhaps the most extensive, and certainly is the best organized, of the country's manufacturing interests after sugar production.

In the larger Venezuela shoe factories, where ready-to-wear shoes form the unit of production, the nucleus of a mechanical equipment is to be found, but a virgin field is offered for the machines and time-saving and speeding-up processes which have made the New England industry of today. The saddle production, similarly, is making notable strides, because of the superior finish and strikingly handsome appearance of the Venezuelan improvement upon the Mexican model. This is true, likewise, of belts, suit-cases and traveling

bags, purses and other leather goods manufactured in the republic.

English machinery of a type and pattern in use fifteen years ago in the Manchester and Birmingham mills is mainly employed now in the five or six cotton textile mills at Caracas, Valencia and at a city in the eastern section of the republic. Almost all of the machinery imported from England is about ready to be scrapped. The cotton industry of the country, having its basis in a field production of 43,000 quintals of seeded raw cotton grading as Cotton No. 2, is in its infancy; yet already $2,000,000 have been invested in manufacturing. As new industrial activities and higher wages, coupled with improved living conditions and a hint of the refinements of civilization, have brought about a complete metamorphosis of the native mestizo and Indian and negro working elements of the population, the demand for cotton goods—sufficient for wear at all times and in any but the higher mountain regions—not only will increase, but will expand in scope and variety. The larger mills of Caracas and Valencia employ several hundred hands and the element of time and labor saving already is giving rise to the need for the most improved features of motive and mechanical installation. The boll cotton is produced, in each instance, almost within sight of the spindles and what with a rising tariff against importation of the finer, fancier cottons, the only grades now finding a profitable entry into the country, the native industry is entering upon an area of great productivity and prosperity. The English machinery models may be supplanted, however, only by a most careful study of the field and the adoption of a service plan wherein the actual sale of the machinery will be but incidental to an all-round betterment of processing. But with the introduction of a comprehensive survey of the needs of the industry from field to market and the demonstration of actual economies to be realized, the opportunity for machinery contracts in the cotton mills is among the best the republic has to offer.

American Cigarette Machinery Used

Tobacco of generally splendid quality is grown upon a large scale. The cigar and cigarette-making industry is a soundly established and well-organized entity and has its chief impulse in the fierce competition that has developed between the many manufacturers. Modern machinery is installed in the larger plants, which are in the cities, of course, and cigarettes, in particular, have the benefit of the commonly known devices for quick sorting, rolling, sealing and packeting. Almost all of these are of American origin. The cigarette paper, of poor quality, is made in Barcelona, Spain, and is controlled as a monopoly. Only the fancier brands of foreign cigarettes are on sale in the country, the native product having vastly the greater proportion of consumption. One of the chief American tobacco interests recently acquired control of the principal cigarette factories in Caracas.

Several large breweries, a national cement factory, furniture and wood-working plants, marble quarries and cutting establishments and divers industries for the manufacture of soap and candles, glass, ice, matches and cotton-seed oil are maintained within the area of "Industrial Venezuela," and all of these are natural markets for up-to-date machinery.

Labor in Venezuela occupies a wholly different status from that in this country. Instinctively and fundamentally the Venezuelan workman inclines towards mechanics, and, as a rule, he is skillful—in many instances uncannily so. He invariably proves himself to be capable, after a brief instruction, of handling and repairing all sorts of machinery and tools. The wage levels are about sixty-five per cent of those prevailing in this country, except for the completely unskilled and then they are very much lower, depending, of course, upon the locality. At interior points from 60 to 90 cents per day is considered a good wage. The supply of both skilled and unskilled labor, however, is limited and as the Venezuelan industries increase in extent and operation and draw more and more upon the relatively small proportion of workmen to the population, the question of labor-saving and speeding-up devices and machinery, which hitherto has not been a factor because of cheapness and abundance of help for industry operating upon a restricted scale, must come to the fore as a subject for careful consideration for the Venezuelan industrial employer.

Does Big Business Tend to Retard Progress?

By Harry Senior

Anent the editorial on page 187 of American Machinist in respect to the semi-humorous charge brought by Charles Kettering against the automobile manufacturers, it seems to me that your solicitude lest the same charge might be brought against machinery manufacturers is without foundation, for Mr. Kettering's charge is in itself contradictory.

If the manufacturers of automobiles did *not* make better machines from year to year why do we continue to trade in our cars? There is a reason for all things, and those of us at least who are mechanics, are not altogether the victims of the salesmen's wiles. We turn in our old cars for the purpose of getting better ones and not often do we get stung.

There may be a slight modicum of truth in your last paragraph, quoting Mr. Kettering, that big business militates against changes, but in times like these the condition does not hold. I am fairly well acquainted with the machine and tool industry throughout New England, and never have I seen a time when so many changes were being made and so thorough and determined efforts toward improvement put forth as at present.

The resumption of business will soon dispel any suspicion we may have entertained that the limit of improvement has been reached.



Two Special Machines for Ordinary Work

Comparatively Small Machine Does the Work of a Large Planer—Work Remains Stationary While Tools Move—Combination Milling and Boring Machine

BY MILTON WRIGHT

THE two special machines herewith illustrated and described, though unique in design, cannot be considered special purpose machines for the reason that they were built to accomplish results regularly obtained on standard planing, boring and milling machines. Nor did their designer seek to upset present-day machine-shop practice by building such machines for the market; rather was he concerned in making for

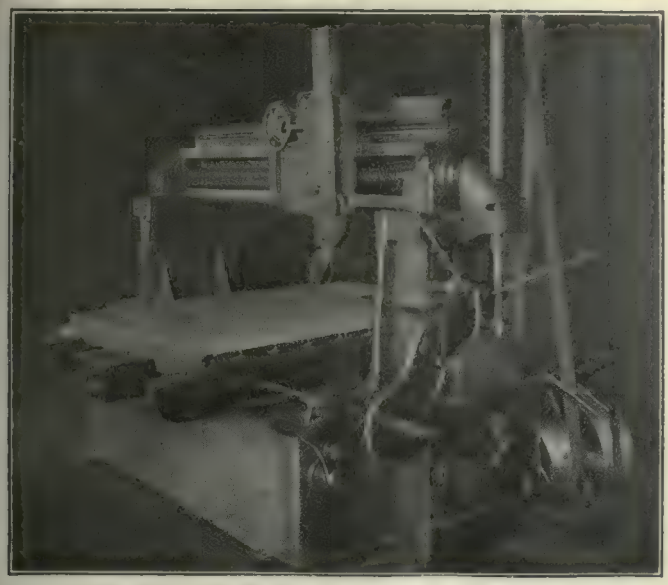


FIG. 1. A PLANER OF UNIQUE DESIGN

his own use something that would modify or remove the restrictions imposed b ymachines of standard construction in the manufacture of his own product.

The machines were designed by F. H. Sleeper, of the Sleeper & Hartley Co., Worcester, Mass., built in the shop of that firm, and are in regular daily service performing operations within the range of each upon the parts of spring coiling machinery.

The machine shown in Fig. 1 is a planer, incorporating all the regular movements and adjustments of a standard planer but in which the cutting movement, instead of being accomplished by sliding the work back and forth under a stationary tool, is by reciprocation of the head, or saddle, along the crossrail, while the table is fed intermittently by means of a screw, ratchet and pawl. The capacity of the machine is 4 ft. in each of its three dimensions.

The crossrail is of unusually heavy construction with substantial square section ways upon which the saddle slides, and the latter has a comparatively long bearing upon the rail and is strongly gibbed to it. Movement is imparted to the saddle by a quick-pitch, triple-thread screw, driven through bevel gearing from the first shaft, which in turn derives its motion from a pair of open and crossed shifting belts. The stroke of the saddle is adjustable from ¾ in. to the full limit of 4 ft., and to any position along the rail. The stroke adjustment is by means of movable dogs on a dial located at the operating position and is at all times within easy reach of the operator regardless of the position of the saddle on the rail.

The crossrail is supported on trunnion bearings and may be swung to an angle of 45 deg. either side of the vertical position; the trunnion nearest the operator being graduated to facilitate the setting. The trunnion bearings are in turn borne by the inner members of "telescoping" housings, by means of which the rail may be elevated to give the full clearance of 4 ft. under the tool. The rail is shown in Fig. 1 at its lowest position.

The toolbar has a vertical movement of 12 in. within the saddle, and is operated by a handwheel and worm gearing. Power down feed is applied by a ratchet and pawl to which motion is transmitted by an adjustable cam on the crossrail.

The table is supported on three flat ways, the center one of which is double, and to it the table is gibbed. This central way guides the table and takes the thrust of the tool; the office of the outer ways is merely to support the weight of table and work.

The table may be fed in either direction by means of a screw lying between the two parts of the center guideway and driven by a ratchet and pawl.

A closer view of the operating position is shown in Fig. 2, from which the details of the drive and control may be studied.

Near the lower end of the vertical shaft is a worm that meshes with a worm wheel in the middle of a short transverse shaft. This latter shaft carries upon its outer end the disk on which are the movable dogs of the reversing mechanism, and upon its inner end the first of a train of gears that transmit motion to the feed screw. This shaft, then, makes a partial rotation, forward and back, at each cycle of movement. The amplitude of the movement, the point of reversal, and



FIG. 2. DETAILS OF THE DRIVE AND CONTROL

the position of the saddle on the crossrail are thus determined by the position of the dogs on the disk.

The gear on the inner end of the transverse shaft drives a friction box similar in construction to that of

a standard planer, and this in turn oscillates the gear segment at the left; the amplitude and relative direction of the movement being determined by the position of an adjustable crankpin with relation to the center of rotation of the friction box. The pinion driven by the gear segment is connected to its shaft through a double ratchet and reversing pawl, by means of which the feed is applied in either direction or is disengaged.

The swinging lever operating the belts is provided with two handles by means of which the traversing movement of the tool is controlled by hand. This movement may thus be stopped, started, or reversed as

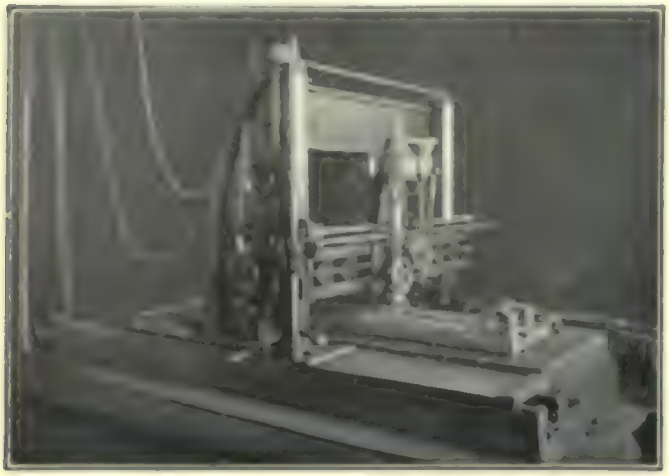


FIG. 3. COMBINATION DRILLING AND MILLING MACHINE

easily and accurately as the corresponding movement of a planer table, either from the operating position or from the back of the machine.

Power for elevating the crossrail is supplied by a separate electric motor located on the outside of the farther housing. To make this adjustment it is necessary for the operator to loosen several clamping bolts on both housings and he would, therefore, naturally be upon the opposite side of the machine when the power was required. What would thus seem at first glance to be a chance disposition of a motor control in an out-of-the-way place is really the result of careful motion study upon the part of the designer.

While this machine would be considered by the casual observer to be a freak, a survey of the conditions which brought it into being would show it to be a logical and practical development. The frames of the spring-coiling machine are made up of long castings that in the larger sizes run into considerable weight. Practically no planing is required over their length, and to plane them widthwise would necessitate the use of a standard planer whose width between housings would be out of all proportion to the job, or else would require the use of long overhanging tools. On this machine there is no restriction as to the length that can be accommodated, and the general handiness and ease of control compare favorably with those of a shaper that would possess but a fraction of its capacity.

The second machine to be considered is by the same designer and is at work in the same shop. It is called a combination milling and boring machine and has even greater range and versatility than the planer. As may be seen in Fig. 3, it resembles in general appearance a standard planer, but differs materially in two respects. Instead of the saddle and toolslide of a planer, the crossrail carries a head similar to that of a radial drilling machine; and it is the housings that move—not the platen.

The platen, or table, is the finished upper surface of the bed casting. It is 4 x 8 ft. in dimension and is provided with T-slots and holes for poppets like a planer platen. The distance between housings is 6 ft. and the maximum height from the table to the lower end of the spindle is 4 ft. The housings may be moved from end to end of the machine. The vertical movement of the spindle is 15 in., independent of the power-driven vertical movement of the crossrail.

With this machine it is possible to secure a casting to the surface of the table and perform any machining operation that can be done with a milling cutter on all of the five exposed surfaces without resetting.

The part shown on the table in Fig. 3 is a special job and will have to be reset to bore the two bearings to be seen at the right, for the machine will not bore holes parallel with the table. All other operations have been completed, including the "letting in" of the caps, drilling and tapping for the cap bolts and finishing a dovetailed slide.

A pit at the end of the machine provides for long pieces that require machining on the ends. The housings over-run the slides a sufficient distance to enable the operator to bring the drills or cutter into action in this position.

The machine has two complete sets of movements; one a slow and powerful drive to the tools and feeds with ample provision for speed and feed changes; the other a rapid traverse of all parts for the purpose of bringing the tools quickly into operating position at any part of the work. The rapid movement derives its power from an auxiliary motor and is independent of the speed and feed changing devices, a reversing switch for this motor being mounted on the housing.

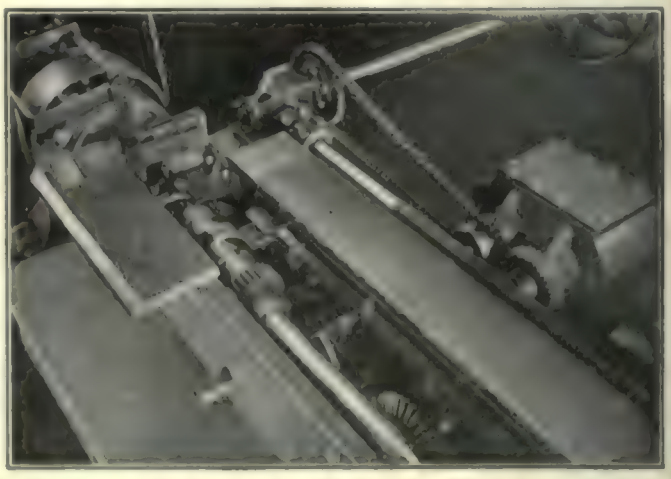


FIG. 4. MAIN DRIVE AND SPEED CHANGE GEARBOX

In Fig. 4 may be seen a portion of the driving mechanism, from which the cover has been removed. The main drive is by belt from an overhead countershaft to the pulley at the left. The main clutch by which all movements may be disengaged or reversed is shown, as is also one of the pair of bevel gears by which the motion is transmitted to the gear box at the right. The auxiliary motor drives through the chain directly to the gear box, but the change gears therein are not involved in the rapid movements, as a sliding clutch puts the gear box out of action before the power can be applied.

Standardizing the Laws Affecting Foreign Trade

By A. J. Wolfe
Chief, Division of Commercial Laws, Department of Commerce

The lack of uniformity in the laws of the various countries which appear as factors in the international exchange of goods is felt as a serious drawback by merchants and jurists everywhere. Standardization is naturally a work of slow growth; it is the inevitable effect of evolution in international merchandising. The time may never be reached, of course, when all countries will adopt commercial codes of substantially identical tenor. Local conditions, the weight of tradition, and radical divergence in the development of jurisprudence preclude this. But there is no reason apparent why international agreement should not establish a certain amount of uniformity in the treatment of various instruments of foreign commerce, such as bills of lading, in regulating bankruptcy practice, in arbitrating commercial disputes, in affording recognition to foreign judgments, in settling the difficult problem of double taxation, in standardizing patent, trade-mark, and copyright laws, and in regulating the status of alien corporations. A limited degree of such standardization has been attained by certain groups of countries, and the tendency is toward further progress along these lines.

Recognition of Foreign Judgments

In this connection the deliberations of the International Law Association at The Hague in the early part of September, as reported in the European press, are of sufficient importance for a brief review in *Commerce Reports* and deserve a close study by American business men, jurists, and economists.

The recognition of the effects of foreign judgments was discussed in a paper prepared jointly by Prof. J. Kosters, Judge of the Supreme Court of the Netherlands, and by Prof. Suyling, of the University of Utrecht. The aim of the report was to present a practical solution of this difficult subject by a draft of a collective treaty. The eminent Dutch jurists pointed out the great divergence of juridical effects of recognizing foreign judgments. In England and in the United States the execution of foreign judgments not being permitted, it is necessary to start fresh proceedings before domestic courts, though the existence of a foreign judgment is regarded as prima facie evidence of the basis of a new claim. Suits brought on this basis, the paper states, are generally successful. New litigation, however, is avoided in a number of states which have regulated the practice of affording recognition to foreign judgments on the basis of reciprocal treaties.

The relators proposed a collective treaty for the elimination of the difficulties hindering the execution of foreign judgments where the rights of all parties concerned have been properly safeguarded. This can be done, of course, only on the assumption that a foreign court deserves full confidence and that its decision should be in principle respected by all states. The report advocated the establishment of an International Court for the execution of foreign judgments.

An International Court of Appeals was proposed by another relator, who brought out the fact that merchants everywhere desire stability in the interpretation of existing rules and customs, certainty of obtaining justice against a debtor and equity at the hands of the creditor, and simplification of the formalities of contracts. The relator commended all endeavors which have been put forth for the attainment of uniformity in mercantile and maritime laws and urged the adoption of a common law on subjects of common interest. This, of course, the relator pointed out, requires a common interpretation by national courts. This can be obtained by international agreement, and further requires the granting to the successful litigant of an exequatur by the authorities of the country where the judgment is to be executed.

A court of appeals in the matter of international agreements, conventions, and common litigation, with appellate jurisdiction from national courts in matters covered by such agreements, conventions, and legislation, was proposed as the solution of the problem.

Another relator went into the subject of standard contracts and of arbitration. Two important groups of contracts which are internationally regulated were used as a basis of the discussion. Both of these groups concern the grain trade. The London Corn Trade Association regulates international sales in the grain trade; the German-Dutch group is concerned more especially with the sales from Baltic and Russian grain areas. The London group publishes contract forms for all varieties of products within its scope of activity. Oil seeds, cotton, copra, and rubber are similarly dealt with by respective associations. Traders merely agree on the choice of contract and fill in details. Sometimes they simplify matters by exchanging contract notes, basing same on "contract form No. —." This provides an easy inclusion of an elaborate total of conditions regulating the contractual relation in all details. The full extent of the c.i.f. clause is covered in the clause interpretation, and it can be positively understood by parties to the contract that, for instance, the perils of the sea are on buyer's account.

Arbitration is inseparably bound up with contracts and conditions, but the relator pointed out the lack of a judge to apply the special law. Customary clauses of sale should be regulated by international agreement. This is particularly desirable in f.o.b. sales.

Of great interest to American business men is a report by Prof. Suyling, of Utrecht, on the subject of double income taxation in Great Britain and the Netherlands, which brings out points of view of value in considering the taxation problems of Americans with foreign sources of income. The relator pointed out that the right of taxing income on account of the place of its origin is exercised in some countries with more discretion than in others. As long as the laws of various states declare incomes taxable either on account of the place of origin or on account of the residence of the recipient, profits are exposed to the risk of being taxed in more than one country. The plurality of the factors upon which states base their taxing power must necessarily lead to double taxation when the person receiving the income resides out of the country where the profits accrue. To avoid this the states would have to base their taxing power on one and the same set of facts. If residence were the only factor, double taxation would be avoided. But it appears clear that the states are not disposed to give up their right to tax income on the several grounds which they regard as decisive, with the result that double taxation is now an unavoidable consequence of a system which, for the time being, is not likely to be changed.

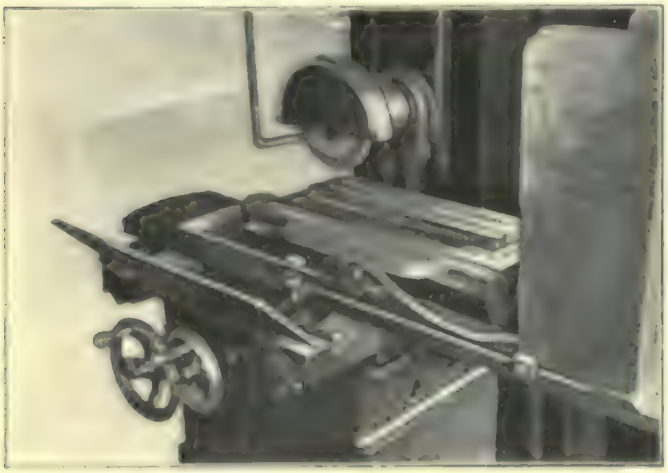
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Jig for Grinding the Ends of Small Round Pins

By Amos Ferber

A jig for holding small round pins in a vertical position for grinding to exact length, is shown in the accompanying illustration. The ends of the pins must



JIG FOR HOLDING SMALL PINS TO GRIND THE ENDS

be exactly square with the axis and the tolerance with respect to length is very small; but 0.0005 in. plus or minus being allowed.

The central feature of the jig is a steel bar ground accurately square and having thirty V-shaped grooves across each edge. The side pieces, though permanently fastened to the central bar, are merely to provide means for holding the pins in the grooves and are not depended upon in any way to locate them.

To load the jig it is placed upon the magnetic chuck resting upon two thin parallel strips that allow the pins to project far enough so that on grinding the reverse side of the wheel will not touch the bar and destroy its accuracy. Current is now turned on the chuck and pins dropped into the grooves until all are full. The holding screws are now set up lightly and each pin tapped with a lead hammer to insure that it is seated on the surface of the chuck; after which the screws are finally tightened.

The first side is ground with the jig still upon the parallel strips but after this side is brought to a finish the strips are removed and the whole set-up is handled thereafter as a single flat piece.

The production is approximately 80 pins per hour.

Handy Locating Device for Milling Machine

By Frank H. Baker

I note on page 79 of American Machinist that Frank M. Johnson describes a handy locating device to use on the milling machine. I made a similar tool about three years ago, though I use it in a little different manner than that advised by Mr. Johnson.

As I have a lot of die work that requires much buttoning, I find it much easier to do this at the bench. I then place the arbor in the spindle of the milling machine and slip over it a collar that is a nice fit for the button, which must be of the same diameter as the locating buttons. Securing the work to the table of the machine I then adjust the position of the latter by means of the screws until the collar on the arbor will just slide easily over one of the locating buttons on the work.

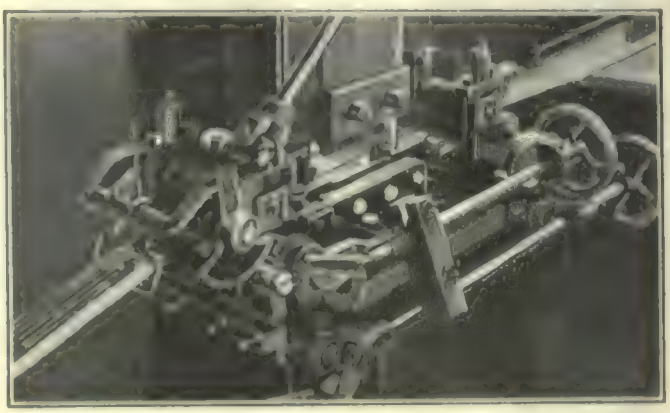
I have also used it without the collar, as described by Mr. Johnson. When the collar is used it is advisable to make it as long if not a little longer than the button.

A Reversing Roll Feed for Blanking Hard Stock

By Milton Wright

A double roll press feed that can be made to change the direction of its movement and still maintain its relation to the movement of the punch, is shown in the accompanying illustration. In addition to the change in direction the stock can be moved across the die at each reversal so that unbroken stock is fed to the punch at each stroke of the press.

The reason for making the device with these unusual movements is that the stock is hard steel and the blanks are required to be perfectly straight after



REVERSING ROLL FEED FOR BLANKING HARD STOCK

leaving the die; therefore, the usual method of feeding from a coil and punching successive rows in the same direction is out of the question.

The rolls receive their motion from a ratchet and pawl which is in turn driven from a sliding pin in the yoke at the outer end of the press crank. This yoke is so proportioned as to give an equal amount of throw with the pin on either side of the center.

The roll housings are mounted upon cross-slides gibbed to the frame of the device and, by means of

screws geared to the handwheel, may be moved across the die in unison.

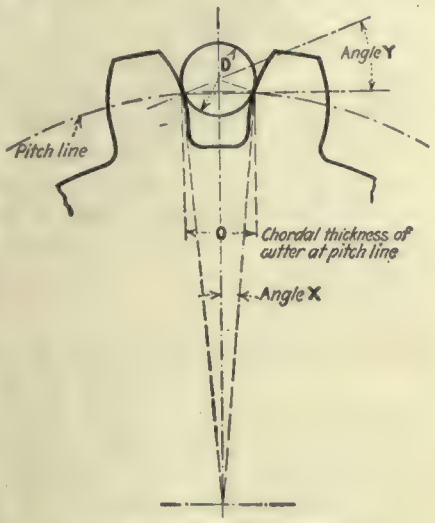
The stock is delivered to the press in flat strips about ten feet long. Starting at one end of a strip the rolls pass the stock along each time the punch is withdrawn until the end is reached, when the operator moves the rolls back a sufficient amount to bring fresh stock under the punch, moves the crankpin to the opposite end of the yoke, and trips the press for the return pass.

Thus the piece strip of stock runs back and forth under the punch, moving a step nearer the press at each pass, until all has been used. The time required to reverse the mechanism is but a few seconds and the production is nearly as rapid as could be obtained by using a coil and winder and transferring the roll of stock from one reel to the other at each pass.

Diameter of Pins for Gear Chucks

By William Owen

The formula given in this article is for the quick and accurate calculation of the diameter of the pins used in chucks for holding spur gears while grinding or reaming the bores. This method is used so that the bore will be absolutely concentric with the pitch line of the gear. The formula takes into consideration the number of teeth in the gear and the pressure angle, both of which affect the diameter of the pins. The solution can not be accurately found by laying the tooth form out on a larger scale. The accompanying illustration shows the construction used for determining the relation between the parts. The meanings of the symbols are: N, number of teeth; P, pressure angle; D, diameter of pin; and O, chordal thickness of cutter at pitch line.



PIN FOR GEAR CHUCK

$$\text{The angle } X = \frac{360}{4N}, \text{ and}$$

$$\text{the angle } Y = X + P$$

$$\text{Then, } D = \frac{O}{\cos Y}$$

As an example, assume an involute gear having a 3-in. pitch diameter, 6 diametrical pitch and a 14½-deg. pressure angle: Find the size of the pins needed in the gear chuck.

$3 \times 6 = 18$ teeth

$$X = \frac{360}{4 \times 18} = 5 \text{ deg.}$$

$Y = 14\frac{1}{2} + 5 = 19\frac{1}{2}$ deg.

$O = 0.2614$ (page 592, *American Machinist Handbook*)

$$D = \frac{0.2614}{0.9426} = 0.2773 \text{ in. diameter of pins.}$$

A Simple Wire Straightening Device

By Charles E. Frank

The illustration herewith shows a very simple and easily made device, for straightening wire from a coil, that can be used in any hollow spindle lathe provided with a drill chuck that has a hole through the shank. It is not intended as a substitute for a commercial wire straightener, but it employs the same principle and may be made up in a very few minutes when needed for an emergency job.



WIRE STRAIGHTENING DEVICE

It consists of a short piece of tubing having an internal diameter somewhat larger than the wire with which it is to be used; the external diameter does not matter so long as it will go in the drill chuck.

The tube is bent as shown in the cut so that the ends will lie in the same parallel line, with a bow of greater or lesser proportions, according to the size and nature of the wire to be straightened, between them. The amount to which the tube must be bowed can best be ascertained by trial.

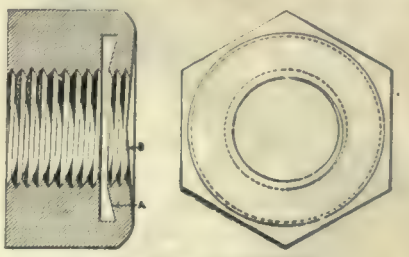
The wire from the coil should be threaded through the lathe spindle and chuck before the tube is gripped in the lathe. The end of the wire can then easily be pushed through the bent tube with a pair of pliers.

The tube is now gripped in the chuck as shown. No support is necessary for the outer end, which, if the tube has been correctly bent, will run true. Start the lathe, which should run not less than 300 r.p.m. and draw out the wire by means of the pliers. If there is sufficient bend in the tube the wire will issue practically straight and any desired length may be drawn out.

A Friction Locknut

By H. D. Chapman

The accompanying sketch shows a locknut that is simple in construction. The sectional view shows how the nut is constructed. A groove A is cut around on the inside of the nut. The top of the nut is then stove in as shown at B, forcing the threads above the slot out of lead with those below. When the nut is screwed on the bolt the threads of the bolt will draw all the threads of the nut in lead and create a friction which locks the nut tight against any vibration.



FRICTION LOCKNUT

This nut may be used over and over again without destroying the threads on either nut or bolt.

Handy Gooseneck Toolholder

By W. Wilson

Having had very good success with the toolholder shown herewith, I am passing it along for the benefit of any who may be interested. We use it principally for



GOOSENECK HOLDER FOR RADIUS FORMING TOOLS

a radius tool but of course it can be used for any shape desired.

There are three or four holders kept in the toolroom and a board full of hooks carries the bits or cutting edges in pairs, a concave and a convex bit as shown at *A* constituting a pair, are held together by brass rings. The saving in high-speed steel over the old method of grinding the radius in a solid tool is obvious, but the saving of storage space and sharpening time is also very marked, this being merely a surface job.

Bushings as shown at *B* regulate the amount of spring, depending on the side of radius cut, a large radius, of course, requiring a stiffer gooseneck than a small one.

Screw *C* may be added if desired to make the holder solid, instead of a spring tool.

Increasing Screw Machine Production With a Special Tool Post

By D. A. Nevin

There are instances in almost every hand-screw machine or turret lathe department where it is necessary to use two machines to complete all of the opera-

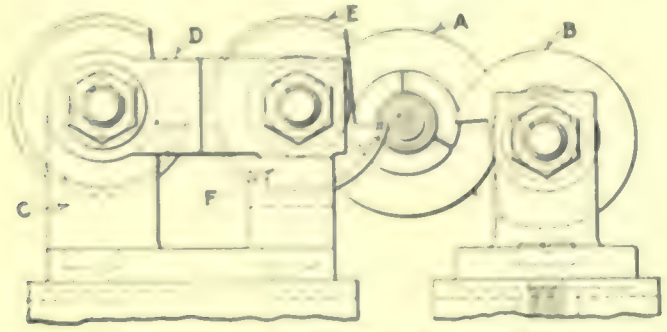


FIG. 1 THE TOOLPOST IN POSITION

tions on work, because of all the turret holes of the first machine being used, and more than one cross-slide forming operation being required. In the following paragraphs the writer suggests the adoption of a special double toolpost for holding two circular form tools, thus supplying an economical means for increasing production and at the same time releasing a machine for other work.

In Fig. 1, *A* is the chuck and spindle nose of a hand-screw machine, *B* the rear toolpost and circular cut-off tool. The base of the special toolpost is shown at *C* and supports the offset swinging arm *D*, to which is bolted the circular form tool *E* that is used for the roughing operation.

The arm *D* swings on the bushing shown at *A* in Fig. 2, and rests upon the support *F*, Fig. 1. The bushing *A*, Fig. 2, is sufficiently longer than the thickness of the swinging arm to cause the bolt to clamp the form tool when the nut is tightened. The thickness of the roughing tool is a slide fit between the lugs of the outer support, thus holding the cutter rigid during the cutting operation.

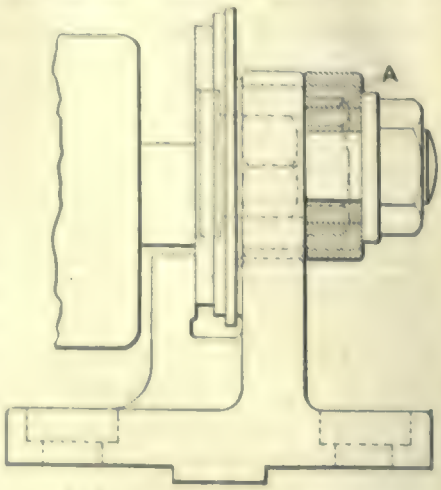


FIG. 2. END VIEW OF TOOLPOST

The toolposts have square holes to suit the shoulders on the clamp bolts; those which the writer used were forged from steel, although in many cases steel or iron castings will be found satisfactory.

To Find the Area of a Crescent

By W. J. Edmonds, Jr.

Let r = radius OA
s = radius PA.
$2m$ = number of degrees in the central angle AOB.
$2n$ = number of degrees in the central angle APB.
π = the ratio of a circumference to its diameter, or 3.1416 nearly.

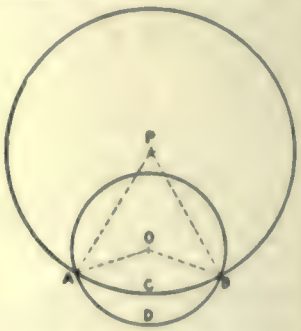


DIAGRAM OF CRESCENT

Then the area S of the crescent $ACBD$ is:

$$S = r^2\left(\frac{m\pi}{180} - \frac{1}{2}\sin 2m\right) - s^2\left(\frac{n\pi}{180} - \frac{1}{2}\sin 2n\right)$$

Chatter in Milling Machines

By Fred A. Parsons

Referring to articles by P. V. Vernon and Elam Whitney, which appeared under the above title on pages 386 and 774, Vol. 55, of the American Machinist, the writer contends that the cause of chatter in milling machines mentioned by those gentlemen is quite well known and recognized at our plant.

It is a part of the standard practice of the demonstrators employed by the Kempsmith Manufacturing Co. to look for the cause of chatter referred to in the above articles when other indications fail.

The method of curing the chatter is one of the many things about a machine shop which, as Mr. Vernon states, is "common practice" with the operators, but comparatively unknown to the men higher up unless they have worked in the shop and absorbed them.

Boring Deep Holes in the Lathe

By J. W. Hertner

The article on "Tool Engineering," page 67 of American Machinist, contains some very interesting data on the use of boring tools in the turret lathe. I wonder how many lathe operators there are, who have not at some time or other been troubled by the clogging and digging in of the tool because of chips that work in between the walls of the hole and the boring bar.

With the cutting tool ground in the usual manner, the tendency of the chips is to fall behind it and thus to be in position to crowd into the narrow space. If the hole ahead of the tool is a cored one, the rough and uneven walls aggravate this tendency and often such a hole will be as bad, if not worse, after being bored than before.

The writer has found that a good way to overcome this tendency of the chips to crowd the bar is to grind the tool with a rake that will cause the chips to fall ahead of the tool, or between it and the chuck. With the cutter ground in this manner it is a simple matter to bore a short distance into the work until the size is established, then run the cross-slide back until the point of the tool clears the walls of the rough hole and traverse the carriage to bring the cutting tool to the inner end of the work.

Before running the cross-slide back, its position should be noted by means of the micrometer dial on the crossfeed screw. Returning the tool to cutting position by means of this mark, the reverse feed is thrown in and, with the tool feeding toward the tailstock, the chips will fall behind the cutting point and will come out between the work and the chuck, leaving none to crowd in between the bar and the walls of the hole.

Milling Machine Dynamometer—Discussion

By John Airey

I read with interest an article entitled "Milling Machine Dynamometer," on page 148 of American Machinist. Mr. Poliakoff's device is essentially for commercial testing. The apparatus used by Mr. Oxford and myself is exclusively a research endeavor and has not been suggested by us as desirable for other fields. Mr. Poliakoff's comparison is therefore unfortunate as it distorts one's perspective of the real scope of each apparatus.

The third piston used in the writer's instrument was not used (as apparently Mr. Poliakoff believes) because of the table travel, as this piston would be equally necessary if the table did *not* move. The object of the investigation was fully to determine the force exerted by the cutter. This involved the determination of three quantities—*magnitude*, *direction* and *location*. It is no more possible to do this with only two measuring devices than it is possible to solve for three unknowns by means of two equations, and this irrespective of table travel.

The dynamometer shown in Fig. 1, page 148, cannot possibly give data from which the driving torque can be obtained. Emphasis on this statement is equally legitimate as is the condemnation of perpetual motion. The dynamometer in question will give horizontal force, after an allowance is made for friction, but I doubt its ability to give vertical force due to the unknown influence of a couple caused by the horizontal forces. This couple influence might be compensated for in the computation but not in an entirely satisfactory manner.

The later dynamometer designed by Mr. Poliakoff and marketed by the Cincinnati Milling Machine Co. (described on page 114, Vol. 55, American Machinist) has a useful sphere of action in comparing horizontal and vertical forces. Even this instrument does not, however, enable the experimenter to find the location of the resultant force, i.e., its perpendicular distance from the spindle; hence the power is indeterminate.

The description on page 114 is inferentially misleading, in that it condemns the crudeness of the method in which motor input is measured. This instrument cannot measure power but the features it does measure throw considerable light on the action of a cutter from the standpoint of jig and fixture design.

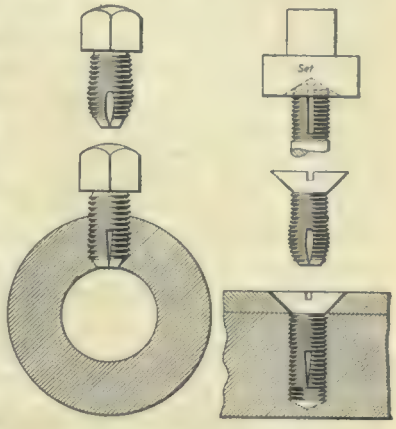
There is a crude proportional connection between end thrust and power consumed (equivalent to assuming constant lever arm of force from spindle), but it would not be research if this assumption were made.

Self-Locking Screws

By H. D. Chapman

The illustration shows the manner in which I have prepared screws to keep them from jarring loose when in parts that are subject to vibration.

A saw cut is made in the end of the screw which is then upset slightly by the use of the tool shown, closing the split ends together and causing the body of the screw to bulge slightly. This expansion of the screw should not be more than 0.025 inch. The friction of the screw against the sides of the hole will prevent it from coming loose. I have used screws prepared in this way in pulleys on line shafts and in other places where I had experienced trouble from the ordinary screws. Thus far they have remained tight.



SELF-LOCKING SCREW

Kink in Cutting Left-Hand Threads

By Arthur F. Parker

The writer had occasion to thread a number of gate valve stems ¾ in. in diameter, Acme double thread, 6 pitch, left-hand.

A neck from which to start the thread would have been impractical because of the weakening effect upon the stem, and as the threads had to start from a shoulder it would have been a slow and tedious job to start each cut in solid stock.

As an experiment I placed the toolpost back of the center line and ran the lathe backward, starting each cut from the tailstock end as would be done in right-hand threading. The lathe was equipped with a thread dial so that the carriage could be unlocked and run back by hand. The job was finished in a surprisingly short time.

A word of caution to anyone who tries this scheme: Make sure that the faceplate is on tight.

EDITORIALS

Jobs or Bonus?

ONE thing which seems to be lost to the sight of those advocating a cash bonus for World War veterans, is that the giving of a relatively small amount of cash to each ex-service man may result in keeping many thousands out of work indefinitely. Evidence is piling up from every side that a bonus bill which would saddle the country with four or five billions of additional debt, would have a very serious effect on our slowly reviving business. Any retardation of business revival would cost the majority of bonus beneficiaries far more than they would receive from the Government in bonus payments. As for the rest of us—but bonus advocates seem to have thought very little of us.

We cannot but sympathize with the feeling of many veterans who remember the various and sundry kinds of profiteering practiced by men in all walks of life who stayed at home. But is a cash bonus the best way to even the balance? Are many months without work, revenge and a five-hundred-dollar bonus to be preferred to a job? Of course there are, unfortunately, many unemployed, some of them ex-service men, but their chances of employment will be much better if no bonus legislation is passed.

There is no need to comment here on the sordid features of the fight for the bonus. That part of the movement is being handled on the editorial pages of the daily press much more ably than we could treat it. We are trying only to take a practical view of the probabilities of the case and to point out that for the majority of the ex-service men a bonus would be far more of a hindrance than a help. Incidentally, the writer of this editorial is an ex-service man and a former member of the American Legion.

The Dangerous Dirigible

THE wreck of the Roma, following so closely that of the R-38, calls attention once more to the dangers of the lighter than air machine at the present stage of development. The wreck of the R-38, according to the latest reports, was directly due to faulty design, little or no allowance having been made for the stresses set up while in flight. In both cases the gas caught fire and added to the horrors of the disaster.

These disasters emphasize, more than any argument could, the comparative cost and safety of the heavier-than-air craft. The cost of either the wreck of the Roma or the R-38 is far greater, both in casualties and cost, than the total for the air mail since its inception in 1917. The high cost of the units involved, and the dangers of disaster which still exist, make it clear that we can afford to spend more on airplanes, if not less on dirigibles.

The air mail has a record of completing 98 per cent of its scheduled trips, flying over 400,000 miles in three months, with no loss of life in service and only one on a "ferry" trip. Since the beginning of the Air Mail Service in 1917, the mail pilots have flown 3,400,000 miles with a total loss of thirty lives, of which seventeen occurred in 1920. The casualties for 1921 were remarkably small.

While we cannot neglect the dirigible entirely, as development work must be done in order to learn its possibilities, there can be no question as to the advisability of continuing the air mail as a practical method of developing the airplane. Our Air Mail Service is the standard of the world—can we afford to relinquish this position?

The Patent Office Gets Relief

AFTER months of strenuous effort to overcome opposition of the most baffling kind, the supporters of the movement for the relief of the United States Patent Office have won a measure of success. Congress has passed the Lampert Patent Office Bill and President Harding signed it on Feb. 18.

Just why there should be opposition to the movement to put the Patent Office on a modern business basis is hard to fathom. The Patent Office has always paid its own way and will continue to do so under the new law. Efficiency in this division of the administration of the Government is absolutely essential to our industrial well-being. It is unnecessary to remind the men of the machinery industry of this obvious fact, but in doing so we hope that they will make it a point to do their part in educating the rest of the country to a realization of what a smooth-running patent office means.

Our national inventive genius has been one of the strongest factors to keep us in the race for industrial supremacy. Reduce the incentive to inventors and the whole industrial structure will be in danger of collapse. Remember that things do not stand still on this earth of ours; they either progress or they decay. We can't afford to stop progressing.

The Business Outlook Is Brighter

WITHOUT undue optimism of the sort which claims to see daylight before dawn, we can safely say that business is on the mend. There is no boom in sight, and we should be thankful for it. But even the most pessimistic must admit a real improvement in actual business, as well as in the general feeling toward the future.

A study of the list of shops which are reopening after more or less protracted closure cannot fail to be encouraging. And the fact that these are not in any special line or particular locality makes it all the better. Railroad shops in Delaware, in Pennsylvania, New York and in Texas; automobile shops in various cities, shops manufacturing stoves, axes, taps and dies, structural steel, tubing and other products all report increases in output, more men employed or longer hours worked.

The sooner we all realize that resumption is actually on the way, and do our part toward placing orders, even if small, the sooner we shall see a more marked improvement in every line. Every little helps and we can all do that little. Why not do it now?

Shop Equipment News

Cincinnati Automotive-Parts Grinding Machine

A grinding machine especially adapted to handling the parts of internal-combustion engines has recently been brought out by the Cincinnati Grinder Co., Cincinnati, Ohio. It is intended for operation on crankshaft bearings, valve seats and stems, piston rings, pins and push rods. In addition, it is capable of handling many other parts used on automobiles, motor trucks and such machines. The machine is made in two styles, one for power feed and the other for hand feed. It can be furnished for either belt or motor drive.

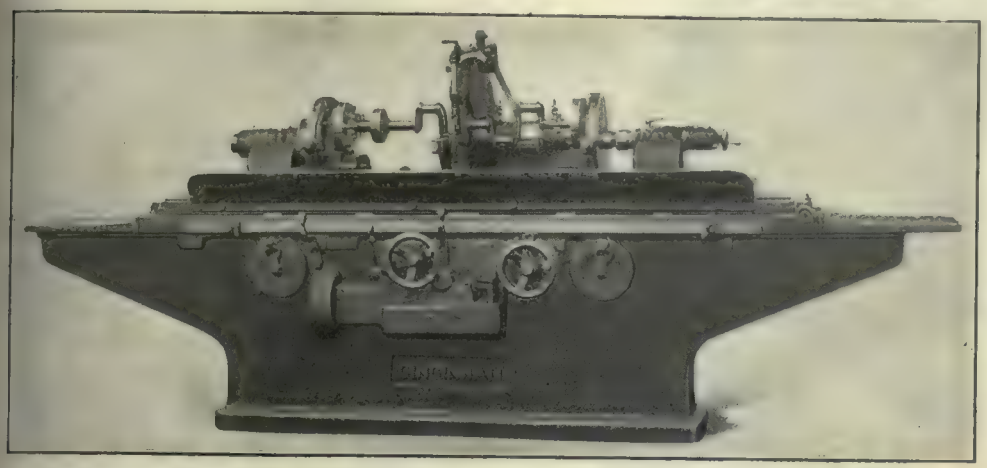


FIG. 1. CINCINNATI POWER-FEED AUTOMOTIVE-PARTS GRINDING MACHINE

The power-feed machine, shown in Fig. 1, provides power traverse and automatic reverse to the table, and automatic in-feed to the grinding wheel. The hand-feed machine, while the same in design as the power-feed machine, is not provided with the units giving the power traverse and automatic features. However, a fast and a slow hand traverse movement are provided for the table, the slow movement being of particular use in truing the wheel.

The grinding wheel ordinarily employed is 24 in. in diameter, has 1½-in. face and a 12-in. hole. The necessary mounting and guard are provided for the wheel, as well as a wheel-truing fixture for both the side and the face. A simplified type of overhead countershaft is also furnished, when direct motor drive is not employed. Two back rests with wooden shoes and two crankheads are furnished. For holding flanged-end cranks, two adaptors are provided. A universal piston holding and driving fixture is also furnished.

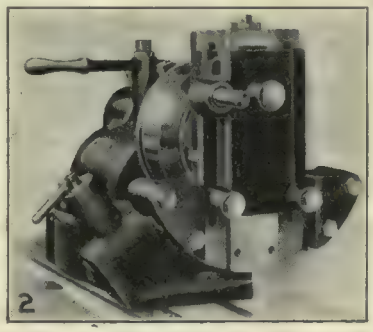
To permit of plain cylindrical grinding, footstock and headstock centers, a driving plate and three sizes of driving dogs can be provided. A number of additional attachments have been developed for handling special work. Thus, such fixtures as a valve-seat grinding attachment, a radius truing device and an internal grinding fixture for motorcycle cylinders may be applied.

The sliding table is of heavy construction, and is equipped with cross girts of I-section. The base has a box section that is thoroughly ribbed and braced, so as to resist torsion and twisting strains. The water tank and the wheelslide pedestal are cast integral with the bed. The base has a three-point bearing on the floor or foundation, thus assisting it to remain in alignment.

The machine is manufactured on the unit system, so as to provide accessibility. The method of manufacture provides for interchangeability of parts, so that worn or broken ones may be easily replaced. All sliding and revolving parts are provided with means of lubrication and are readily accessible.

The machine provides a swing over the table of 17 in. The maximum distance between the centers is 72 in., although with both the workhead and the footstock overhung, 78 in. may be obtained. The machine requires 7 hp. for driving. The floor space occupied is 58 x 226 in. The weight of the machine is 8,030 lb. when equipped with power feed, and 6,600 lb. when equipped for hand feed. The weights for domestic shipment are, respectively, 9,130 lb. and 7,700 lb.; for foreign shipment, the weights are 10,130 lb. and 8,700 lb. The contents of the export box are 240 cubic feet.

In Fig. 2 the crankhead for the headstock is shown. It is possible by the use of the head to handle with equal effectiveness and speed all sizes of crankshafts, whether of short or long stroke. The crankshaft may be easily placed in the machine, and the pin brought to the correct alignment by the use of an indicator. Quick-acting adjustments are provided. It is possible to hold rigidly either plain or flanged cranks.



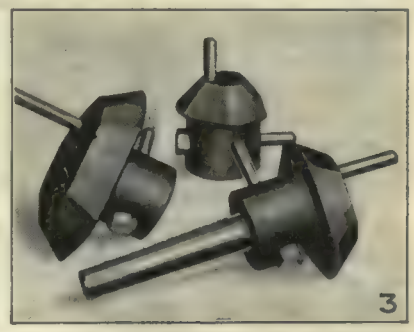
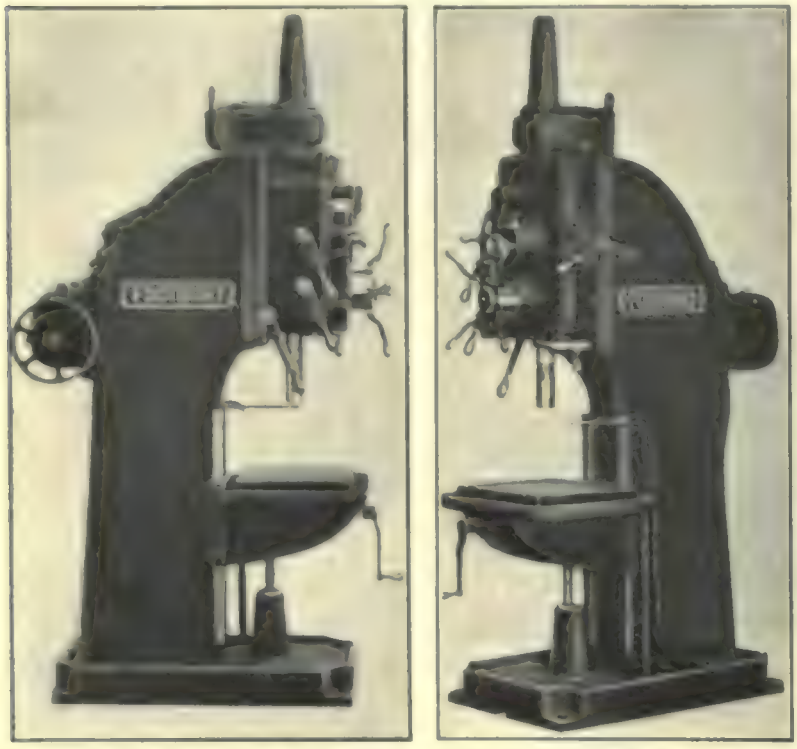


FIG. 2. HEADSTOCK CRANKHEAD. FIG. 3. UNIVERSAL PISTON ATTACHMENTS

In Fig. 3 can be seen the universal piston grinding attachments. It is possible to handle all sizes of pistons with the attachments. The lower end of the piston rests on the conical end of the attachment, and the top of the piston is supported by the center of the tailstock. The device drives the piston by means of a pin.

Foote-Burt 20-in. High-Duty Drilling Machine

The Foote-Burt Co., Cleveland, Ohio, has recently re-designed its No. 23 high-duty drilling machine. The machine has a 20-in. swing and a capacity for driving



FOOTE-BURT NO. 23-20 HIGH-DUTY DRILLING MACHINE

1¼-in. diameter drills in steel. The simplicity of the design and the ruggedness of the construction are the principal points to which the maker calls attention.

The view at the left of the accompanying illustration shows the depth through the column at the point of the maximum stress. There is no joint in the upright in the horizontal plane, as such a joint entails the placing of a considerable tensional strain on the bolts holding it together. The head is bolted to the vertical face of the upright, and the construction is such that the bolts have a shearing rather than a tensional stress. The base, upright and jack-screw supports are all cast integral, so as to add to the rigidity of the structure.

The working table is supported by a single telescoping screw, and has a working surface of 20 x 16 in. Although its vertical movement is 22 in., it is not necessary to provide a hole in the floor for the screw.

The machine is driven by a belt running on a single pulley, so that no countershaft is required. A friction clutch is utilized to engage and disengage the drive. The head itself contains all the mechanism for changing the feeds and speeds. The cover of the head is removable, so that the gears may be inspected. When necessary, the complete head can be removed as a unit, thus making all the gears easily accessible. The gears for changing the feeds and speeds are made of heat-treated steel. The speed-change gears run in an oil bath, while the feed gears are lubricated by means of a splash oiling system.

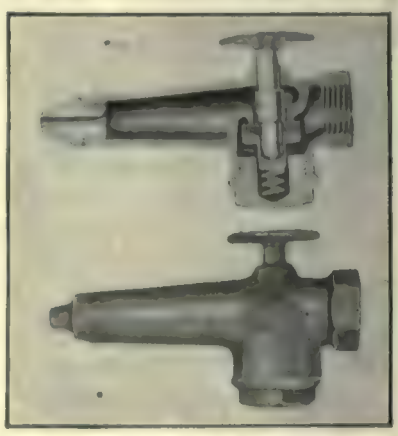
The gears driving the spindle at the top of the head are of the helical type, so as to give a uniform and smooth motion. They are packed in grease with a supply sufficient to last for several months. The spindle is fed by means of a double rack, to eliminate side thrust on the spindle sleeve. A power feed of 12 in. is provided. The maximum distance from the nose of the spindle to the top of the table is 28¾ in. The bearings in the driving shaft are of the Hyatt type for the carrying of the radial loads, while taper roller bearings serve to absorb the combined radial and thrust loads. A heavy ball thrust bearing is provided on the spindle.

Nine changes of spindle speed are provided. When the driving pulley runs at 500 r.p.m., the speeds range from 75 to 610 r.p.m. Three changes of feed are provided, so as to give feeds of 0.006, 0.012 and 0.026 in. per revolution. Changes are effected by means of the levers shown on the head. No clutches nor sliding keys are used in shifting the speed and feed ratios, but sliding gears are employed. The accessibility of the controls to the operator should be noted, as it is not necessary for him to move to the side of the machine to change either the speeds or the feeds. The mechanism of the head is completely inclosed, including also the top of the spindle when at the height of its travel. The machine is provided with a gear-driven pump for supplying cutting compound to the work through the pipe shown.

Due to its ease of operation and to its rigid construction, the machine should serve for work at high speed and heavy feed where large-scale production is desired. The maker claims that the construction permits of the elimination of a number of parts required in the former model. The weight of the machine is 2,700 pounds when equipped as shown, and without work-holding fixtures or attachments.

Jenkins Air Gun

Jenkins Bros., 80 White St., New York, N. Y., have recently placed on the market a brass air gun adaptable to general use in foundries, machine shops, woodworking and textile mills, electrical stations and garages. The valve, a section of which is shown at the top of the accompanying illustration, holds tight under pressure when closed and eliminates waste of compressed air from leakage. The renewable disk with which it is fitted is cast of steam bronze. It forms a contact on the seat and takes the wear. In case small particles of foreign matter accumulate on the disk and seat, they can be easily and quickly removed. By unscrewing the cap in the lower part of the gun the disk and disk holder can be taken out, rubbed on emery and replaced.



JENKINS AIR GUN

The air gun is made in ¼-in size, and can be used for ⅛-, ¼-, ⅜- and ½-in. hose by the use of different hose nipples.

Reed-Prentice Four-Way Drilling Machine

The Reed-Prentice Co., Worcester, Mass., has recently placed on the market the machine shown in Fig. 1 for drilling simultaneously four holes at right-angles to each other and in the same plane. The machine is adapted to various uses, but was designed primarily for drilling an automobile rear-axle housing, such as shown on the floor in front of the machine. It is intended for large work, since the maximum distance between opposing spindle chucks is 26 in., and the distance from the table to the spindle centers is 6 in.

The four spindles have a maximum travel of 3½ in. each, and are operated simultaneously by a feed mechanism inside the base. The mechanism is engaged by means of a lever at the left of the machine. When the drills cut through the work, the automatic trip releases the feed to the four spindles simultaneously.

The machine is driven by means of a belt running on the pulleys at the right of the machine. The spindles may be advanced to or withdrawn from the work by hand by the use of the large handwheel shown on top of the machine at the left. As the drills become shorter, due to grinding or breakage, the inner spindles may be adjusted longitudinally in the main spindles.

All bearings inside the machine are lubricated by forced feed, while sight-feed oilers are provided for

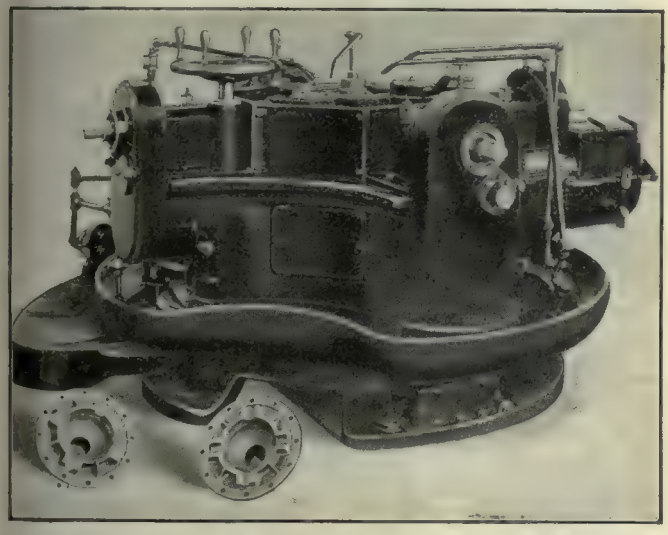


FIG. 1. REED-PRENTICE FOUR-WAY DRILLING MACHINE

the main spindle bearings. Cutting compound is furnished to each drill by a forcing system, the settling tank of which is in the base at the left of the machine. The base is so constructed that the compound flows back readily to the settling tank.

The work-holding fixture, a view of which can be seen in Fig. 2, is intended for rapidly handling the parts. Inside the fixture are four hard steel strips to guide the work and locate it centrally. In the lower part of the fixture are guiding pins, which engage two of the holes in the rim of the housing and locate the work in the proper relation to the drills themselves.

The lower half of the housing to be drilled is first dropped into position, and then the four plungers located between the spindles are forced toward the center by means of the lever on top of the fixture. The upper half of the housing is placed on top of the lower portion. By means of the guide pins on the plungers fitting four holes in the housing flanges, the position of both halves of the housing is maintained. The work is then clamped onto the slabbed portion of the plungers by means of a center bolt through the two housings. The plungers thus support the work during the drilling.

When the holes have been drilled, the upper part of the housing is first removed, and then the four

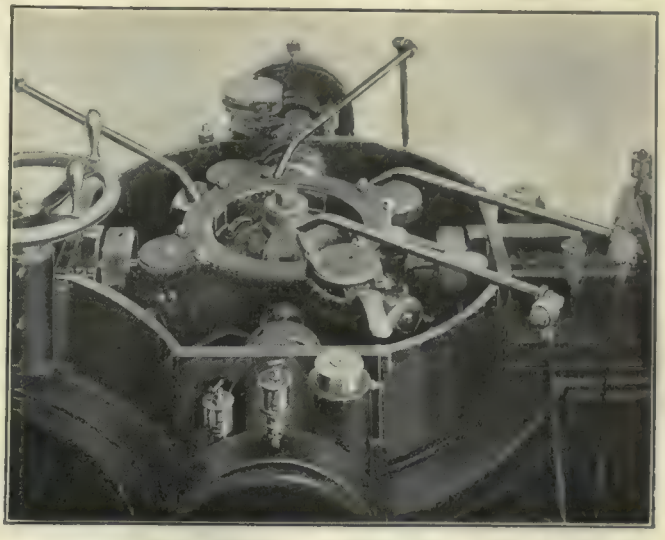


FIG. 2. WORK-HOLDING FIXTURE OF FOUR-WAY MACHINE

plungers are withdrawn, allowing the lower half of the housing to be raised by means of a lever. This lever actuates four vertically operated plungers, so as to bring the lower half of the housing into a position from which it may easily be lifted out of the fixture.

The drills are guided by hardened steel bushings inserted in the body of the fixture. Both accuracy regarding the work and high speed of production are claimed for the machine. All parts are rigidly made, so as to obtain permanent alignment. When desired, a motor drive can be readily incorporated in the machine, the power from the motor being delivered through gearing. The machine has an overall height of 49½ in., while it is 85 in. in width and 96 in. long. It weighs approximately 7,550 pounds.

A machine of somewhat smaller proportions is also made to care for a lighter class of work, such as universal-joint rings and differential spiders. In the former case it drills simultaneously the four holes in a ring, and in the latter it turns the four arms on the crosses. However, it embodies all the features of the large machine just described.

Whitcomb-Blaisdell Planer Arranged for High Speed

The Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., has recently equipped one of its 26 x 32 x 18-in. planers for operation at a speed of 150 ft. per minute on both cutting and return strokes. The successful maintenance of such a high speed is attributed to the second-belt type of drive, wherein the bull wheel is driven by belt instead of gears.

The bed of the machine is cast in one piece. The table contains T-slots, but no holes, and the steel rack extends for the full length of the table. Thirty-inch driving pulleys and shipper motion are provided. Two heads are mounted on the crossrail, both running on the lower screw. The minimum distance between the tools is 12 inches.

The material planed consists of composition brass screen plates about 13 x 30 in. in size.

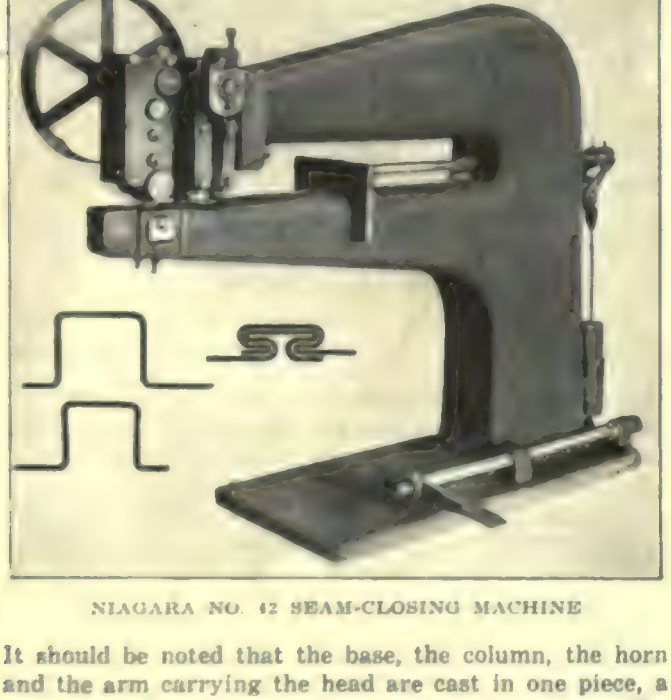
Niagara No. 42 Compound Seam-Closing Machine

The machine shown in the accompanying illustration has recently been placed on the market by the Niagara Machine and Tool Works, Buffalo, N. Y., for closing side seams of sheet-metal drums such as used for holding calcium carbide. It is intended for producing a seam tighter and more substantial than the single-locked seam. The compound-locked seam formed is practically air tight; and if desired to be completely air tight, may be filled with a sealing compound.

The small sectional view at the left of the illustration shows the offsets that are formed in the metal to be joined. This operation is performed in a double-crank press. The sheet is then rolled to the form of a cylinder the size of the drum desired, and is placed over the horn of the seam-closing machine. The offsets fit on the guide piece set in the top of the horn, so as to hold the seam in the proper position, and to guide the work as it passes from the machine.

The machine is driven continuously by means of a belt, and therefore does not require tight and loose pulleys or a clutch. By depressing the treadle connected to the sliding gage, the work is moved forward along the horn and fed between the first set of rolls. These horizontal rolls squeeze the seam together at the bottom, and feed the work automatically through the machine after they have once obtained a grip. The second set of rolls flatten, and thereby close the double-locked seam to the form shown in the small sketch at the center of the illustration. The seam is then completely formed, and the drum is delivered from the press.

The maximum length of work that can be seamed is 42 in., and the minimum diameter of work that can be seamed at this maximum length is 13½ in. On drums of shorter length, smaller diameters can be seamed. The machine is intended for operating on soft steel of 22-gage or lighter. The pulley, which is 20 in. in diameter and has a 3-in. face, is ordinarily run at 100 r.p.m.

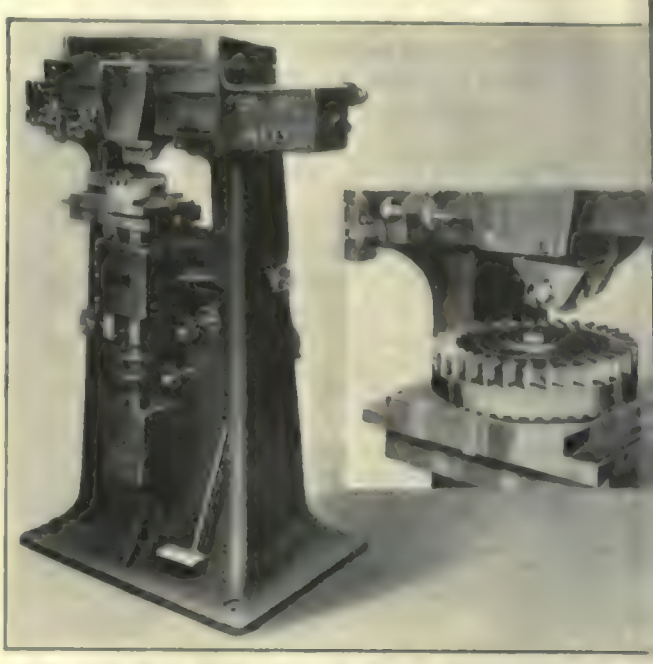


NIAGARA NO. 42 SEAM-CLOSING MACHINE

It should be noted that the base, the column, the horn and the arm carrying the head are cast in one piece, a construction that greatly increases the rigidity. The weight of the machine is approximately 2,700 pounds.

Martin Hydraulic Marking Machine with Circular Table

On page 638, Vol. 48, of AMERICAN MACHINIST, the appeared a description of the No. 12 hydraulic marki machine made by the Martin Machine Co., Inc., Turn Falls, Mass. The machine has recently been equipp for marking work, such as cutters, rings and bearin



MARTIN MARKING MACHINE WITH CIRCULAR TABLE

that requires an inscription to be placed in circul form. The accompanying illustration shows the machi equipped with the device, and also shows a close-up vie of the marking table.

The disk or cutter to be marked is placed on th table or fixture, the top of which revolves on ball bea ings. The position of the fixture can be adjusted, as to mark at any desired radius on the work. Th disk or work is ordinarily held in the center of th revolving plate by means of a plug in the center-hol A plain roll type of die is used. However, the die do not change its position relative to the machine, althoug it is revolved by means of a rack fastened to the sli of the machine. As the die comes in contact with th work and revolves, it automatically causes the top pla of the fixture, together with the piece, to revolve. N difficulty is encountered in the marking if the piec vary considerably in thickness.

The machine is driven by a belt on pulleys at th rear, the power being utilized to operate a rotary pum By means of the pump, oil pressure is maintained fo operating both the vertical table that raises the wor to the marking die and also the horizontal die-holdin slide. In operation, when the treadle is depressed, th work is raised to the operating point, and the die revolved. As soon as the marking is completed, a adjustable stop on the slide trips the reverse lever, as to cause the slide, and consequently the die, to retur to its starting point and the table to drop back to it original position. The travel of the slide can adjusted from ¼ to 7 in., and the travel of the table u to 6 in. The machine has a height of 50 in., and re quires a floor space of 27 x 22 in. It weighs 1,05 pounds.

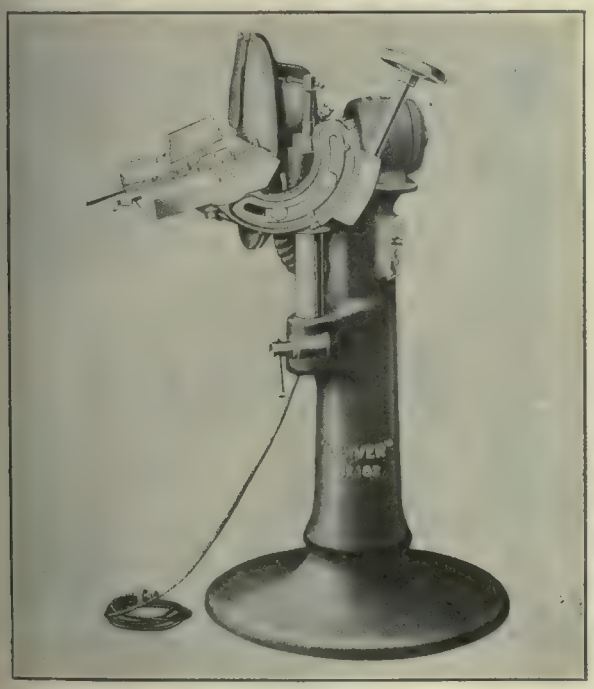
Oliver 15-in. Disk Sanding Machine

The Oliver Machinery Co., Grand Rapids, Mich., has recently brought out the 15-in. disk sanding machine shown in the accompanying illustration. The machine is designed as No. 182, and is intended for accurately sanding such pieces as segments, coreprints and small pieces made in pattern and cabinet work. It can be utilized for sanding circular work up to 15 in. in diameter and duplicating work up to 7 in. wide. When sanding wood, garnet paper disks are employed; and for grinding or polishing metal, aloxite or emery cloth disks are used.

The device is mounted on a heavy cast-iron column equipped with a wide flange to give a solid footing. The disk head mounted on the column contains the disk, the disk shaft, the ball thrust bearing and the exhaust fan. The exhaust system is arranged to deposit the dust within the column. The disk itself is removable for renewing the abrasive paper or cloth. It is run at a speed of 1,725 r.p.m. by means of a ball-bearing electric motor.

The motor may be furnished for either direct or alternating current of 110 or 220 volts. A push-button switch is mounted on the column in a convenient position for the operator. Because of the fact that the motor can be driven from a lighting circuit, an extension cord is provided. In this way, the sanding machine can be moved to the desired position in the shop and connected to a convenient socket.

The table is made of cast iron and is 9¼ in. wide, 21 in. long and 37 in. above the floor. It can be tilted 45 deg. downward, or 25 deg. upward by means of a handwheel, which is so connected through a worm as to be self-locking. A graduated index shows the angle. The table has a vertical adjustment of 6 in., and can be swung to the right to give clearance around the disk.

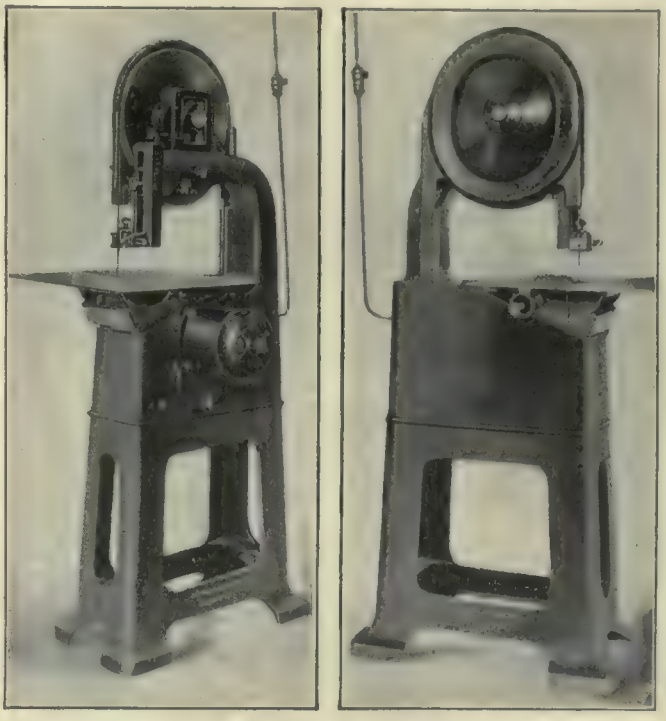


OLIVER 15-IN. DISK SANDING MACHINE

An angle gage can be mounted on the table for cutting work at angles. A circle, segment and duplicating gage is also furnished. The tool should have a wide application for the finishing of small work.

Wallace 16-In. Motor-Driven Bandsaw

J. D. Wallace & Co., 1401 West Jackson Blvd., Chicago, Ill., has just placed on the market a 16-in. motor-driven bandsaw. The machine is intended for general



WALLACE 16-IN. MOTOR-DRIVEN BANDSAW

use in pattern and carpenter shops, and is easily portable. Two views of it are shown in the accompanying illustration. It will be noted in the view on the left that the machine is driven by a totally inclosed motor, mounted on the side of the frame. The motor drives the lower wheel by means of a fabroil gear and steel pinion, both the gear and the pinion running in oil.

The motor is of ½ hp. and the armature runs on ball bearings at a speed of 1,750 r.p.h. It drives the saw at a speed of 3,150 ft. per minute. Because of the fact that the motor can be driven by current taken from an ordinary lighting circuit, it is practicable to move the machine about the shop to the position where it may best handle the work. The portability of the machine is one of its chief features.

The table consists of a ground steel plate 19 x 21 in. in size. It is mounted on a large rocker bearing, so that it may be adjusted in angularity from 45 deg. forward to 5 deg. to the rear. An indicator is provided to show the angle at which the table is tilted. The table may be easily removed.

The machine is equipped throughout with ball bearings. Not only the saw wheels run on them, but the upper and lower guides for the saw are of the ball-bearing type. The saw blade bears on the periphery of the roller. All adjustments on the machine are made by means of handwheels or thumbscrews, so that it is not necessary to have special tools or wrenches in setting up or adjusting.

The wheels carrying the saw are steel disks 16 in. in diameter. The guards are built into the machine and thoroughly protect the disk and the saw. The saw has a maximum capacity for wood 8 in. in thickness. The table is 42 in. above the floor. The machine is 5 ft. 9 in. in height overall, and requires a floor space of 15 x 29 in.

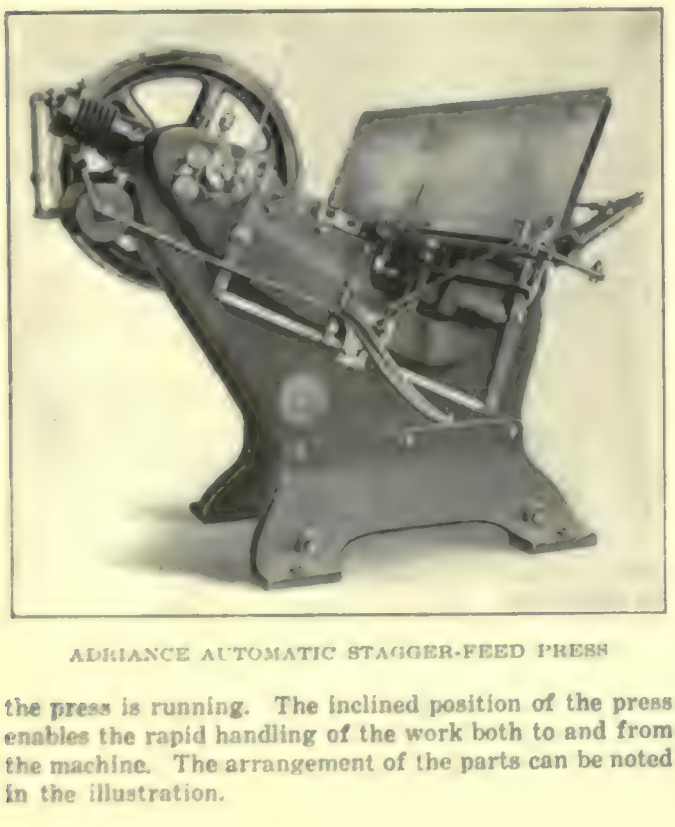
Adriance Machine Works Automatic Stagger-Feed Punch Press

The Adriance Machine Works, Inc., 88 Richards St., Brooklyn, N. Y., has recently placed on the market the stagger-feed press shown in the accompanying illustration. The machine is designated as the No. 564-A press, and is intended primarily for the production of such work as can tops and bottoms, small shells and jar closures. Lithographic designs can be accurately fed, as perfect register is obtainable. The scrap is ejected automatically, and cut into skeleton frames. The automatic operation enables rapidity of production.

Due to the staggered feed arrangement, blanks are punched out with but a thread of metal between them, so as to reduce the amount of waste. There is only one die, so as to save on the initial cost of the set-up and also to save time in making adjustments. The maker calls attention particularly to the simplicity of the construction, and to the fact that fewer parts are used than in former models of the same style of press.

The quantity of work produced depends upon the size of the work, although the maker states that over 100 blanks of from 1 to 4 in. in diameter can be accurately punched out per minute. The speed is obtained very largely by the continuous action of the punch, while the sheet carrier travels in either direction. It is not necessary for this carrier to return to the starting point after punching a row of holes; and as soon as the end of a row is reached, the carrier automatically reverses in direction and the next row is punched out as the carrier returns to the starting point. As soon as the last blank on the sheet has been punched, the carrier stops automatically and ejects the sheet, then being ready to receive a fresh sheet. One operator can ordinarily run several presses, and can obtain a production of over 100,000 blanks a day, the maker states.

The safety of the operator is assured, as it is not necessary for him to place his fingers near the die while

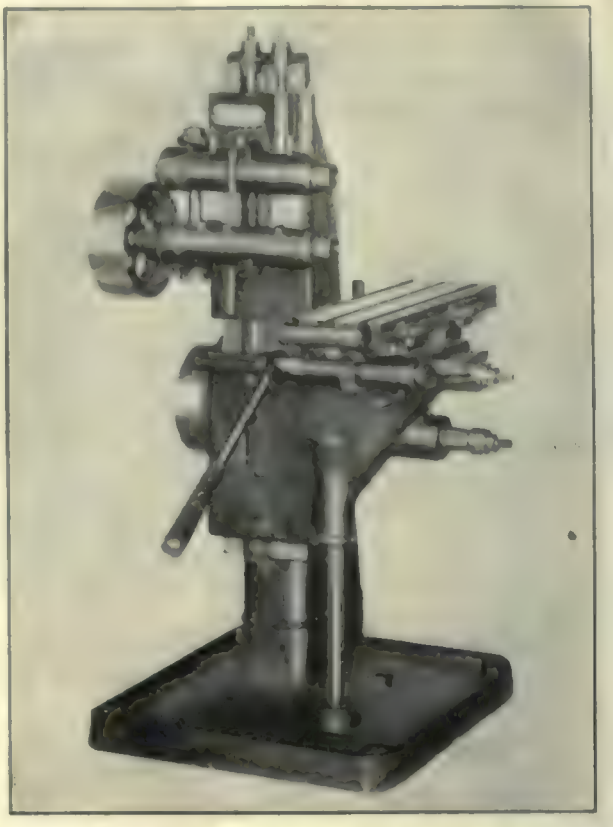


ADRIANCE AUTOMATIC STAGGER-FEED PRESS

the press is running. The inclined position of the press enables the rapid handling of the work both to and from the machine. The arrangement of the parts can be noted in the illustration.

Superior Machine and Engineering Co. Duplex Hand-Milling Machine

The Superior Machine and Engineering Co. of Detroit, Mich., has recently placed on the market the duplex hand-milling machine illustrated herewith. The



SUPERIOR MACHINE AND ENGINEERING CO. DUPLEX HAND-MILLING MACHINE

machine is intended for such work as slitting piston rings of the step type, for sawing apart babbitt-lined bearings for automobile crankshafts, and for milling two keyways or slots at the same time. The main features of the machine are the same as those of the single-spindle "Superior" hand-milling machine described on page 1115, Vol. 52, of AMERICAN MACHINIST. The specifications of the machine, which was designated as the No. 1, were given in that article.

The sliding surfaces are long in proportion to the width, so that the slides move freely. Each sliding member can be securely clamped in position. The machine is ordinarily driven directly from the main line shaft. It can also be driven by a motor of 1½ h mounted on a bracket fastened to the base of the machine.

On the end of the main driving shaft is a chang pulley, from which power is transmitted by belt pulley on the lower spindle, and then through helic gears and a vertical shaft to the upper spindle. The gears are hardened and run in oil. The numbers teeth on the gears are prime to each other, so as insure a uniform distribution of wear. The spindl are made of high-carbon steel and run in bronze bea ings. Graduated dials are provided on all adjustin screws for indicating accurate adjustments. The tab is operated by means of the hand lever, through a ra and pinion. The machine weighs approximately 9 pounds.

Stevenson Model 6-A Multiple Gear Shaper

A machine for shaping all the teeth of a gear at one time was described on page 154, Vol. 55, of AMERICAN MACHINIST. The direction of reciprocation of the ram was vertical, and the cut was taken on the up-stroke. The machine was known as the Model 5-A multiple gear shaper, and was made by the Stevenson Gear Co., of Indianapolis, Ind. The same concern has now brought out a vertical-spindle, down-stroke multiple shaper operating on a principle similar to the up-stroke machine. It is known as the Model 6-A, and a view of it is shown in Fig. 1.

The machine operates in much the same manner as a vertical shaper or slotter, except that the tools are stationary and the gear blanks are reciprocated past them. The machine consists primarily of a multiple-tooled head for operating on the blank, which is carried on a ram. A feed mechanism is provided for bringing the tools gradually to depth on successive cuts, and a mechanism for indexing the gear blank a space equal to one tooth at every stroke of the ram.

The spindle and the arbor of the machine are both hardened and ground, so that the arbor with the gears can be very easily removed and replaced. In practice, two arbors are usually employed; and the operator fills one with gears while the other is in the machine. In Fig. 2, a view of the work mounted in place in the machine can be seen. The down-stroke type of shaper is particularly adapted to the cutting of spur-gear teeth on parts that have a somewhat larger diameter than the gear itself, so that the entire gear cannot be passed entirely through the head.

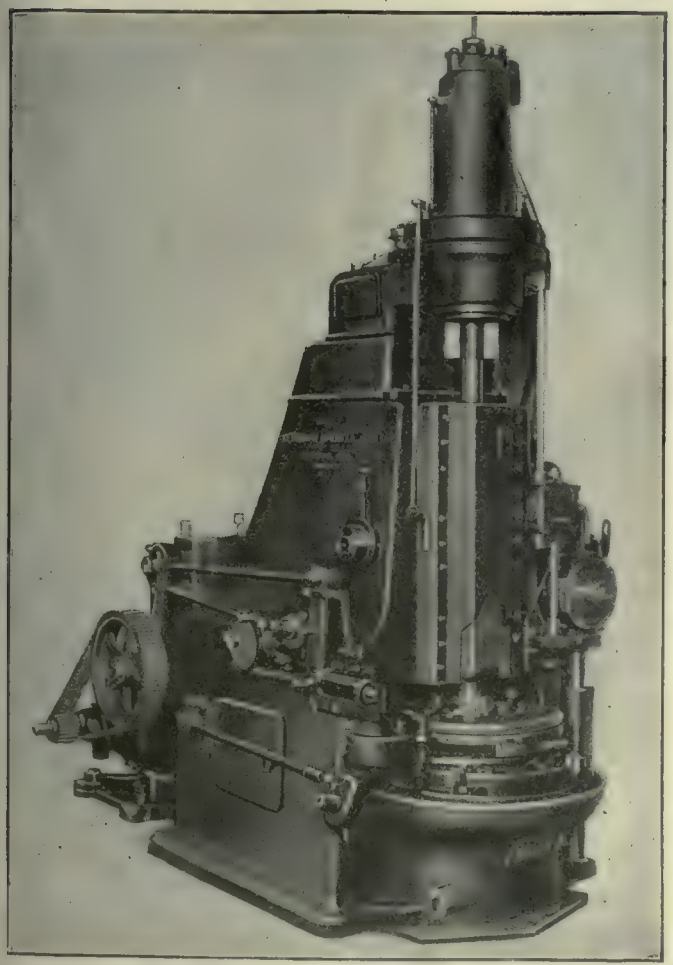


FIG. 1. STEVENSON MODEL 6-A DOWN-STROKE MULTIPLE GEAR SHAPER

When the arbor is placed in the machine, the draw-bolt is revolved by power to draw the arbor securely into the socket. An automatic overload throw-out disengages as soon as a predetermined pressure or tightness has been obtained. The ram is then lowered by power to the operating or cutting position, and automatically stops at the proper place. The operator starts the machine by means of an electric push-button switch.

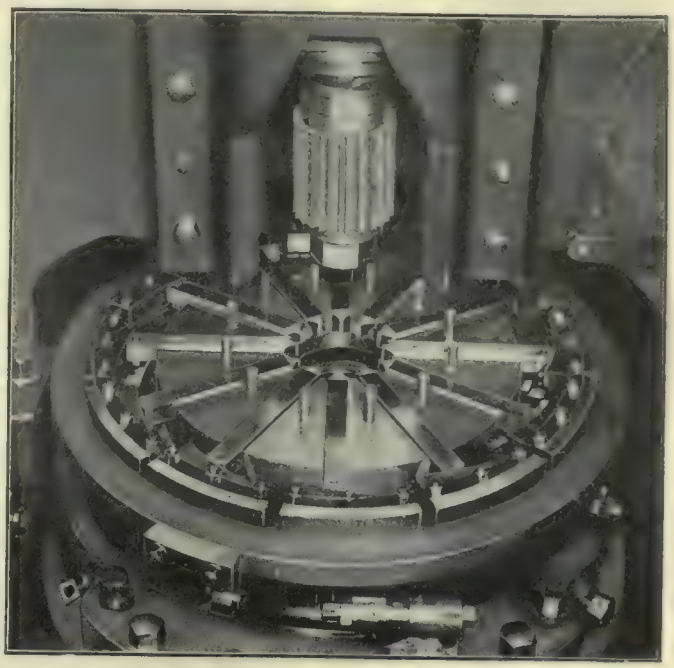


FIG. 2. ARRANGEMENT OF TOOLS AND WORK

To stop the machine, the push-button switch is again used, and an electric brake is applied automatically. The spindle is then raised, and the finished gears removed, so that an arbor carrying uncut blanks can be put in the machine. The entire time for cutting a gear occupies from one to four minutes, depending, of course, on the conditions. The time required for stopping the machine, changing arbors and starting again is slightly less than one minute.

The toolhead employed is interchangeable with that on the up-stroke machine. In Fig. 2 the chip guard and cover of the head have been removed, so as to show the arrangement of the tools. The toolhead consists essentially of a flat steel plate 30 in. in diameter, provided with a hole in the center and having a number of radial grooves in its face. Feeding movements are imparted by an annular sectional cam ring, to the tools which are placed in these grooves. As the gear blank is reciprocated, the tools are gradually fed in to the full depth of the tooth.

At the completion of each stroke of the ram, and before the next cut begins, the gear blank is indexed a space equal to one tooth. After the tools have been fed to the full depth, they are held stationary until the gear has indexed one complete revolution. This permits each tool to take one last cut on each tooth, so as to insure uniformity of spacing. Two toolheads are provided for each machine, so that while one is in use the tools on the other may be sharpened and reset. The machine itself may thus be used practically continuously.

The toolbits are rectangular in section, except for the V on the lower side. The gear-tooth profile is formed at

the inner end of the tool, and is backed off to permit sharpening without changing the form. The outer end of the tool rests against the surface of the cam, and means are provided for retaining it in close contact with the cam surface. Various types of cutting tools are provided, so as to care for different conditions and classes of work.

Ordinarily, the roughing and finishing tools are set alternately about the gear blank, the roughing tools slightly in advance of the finishing tools. The roughing tools thus cut grooves to the width of the bottom of the tooth space, and the finishing tools cut on the sides only. Usually the same number of tools as there are teeth in the gear are employed. However, this is not necessary, as multiples of the number of teeth, or numbers approximating the number of teeth, can be used.

The depth to which the tools are fed is determined by an adjustable micrometer stop located on the front side of the toolhead, so as to limit the rotary movement of the cam ring. The tools are automatically clamped in place during the cutting stroke, and unclamped at the end of the cut so that they may be fed forward again. The feed mechanism can be seen on the side of the machine in Fig. 1.

The mechanism for indexing the work is inclosed in the housing on top of the head. The mechanism for driving the ram consists principally of a crank mounted on the side of the machine and driving a reciprocating slide. Power is furnished by the motor shown mounted in the rear of the shaper and driving it by means of a silent chain belt. The motion of the slide is transmitted to the ram through two gears mounted on a rocking shaft. This mechanism serves also for temporarily elevating the ram during the time required for changing arbors.

The power for elevating the ram is obtained from a small motor mounted at the back and at the right side of the machine. The limits of travel of this motion can be adjusted by means of collars. Means are provided for easily setting the ram and the work in the proper vertical relation to the tools. When handling very heavy work, a small power-operated crane at the right of the toolhead is used to facilitate the insertion and removal of the loaded work arbors.

The machine is adapted to the production of parts other than gears in which there are teeth or grooves to be cut, such as in sprockets, splined shafts, reamers and milling cutters. The advantages claimed are the speed of operation and the accuracy of the work. The accuracy is due largely to the fact that cuts are taken simultaneously on all sides of the blank, so that the pressure is uniform on all sides and the work cannot spring away from the tools. Speed is obtained, not only because of the fact that so many tools are cutting at once, but also because a number of blanks can usually be cut at one time. The machine will be built in sizes to handle work of all classes.

Davis-Bournonville Cutting Torch

The oxy-acetylene cutting torch shown in the accompanying illustration has recently been placed on the market by the Davis-Bournonville Co., Jersey City, N. J. The torch differs in design from the model formerly made by the concern, in having two tubes instead of three connecting the head with the handle. The oxygen and acetylene are mixed in a chamber between the handle and the head. A special tip is required, so as to properly take care of the preheating gases, which have been mixed before reaching the tip.

The tubes are silver soldered in the head, which is



DAVIS-BOURNONVILLE CUTTING TORCH

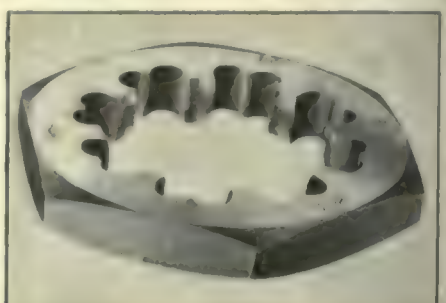
a copper forging and capable of withstanding high temperature without damage. The entire torch is strong and rugged in construction, although the weight is less than that of the previous model. Provision is made for easily removing the back end, in case it becomes necessary to clean the screen or renew the oxygen valve seat.

The ratio of the gases is controlled by two needle valves, one having a crossbar handle and the other a knurled disk handle. The oxygen valve is operated by a trigger so connected to a linkage that it remains in either the closed or open position. The operator may continue cutting without holding his finger on the trigger after the cut is started. Reverse pressure on the trigger closes the valve when it is desired to stop the cut. Spring pressure is utilized to hold the trigger in place until it is again desired to open the valve.

The tip is made of copper and held in a taper seat by a nut in a manner very similar to that on the standard torch. It is made with the cutting oxygen hole in the center and the preheating holes around it. The number of these preheating holes varies from two to six, depending on the combustible gas, the manner in which the torch is applied, and also the metal to be cut. Bent tips for cutting off rivets are furnished. Gases of low calorific value such as butane, hydrogen and even illuminating gas, may be used for cutting, although acetylene is recommended. The distribution of the mixed gases to the tip insures that all preheating flames are uniform in balance. The torch is stated to have superior characteristics for cutting wrought iron, steel and cast iron.

Greenfield Re-threading Die for Ford Hubs

The Greenfield Tap and Die Corporation, Greenfield, Mass., has recently placed on the market a hexagon die, shown in the accompanying illustration, for re-chasing threads on the hubs of Ford automobiles. The die is 2¼ in. in diameter, and has 24 threads per inch. There are eight flutes. The tool is specially intended for the use of repair men, so that it is possible to easily refinish the threads on the hub. The threads may thus be put in proper condition after they have been injured either by blows or by crossing the threads in careless assembling.



G.T.D. RE-THREADING DIE FOR FORD HUBS

Parker Grinding Machine Spindles

The Ex-Cell-O Tool and Manufacturing Co., 1214 Beaubien St., Detroit, Mich., has recently placed on the market grinding spindles for use where very high

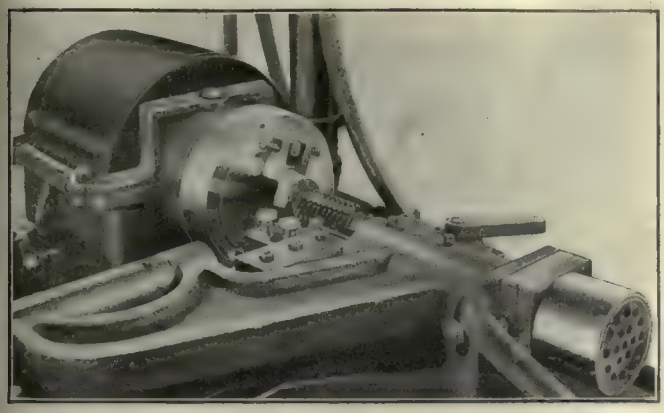


FIG. 1. PARKER AIR-DRIVEN GRINDING SPINDLE

speeds are required. The spindles are made in both belt-driven and air-driven styles. The type of bearings employed is the same in both cases. The spindles can be furnished to fit any make of grinding machine. A special mounting, such as shown in the foreground of Fig. 1, is used for properly holding the spindle. The abrasive wheel and spindle may be seen at about the middle of the illustration, while the air hose and the case of the air turbine are at the extreme right.

The belt-driven spindle, shown at the top of Fig. 2, is provided with two sets of ball bearings for both the spindle and the pulley shaft. A coupling is provided between the two latter members, so that the pull of the belt is not transmitted to the spindle itself. The sectional view of the air-driven spindle is shown at the bottom of Fig. 2. The turbine is at the right, inside the cylindrical case that was already noted in Fig. 1. The rotor is made of steel, and equipped with thirty buckets on its periphery. The air pressure used varies from 40 to 60 lb. per square inch, depending on the speed desired. The air is carried to the buckets through two nozzles. Driving by air is stated to permit of rotating speeds as high as

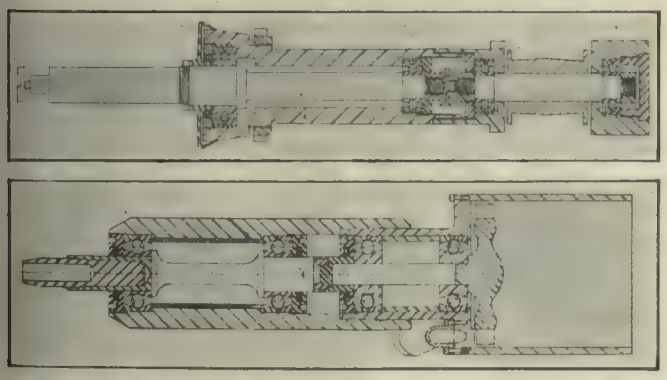


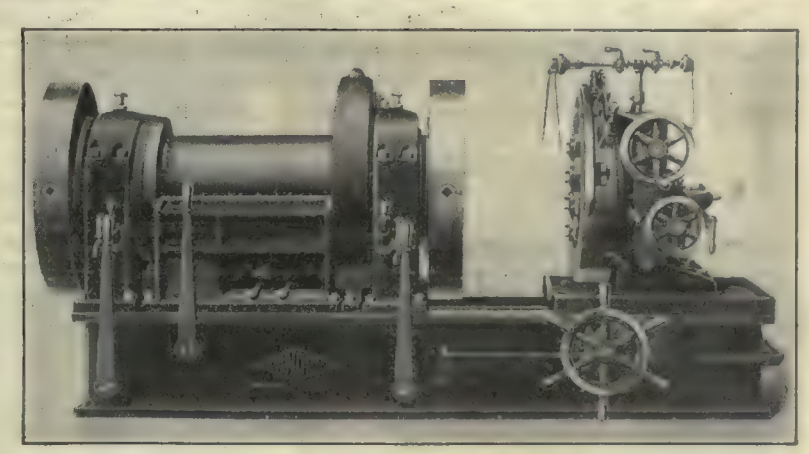
FIG. 2. SECTIONS OF PARKER GRINDING SPINDLES

100,000 r.p.m., and to cause much less vibration than that occurring when belts are employed.

The construction of the ball races is of importance, as the balls rest in rather deep grooves. The angles of the grooves are so proportioned as to cause the balls to rotate about axes perpendicular to the axis of the spindle, as well as about one parallel to it. In this way, uniform wear is obtained on the balls. The deep grooves allow for the taking of considerable thrust pressure, and prevent the spindle from moving longitudinally. Provisions are made for keeping the ball bearings sufficiently oiled. The spindles are stated to be free from vibration and suitable to a variety of small internal or form grinding operations.

Landis 12-in. Pipe-Threading and Cutting Machine

A 12-in. pipe-threading and cutting machine has recently been added to the line of pipe machines manufactured by the Landis Machine Co., Waynesboro, Pa. The machine, shown in the accompanying illustration, may be equipped for threading oil-well casing and hydraulic pipe, in addition to ordinary line pipe. It has a range from 4 to 12 in. and may be equipped to thread and cut pipe as small as 2½ in. Two dieheads are employed, a 6-in. head for a range from 2½ to 6 in., and a 12-in. head from 6 to 12 in. The entire range of each of these heads is covered by but one set of chasers, which are applicable to all sizes of threads.



LANDIS 12-IN. PIPE THREADING MACHINE

The carriage which supports the diehead, the cutting-off tool and the reaming tool can be moved by either power or hand. The power traverse movement operates either forward or backward, and is controlled by a lever located on the operating side of the carriage. To advance the carriage toward the chuck, the lever is pulled and held until the threading position for the diehead is reached. To reverse the movement of the carriage, the lever is pushed forward and held. Releasing the lever instantly stops the carriage, no matter at what point of its travel it is. Automatic stops prevent the diehead from coming in contact with the chuck in the forward movement, and the carriage from running off the guides in the backward movement.

The reaming tool can be quickly set to position and locked. The reamer is fed to the pipe by rotating the cutting-off feed handwheel in a counter-clockwise direction. Landis stationary pipe dieheads fitted with flat chasers are employed.

The chucks for gripping the pipe have three jaws. The jaws are geared, have universal adjustment and are self-centering to the pipe. The rear chuck is equipped with flange grips for fitting up flanges.

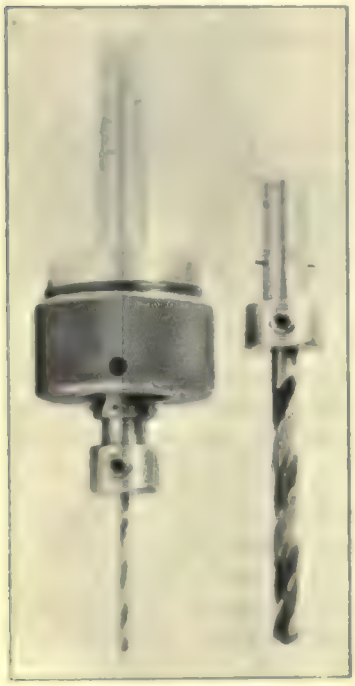
The machine has a single-pulley drive. The eight variations of speed are obtained in the speed box located under the main spindle, by shifting levers on the side of the box. The machine can be started and stopped by means of a friction clutch by operating either one of the two levers located at the extreme ends of the headstock. This construction enables the operator to start and stop the machine either when threading or when fitting-up flanges. A lever is located midway between the starting and stopping levers for reversing.

All gears are fully enclosed. With the exception of the main drive gear and its pinion, all gears run in an oil bath. The main bearings are lubricated by means of flat link chains which run in oil contained in large reservoirs. The driving pinion shaft and the reverse shaft are lubricated by sight-feed oilers. All levers are located on the operating side of the machine in convenient reach for the operator.

The machine can be converted to motor drive by substituting a sprocket for the pulley and fitting a plate to the side of the machine for mounting the motor. A silent chain connects the motor to the sprocket. All belt-driven machines have provisions for attaching the motor plate. The length of the machine is 11 ft. and the extreme width is 5 ft. It weighs 13,000 pounds.

"SaveAll" Drill and Tap Chuck No. 12

The SaveAll Tool Co., 49 River St., Waltham, Mass., has recently placed on the market the No. 12 drill and tap chuck shown in the accompanying illustration. The chuck is provided with a friction drive and a positive safety device. It has a No. 2 Morse taper shank. The range of capacity of the chuck is from $\frac{1}{4}$ to $\frac{3}{4}$ in. with either straight-shank drills or taps.



"SAVEALL" DRILL AND TAP CHUCK NO. 12

The collets can be furnished with the size of hole desired to hold the drill. The drill is fastened in the collet by means of a hollow-head setscrew. The device is equipped with a shearing pin, so that if the driving torque becomes too great, the pin is sheared and the drill relieved of the turning force. The advantage of the arrangement is that it enables drilling at high speed with comparative safety. Should the drill or tap encounter some obstruction, the shearing pin will be cut before the drill is broken.

When the device is used, it is not necessary for the operator to give as great attention to the action of the drill, as the safety device takes care of any overload that may occur. The maker states that holes $\frac{1}{4}$ to $\frac{3}{4}$ in. in diameter may be drilled 2 in. deep in machine steel at from 240 to 300 per hour without breaking or burning the drill.

Diamond Universal Hob for Cutting Sprocket Teeth

The Diamond Chain and Manufacturing Co., Indianapolis, Ind., has recently placed on the market a hob for the cutting of sprocket teeth. The hob operates on the same principle as those employed for cutting gear teeth, and each one is capable of cutting sprockets having any number of teeth and a given pitch and roller diameter. It is not limited to a small range of teeth, as with form rotary cutters. One hob is thus capable of doing the work formerly performed by six to nine cutters. A view of the hob is shown in Fig. 1.

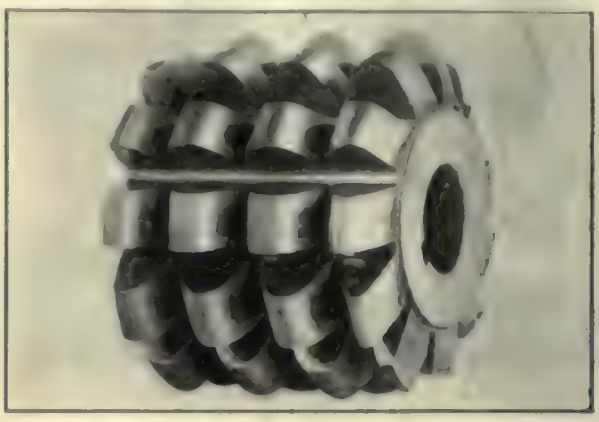


FIG. 1. DIAMOND UNIVERSAL SPROCKET HOB

The teeth cut by the hob conform to the specifications for the new "American standard" tooth form that has been approved by many manufacturers of roller transmission chains in this country, as well as by the Society of Automotive Engineers, the American Society of Mechanical Engineers and the American Gear Manufacturers' Association. With this tooth form, the space angle gradually decreases as the number of teeth in the sprocket increases, and the tooth angle gradually increases. The generating action of the hob tends to produce the same changes, although not at just the same rate.

In hobbing sprocket teeth, the following points that are at variance with the conditions encountered in hobbing spur-gear teeth should be noted: The circular pitch decreases as the number of teeth increases. It is desirable to increase the radius of curvature on the tooth as the lower or acting part is approached, and finally to change the curve from convex to concave. The pitch of the hob is greater than the circular pitch of the sprocket for all over a certain number of teeth, and



FIG. 2. EFFECTS OF VARYING PITCH AND NUMBER OF TEETH

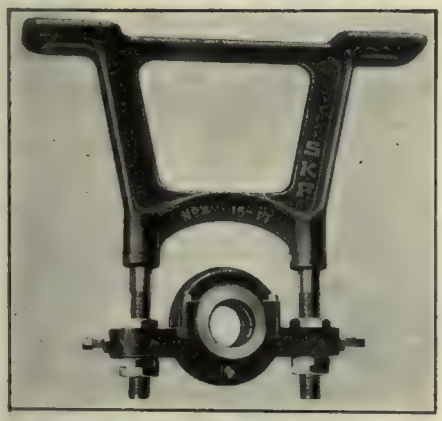
is less than the circular pitch of the sprocket for all sprockets having less than that number. Thus, the imaginary circle which rolls upon the theoretical pitch line of the rack is sometimes larger and sometimes smaller than the pitch circle of the sprocket.

The effect of making the pitch of the hob either less than the pitch circle of the sprocket, or greater, is shown in Fig. 2, the same hob being used in each case. The pitch of the sprocket was altered by changing the diameter of the pitch circle. At *A* the pitch of the hob is equal to the pitch of the sprocket; at *B* the pitch of the hob is 10 per cent less than the pitch of the sprocket; and at *C* it is 10 per cent greater than that of the sprocket. Thus *B* shows that if the hob pitch is less than the circular pitch of the sprocket, the tooth curve tends to become more convex, the angle of the tooth face tends to become greater, and the teeth are more pointed at the ends. The reverse conditions are true when the hob pitch is greater than the circular pitch of the sprocket.

After the hob pitch has been properly determined and the tooth contour properly designed, the entire range of tooth numbers can be cut without varying from the prescribed shape of the tooth as much as the various teeth do within the range of one rotary cutter of the ordinary type. Views *D* and *E* show the difference in form of teeth cut with the universal hob when the tooth numbers of the sprockets are respectively 7 and 56. Rapidity of cutting is claimed for the hobbing process, as well as accurate indexing.

Skayef Ball Bearing Line-Shaft Hanger

The accompanying illustration shows the improved ball bearing line-shaft hanger recently placed on the market by the Skayef Ball Bearing Co., 165 Broadway, New York, N. Y.



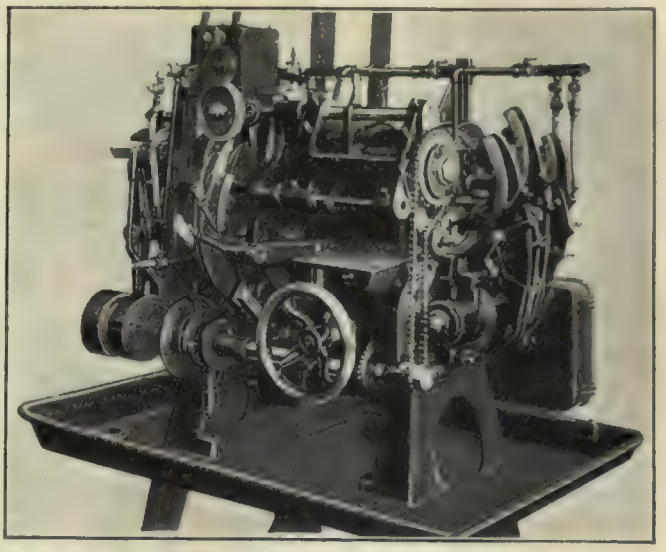
SKAYEF BALL-BEARING HANGER

The hanger is equipped with S. K. F. self-aligning ball bearings such as formerly employed. The device employs two-point suspension, thus carrying the bearing in a split housing rigidly held by two threaded suspension rods. The unit is strong, compact and easy to assemble, locate and inspect. The necessary vertical or horizontal adjustment can be made at the end of the housing by means of locknuts and set-screws. The pressure applied while making adjustments is not transmitted to the bearing.

The self-aligning feature of the bearing enables the shaft to turn with a minimum amount of friction, and prevents rubbing, heating and binding. The line shafting may be laid out on the floor with the bearings in plain view, and then raised in position for final adjustment with the upper halves of the housings off. This permits of securing correct alignment of all the bearings on the shaft. The low friction of the bearings permits of operation with only a small amount of power.

Slotting Attachment for Davenport Automatic Screw Machine

The Davenport Machine Tool Co., 167 Ames St., Rochester, N. Y., has recently developed a screw-slotting attachment for use in its five-spindle automatic screw



DAVENPORT SCREW-SLOTTING ATTACHMENT

machine. The machine, which was described in detail on page 669, Vol. 33, of AMERICAN MACHINIST, is shown in the accompanying illustration with the attachment in place. The attachment is intended for slotting all screws within the capacity of the machine, requiring no additional time for the operation. It consists primarily of a three-hole turret mounted on a suitable bracket, which is attached to the machine by means of the bolts holding the stationary head caps in place.

The saw head is mounted over the revolving head and uses the same change gears as the machine itself. This arrangement permits of any change in speed desired. The whole attachment is protected by guards not shown in the illustration.

In the turret there are three sliding plungers carrying in their front ends bushings to fit the screws being slotted, and having T-heads at their rear ends. Three sliding spindles, one of which is the regular E-position tool spindle, are yoked together by a spider and given a sliding motion by means of the regular cam lever. Two of the spindles have heads with T-slots to engage the T-heads of the turret plungers; the third or front spindle carries the ejector which slides through the plunger.

The turret is revolved one-third of a turn at the same time that the crankshaft which indexes the machine revolves one full turn. The cycle of operations is as follows: Just as the screw is cut off, the plunger carrying the bushing pushes up over it, so that the screw remains in the bushing. The plungers are drawn back by the spindles to a stop and the head indexes. The turret at the same time revolves one-third of a turn, and the T-head of the plunger slides out of the T-slot of one spindle and into the next. At the next forward movement of the spindles, the screw is carried forward, slotted and returned. In the meantime, another screw is being picked up by the following spindle. At the third forward movement, the slotted screw is in the ejected position. Instead of the plunger sliding forward, the ejector pin passes through the plunger and bushing and ejects the screw. This completes the cycle.

Thus, at each forward movement one screw is picked up, another slotted and a third ejected. The attachment may be easily applied to the Davenport machine, and when not in use can be removed by taking out two bolts. With slight modification, the attachment can be used for other second-operation work, such as milling, cross-drilling and burring.

Simplex Machine-Time Calculator

A calculator for computing the time required for machine-tool operations, has been brought out recently by the Simplex Calculator Co., Box 184, York, Pa. The device has been designed for general use in the machine-tool field, and is applicable to either rotating or reciprocating work or tools, so as to cover all cases that may arise in the computing of machine time.

As shown by the accompanying illustration, the calculator consists of a cylinder within an aluminum case, and a slide rule of special design attached to an extension of the base. For use with rotating work or tools, as in lathe, boring mill, drill press, or milling operations the cylinder carries tables indicating the revolutions made per minute for diameters of from ¼ in. to 10 ft. at all ordinary cutting speeds. The range of speeds is shown above the slot on the left-hand end of the case. The slide rule bears four scales, indexed successively: Feed, r.p.m., length and time.



SIMPLEX MACHINE-TIME CALCULATOR

The number of revolutions made per minute by a given piece of work is read in the slot opposite the diameter and directly under the cutting speed selected. This number is transferred to the rule, is located on the r.p.m. scale of the slide, and is moved directly under the number representing the chosen feed on the feed scale. The indicator is then moved along the third or length scale to the number representing the length of cut or inches to be traversed. Directly under this number, on the fourth scale, the result or time in minutes is read. Thus, to complete a problem for rotating work or tools requires but one setting of the cylinder, one movement of the slide and one movement of the indicator on the rule. The sequence of operations can be easily followed on the scales.

In connection with planer, shaper, slotter, or any other reciprocating tool, the procedure is similar. The number of square inches planed per minute at various forward and return speeds and feeds is read on the cylinder through the slot on the right-hand end of the case. To determine the total number of square inches of surface to be planed, the length is multiplied by the width, either mentally or with the rule. This result is divided by the number of square inches planed per minute, and with one setting of the slide on the rule, the quotient or time required is read on the fourth scale at the end of the slide.

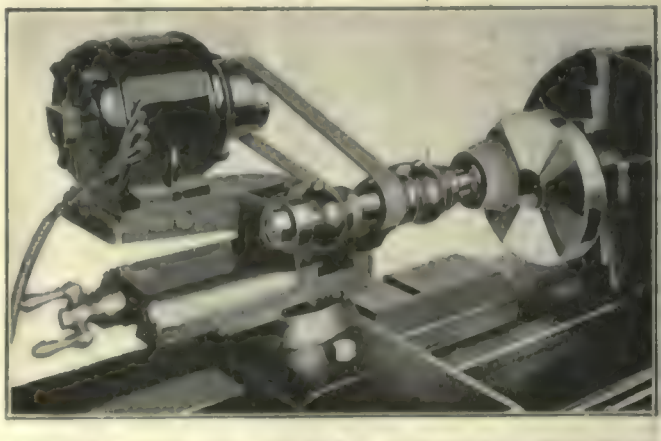
This instrument is intended primarily for rate setters, estimators, and those whose duties require the daily or frequent predetermination of time for machine operations. It is a convenient desk size, being about 16 in. in length and not over 3 lb. in weight. With its use pencil calculations are eliminated, computing time reduced, and chance for errors minimized. Because of its simplicity, it can be used by anyone familiar with the practical side of machine-tool operation. Directions for operation are carried on the device itself.

Liberty "Elteco" Universal Toolpost Grinder

The Liberty Tool Co., Inc., Irvington, N. J., has recently placed on the market the "Elteco" universal toolpost grinder. The base of the device is ordinarily mounted on the swiveling toolslide of the lathe, as shown in the accompanying illustration. The spindle is mounted so that its height can be adjusted to bring it on the same level as the center line of the lathe spindle. It is hardened and ground, and provided with one taper bearing so constructed that adjustment for wear may be made.

Different types of wheels and spindle extensions can be used. These extensions screw on the threaded end of the spindle, and also fit the taper portion, to provide a true-running fit. When doing ordinary cylindrical grinding, the machine carries a 5½ x 1-in. wheel protected by means of a guard. When equipped for face-grinding, as shown in the accompanying illustration, a cup wheel may be employed. For internal grinding, two extension arbors are provided. Holes as small as ½ in. in diameter can be ground, the maximum length of the hole being 6 inches. Longer holes can be ground if the diameter is greater than the minimum.

The spindle is driven by means of a belt running on a two-step pulley and connected to a ⅛-hp. electric motor. The motor may be provided for either alternating or direct current, to suit the conditions of the installation. It is mounted on a slide, so that the tension of the belt can be adjusted. Both the longitudinal and transverse feeds are obtained, of course, from the slides of the lathe. The device is intended for doing accurate grinding work where large quantities are not required.



LIBERTY TOOL CO. "ELTECO" UNIVERSAL TOOLPOST GRINDER



NEWS SECTION

Steel Foundrymen Study Manufacturing Problems

Officers and operating representatives of the Electric Steel Founders' Research Group held their regular meeting in Milwaukee on Feb. 6, 7 and 8. This group was formed about two years ago for the systematic prosecution of co-operative technical work which could be directly applied in improving the manufacture of steel castings.

Reports were made by the operating heads of plants on comprehensive investigations into important foundry problems. The group researches which were reported in detail at the meeting included those on the subjects of annealing, core practice, facing sands, furnace practice and pouring practice.

The members of the group are the Electric Steel Co., Chicago; the Ft. Pitt Steel Casting Co., McKeesport, Pa.; the Lebanon Steel Foundry, Lebanon, Pa.; the Michigan Steel Casting Co., Detroit, and the Sivyer Steel Casting Co., Milwaukee. The headquarters are at 639 Diversey Parkway, Chicago.

Committee To Study Unemployment

The fundamentals of unemployment and control of the business cycle are to be the subjects of a thorough investigation by a special committee of the President's Conference on Unemployment, selected last week at a meeting in the Department of Commerce. Owen D. Young, vice-president of the General Electric Company, was named chairman; Joseph H. Defrees, president, Chamber of Commerce of the United States; Clarence Mott Woolley, president, American Radiator Co.; Matthew Woll, vice-president, American Federation of Labor and Miss Mary Van Kleeck, Russell Sage Foundation, are the other members of the committee. Edward Eyre Hunt, secretary of the President's Conference on Unemployment was appointed secretary of the new committee, and Wesley C. Mitchell, of New York, was named field director of study.

Auto Exports in 1921

During the year 1921 41,392 motor cars were exported from the United States. Of this number, Latin-American countries took 33.1 per cent; British North America, 15.4 per cent; Asiatic countries, 14.5 per cent, and Europe, 13.1 per cent.

Pittsburgh Conference on Engineer Training

The United States commissioner of education has called a conference on commercial engineering on behalf of a committee appointed by him to investigate business training of engineers and engineering training for students of business. The conference will be held May 1 and 2 at the Carnegie Institute of Technology in Pittsburgh. President Arthur Hamerschlag of this Institution is a member of the committee.

The conference will be open to the public. Invitations to appoint delegates, will be sent to commercial and trade organizations.

Aeronautical Chamber of Commerce Meeting

A special meeting of the Aeronautical Chamber of Commerce was held at its rooms, 501 Fifth Ave., New York, on Feb. 24 for the purpose of nominating governors for the different classes of membership and getting their activities under way. The meeting was well attended by representative men of the various aircraft industries.

The nominations for governors for Class A, or manufacturers of aircraft, were: C. C. Witmer, F. H. Russell, J. L. Larsen, Grover C. Loening, S. S. Bradley and F. B. Rentschler. For Class B, makers of instruments and accessories, they were: B. E. Bushnell, Charles H. Colvin, Sherman M. Fairchild and Lawrence B. Sperry. For Class C, C. F. Redden was the nominee.

Meetings at frequent intervals were suggested to discuss the technical side of aviation. Attention was also called to the desirability of keeping in touch with aviation meets, and of working with the Congressional committees which are interested in the development of aviation.

Polish Bonds to Buy Motor Trucks

The rumor that the Polish government is to spend $10,000,000 on various kinds of machinery seems to be based on the following facts: Polish bonds to the amount of about $3,000,000 are to be offered in the United States. If they are sold, the money realized is to be spent here for motor trucks and other mechanical equipment. The greater part is to be spent for trucks.

President Signs Patent Office Bill

The President signed the Patent Office relief bill on Feb. 18. Since the bill carries only the authorization for the appropriation, the reorganization and installation of additional personnel must await the actual granting of the money. It is probable, however, that the appropriation can be carried in a forthcoming deficiency bill. The change in patent fees does not become effective until April 19.

The bill just passed raises the salaries of the principal examiners from $2,700 to $3,900 a year, and the pay of the assistant examiners is increased by from $150 to $900 a year. The commissioner's salary is to be $6,000 instead of $5,000. The additional salaries provided for are paid by additional fees. The meagre increases cost the taxpayer nothing. The five members of the board of examiners in chief, appointed by the President, men whom the statute requires to have both a legal and a scientific education, are to get $5,000 instead of the present $3,500. The pay of the clerks, at present the lowest in the Federal service, is raised from $720 to $1,100. The eight chiefs of clerical divisions are to get $2,500 instead of $2,000. The pay of the two examiners of interferences is put up more handsomely from $2,700 to $5,000 and that of the five law examiners from $2,750 to $4,000.

The increase of the force provided by the bill consists of one law examiner, twenty-six assistant examiners and twenty-two clerks. Insufficient as it is, the bill will check the exodus in the Patent Office and infuse new energy and activity. The loss, however, of so many men of long experience and special training cannot be made good immediately.

J. Wallace Carrel President Cincinnati Metal Trades

At the annual meeting on March second of the Cincinnati branch of the National Metal Trades Association the following officers were elected: President, J. Wallace Carrel, vice-president and general manager of the Lodge & Shipley Machine Tool Co.; vice president, E. A. Muller, vice-president and general manager of the King Machine Tool Works; secretary, David C. Jones, vice-president of the Lunkenheimer Co.; treasurer Neil Lamont, works manager of the Laidlaw Works of the Worthington Pump and Machinery Corporation.

Business Conditions in England

BY OUR LONDON CORRESPONDENT

The official figures of overseas trade bear out the general impression regarding last year. It is shown that imports totalled about 1,087 million pounds, the corresponding declared value for 1920 being about 1,923 million pounds, while exports of United Kingdom produce last year were valued at less than 703 million pounds, as against nearly 1,334 million pounds in 1920. Similarly re-exports (exports of foreign and colonial produce) were valued at more than 107 million pounds against about 223 million pounds. Of imports, the chief groups are food, drink and tobacco at about 567 million pounds; raw materials and articles mainly un-manufactured, more than 271 million pounds; and articles wholly or mainly manufactured more than 245 million pounds. Similarly in exports, food, drink and tobacco accounted for nearly 38 million pounds, raw materials, etc., 64 million pounds and articles wholly or mainly manufactured 589 million pounds. One export item last year which showed an increase was that of machinery which exceeded 75 million pounds in value. Putting it roughly, both exports and imports were only a little more than half the value of 1920, part of the difference being due to differences in prices. Calculating on average values in 1913, it has been shown that total imports were down last year by 25 per cent, total exports by 50 per cent, and re-exports by 21 per cent.

Fewer Company Registrations

Some figures have recently been made available relating to company registrations during last year. These totalled 6,395, with a capital of £99,034,-325, compared with 10,065 companies in 1920 capitalized at £568,894,382. Last year engineering businesses provided 351 companies with a capital of £2,948,-375; and motors 288 companies with a capital of £2,390,084.

The decline in merchant shipbuilding last year is shown in the annual summary just issued by "Lloyd's Register," which gives the world's output as 4,341,-679 tons. Of this the United Kingdom was responsible for 1,538,052 tons, or about 35 per cent, and the United States for 1,006,413 tons. Great Britain produced about three-quarters of her previous year's output, and, according to the figures given, the United States produced a little less than half the previous year's output. Germany is credited with 509,064 tons, and Holland, Japan and France each approached the quarter-million figure.

But all is not dismal. The government finds it easy to raise money at lower rates, and National Saving Certificates (a highly popular and profitable means of thrift) are to be raised in price. Appeals for capital have been quickly over-subscribed, the general pleasure in Washington conference decisions is almost unabated (though the linked sweetness seems a little too long-drawn-out for popular staying power) and the Cannes fiasco has only helped to strengthen the growing determination that the future of Europe (or is it of the whole civilized world?) shall be settled not by gusts of revenge, greed or fear, but by consideration of economic facts. The official figures of cost of living show another decline, now being 92 points above the pre-war figure, the lowest in fact since 1918. The largest decline is in the actual cost of food; rents, among the main items, have risen somewhat. Unemployment figures have shown a decline recently. According to the Ministry of Labor the mean percentage of unemployed during last year among the trade unions making the returns was 15.3, no such height having been reached previously during the seventy years during which these figures have been collected. In the engineering industry probably more than 25 per cent are unemployed, this apart from men on short time. Last year a reduction of about six million pounds was effected in the wage rates of more than seven million workpeople officially in review, but not including such classes as certain municipal and government employees, domestic servants, shop assistants and agricultural laborers. These reductions more than wiped out the increases reported during the previous year.

The Machine Tool Trade

A return has been supplied by the Board of Trade to the European edition of American Machinist showing exports and imports of machine tools from and into the United Kingdom during last year. Dealing only with complete tools, the weight of British-made tools exported was 19,972 tons, valued at £2,888,448, or about £145 to the ton. This is a 50 per cent increase on pre-war ton values, and of course the total value, though less than 1920, is otherwise the highest entered for any given year and is about three times pre-war value. The weight also exceeds last year's figures and is about 33 per cent above pre-war rates.

Of machine tool imports the total on the same basis amounted to 2,940 tons or less than the pre-war average; and the value amounted to £609,339, or about twice pre-war values, the value per ton being about £207, which is also about twice pre-war figures.

An analysis of the figures published by the European edition shows that taking values per ton, only in the case of drilling machines is the British article higher than the imported tool. It also makes quite plain the fact that the average tool imported is much lighter than the average British machine tool exported; the average lathe imported, for example, weighing 0.43 tons, as against an export figure of 2.46 tons. Similarly, in drilling machines the figures are 0.23 against 1.19, grinding machines 0.47 against 1.03, planing and shaping machines 0.74 against 3.83, and in presses, etc., 1.95 against 3.78. But in milling machines the average tool imported was slightly the heavier, namely, 1.66 tons as compared with British export at 1.57 tons. The official tables need to be further sub-divided as, taking values, nearly a quarter of the exports and more than a third of the imports are entered under the heading "other." In exports, the largest single item, approaching £1,000,000 (£974,392 in fact) was for lathes, the next being drilling machines at £380,-886, followed by planing and shaping machines at £298,675. Lathes also form the largest item in the import values, namely, £79,502, excepting presses, etc., which were valued at £145,663, with drilling machines at £52,347, milling machines at £46,719, grinding machines £43,459, and planers and shapers at £23,797.

A scurry through some of the leading machine tool firms would necessarily leave the on-looker somewhat depressed, and specialists have found it advisable almost to drop the production of machine tools and to take up ordinary engineering manufactures and repairs. The lack of orders extends over almost the whole field of machine tools but several press firms have been very hard hit and one in particular has, according to report, made some very doubtful debts. Very few of the motor car firms can be regarded as busy, though this is certainly true of three or four in the Coventry district, mainly engaged in the production of the lighter car. The export trade is wanting. Returning to machine tools, some firms, besides necessarily diminishing the works staff, have also discharged a very large proportion of the office personnel. But this is not true in every instance. The drawing office of Alfred Herbert, Ltd., Coventry, for example, appears to be just as busy as when trade is booming. The firm is introducing a new, or rather revised, lathe with V-bed and all slides completely covered, besides a number of smaller machine shop items.

Prices Down To Get Orders

Machine tool prices have, of course, been lowered, in some cases by 20 or even 25 per cent; in fact the representative of one firm was told that a competitor had reduced his price since last June by 30 per cent. Of course, similar statements are often made for the purpose of obtaining further concessions, and a case within the knowledge of the writer recently forms an instance. Some special engineering material, made by three or four firms only, was quoted by one firm at £40 a ton, this not including any machining, which, it was subsequently discovered, would be needed. Being given fullest particulars, another firm quoted £30 and was told over the telephone by the purchasers that they had expected to pay £27 but would be willing to go to £28 if that price would be accepted at once—and it was. Another firm, in this case a well-known machine tool concern, to secure an order reduced by £800 the price of a machine described as by no means expensive.

A statement made by the liquidator of the Aircraft Manufacturing Co., Hendon, will be read with some attention on your side. It claimed that the Gnome and Le Rhone engines, in which the company is interested, were used for the United States aircraft, in connection with which "the company had not been adequately remunerated," to use the words of the liquidator. Holt Thomas, a former chairman of the company, wrote that "the De Haviland machines are now the favorite of the world." He believed their use for peace purposes in the United States was a breach of agreement. "If it were not for this the good will and designs would be worth a large sum to the company in the United States."

The French Machine Tool Market

By C. E. CARPENTER
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The opening weeks of the new year have witnessed an improvement in the demand for machine tools in France which, if maintained, will help a great deal toward dispelling the gloom resulting from last year's almost total suspension of business. By this, it is not meant that anything approaching a brisk demand has sprung up. On the contrary, buyers are "few and far between" and those that have purchases to make are exceedingly careful in selecting the best values for their investment. However, the fact remains that inquiries are being sent out in increasing numbers and that a fair amount of machinery is being purchased.

In some cases the purchases are the result of the carrying out of long-deferred programs, indicating that a better feeling concerning the future exists among metal-working plants. In other cases machines are being bought by foreign manufacturers who seem to have come to the conclusion that the future possibilities of the French market warrant the development of branch factories in France, while the hird category of buyers comprises those shops that need one or more machines for replacement purposes or for rounding out their normal equipment. In the aggregate it can be conservatively stated that a substantial amount of machinery has been bought during the past five weeks, and, furthermore, that the next few months should bring a further improvement in the demand.

The price question is not so encouraging, for while sales have been made, the buyers, rather than the sellers, have profited in the majority of transactions, the reason being that business in France is decidedly in the throes of the liquidation process to the consequent advantage of the buyer. The seller, with true French tenacity, resisted the encroachment of the inevitable readjustment until the marked improvement in the exchange rate gave warning of the impending drop in values.

Liquidation in Process

The liquidation process, as far as machine tools are concerned, promises to be a very complicated and prolonged one, for not alone have the importers been loaded down with heavy stocks left over from the post-war inflation, but the shop owners themselves have had, and still have, sufficient surplus stocks to make them formidable competitors of the legitimate dealers and importers. The tremendous activity of the metal-working plants during the war and following the armistice brought about the importation of a great many more machine tools than such plants need for their normal work. Great numbers of machines are therefore idle throughout the country and their owners have begun to take stock of them and to seek to find a means of either disposing of them for much-needed cash, or of exchanging them for other needed equipment.

The direct result of this situation has been the creation in France of a second-hand machine tool market, which did not exist before the war, but which is now so firmly established that it is certain to be an important factor in the trade until the large surplus stocks are thoroughly digested. In the beginning of the development of the second-hand market there was considerable mistrust of used machines on the part of the large users, but the rapidly mounting prices of new machines caused many buyers to overcome their prejudice and to experiment with second-hand material. The experiments were apparently satisfactory, for a heavy trade has since sprung up and it can safely be said that few buyers nowadays purchase machinery without having first thoroughly canvassed the second-hand market.

Left-over Army Stocks

Probably one of the greatest factors in the creation of the second-hand machinery market in France were the stocks of machines in the American and British army repair shops throughout France. In the case of the American army, all the stocks were taken over by the French government and reserved for the needs of the devastated provinces; while in the case of the British stocks the British Ministry of Munitions, through its branch in Paris, advertised them extensively in the French press. When prospective buyers found that the machines were in excellent condition and fully tooled and that the prices were considerably below normal market values, they were encouraged to seek further for similar bargains. Many buyers also visited the American camps and endeavored to make purchases but were prevented by the ruling favoring the devastated provinces of the North.

In the partially dismantled American camps no machine tools now remain, except at Verneuil, the main repair shop of the Motor Transport Corps. At Verneuil, the machine tool equipment is still intact, but will shortly be offered for sale by the private liquidators who have taken it over from the French government. Efforts are being made to dispose of the Verneuil repair shop as a single unit. If this method proves unsuccessful which it no doubt will, on account of the unfavorable situation of the place for a manufacturing enterprise, the machines will be sold in single lots, thereby further adding to the difficulties of machine tool importers, for the Verneuil equipment comprises a large number of the best makes of American machine tools, and they were so slightly used by the motor transport mechanics, that they are to all intents and purposes equivalent to new machines. A complete inventory of the machine tools in the Verneuil shops, if printed, would resemble very closely the index to the advertising pages of the American Machinist.

Surplus army stocks, however, important as they have been on the machine tool market during the past three years, are comparatively small in comparison with the vast numbers of machines still in the hands of machine shop owners, which will eventually find their way into trade channels, A notable case that will serve as an illustration is that of Automobiles Berliet, of Venessieux, near Lyon. The Berliet plant, begun during the war and completed after the armistice, was built for the purpose of manufacturing a low-priced car on American lines. It aimed at what was, for France, a very large production and no expense was spared in equipping it with the best American machine tools. Before the production could be got fairly under way the bottom dropped out of the automobile market and it was found that a large part of the machine tool equipment could not be used for a long time to come. Printed specifications of the surplus machinery were distributed broadcast among French machine shops and dealers and many sales were made at substantial prices. Another notable instance is that of a large shop in the southern part of France which purchased, during the latter part of the war, a complete machine tool equipment for the production of aviation motors with the ultimate object of the construction of automobiles or tractors. Labor troubles after the armistice interfered with the after-war program so seriously that some months ago the entire machine tool equipment was placed on the market.

American Machines in Favor

The direct result of these, and many similar instances, coupled with the unfavorable rate of exchange prevailing between France and the United States, has been to discourage importations of American machines. On the other hand, some consolation is to be found in the fact that importations of German machines have likewise been affected, since German prices even though low have been higher than those asked for surplus stocks of American machines. Another point of great importance to future American trade with France is the fact that, due to the comparatively low prices of surplus and used American machines, many of the small shops have been able to buy them and to become familiar with American accuracy and design. Before the war, these small shops were content to buy exclusively German machines. As conditions now are, not until the stocks of new and used American machines are thoroughly digested will it be possible for German machine tool builders to gain much headway in France; and by that time it is to be hoped that not only will German production costs have greatly increased but that the exchange rate between France and the United States will have improved to a point that will render further substantial importations possible.

Market for Oil-Well Equipment in Argentina

Argentine purchases of oil-well equipment and supplies promise to be important during the present year, according to advices received from commercial attache Edward F. Feeley, of Buenos Aires. Large manufacturers are urged to keep on the ground qualified representatives who are thoroughly acquainted with the technical features of the business.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

The skeptics in German industry who doubted the soundness and duration of the business boom, have been satisfied by subsequent developments. Starting with the iron and steel industry, where the record business of November suffered a sharp decline in December, slackening of business spread all over the metal industries. The weakening of the domestic market is not yet very extensive; the export market has been strongly affected by the reverse movement of the exchange. The large volume of business concluded at the culmination of the boom, which was coincidental with the lowest mark quotations, is tottering, and threatens to demoralize the export business. A great many of the export orders filled in November are in a state of cancelation. Either the buyers or the sellers were quick to attempt a withdrawal, when in December the mark doubled its November value. Where the contracts were payable in marks the foreign buyers fought shy, and if made out in foreign money the German sellers felt the pinch. The events of December are a drastic illustration of the one-sided merits of the new policy to sell in foreign currency on export orders. Although sellers have it in their hands to insure themselves by making use of an arrangement offered by the German States Bank to cover against the day of delivery within one year from the receipt of the order, it seems that very few manufacturers have made use of it. The most pressing necessity of the times, the stabilization of the exchange, could not be put forward in a stronger light than by recent experiences.

Disappointed at Cannes

The rapid change of complexion in the money market and the outlook upon the Cannes conference, where decisions most vital to German industry were held in abeyance, are primarily responsible for the sudden drop of business. The population was led to expect a new settlement favorable to German finances, the influence of which on business no one seemed quite able to foreshadow. The greater part of the press of the country was tuned to hopeful strains, signaling a new and better era; but manufacturers were not able to see the advantages if the expectations promised by the Cannes conference were realized. Although Dr. Rathenau, who doubtless represents large industrial interests as well as public ones, plays a prominent part in this matter, the iron and steel industry, comprising the machine building and metal working industries, is generally opposed to the government's policy with regard to the reparations. The point of view prevailing in this industry may be gleaned from the opinions heard at an interview with an industrial leader of high standing, who also plays an important part in public matters. These opinions are of unparallel frankness, which explains the desire of the gentleman in question not to disclose his identity. They are quite typical of this class of business man. Asked for his opinion of the consequences of a moratorium on Germany's economic life, and specifically on the German industry, the following answer was made:

"A moratorium, as contemplated at Cannes, has the avowed object of giving Germany a short time to rally its strength—hardly more than a breathing spell, which is entirely insufficient. Germany needs four to five years of absolute rest, free from outside pressure. Germany is a body with thinned-out blood, shaken by the consequences of serious illness. In foreign countries the strength left in this body is largely overrated. This is particularly true of the industry. Small blame to them in this respect, as the German industry itself has been and is still overrating its strength considerably, and is only now commencing to realize its true relation of strength to foreign rivals. The truth in this respect has been deliberately suppressed inside and outside the country. Reports on the external conditions of the industry, often highly flavored according to the immediate objects in view, have been circulated widely, but serious critics of internal conditions have found very little or no opportunity to voice their opinion in public. Foreign countries have formed an entirely erroneous opinion of the state of German industry. This prosperity exists on the surface only, and disappears under the critical eye. It exists solely on the grace of the under-parity of our cost of material and labor. It is necessary to preserve a sufficient margin between this under-parity and the rate of exchange. The cost of material and labor has a constant upward tendency. There can only be a certain stability of business as long as the rate of exchange has a corresponding movement.

"It was the chief aim of the Cannes conference to stop further depreciation of the German currency and to help the mark to improve. At the same time, it was aimed to further raise the price of coal and transportation, which naturally would result in a general rise of prices and cause a considerable increase in manufacturing cost. The inevitable result would be the elimination of German industry from competition in the Western markets. This is no exaggeration, as can be seen from the fact that certain classes of industry find it hard, even under the present conditions, to compete against foreign rivals. The opening of the Eastern market would be an entirely inadequate compensation, even if it could be performed as quickly as optimists think. The decision contemplated at Cannes would put the German industry in a very precarious, not to say critical, situation. Payments in kind instead of gold, as arranged under the Wiesbaden agreement, would not bring relief, as they would not work in practice. They amount to a compulsory export, a matter which is in such sharp antithesis to the laws of supply and demand that it would be idle to count upon them."

Inefficiency of Industry

Turning to the specific condition in the German iron and steel industries especially with regard to the manufacturing cost in comparison with other countries, the following opinion was expressed:

"It is true that we pay much less for labor and material, especially in comparison with the United States, our chief rival, but no conclusions should be drawn from this fact alone, without taking all other conditions into consideration. Our factories have deteriorated. They are full of equipment fit only for scrapping. A large part of the old machinery left over from the war has, by misunderstood economy, been kept in service. Our labor conditions, although the efficiency of the workmen has greatly improved during the last year, are far below normal. Manufacturers are forced by law to keep a large amount of unproductive labor. This and other burdens for the benefit of the workmen are greatly adding to overhead expenses. The eight-hour day, which in reality is only a seven-hour day, is entirely inadequate for a country thrown upon work as its main asset. We have again a piece-work system but only by name. It is really only a premium system, and not a very efficient one at that. The control of the manufacturers has been greatly restricted under the Shop Council Law, which so far has only acted as a handicap to efficiency, and is benefiting solely one side, that is, the employee. Germany has always been far behind in the highly advanced economics of the shops in the United States, and is now further removed than ever. Modest attempts to copy American methods started in pre-war times but were interrupted by the war, and have never been resumed. During the intervening years nothing has been done to eliminate waste of material and labor and nothing can be done under present conditions. On the contrary, since the outbreak of the war the industry of the country has been drifting away from this aim, and is now wallowing in waste."

Machinery Trade Busy

In the machine building industry it can be noticed that competition, which in November was hardly noticeable, has again commenced, resulting in a certain amount of underselling. This applies particularly to the weaker members of the industrial family. As a consequence, the upward tendency of prices has reached its culmination, and prices are again more or less on the retrograde. The latter is somewhat accelerated by information coming from all parts of the machine building industry of tenders for foreign specifications having fallen through on account of high prices.

In the machine tool building industry the business in hand is still large, keeping manufacturers employed for several months ahead. Cancellations are, however, not infrequent, and many orders for long delivery have already been annulled. Manufacturers are as a rule not over-eager to bind buyers to their bargain if the orders were given at firm prices. During October and November many manufacturers had booked orders for export in the currency of the buyer, when the mark was 250 to 300 to the dollar. In view of the certain increase of cost and overhead, and in consideration of the uncertain hope that the rate of exchange would again sink to the level on which the quotations were based, they are only too willing to withdraw and are often doing their best to force cancellations.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

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Actors and public speakers understand that there is generally an interval between the delivery of their most telling passages and the response of the audience in laughter, applause or disapproval.

In the financial and commercial markets there is a similar interval between the time at which a change in basic conditions becomes apparent and the reaction of the public mind as expressed in prices. The reason for this interval is the same in both cases. Individually or collectively the intelligence of the average man is slow to appreciate the significance of what he hears. He takes time to make up his mind and more time to act upon his conclusions. In the case of influences that are at all obscure, or for an understanding of which an academic knowledge of economics is necessary, the interval between cause and effect is likely to be lengthened. To most business men seeing is believing and they wait for leadership before taking the course logically indicated by what they hear. This explains why so few buy at the bottom and sell at the top, and why the merchant or speculator must understand psychology as well as arithmetic if he is to succeed. It also explains why we are only just now beginning to feel the effect of the change in conditions that was apparent and repeatedly pointed out in these letters weeks and months ago.

World Markets Firm

The markets on both sides of the Atlantic were nearly all affirmatively strong last week. In London the stock exchange was described as booming and both speculative and investment issues were eagerly bought on easy money and the advance in exchange which carried sterling up to 4.41¼ last Thursday and lifted francs, Canadian dollars and most other foreign currencies proportionately. German marks and Austrian kronen were the only laggards in the upward movement, but they are hopelessly and literally water-logged by the flood of paper money which flows from the printing presses at Berlin and Vienna.

The *Bankers Magazine* of London estimates that the advance during January added 113,751,000 pounds to the market value of 387 standard securities, and the additional rise during February has probably doubled this so that the English are "feeling richer" by more than a billion dollars.

In New York both bonds and stocks are higher, but the activity has shifted from the former to the latter and has been especially noticeable in the case of the low priced railway shares whose earning power and strategic value in the inevitable consolidations provided for in the Esch-Cummins bill speculators and investors are at last commencing to discover. That the farsighted crooks who run the bucket shops are welching under cover of bankruptcy is another indication of good times.

On the Chicago Board of Trade wheat has sold at an advance of more than 40 cents over the season's low. Corn is up 14 cents from the bottom and hogs, hog products and cattle are well on the way to the level of normalcy.

Price Trend Upward

In the cotton market there has been a recrudescence of bullish sentiment and though the advance has halted around 18 cents, the present feeling is that a crop of 10,000,000 bales next year will be too small to supply the increased American consumption plus the larger demand from Europe that is expected as a result of the greater purchasing power indicated by the advance in foreign exchange. The prices for many of the less talked of commodities such as hides, leather, wool, lumber, coffee and cotton oil are likewise tending upward, and while sugar was slightly lower, the much talked of surplus is being distributed with amazing rapidity. The steel business is looking up because the railroads are buying more freely and a slight decline in copper, due probably to the expectation of an increased supply from the recently reopened mines, is almost the only exception to the upward movement.

Although February is normally the dullest month of the year in the retail trade the consumptive offtake is gaining and this is reflected in jobbers' sales, which are increasing, although the buying is still from hand to mouth. Cotton fabrics are in better demand. The American Woolen Co. is sold up on many of its lines and has withdrawn them while dealers in silks say they are doing a good business despite the discreditable gyrations of raw silk in the Yokohama market.

Confidence Restored

Railroad traffic is gaining, car loadings are increasing and earnings are much better than had been expected. There seems every reason to expect a cumulative gain in the volume of business at gradually advancing prices as spring opens and summer approaches. The persistent pessimism of the last twelve months has restricted buying. Shelves are bare. Stocks are low all along the line from producer to consumer and it will take some time to replenish them. But the recognition of these conditions recently manifest in the more speculative markets is not yet universal.

Some are still skeptical and we must continue to make allowance for the interval between good news and its complete acceptance. When that time arrives the upward movement will be finished, but as it has taken nearly a year of rising bank reserves to convince a relatively small proportion of the business community that the tide *could* turn another year may elapse before everyone realizes that it *has* turned. By that time it will probably have reached its flood and those who then suggest that it may fall again may be execrated for their farsighted pessimism as was the writer for his optimism twelve months ago.

But for the present and the near future there is nothing to indicate any contraction in the abundant supply of credit upon which the revival now in progress is pedestalled. The Federal Reserve statement, published last Friday, is in fact almost sensational in the plethora of money that it reflects. The reserve ratio has advanced from 76.4 per cent to 78.1, and the stock of gold has gained another $10,000,000. The Federal Reserve notes in circulation amount to $2,255,000,000, and the deposits to $1,772,000,000, against which there is held $2,947,000,000 in gold. These figures are, I think, almost without precedent in the history of banking. It is not surprising therefore that President Harding and the Federal Reserve Board are exultant in predicting better times, although it is hard to see how they can prevent the gold inflation so frequently prophesied in these letters, unless they persuade Mr. Fordney to include a prohibitive duty on further imports of gold in his tariff bill.

The Coal Strike Menace

There are, however, as usual a few clouds on the horizon and, although they are not very black, they are not to be ignored. The darkest is the threatened coal strike set for April 1. There is reason to hope that it will be averted, now that the miners and the operators are talking together. The public do not fully understand the merits of the controversy, but if it issues in a coal famine the consumers will make their anger felt through Congress and both parties to the quarrel are commencing to realize this.

The postponement of the Genoa Conference now practically agreed upon is another shadow across the path of reconstruction in Europe that may or may not be of auspicious augury, but in so far as the United States is concerned it is not immediately important and is more than counterbalanced by the impasse which confronts those who were bent upon the passage of the Bonus Bill. The ship subsidy bill is the next measure to which the opponents of group selfishness must address themselves. A cursory examination of it indicates that in the end it will probably cost the Government more than it hopes to obtain for the ships whose sale it is expected to make possible.

There are, however, relatively minor matters. The important fact is that the winter of our discontent is nearly ended and that we have reason to hope that the summer will be made glorious by the sunshine of confidence and prosperity.

The Trend of Business Improvement—Plants Resuming

The Woods-Evertz Stove Co., Springfield, Mo., has resumed operations at its plant, following a shut down since last November. Employment will be given to about 125 men.

The Cox-Lite Co., Perkasie, Pa., manufacturer of automobile equipment, is operating on a capacity schedule and has booked orders insuring maximum production practically throughout the year.

The Jordan Motor Car Co., Cleveland, Ohio, has placed its plant on a full capacity operating schedule.

The Somerville Iron Works, Chattanooga, Tenn., manufacturer of cast-iron pipe, etc., is maintaining a full-time operating schedule at its plant in the North Chattanooga district.

The Bessemer and Lake Erie Railroad Co., has reopened its shops at Greenville, Pa., following a period of curtailment. Practically all old employees have been taken back.

The Kansas City Nut and Bolt Co., Kansas City, Mo., will increase its production schedule at once. The plant has been operating at close to 50 per cent of normal.

The Steel Products Co., 2,196 Clarkwood Road, Cleveland, Ohio, is adding to the working force at its local plant and since the first of the month about 100 men have joined the force. Employment is now being given to about 400 operatives.

The Pere Marquette Railway Co., Detroit, Mich., will expend over $4,000,000 during the present year for extensions and betterments. A contract for 500 freight cars for automobile transportation has been awarded to the Western Steel Car and Foundry Co., Chicago, Ill., at a cost of about $850,000. Plans are under way for the construction of new car shops on a site to be announced later, and purchase of approximately 15,000 tons of steel rails, estimated to cost about $900,000, will soon be made.

The Sharon Steel Hoop Co., Sharon, Pa., has placed four additional mills in service at its plant, with adoption of a full-time working schedule in the finishing department for the first time in eight months.

The Richardson & Boynton Co., Dover, N. J., manufacturer of stoves, ranges, etc., will transfer a large portion of local work to its plant at Buffalo, N. Y., where operations will be increased to provide for the change. This arrangement is being made because of labor troubles at the Dover works.

The Bethlehem Shipbuilding Corporation, Ltd., is arranging for an increase in the working force at its Harlan Works, Wilmington, Del., and about 200 men will be added. The company has taken an order from the Philadelphia and Reading Railroad Co., for fifty steel passenger cars and production will be carried out at the local yard.

The Dodge Brothers Co., Detroit, Mich., manufacturer of automobiles, has placed its recently completed closed body plant in service, and operations will be maintained at capacity.

The Page Harshey Co., Welland, Ont., Canada, resumed operations at its local steel pipe mills on Feb. 13, following a period of curtailment. Employment will be given to about 300 men, under day and night schedule.

The International Silver Co., Meridan, Conn., is increasing the operating time at its plant at Wallingford, Conn., to a 13-hour day schedule, as against a previous 9-hour day.

The Royal Typewriter Co., Hartford, Conn., has increased production at its plant, effective Feb. 13, placing practically all operating departments on a full-time basis.

The Pennsylvania Railroad Co., is arranging for full time operations at its shops at Altoona, Pa., which have been on a curtailed schedule for a number of weeks past. The working force is being increased at the car shops of the road at Trenton, N. J., and about 135 additional men have resumed during the past fortnight, including machinists, pipe fitters, boilermakers, sheet-metal workers, blacksmiths and helpers.

The Mullins Body Corporation, Salem, Ohio, manufacturer of automobile bodies, is increasing operations and adding to the working force at its plant. About 400 men have been added recently in the different departments, and present capacity, with the new plant in service, is about 75 per cent greater than in 1920.

The Philadelphia and Reading Railroad Co., Philadelphia, Pa., has placed an order for 2,500 coal cars, equally divided among the Standard Steel Car Co., the Pressed Steel Car Co., both of Pittsburgh, Pa.; the Midvale Steel Co., Philadelphia, Pa.; and the American Car and Foundry Co., New York.

The Marietta Casting Co., Marietta, Pa., manufacturer of iron and steel castings, is planning for the immediate resumption of operations at its foundry, following an extended period of curtailment.

The Chattanooga Plow Co., Chattanooga, Tenn., is maintaining an active production schedule at its agricultural implement works, with full operating force.

The Erie Railroad Co., New York, has concluded arrangements with the Hornell Repair and Construction Co., Hornell, N. Y., now operating the local shops of the road under lease, for the management of its car and locomotive shops at Salamanca, N. Y., and Bradford, Susquehanna and Brookwayville, Pa. A lease will be taken on the plants and operations placed under way at once for contract work for the railroad. A similar arrangement has been made with Charles Wagner, 144 Pavonia Ave., Jersey City, N. J., for the operation of the local shops of the road. The plant will be operated for contract work and employment will be given to about 400 men.

The Columbia Rolling Mill, Marietta, Pa., resumed operations at its plant on Feb. 15, following a shut down of about one year.

The Acme Wire Co., New Haven, Conn., is increasing production at its plant at Hamden, near New Haven, and making additions in the working force. Over 100 men have been added during February.

Mining and Metallurgical Engineers Elect Col. Dwight

Col. Arthur S. Dwight, of New York, was elected president of the American Institute of Mining and Metallurgical Engineers at its annual convention held in New York City on Feb. 20 to 23. Col. Dwight's election was announced at a business meeting which opened the 125th meeting of the institute. More than 1,000 engineers from all parts of the world attended the convention, which was held at the Engineering Societies Building. The world's oil reserves in relation to America's future supply was the leading topic of discussion.

J. V. W. Reynders and A. R. Ledoux, both of New York, were elected vice-presidents and directors of the institute. Other directors chosen were: Charles F. Rand and George D. Barron, of New York; William H. Basset, Waterbury, Conn.; Thomas B. Stearns, Denver, Col.; and William Kelly, of Vulcan, Mich.

Mining men from the Butte, Anaconda and Arizona regions and from the coal producing states of West Virginia, Pennsylvania, Ohio and Illinois thronged the sessions to hear discussion on conditions in the nation's great mining industries. Abstracts of some of the papers presented will appear in later issues of AMERICAN MACHINIST.

National Board Hits at "Outlaw" Unions

The Associated General Contractors of America, the American Institute of Architects, the Engineering Council, the National Building Trades Employers Association, and the building trades department of the American Federation of Labor through the "National Board for Jurisdictional Awards," which has just concluded its regular quarterly meeting in Washington, have reached a national agreement through a resolution heavily penalizing union workmen who refuse to abide by the decisions of the board.

The resolution provides that local building trade councils of union labor shall suspend unions and refuse to recognize or support those unions which refuse to abide by decisions of the national board; it also provides that general contractors and sub-contractors who employ only union labor shall incorporate in their agreements with labor a provision that will secure compliance with all the decisions of the board and that they shall refuse employment to members of local unions which do not abide by such decisions, and further that architects and engineers shall insert in all their specifications and contracts a clause that such decisions shall be followed.

This action was taken as the result of the report of a special committee of the national board appointed to outline the procedure to be followed in clearing up the situation created by the refusal of the United Brotherhood of Carpenters and Joiners to conform to the decisions of the board in the case of settling the dispute between the carpenters and the sheet-metal workers which was decided in favor of the latter.

Cleveland Letter

Gear manufacturers in the Cleveland, (O.) district were busier during the last week or so than they had been for several months. Increased demand from the automotive industry is largely responsible for this. The Van Dorn-Dutton Company believes it has a goodly portion of the gear orders from this source, and in addition is building equipment for road making machinery, for the printing industry and the like. Most orders are small, but more frequent, and most calls are for immediate delivery.

The Grant-Lees Gear Company is working close to normal capacity, and reports several orders booked for months ahead of delivery. The Union Rolling Mills of the Bounne-Fuller Company are speeding production, based upon new orders from the automobile trade for semi-finished material.

The White Company has started the production of a rail motor car chassis, upon which will be placed car bodies seating up to 40 passengers made by the J. G. Brill Company, of Philadelphia. The completed cars, the White officials assert, will be used for branch railroad line service. A test of the car has already been made by the Baltimore & Ohio Railroad, between Philadelphia and Wilmington.

The opening of locomotive repair shops of the Toledo & Ohio Central Railroad, at Bucyrus, Ohio, and also at Kenton, Ohio, on March 1, was announced by rail officials. These plants have been closed for several weeks. Close to 300 men will be re-employed. Plans do not call for the opening of the car repair shops at this time.

Fire damaged the plant and stock of the Gabriel Manufacturing Co., Cleveland, Ohio, to the extent of $23,000. The origin of the blaze has not been determined. Resumption of operations at an early date is planned by plant officials.

Plans for a new sugar refinery at Shanghai, China, were announced by officers of the China National Sugar Refining Co. of that city, who were in Cleveland, Ohio, this week. Principal reason for the visit was a study of the local market for equipment for the proposed plant, they explained. The officers also stated they were seeking an American engineer to direct operations, and wanted nothing but American machinery. The company is capitalized at $5,000,000.

Warning!

The following letter was sent to the general manager of the National Machine Tool Builders' Association by a New England member:

"On Feb. 8, we were visited by a man who presented a card bearing the following inscription:

MEMBER A.S.M.E.
R. C. CANNON, M. E.
MILWAUKEE, WIS.
PLANT ENGINEER,
PAWLING & HARNISCHFEGER CO.

As we have done business in the past with the above company, the bearer of the card was duly received as an accredited representative of Pawling & Harnischfeger. He claimed to be interested in behalf of his company in investigating other of our machines, and spent the entire day with us.

On his arrival, he informed us he had left a package of blueprints he had brought for our consideration on the train and in addition a wallet containing the most of his money, also important papers. He had, however, a certified check drawn on the West Allis Bank, West Allis, Wis., which we agreed to cash for him.

After his departure and at his request, we forwarded in his name to Pawling & Harnischfeger Co. circulars and other data relating to the matters he discussed with us. We have just received a letter from Pawling & Harnischfeger acknowledging receipt of the circulars and our letter addressed to R. C. Cannon, care of, Pawling & Harnischfeger; from which it is evident that the man is an imposter. In addition, the certified check which we cashed is declared a forgery by the West Allis Bank and returned to us.

We thought it advisable to inform you at once regarding this matter, as you might, under the circumstances, wish to take some action in regard to placing other members on their guard against this party."

The general manager of the association states that the same fraud has been heard of in Cincinnati, and evidently is making the rounds of the machine tool builders. Also that any member approached by him should hold him for the police, have him arrested for forgery and immediately notify the office of the National Machine Tool Builders' Association, Room 817 Provident Bank Building, Cincinnati, Ohio.

Chicago Letter

There is no doubt that February business in the local machine tool market will prove better than that of January. A few concerns report February business as double that of any month for sometime past, and stated that January was one of the very poorest months.

All dealers report inquiries as increasing in number, and buying is slowly but surely becoming more frequent. One of the dealers sold a large order to the Board of Education of Hammond, Ind., amounting to about $15,000. Auction sales, which continued throughout the months of depression, have been very quiet, none being held recently. There is a report that the equipment of the Obenberger Drop Forge Co., Milwaukee, Wis., will be sold soon to satisfy the claims of creditors.

Prospective buyers are thought to be keeping in the background, expecting the dealers to reduce prices.

A little more hope is being placed in the future buying of the railroads. The Pere Marquette is expected to issue a list soon calling for about $100,000 worth of machinery and shop equipment. The Sante Fe has added two new machines to its list, one Atkins No. 7 power-driven bandsaw, or equivalent, and one Fay & Egan No. 62 universal wood-working machine, arranged for belt drive. There is also a report that the East St. Louis & Suburban R.R. is in the market for one large wheel press.

About six months ago Leon E. Stanhope architect, 58 West Madison St., announced that he was making preliminary plans for a local concern to erect a twenty-one story garage building on the southeast corner of Wabash Ave., and South Water St. A few weeks ago Lamb & Ruth announced they would be the engineers on a $2,000,000 twenty-five story garage to be erected on a site about half a block south of the first big garage project. Giaver & Dinkelberg are the architects and announce that plans and specifications will be completed in about ninety days. The National Automobile Hotel Co. is the owner.

Cleveland's Industrial Association

The Industrial Association of Cleveland was organized a few years ago as an "alliance of Cleveland employers and employees, with club rooms where men and management might get together, to study and discuss problems of mutual interest, to meet on equal terms, to get acquainted with one another, and to join together for constructive thinking." With this idea sincerely and honestly carried out, the Industrial Association has developed into an educational and social institution where in open forum, in classes, lecture meetings and discussion groups, solutions of industrial and business problems are sought through democratic exchange of view points.

The association maintains well appointed club rooms in one of Cleveland's hotels. Chess, checkers, cards and pool games, books and magazines, daily luncheon service in the club mezzanine, Saturday night dances and weekly social activities are among the social advantages offered by the association. Men and women are listed in the membership, from the president of the Chamber of Commerce, to the men in the shop.

This winter the association has offered to its members an unusual business training course. Sixteen of Cleveland's leading business men were prevailed on to give one lecture each, in a course which covered the elements of business building and constituted a comprehensive survey of modern business organizations and methods. Special groups of members, also unite to discuss mutual problems. There is a salesmen's club called the "50-50 Club," "The Faneuil Club" for those interested in becoming effective speakers, and the "Efficiency Club," each of which offers opportunity for members.

Chamber of Commerce Votes Down Soldier Bonus for Third Time

A referendum vote among members of the Chamber of Commerce of the United States upon the proposal that a cash bonus be given former service men, has resulted in a 72 per cent majority against the suggestion. This is the third time that the chamber has gone on record as opposed to the cash bonus.

The following are results of votes taken at the same time with that on the bonus:

Upon the suggestion that a national system of reclamation be initiated through adequate Federal appropriation for affording former service men opportunity to cultivate the soil: For, 1,249; against, 452. Carried.

Favoring national legislation and appropriations to enable former service men to build homes: For, 1,022; against, 668. No decision.

Favoring national legislation and appropriations to enable former service men to obtain vocational education: For, 1,378; against, 316. Carried.

Business Items

The Medart Patent Pulley Co., Inc., of De Kalb Avenue, St. Louis, Mo., has changed its name to the Medart Company. This change in name does not indicate any change in the organization, but is simply to correct a misleading impression that the company manufactured nothing but pulleys.

The Savage & Winter Co., machine tool and electrical machinery dealers, has moved from Minneapolis to 914 Pioneer Bldg., St. Paul, Minn.

The A. Z. Boyd Co., 126 Chambers St., New York City, has taken the agency in that city for the sale of the line of screwplates made by the Russell Manufacturing Co., of Greenfield, Mass.

Monaghan Bros. & Co., Newark, Ohio, has leased the foundry of the Scheidler Machine Co., in that city and will start operations as soon as new machinery has been installed.

The Chicago Flexible Shaft Co., of Chicago, Ill., has reopened its St. Louis office. J. J. Wittenburg is in charge. The office is located in the Railway Exchange Bldg.

The Gilson Manufacturing Co., Port Washington, Wis., has purchased the plant and equipment of the Globe Metal Products Co., in Sheboygan, Wis. The Gilson company will operate both plants.

Charles E. Skelton, formerly of the Skelton-Chapin Co., Syracuse, N. Y., has severed his relations with that concern and has organized a company under his own name. A machine shop has been opened at 4,025 So. Salina St., where experimental and development work on machinery will be carried on.

The Brazil Trust Co., Brazil, Ind., has been appointed receiver for the Union Steel Co., of that city, manufacturer of tools and automobile parts. The Union Steel Co. moved its plant from Chicago just a year ago. Walter H. Miller, superintendent of the company, will be placed in charge to operate the plant.

Consolidation of the Hesse-Martin Iron Works and the Ersted Machinery Manufacturing Co. has been accomplished. The consolidated foundry and machinery business will operate at the plant of Hesse-Martin, 168 East Taylor St., Portland, Ore., which will be enlarged and improved.

The McMullen Machinery Co., 64-66 Ionia Ave, Grand Rapids, Mich., has been appointed exclusive representative, by the Diamant Tool and Manufacturing Co., Inc., 91-97 Runyon St., Newark, N. J., in connection with the sale of Diamant standard punch and die sets in the Michigan territory.

The C. G. Garrigus Co., Haddam, Conn., has been organized and incorporated under the laws of Connecticut to manufacture and deal in machinery, hardware and tools. The capital stock is $50,000 and the incorporators are Clarence G. Garrigus, 105 High St., Bristol, Conn.; A. C. Garrigus, Tylerville, Conn., and H. L. Webster, Waterville, Conn.

H. D. Smith & Co., manufacturer of tools, Plantsville, Conn., has filed a certificate with the Secretary of the State of Connecticut, to increase the capital stock of the company from $200,000 to $300,000.

At the recent meeting of the directors of the American Brass Co., Waterbury, Conn., and Ansonia, Conn., the following officers were elected for the ensuing year: Chairman of the board, C. F. Brooker; vice-chairman and first vice-president John P. Elton; vice-presidents, Edward L. Frisbie, Thos. B. Kent and Gordon W. Burnham; treasurer, Clifford F. Hollister; assistant treasurers, Major W. Judge and A. Bernham Terry; secretary, Edmund H. Yates; assistant secretary, Elton S. Wayland. Executive committee: Charles F. Brooker, Edward L. Frisbie, Thomas B. Kent, John P. Elton, Gordon W. Burnham, John A. Coe, George H. Allen, Clifford F. Hollister, John D. Ryan, Cornelius F. Kelley and Benjamin B. Thayer.

The Springfield Realty Corporation has been formed with $400,000 capital to take over and hold the real estate of the Van Norman Tool Co., Springfield, Mass. The charter carries the right to issue bonds.

The Norwood Engineering Co., Florence, Mass., has been reorganized with G. Wilson MacDow, of Boston, as the principal owner. No radical change will be made in the lines of the business. The new officers are: President and treasurer, Warren M. King; vice-president and general manager, H. W. Hosford; clerk, H. B. Haven; assistant treasurer, G. Wilson MacDow; directors, H. P. Otis, L. C. Perrin and R. N. Smithers.

The business formerly conducted by Carl H. Swartz, at Freeport, Ill., under the name of the Swartz Iron Foundry, has been incorporated and will be known as the Swartz Manufacturing Co. Inc., in the future. A machine shop has been erected and for the time being the company will devote its energies to the manufacture of semi-lightweight pistons for the replacement trade. A full line of pistons for practically all makes of motor cars, tractors and commercial motors will be included.

The Fulton Machine and Vise Co., Lowville, N. Y., has gone into bankruptcy.

The American Brass Co., of Waterbury, Conn., has been merged with the Anaconda Copper Mining Co. of Montana. The companies will retain their separate officers and organizations.

The Blake Nut-Lock Co. has been incorporated at Buffalo, N. Y. Capital stock is given as $500,000; directors are George J. Blake, A. C. Blake, W. J. Bauman, G. W. Schworm and E. D. Dole.

The Clinton Supply Co., Inc., 110 S. Clinton St., Chicago, Ill., has been designated to handle Royersford products and the Sells roller-bearings, made by the Royersford Foundry and Machine Co., of Royersford, Pa.

The Chapman Valve Manufacturing Co., Indian Orchard, a suburb of Springfield, Mass., is planning to construct about twenty-five more houses for its workmen near the plant in Indian Orchard.

The Terre Haute Boiler Works at Terre Haute, Ind., will start operations at full capacity in a few weeks. New machine equipment has been installed and about sixty workmen have been employed for the present.

Personals

J. B. DOAN, retiring president of the Cincinnati branch of the National Metal Trades Association, was tendered a complimentary dinner on Feb. 17 by the executive committee of the organization. Mr. Doan was presented with a silver service.

W. B. MCSKIMMON, secretary of the S. W. Card Manufacturing Co. division of the Union Twist Drill Co., Athol, Mass., was given a dinner by a group of his friends on March second, which was the fiftieth anniversary of his birth.

WILLIAM R. WEBSTER, vice-president of the Bridgeport Brass Co., Bridgeport, Conn., was elected a director of the Automatic Machine Co., machinery manufacturers, of that city.

PHILIP MCKENNA, of Bridgeport, Conn., recently left on a business trip into Mexico, in the interests of the Crane Company, of Chicago.

PETER F. AUGENBRAUN, who will have charge of the new Yale & Towne Manufacturing Co.'s plant in Germany, sailed from New York on Feb. 4. Mr. Augenbraun, who has been with Yale & Towne for the past thirty years, was tendered a farewell dinner at the home plant in Stamford. Conn., just before he left, and was presented with a handsome gift from his associates.

M. A. HERALD, of Pittsburgh, Pa., has joined the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., as western Pennsylvania representative, with headquarters at Pittsburgh.

JOHN T. SLOCOMB, formerly of J. T. Slocomb Co., Providence, R. I., who sold out his interests in that company almost two years ago, now holds chief interest in and is manager of the Economy Cooker Co., Providence, R. I., manufacturer of a steam pressure cooker made of monel-metal.

C. F. BLISS, president of the Farrel Foundry and Machine Co., Ansonia, Conn., was elected a director of the Ansonia National Bank at the recent annual meeting.

LESTER G. SIGOURNEY, has been elected secretary of the New Departure Manufacturing Corporation, Bristol, Conn. Mr. Sigourney has been with the company for a number of years.

EBENEZER HILL, has resigned as president of the Norwalk Iron Works, South Norwalk, Conn.

HENRY D. SHARPE, president and treasurer of the Brown & Sharpe Manufacturing Co., Providence, R. I., manufacturers of machinery and tools, has been elected vice-president of the Providence Journal Co., publishers of the *Providence Journal*.

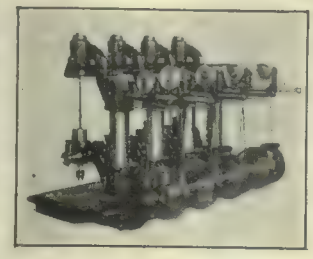
E. D. MITCHELL, who has been American manager of Alfred Herbert, Inc., and who is returning to the home office in Coventry, England, was given a testimonial dinner on March second at the Engineers Club, New York. He was presented with a silver token.

R. L. WHITE has been appointed district manager in charge of the Detroit office of the Wilson Welder and Metals Co., of New York.

Condensed-Clipping Index of Equipment

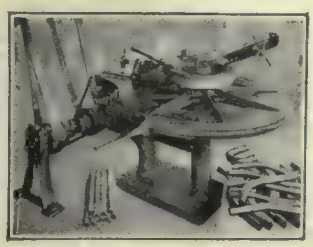
Patented Aug. 20, 1918

Drilling Machine, Bench, Class-O
Henry & Wright, Hartford, Conn.
"American Machinist," Oct. 6, 1921



This high-speed drilling machine is intended for driving 13/64-in. drills to their full capacity. The machine is equipped throughout with ball bearings and has a maximum speed of 12,000 r.p.m. Two-step pulleys provide four changes of speed. The weight of the spindle is over-balanced by a short coil spring on the pinion shaft, thus providing for a quick return and serving to prevent the breakage of drills when "breaking through" the work. The machine is ordinarily built with four spindles, spaced 7 in. apart. The distance from each column to the center of its spindle is 5¼ in.

Bending Machine, Pipe, No. 5-B
Wallace Supplies Manufacturing Co., 420 Orleans St., Chicago, Ill.
"American Machinist," Oct. 6, 1921



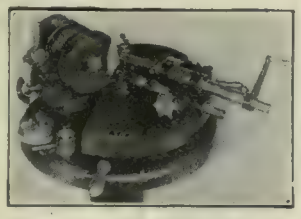
The machine is known as the 5-B, being adapted especially to the bending of pipe and tubing. It is known as the No. 5-C when equipped with dies for the bending of angles, channels, tees and other structural shapes. The mandrel which supports the walls of the tubing from the inside during the process of bending may be quickly inserted and removed. When bending tubing heavier than 1/16 in. wall thickness, the inside mandrel may be dispensed with, and the forming done by means of the outside follower bar only. Forming dies or heads up to 50 in. in diameter may be used. Floor space, about 52 x 66 in. Net weight, 1,200 pounds.

Cushion, Spring, Punch-Press, Even-Pressure
Marquette Tool & Mfg. Co., 319 W. Ohio St., Chicago, Ill.
"American Machinist," Oct. 6, 1921



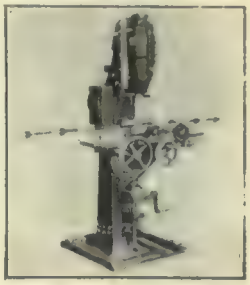
This cushion is for giving a uniform pressure during the entire length of the stroke when drawing a shell on a punch press. It is stated that sufficient pressure is obtained at the beginning of the draw to eliminate the wrinkling of the metal and the unnecessary wear on the dies resulting therefrom. By doing away with the increased pressure toward the bottom of the stroke, backlash of the press is eliminated. The adjustment is left undisturbed when the attachment is removed from the press. The device is attached to the press by means of a single bolt. The attachment takes up very little room under the bed of the press.

Grinding Machine, Tap
Bickford-Switzer Co., 50 Norwood St., Greenfield, Mass.
"American Machinist," Oct. 6, 1921



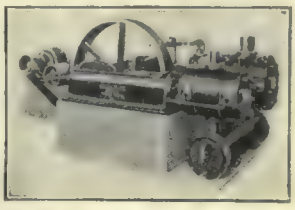
The machine is similar in appearance to the company's drill grinding machine. It is intended to sharpen taps having any number of lands or flutes from two to six, by grinding an eccentric relief on top of the cutting land. The limit of the capacity is 1⅜ in. diameter for hand taps, 1¼ in. for tapper or machine nut taps, and 2 in. for pipe taps. A cam on the main or work-carrying spindle causes the tap to approach and recede from the wheel as it is revolved. The machine can sharpen countersinks and chucking reamers having not more than six flutes. It is equipped with a ½-hp. motor, is mounted on a column and weighs 300 pounds.

Mortising Machine, Hollow-Chisel, Vertical, Motor-on-Spindle
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," Oct. 6, 1921



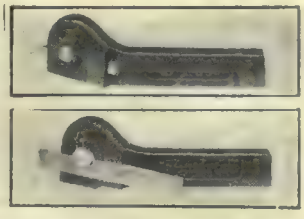
The principal feature of the device is the fact that the motor is mounted directly on the spindle of the machine. The motor operates on either two or three phase, 60-cycle, alternating current at a speed of 3,600 r.p.m. The rotor is mounted directly on the machine spindle, which runs in ball bearings. An inclosed starting switch with fuses is mounted on the machine. The machine is equipped with a compound table having a feed operated by a handwheel through a rack and pinion.

Compressor, Air, "Imperial Type XCB"
Ingersoll-Rand Co., 11 Broadway, New York, N. Y.
"American Machinist," Oct. 6, 1921



The machine has plate valves for both the air intake and discharge, and a 5-step clearance control for regulating the output. The compressor is automatically loaded and unloaded in five successive steps through the reduction of or the addition to the clearance space of the air cylinders. The machine can be furnished single-stage for low pressures and two-stage for higher discharge pressures. The compressor can be furnished with a short-belt driving attachment employing a floating idler, thus decreasing the length of the belt and the floor space required.

Toolholders, Spring
Wilkard Tool Co., Inc., 105 East Main St., Stratford, Conn.
"American Machinist," September 15, 1921



The holder is made of drop-forged steel, and is hardened to a spring temper. The "goose-neck" is formed by means of a saw-cut through the body of the shank. At the top of the illustration is shown the regular form of threading and forming toolholder having a right-hand offset. The toolbit is carried in a square broached hole, and a non-binding clamping device operated from the side is employed to hold it in place. At the bottom of the illustration is the cutting-off toolholder of the right-hand offset type. The cutting-off tool is also made in a right-hand straight style. The device is made in sizes.

[Note: To replace the card previously printed where the address was incorrectly given as Chicago, Ill.]

Grinder, Heavy-Duty, Electric, Ball-Bearing
Van Dorn Electric Tool Co., Cleveland, Ohio.
"American Machinist," Oct. 6, 1921



The machine is equipped with two 14 x 2½-in. face-grinding wheels mounted on the motor shaft. The wheels are inclosed in heavy housings, the ends of which are removable. The toolrests have both horizontal and vertical adjustments. The motor has a normal continuous rating of 4 hp. It is ordinarily furnished to operate at 1,200 r.p.m. on three-phase, 60 cycle, alternating current, of either 220 or 440 volts. The motor housing is smaller in diameter than the grinding wheels. The housing is dustproof, a fan within the motor furnishing ventilation. The spindle is mounted on ball bearings. The motor is started and stopped by means of a pedal at the base. Net weight, about 700 lb.

Clip, paste on 3 x 5-in. cards and file as desired

Book Reviews

Year Book of National Association of Cost Accountants. The book is devoted principally to recounting the proceedings at the Second International Conference held by the National Association of Cost Accountants at Cleveland in September, 1921. In addition, the members of the association are listed both alphabetically and geographically, and officers of the national association and of the various chapters are given. The reports of all committees are printed in full.

The convention papers with the discussions that followed them occupy the greater portion of the volume. The subject matter is divided into five main parts, that corresponding to the five major sessions of the convention. The first is devoted to the subject of interest as an element of cost; the second to cost systems as a means of preventing waste; the third, to uniform methods and standardized costs; the fourth, to the distribution of overhead under abnormal conditions; and the last to the executive uses of a cost system. The addresses given at the banquet on more general subjects are also printed in full.

The material presented is of considerable scope and value, since it represents the best practice and the best ideas of men actively engaged in the art of cost accounting. The book may serve as a reference volume for the opinions of prominent men on the subjects treated, although, of course, it has not been compiled as a complete treatment of the subjects, such as required for text books. The opinions advanced necessarily represent the lastest ideas and practice of industries, since the papers treat of the methods being evolved to meet current problems.

Ryerson Journal and Stock List. Published by Joseph T. Ryerson & Son, Chicago. $1.00 per year.

This is the outgrowth of "Ryerson's Monthly Stock List" and now includes a thirty-page magazine section. Increased space is thus available for new steel products. The stock section is thumb indexed for convenient reference. It is issued bimonthly and has much of interest to buyers generally.

The Airplane Engine. By Lionel S. Marks, B.Sc. M. M. E., 454 pp. 6 x 9 in., 341 illustrations. Published by McGraw-Hill Book Co., New York, N. Y. Price $5.

Beginning with a chapter on the power required to drive airplanes and showing plane resistance, propeller efficiencies, variations in engine and propeller torque, etc., the author goes by logical steps to the last chapter on potential developments.

Typical airplane engines are shown under engine efficiencies and capacities and also under dimensions and arrangements. These include American, British, French, German and Italian motors in considerable detail. Engine efficiencies include volumetric capacity, fuel mixtures, air temperatures, throttling, compression ratio, jacket water temperature and other considerations. A chapter on engine dynamics takes up problems of torque, side thrust, offset cylinders, balancing and other features of both stationary and rotating cylinder engines.

The chapter on engine details is of special interest as it includes cylinders, wall thickness, valves, pistons, connecting rods, crankcases and propeller hubs. Valves and valve gears include location and arrangement as well as the shape of valves used; valve materials and operation are also discussed while cams and cam followers, valve springs and rockers also receive attention.

Radial and rotary engines are shown in considerable detail and are always interesting as examples of design. This chapter also takes up the question of air-cooled cylinders of different construction. It points out that a steel cylinder with an aluminum head cast in place makes an extremely efficient combination. Water cooling systems are treated in a separate chapter.

Fuels, carburetors, fuel systems, ignition and lubrication all receive careful attention all being very important items in engine design and operation. Here again the leading engines from various countries are shown and attention called to various details.

Geared propeller drives, supercharging devices, manifolds, mufflers and starting devices are taken up in detail, making the whole book of extreme value to either designers or builders of engines for airplane service. The author credits the researches of the various governments, resulting from the developments of the war, for much of his material. He has however utilized his wide experience and activity in this line to good advantage in making his selection and the result is a distinct addition to a field in which accurate and concise knowledge is necessary.

An Investigation of Oxyacetylene Welding and Cutting Blowpipes. Technologic paper No. 200, of the Bureau of Standards, Department of Commerce, by Robert S. Johnston. Complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 35 cents.

At the request of the War Department, the Bureau of Standards conducted an investigation of the operation, efficiency and safety of oxyacetylene welding and cutting blowpipes. Apparatus from fourteen different manufacturers was submitted to test. All welding blowpipes were submitted to welding tests on ½-in. and 2-in. metal. During the cutting tests the blowpipes were operated at the maximum speed at which they would cut metal of specified thickness, ½-in., 2-in., 6-in. and 10-in. metal was used in the cutting tests. The results of the initial series of tests indicated that there are some phenomena in connection with the operation of a welding blowpipe that are not clearly understood. A very thorough study of the design of the various pipes was therefore made and certain conclusions relative to the cause of the inconsistencies in action were noticed. Another series of tests was then carried on to prove the correctness of the first conclusion. The results of the entire investigation are summarized in the paper.

Pamphlets Received

Pressure Distribution Over the Horizontal Tail Surfaces of an Airplane—II: By F. H. Norton and D. L. Bacon of Langley Field, Va., for the National Advisory Committee for Aeronautics. Published by the Superintendent of Documents, Government Printing Office, Washington, D. C. The results of an investigation undertaken by the aerodynamic staff of the committee to determine the load distribution on tail surfaces of airplanes and to find the distribution of the load when large elevator angles are used. A model airplane was constructed, having aluminum wings and wooden fuselage. The tests were made in a specially constructed air tunnel in which the plane was supported on a spindle.

Investigation of the Fatigue of Metals: Bulletin No. 124 of the engineering experiment station, University of Illinois, Urbana, Ill. A progress report of an investigation to determine whether or not there exists any clearly defined relation between static properties and ability to resist repeated stresses. Copies of this bulletin, showing the results of the tests, can be had from the experiment station.

Trade Catalogs

Detectorod. Bennett Metal Treating Co., Elmwood, Conn. Small four-page circular describing the Bennett detectorod for determining the atmospheric condition of a steel heating oven.

Sundh Cable Drawbench. Sundh Engineering and Machine Co., 1105 Frankford Ave., Philadelphia, Pa. A four-page circular illustrating and describing a reversing drawbench for producing rods, tubes, moldings and bars of various shapes.

Ball Bearings. New Departure Manufacturing Co., Bristol, Conn. Large single-page circular containing names of automobiles, trucks and tractors in which N. D. ball bearings are used.

Northern Hoists. Northern Engineering Works, 910 Chene St., Detroit, Mich. A fifteen-page bulletin showing several types of Northern cranes and hoists in operation.

Diamonds Used in Tools. Arthur A. Crafts & Co., 125 Summer St., Boston, Mass. Catalog No. 22, thirty-two pages devoted to illustrations and descriptions of all kinds of diamond cutting tools, their manufacture and use.

Straightening Press. The P. A. Geier Co., Cleveland, Ohio. Circular illustrating and describing the latest press, designed to straighten without removing from centers.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. S., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

The representation of firms is desired by a company in Spain for the sale of automobiles and accessories. Quotations should be given f.o.b. New York. Correspondence should be in Spanish. Reference No. 801.

A mercantile firm in India wishes to secure the representation on a commission basis of firms dealing in hardware, such as nails, wires, nettings, bolts, nuts, screws, hinges, rivets, butts, padlocks, hooks, and furniture mountings; mason's, carpenter's, and goldsmith's tools. Quotations are requested, including return commission and interest. Terms: Payment against documents in India. Reference No. 832.

A request has been received from an importer and commission agent in India for quotations on machinery, electrical apparatus, hardware, enameled ware, wire fencing, vises, anvils, tool steel, spring steel, mild steel bars and plates; mild steel angles; rolled steel beams; galvanized, corrugated, and plain iron sheets; brass and copper sheets and rods; brass and copper pipes; steel, galvanized, and wrought-iron pipes; boiler pipes and fittings; motor cars, motor cycles, and parts. Reference No. 744.

A railway company in Mexico wishes to purchase 230 boiler tubes, and knobbled charcoal iron, 2 in. outside dimensions, 11 ft. 6 in. long, 13 gage. Quotations should be given c.i.f. El Paso, Tex. Reference No. 808.

An industrial association in Italy desires to purchase agricultural implements and machinery. Quotations should be given c.i.f. Genoa or Leghorn. Correspondence should be in Italian. Reference No. 804.

A mercantile firm in England desires to purchase and secure an agency for the sale of motor cars, lorries, trucks, engines, lamps, and all automobile parts and accessories. Quotations should be given c.i.f. Hull. Reference No. 796.

An engineer in Norway desires to secure an agency for the sale of street and road making machinery; zincked fencing materials; iron and steel wire; glowed iron wire and hooped wire for packing; copper wire for electrical use; copper plates and pipes; perforated copper and metal plates; galvanized corrugated iron; etc. Reference No. 675.

A firm of importers in Sweden wishes to purchase iron and steel. Quotations should be given c.i.f. Karlskrona. Payment: Cash against documents in Swedish bank. Reference No. 671.

A firm of importers in Italy wishes to purchase and secure an agency for the sale of agricultural machinery and implements. Quotations should be given c.i.f. Leghorn or Genoa. Reference No. 707.

Forthcoming Meetings

American Society for Steel Treating: Sectional meeting, New York City, Mar. 3. Hotel McAlpin, 34th St. & Broadway. W. H. Eiseman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Taylor Society: Mid-winter meeting, Philadelphia City Club, Philadelphia, Pa., March 16, 17 and 18. Secretary's headquarters, 29 West 39th St., New York City.

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

Southern Supply and Machinery Dealers Association: Annual meeting April 24, 25 and 26, Birmingham, Ala. A. M. Smith, secretary.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

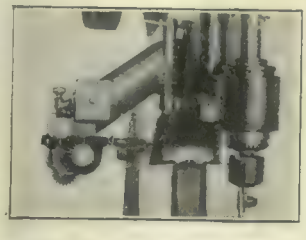
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Cherrying Attachment, Die-Sinking Machine

Pratt & Whitney Co. Hartford, Conn.

"American Machinist," October 6, 1921.



By means of this attachment a formed cutter may be sunk in the metal to be worked, to a depth practically equal to its own radius. The attachment is in the form of a swinging bracket permanently attached to the side of the column of the machine, and when not in use is swung out of the way, as shown. The peripheral teeth of the cutters are made of such form that the back of each tooth corresponds to the working face of a gear tooth; and the cutter is driven from its periphery by means of a pinion. The device is not intended for use in sinking an impression in solid metal, but is rather for bringing such an impression to the exact final form. Cutters from 1 to 6 in. in diameter may be used.

Drilling Machine, Bench, Electric, Portable

Model Specialty Co., 401 East 19th St., New York, N. Y.

"American Machinist." October 6, 1921.

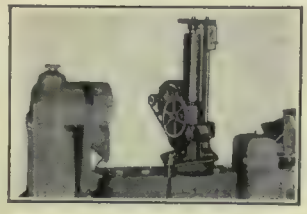


The machine is intended for all-around shop use where a small bench drill is adaptable. Due to its light weight, 34 lb., it is very easily carried. The round column fastened to the base is high enough to permit of drilling objects 18 in. in height from the base of the machine. The table is 5 in. in diameter, can be adjusted vertically on the column, and tilted to any angle desired. The head can be positioned at any point of the column. The spindle slides vertically in the hollow armature shaft. The feed is actuated by a small lever through a rack and pinion, the spindle traveling 1¾ in. The motor is of the shunt type, operating at 1,800 r.p.m. on 110 volts. It is large enough to drill holes up to ½ in. in diameter in steel. A Jacobs chuck is furnished.

Boring Machine, (Re-), Cylinder, Motor-Driven

Storm Manufacturing Co., 6th Ave. and 4th St., So., Minneapolis, Minn.

"American Machinist," October 13, 1921.



The device is adapted to use on practically all types of automobile and tractor engines. It is suitable for reboring motor cylinders with the motors still in the chassis, as shown. When boring cylinder blocks detached from the automobile, a heavy base is provided for mounting the machine. The capacity of the machine is for cylinder diameters from 2⅝ to 6 in. A burnishing head can be furnished. The machine weighs approximately 300 lb.

Regulator, Gas Pressure, American

Alexander Milburn Co., 1420 W. Baltimore St., Baltimore, Md.

"American Machinist," October 13, 1921.

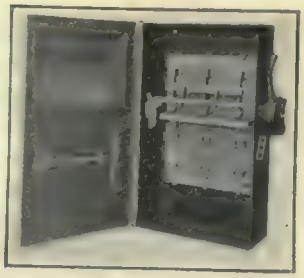


The regulator is intended for the control and delivery of acetylene, oxygen, hydrogen, and other gases under high pressure, such as used in welding. It maintains a constant, predetermined pressure, regardless of fluctuations in the initial pressure line and of variations in the consumption at the torch. The body of the regulator contains a flexible metal diaphragm suitably mounted in connection with a tension spring. In order to adapt the regulator to different types of gas, it is necessary merely to change the gages and the rear connections on it for fitting to the containers.

Starter, Motor, A.C., Small

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

"American Machinist," October 6, 1921.

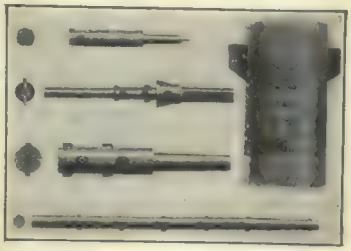


The starter is said to provide complete protection to both the operator and the motor. The starter consists essentially of an enclosed quick make-and-break knife switch, which is operated by an exterior handle. It protects the motor from overloads both when starting and when running, by means of thermal cutouts. All parts are enclosed. The door giving access to the cutouts, cannot be opened unless the switch is in the off position. The WK-30 starters are made in sizes for a.c. motors up to 3 hp. and 110 volts; 10 hp. and 250 volts; or 10 hp. and 600 volts. The type WK-55 starter is similar, but it is made for heavier service.

Boring Bars, Adjustable, Detroit

Firmhil Machine Supply Co., 602 Kerr Bldg., Detroit, Mich.

"American Machinist," October 6, 1921.



The bars are made in three types, the angle adjustable, the straight adjustable, and the removable block, to bore holes from ⅞ to 15 in. in diameter. They are intended for both rough and finish boring and for reaming. The phantom view shows the construction of the angle type of bar. Various combinations of standard cutters may be incorporated in the same bar. The angle type of cutters is particularly adapted to facing and counterboring operations, because setting out and grinding leaves the forward cutting edge in its original position. The removable block-type cutters are interchangeable in the slots, and the changes can be accomplished without removing the bar from the fixture.

Drill and Valve Grinder, Combination, Portable, "Dumore"

Wisconsin Electric Co., Racine, Wis.

"American Machinist," October 13, 1921.

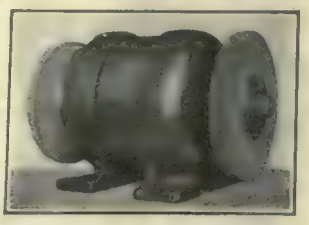


The device is adapted to drilling holes, grinding motor valves, and to service as a portable grinder and buffer. When carrying a drill or a grinding wheel, the rotation of the spindle is continuous. For grinding automotive valves in place on their seats, a separate attachment is used on the drill, as shown, and an oscillating motion is given to the attachment spindle for driving the valve. A universal motor is used, so that it can be operated by either direct or alternating current. The machine is made in two sizes having capacities in steel of ⅛ and ¼ in.

Grinder, Bench, Motor-Driven

Forbes & Myers, Worcester, Mass.

"American Machinist," October 13, 1921.



The machine is adapted to general light work, but is especially intended for use on farms where electric current is available. The motor is fully inclosed, so as to protect the windings from injury. Ball bearings are used. The machine operates at 3,600 r.p.m. on 110-volt, 60-cycle alternating current. It can be supplied either in the bench type, as shown, or mounted on a pedestal. The machine is made in two sizes, the No. 42 having a capacity of ¼ hp. and the No. 62 of ½ hp. The former carries wheels 6 x ½ in. and the latter 6 x 1 in. in size.

The Weekly Price Guide

THIS WEEK'S MARKET

ALTHOUGH the official Pittsburgh mill price on structural steel shapes, plates and bars continues at $1.40@$1.50, a minimum of $1.40 per 100 lb. is accepted even on comparatively small tonnages. Pig iron market shows somewhat firmer tone, due mostly to increasing demand.

New York warehouses quote electrolytic copper at 13⅞c. as against 14c.; copper and brass sheets, wire, rods and tubing down ¼c. per lb. Lead and zinc markets unchanged; slight recovery in tin. Copper sheets; brass rods and tubing also down ¼c. per lb. in Cleveland. Reductions ranging from ¼c. to ½c. per lb. quoted in dealers' purchasing prices on old metals (non-ferrous).

Advance of 2c. per gal. on raw linseed oil in Chicago; prices firm in New York. Cleveland quotes 99c. as against 85c. per gal. in 5 bbl. lots.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK — Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.76
Virginia No. 2	27.74
Basic	19.84
Grey Forge	21.50
CHICAGO	
No. 2 Foundry local	19.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.60	4.00	3.75	4.15
Nos. 12 and 14	3.10	4.10	3.85	4.25
Nos. 17 and 21	3.40	4.40	4.15	4.55
Nos. 22 and 24	3.55	4.55	4.30	4.70
No. 26	3.70	4.70	4.45	4.85
No. 28	4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.45	3.25	3.40
Cold finished flats, squares	3.95	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
¼	7.15		11@12
⅛ to ½	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.00
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 4.77½; New York	5.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	20.75	21@21.50	23.00
Copper wire (carlots)	14.50	17.00	16.25
Copper rods (ton lots)	19.25	22.00	19.50
Copper tubing (100-lb. lots)	20.75	24.00	23.00
Brass sheets (100-lb. lots)	16.25	17.00	18.75
Brass tubing (100-lb. lots)	18.00	19.00	20.50
Brass rods (1,000-lb. lots)	14.25	15.50	15.75
Zinc sheets (casks), (8% dia. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	...
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	...
Solder (½ and ½), (case lots)	19.00	23.50	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.50
Copper, heavy, and wire	9.50	10.00	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.99	.91
White lead, dry or in oil	100 lb. kegs.	New York,	12.25
Red lead, dry	100 lb. kegs.	New York,	12.25
Red lead, in oil	100 lb. kegs.	New York,	13.75
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$3.00
Coke, prompt foundry, Connellsville	per net ton		3.75@4.25

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	....	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3 43
Cone heads, ditto (net)	3.60	3.35	3.53
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., Bridgeport—Rotwink Bros., 28-42 Drouve St.—crank shaft, grinders, sandblast machines, air compressors and power squaring shears up to 121 in. for ¼ metal.

Conn., Bridgeport—M. J. Dowling & Co., 556 Gurdon St., C. W. Beeman, Purch. Agt.—one small drill press, and one 13 in. x 6 ft. Hendey lathe.

Conn., Bridgeport — The Miller Motor Sales Co., Evergreen St.—one Arbor press for truck repair use.

Conn., Bridgeport—J. H. Southey, 576 Gurdon St.—cloth cutting machine.

Conn., Middletown—The Frissell Fabrics Co., 362 Main St.—one 400 lb. Klauder-Weldon cotton yarn dyeing machine.

Col., Hugo—The Lincoln County Democrat—cylinder press.

Fla., Live Oak—The Liveoak Perry & Gulf R.R.—one 40 in. or 42 in. vertical boring machine.

Fla., Tampa—The Frigid Mfg. Co., A. N. Dutcan, Pres.—equipment and machinery for ice machine manufacturing plant at Clear Water.

Ia., Ottumwa—F. O. Parks Scale Co.—one round stencil machine, ½ letters; one cabinet japanning gas oven; one pedestal grinder and buffer.

Ill., Chicago—The Chicago Roller Skate Co., 4458 West Lake St.—one No. 3 and one No. 4 new style consolidated punch presses.

Ill., Chicago—The International Harvester Co., 606 South Michigan Blvd.—one oil separator, belt drive, preferably with crane, 2,500 cu. in. capacity, (used).

Ill., Chicago — A. Olsen, 216 North Lawndale Ave.—lathe, drill press, air compressor, grinder and one 3 or 5 hp. ac. motor with shaft and pulleys.

Ill., Chicago—The Production Tool & Engr. Co., 507 West Jackson Blvd., G. Landsiedel, Purch. Agt.—one Wells tool and cutter grinder No. 190.

Ill., Freeport—The Arcade Mfg. Co., 1 Columbus Ave., B. C. Trueblood, Purch. Agt.—special machinery for the manufacture of hardware specialties.

Ill., Rockford—K. Anderson, c/o J. Turecon, 1409 7th St.—sheet metal working machinery.

Ill., Waukegan—Waywell Chappell & Co—one 22 in. back geared drill press.

Ky., Covington — The Lubricating Specialties Co., 16th and Water Sts.—one No. 5 Toledo punch press or equal.

La., Alexandria—J. B. Hubble, 10th and Hixenbaw Sts.—equipment and machinery for creamery now in course of construction.

La., Gibsland—Reed Bros. Garage—complete machinery and equipment for automobile repair work.

Mich., Detroit — J. C. Burkin, 1265 Alexandrine Ave.—two floor standing machines (Sleighter machines preferred).

Mich., Detroit—The Cadillac Mchy. Co., Boydell Bldg., Beaubien and East Lafayette Sts.—one 59½ Toledo or 80½ Bliss press, or their equivalent, (used).

Mich., Detroit—C. W. Heler, 2393 Carson Ave.—blacksmith's drill press and miscellaneous tools; power cement block machines; concrete mixer.

Mich., Detroit—H. A. Meier, 2153 Bellevue Ave.—one 6 x 8 planer, 42 in. x 14 ft. bed; electric hoist; 3 ton air compressor; 3 ton crane, 35 ft. span.

Mich., Detroit—The Mills Baking Co., 5165 4th Ave.—miscellaneous bakery equipment for proposed addition.

Mich., Detroit — The Motschall Co., Canton Ave. and Blvd. (printers)—cylinder press 25 x 38 in. or larger.

Mich., Detroit—C. G. Push, 4730 Tireman Ave.—small wood turning lathe, power driven for about ¼ hp. motor, also small jig or band saw (used).

Mich., Detroit — P. Smith Grocery Co., Smith Bldg., Griswold and State Sts., W. W. Henderson, Purch. Agt.—cake mixers and miscellaneous equipment. Blodgett oven.

Mich., Detroit—The Warwich Stamping Co., Miller Rd. and Thayer Ave.—miscellaneous equipment for making metal stampings, power driven.

Mo., Joplin—The Auto Repair Co., 607 Bway., C. P. Cleaver, Purch. Agt.—drill press, lathe, belting and shafting for machine shop and garage.

Mo., Joplin — The Fifth Street Garage, 211 West 5th St., C. W. Helm, Purch. Agt. medium size lathe, belt, shafting and electric motor.

Mo., Joplin—H. H. Green, 1615 Main St.—shafting, hangers and bearings.

Mo., Joplin—The Miners Ice & Fuel Co., 218 Main St., J. E. Cambell, Purch. Agt.—belting, shafting, hangers and pulleys.

Mo., Joplin—Nutz Bros., 1301 Joplin St., R. Nutz, Purch. Agt.—electric drill press and lathe for garage and machine shop.

Mo., Joplin—P. F. Parrott, 1720 Main St.—woodworking machinery and machine to make broom handles.

Mo., Joplin—The Purity Ice Cream Co., Bway. and Cox St., C. L. Clark, Purch. Agt.—ice crushers, belting, motors and shafting for ice cream factory.

Mo., Joplin—The Texas Oil Co., East 5th St., C. J. Warden, Purch. Agt.—oil filtering equipment for new station on 5th and Wall Sts.

Mo., Joplin—A. P. Townsend, 913 Main St. (shoemaker)—leather working machinery, shafting, hangers and bearings.

Mich., Munising — Logan & Blom, F. Logan, Purch. Agt.—steam driven laundry machinery.

Mo., Nevada—I. H. Dowell—oil drill for drilling oil wells.

Minn., Waiverton — Hendrickson Bros. will be in the market about April 1 for gravel handling equipment including gasoline cranes, conveyors, bins.

N. Y., Buffalo—Behringer Bros., Inc., 171 Imson St.—four head outside molder.

N. Y., Buffalo—G. F. Haussner, 939 Northampton Sts.—sheet metal machines.

N. Y., Gouverneur—Rich & Lalonde, J. H. Lalonde, Purch. Agt.—drill press, small miller and used shafting.

N. Y., Potsdam—Elliott & Sons Co.—machinery and equipment for the manufacture of hardwood mangle rollers.

N. Y., Richmond Hill—J. Kraus, 440 129th St.—Carver steel die stamping press, size 4 x 8 or larger.

N. Y., Tonawanda—The Buffalo Bolt Co., D. F. Cullinan, Purch. Agt.—one or more No. 60 Waterbury roll threaders, (used).

N. Y., Watertown—E. C. Hodge, Route 5,—saw mill equipment.

N. C., Hickory—The Southern Toy Co., G. F. Ivey, Pres.—one swing cut off saw, short stock; one combined scroll and resaw, 4 in. blades; one glue jointer; one double cut off saw; one single end tenoner; one 4 side, 4 or 6 in. moulder; one vertical boring machine, 6 spindle; one chuck machine for round tenonts; one 50 hp. high speed engine; 100 ft. 1½ in. shafting with couplings and post hangers; one double spindle shaper; dry kiln equipment; 20 factory trucks; one fan and dust collecting system (used).

N. C., Lansing—The Lansing Lumber Co., V. E. Ballou, Mgr.—door and sash machine; flooring machine; end matcher; tenoning machine; moulder; resaw; jointer and sander (used).

N. C., Rose Hill—The Atlantic Coffin & Casket Co., E. McN. Carr, Pres.—one 40 in. high speed fan; one double spindle shaper 1¼ in.; one scroll or band saw, 36 in.; one 12 in. moulder; combination saw table; tilting arbor; rip saw; three drum sander; jig or scroll saw; 6 in. hog; swing cut off saw cabinet planer, 30 or 36 in. wide; 36 lumber trucks for use in plant.

N. C., Salisbury — The Arey Brick & Lumber Co., N. G. Arey, Mgr.—band resaw and gang saw (new or used).

N. C., Statesville—J. C. Steele & Sons, C. M. Steele, Purch. Agt., manufacturers of brick making and clay working machinery—one 30 to 36 in. vertical boring mill, preferably two heads, or 30 in. modern lathe, short bed; Baker Bros. keyseater, to cut to 1¼ in. key ways; bolt threading machine to cut ¼ in. to 2 in. threads; 30 in. side planer with short bed. Must be modern (used).

N. C., Wilmington—The Carter's Production Wks., 210 South Water St., O. Carter Purch. Agt.—single phase, 60 cycle, 110 volt, electric buffing machine, prefer double-ended buffer with wheels complete (new or used).

O., Cincinnati—The Clifton-Pratt Co., 1224 West 8th St., A. E. Clifton, Purch. Agt.—electric welding outfit for general repair work on automobile frames, fenders, etc., Lincoln or similar make.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., A. Smith Purch. Agt.—20 in. drill presses; 12 or 14 in. swing lathes 6-8 beds; power presses, No. 18, 19, 20 or 21 Bliss.

O., Cincinnati—The Fair Mchy. Co., 217 Walnut St., M. G. Overend, Purch. Agt.—12 x 12 in. power hack saw and 12 in. hand jointer.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., A. Jones, Purch. Agt.—lathe with 60-72 in. swing and 18 ft. bed; No. 23 New Britain automatic screw machine.

O., Cincinnati—The E. A. Kinsey Co., 335 West 4th St.—wire crimping or forming machine to be used for interlocking notched wires for cylindrical screens.

O., Cleveland—The Bd. Educ., Rockwell Ave. and East 6th St., S. Hyre, clk.—two 12 in. woodworking speed lathes, 55 in. bed; 220 v. d.c. motor, head stock, variable speed, 600 to 3,000 r.p.m., American or equal; one 20 in. pattern maker's lathe, belt driven, with 2 hp. dc. motor.

O., Cleveland—The city, A. B. Roberts, dir. Public Utilities, City Hall—one locomotive crane for use in city water department.

O., Columbus—The Dept. of Public Welfare, Oak and 9th Sts.—new machinery, including crusher, drying pan, 6 kilns, etc., for brick plant at Junction City.

O., Cleveland — W. Eppler, 3305 West 25th St.—bench lathe.

O., Cleveland—The New York, Chicago & St. Louis R.R. Co., Columbia Bldg., W. P. Dittoe, Purch. Agt.—air compressor, bolt cutter, wheel press, also used miscellaneous shop equipment.

O., Cleveland—The Northern Blower Co., West 65th St. and Barberton Ave.—one punch and shear, ½ by 1½ capacity; one 10 ft. brake 12 gauge capacity; one 10 ft. squaring shears, 12 gauge capacity.

O., Cleveland—The Sterling Brass Co., 4610 St. Clair Ave., S. L. Weil, Genl. Mgr. —Mono rail conveyor system, brass furnace, blowers, lathes for new brass foundry and machine shop.

O., Columbus — The Non-Liquid Door Check Co., Comstock Bldg., E. D. Taylor, Genl. Mgr.— will soon be in market for punch presses and milling machines.

O., Elyria—The Ridge Tool Machine Co., W. Thews, Purch. Agt.—machine tools.

O., Fostoria—L. H. McNeil—hand press, and cutting off machine for bench.

O., Toledo — J. Meyers, 1958 Glendal Ave.—four linotype machines.

Ore., Portland—R. A. Wurzburg, Pres. Columbia Tire Corp., Northwest Bank Bldg.—$170,000 worth of machinery and miscellaneous equipment for tire factory on Columbia Blvd.

Pa., Chester—The Irving Worsted Co.—looms, spindles, etc., for new factory.

Pa., Johnstown—The Lorain Steel Co.—one 10 ton and two 5 ton cranes, mill type.

Pa., Media — Delaware County Prison, c/o E. M. Harvey—receiving bids until March 7 for one washing machine, one extractor, one soap tank and one sterilizer, installed complete.

Pa., Phila.—A. Ayres, 921 Sansom St.—one band saw, (used).

Pa., Phila.—J. Blood & Co.; 7th and Somerset Sts.—knitting machines, automatic operation.

Pa., Phila. — The Elgin Tool Machine Wks., 233 North 4th St.—one 9 or 10 in. screw cutting lathe with hollow spindle.

Pa., Phila.—The Ferris Shoe Co., 6th St. and Duncannon Ave.—machinery for new shoe factory.

Pa., Phila.—The Frankford Paper Box Mfg. Co., 2951 North Marshall St., J. E. Linck, Treas.—machinery for the manufacture of boxes, including presses, cutters, dies, etc.

Pa., Phila.—The Gotham Silk Hosiery Co., 2nd and Norris Sts.—automatic machines for knitting mill and lathe, drill press, etc., for use in machine shop.

Pa., Phila.—F. E. Griffiths Co., 2615 West Hagerts St., F. E. Griffiths, Purch. Agt.—additional machine tools and machinery for the manufacture of meters, etc.

Pa., Phila.—The Leonard Knitting Mills, Inc., A. H. Weiswasser, 5417 Webster St., Pres.—machinery for knitting mills.

Pa., Phila.—The Lewis Textile Co., Frankford and Lehigh Aves., W. J. Steen, Pres.—looms and equipment for textile mills.

Pa., Phila.—The Liberty Knitting Mills, 1029 Race St.—additional machines.

Pa., Phila.—The Meyer Specialty Co., 1800 North 5th St.—one lock corner machine.

Pa., Phila.—H. T. Paiste & Co., 32nd and Cherry Sts. (electrical supplies)—power hack saws, lathes, drill presses and other metal working machinery for new factory.

Pa., Phila.—Pierce-Butler & Pierce Mfg. Corp., Broad and Race Sts., manufacturers of boilers, radiators, etc.—machinery for new factory on Glenwood Ave. along the tracks of the Pennsylvania R.R., including lathes, drill presses, riveting hammers, grinders, etc.

Pa., Phila. — The Precision Brass & Bronze Fdry., T. E. Montgomery, 1001 Chestnut St., Treas. — machinery for foundry and machine shop.

Pa., Phila.—The Reyburn Mfg. Co., 32nd St. and Allegheny Ave.—milling machine and other equipment.

Pa., Phila.—The Rockland Hosiery Mills, Allegheny and Kensington Aves., M. Sarfert, Pres.—additional knitting machine.

Pa., Phila.—Segal & Rothman, 144 North 3rd St.—screw cutting lathe, 4 ft. x 10 in.

Pa., Phila.—Sheplan, Sabol & Palmer, 15th and Wallace Sts.—carders, looms and knitting machinery for new factory.

Pa., Phila. — Supplee-Wills-Jones, 3339 Ludlow St.—ice and ice cream manufacturing machines for new factory.

Pa., Phila.—G. L. Tallman, 28 South Farragut St.—weaving mechanism parts.

Pa., Phila.—M. H. Walwrath Co., Park and Glenside Aves.—additional workworking machinery.

Pa., Phila.—The Wicado Screw & Machine Wks. Co., 4801 Stenton Ave.—one Brown & Sharpe grinding machine No. 10 or 11.

Pa., Pittsburgh—Riter-Conley Co., Oliver Bldg.—one 10 ton, two 7½ ton and three 3 ton, 2 trolley cranes for plant at Lutsdale.

S. C., Chester—R. C. Guy—creosoting machinery and outfit.

S. C., Conway—The Veneer Mfg. Co., W. A. Stilley, Mgr.—lathe, engine to swing 20 to 24 pulley and take in shaft 8 ft. long (used).

Tex., Austin — W. Tips Co., 708-12 Congress Ave.—power threading machine for cutting threads on bolts.

Va., Lynchburg—The Thornhill Wagon Co., E. Thornhill, Mgr.—vehicle wood rim bending outfit; vertical drilling and reaming machine to bore and ream cast iron cylinders from 2½ in. diameter by 8 in. long to 3½ in. diameter by 11 in. long.

Va., Norfolk—The Harrisonburg Poultry & Egg Co., 21 Madison St., R. Richter, Mgr.—modern dairy machinery including pasteurizing equipment for new plant on 12th St. and Monticello Ave.

Va., Winchester—The Winchester Lumber Corp., W. B. Cornwell, Pres. and Genl. Mgr.—dry kiln and complete woodworking machinery outfit for manufacturing flooring (used).

W. Va., Parkersburg—The Parkersburg Rig & Reel Co.—boring mill, radial drill and lathe.

Wis., Appleton—J. Belzer, 776 Lawe St.—machinery and equipment for garage and repair shop.

Wis., Jim Falls—The Jim Falls Co-op. Creamery, c/o T. Saltsgarber—dairy machinery, churns, vats, etc.

Wis., Merrill—The Merrill Buick Co.—presses, 1 and 2 ton, also auto repair equipment.

Wis., Merrill—The Spring Brook Co-op. Dairy Co., c/o G. Karan, Route 6—creamery and cooling machinery.

Wis., Milwaukee—Cappon & Resech, 1348 Booth St.—drill press and lathe suitable for garage duty.

Wis., Milwaukee—The Milwaukee-Western Fuel Co., 120 Wisconsin St., E. A. Uhrig, Purch. Agt.—coal crane and conveying machinery.

Wis., Milwaukee—The West Side Express Co., 2319 Lisbon Ave.—lathe for garage repair work.

Wis., Milwaukee—The Wisconsin Public Service Corp., 559 Marshall St., C. C. Smith, Purch. Agt.—oil gas machine, purifiers and gas compressor for gas plant at Green Bay.

Wis., Minocqua—The Minocqua Heights Hotel So., c/o H. T. Ames—machinery for auto repairing.

Wis., Racine—M. J. Shaw, Inc., 17th and Hamilton Sts.—machinery for the manufacture of shoes, including stichers, eye-let, vamping and lasting machines.

Wis., Sheboygan—The Sheboygan Gas Co., 618 North 8th St.—special machinery and equipment for proposed gas plant.

Ont., Montreal — The Lymburner Brass Wks., Inc., 1025 Boyer St.—complete equipment for brass foundry.

Ont., Montreal—H. H. Robine, 778 St. Catharine St., W.—small lathe and tools (varied) for garage and repair shop.

Metal Working Shops

Conn., East Hartford (Hartford, P. O.)—H. E. Bidwell, 209 State St., has awarded the contract for the construction of a 1 story, 50 x 125 ft. garage sales and service building, with 15 x 122 ft. ell, on Connecticut Blvd. Estimated cost, $40,000. Noted Jan. 12.

Conn., Hartford—The Bush Mfg. Co., Wellington Ave., will soon award the contract for the construction of a 1 story, 50 x 250 ft. manufacturing plant on Wellington Ave., for the manufacture of machinery. Estimated cost, $60,000. Buck & Sheldon, Inc., 60 Prospect St., Archts. and Engrs.

Conn., Hartford—The Hartford Electric Light Co., 266 Pearl St., has awarded the contract for the construction of a 1 and 2 story, 75 x 155 ft. battery charging building on Sheldon St.

Ill., Chicago—W. W. Ahlschlager, Archt., 65 East Huron St., is receiving bids for the construction of a 1 story, 150 x 214 ft. garage on Clark St. and Rogers Ave., for H. and W. Thompson, 4925 North Washtenaw Ave. Estimated cost, $50,000.

Ill., Chicago—A. S. Alschuler, Archt., 28 East Jackson Blvd., is receiving bids for the construction of a 3 story, 100 x 300 ft. office, sales and service building on 22nd St. and Michigan Ave., for the Hudson Motor Car Co., 25th St. and Michigan Ave. Estimated cost, $350,000.

Ill., Chicago—The Briskin Mfg. Co., 215 South Hoyne Ave., (sheet metal works), has awarded the contract for the construction of a 2 story, 50 x 127 ft. factory at 215-17 South Hoyne Ave. Estimated cost, $40,000.

Ill., Chicago—I. Engel, 3056 Palmer Sq., is receiving bids for the construction of a 1 story, 100 x 125 ft. garage and auto sales station on Milwaukee Ave. near Crawford St. Estimated cost, $40,000. Private plans.

Ill., Chicago—A. Mikell, 1311 Washburn Ave., is receiving bids for the construction of a 2 story, 72 x 107 ft. garage on Taylor and Garibaldi Sts. Estimated cost, $50,000. H. Dalsey, 2321 West North Ave., Archt.

Ill., Chicago—Ronneberg, Peirce & Hauber, Archts., 10 South La Salle St., are receiving bids for the construction of a 1 story, 75 x 96 ft. machine shop at 2704-10 West Lake St., for J. Nielsen, care of architects.

Ind., Evansville—J. H. Kreipke Co., 512 West Franklin St., plans to build a 3 story, 33 x 80 ft. warehouse and sheet iron work shop on West Franklin St. Estimated cost, $40,000. Architect not selected.

Mich., Detroit—The City Dept. of Motor Transportation, City Hall, is having plans prepared for the construction of a 1 story garage and service station on Jefferson Ave. Estimated cost, $560,000.

Mo., St. Louis—Bonsack & Pearce, Archts., Laclede Gas Bldg., will receive bids until March 4 for the construction of a 1 story, 75 x 95 ft. garage for D. F. McCabe, 6407 Ridge Ave. Estimated cost, $40,000. Noted Feb. 16.

Mo., St. Louis—Scruggs, Vandervoort & Barney Dry Goods Co., 10th and Olive Sts., has awarded the contract for the construction of a 4 story, 130 x 160 ft. garage on St. Charles St. Estimated cost, $350,000. M. L. Wilkinson, Pres. Noted Feb. 2.

N. C., Highland (Hickory, P. O.)—The Highland Cordage Co., c/o C. H. Geitner, Pres., will build a 1 story, 80 x 440 ft. yarn mill, here. Estimated cost, $50,000.

O., Cleveland—J. Cohen, 2376 East 49th St., has awarded the contract for the construction of a 1 story, 31 x 81 ft. garage at 2627 East 31st St. Estimated cost, $40,000.

O., Cleveland—The Sterling Brass Co., 4610 St. Clair Ave., has awarded the contract for the construction of a 1 and 2 story, 75 x 90 ft. brass foundry and machine shop on East 93rd St. and Catherine Ave. Estimated cost, $80,000. S. L. Weil, Mgr. Noted June 23.

Ore., Portland—R. A. Wurzburg, Pres. of the Columbia Tire Corp., Northwest Bank Bldg., is receiving bids for the construction of a 2 story, 80 x 350 ft. tire factory on Columbia Blvd. along the tracks of the Oregon Washington R.R. and Navigation Co. Estimated cost, $80,000.

Pa., Phila.—E. J. McAleer & Co., 1420 North 8th St., manufacturer of tin ware, has awarded the contract for the construc-

...on of a 1 story, 84 x 139 ft. factory and ...house at 1422 North 8th St. Estimated cost, $6,000.

Pa., Phila.—A. W. Purves, West End Trust Bldg., will soon receive bids for the construction of a 3 story, 35 x 140 ft. garage on Watts and Gerard Aves. Estimated cost, $100,000. N. Hulme, 1524 Chestnut St., Archt.

Pa., Phila.—C. Zeisloft, c/o A. C. Bofinger, Archt., 717 Walnut St., will soon receive bids for the construction of a 1 story, 120 x 136 ft. garage on Ridge Ave. and Lawrence St. Estimated cost, $60,000.

Wis., Merrill—The Merrill Buick Co. has purchased a site on Main St. and plans to build a 1 story, 67 x 125 ft. garage and repair shop. Estimated cost, $55,000. Architect not selected.

Wis., Milwaukee—The International Harvester Co., 217 Oregon St., has awarded the contract for the construction of a 1 story, 20 x 50 x 100 ft. garage on Reed St. Estimated cost, $40,000. Noted Jan. 26.

Wis., Milwaukee—A. Kaufman, 1325 Vliet St., will soon award the contract for the construction of a 1 and 2 story, 50 x 160 ft. garage on Walnut St. Estimated cost, $40,000. R. B. Williamson, Broadway Bldg., Archt. Noted Feb. 2.

Wis., Minocqua—The Minocqua Heights Hotel Co., c/o H. T. Ames, is having plans prepared for the construction of a 4 story, 75 x 250 ft. hotel and garage. Estimated cost, $150,000. A. H. Rantz, Minocqua, Archt.

Wis., Sheboygan—S. W. Miller Piano Co., 2020 North 15th St., is having plans prepared for the construction of a 1 story, 56 x 108 ft. piano factory on Niagara St. Estimated cost, $20,000. Noted Feb. 9.

Wis., South Milwaukee—The Bucyrus Co. will soon award the contract for the construction of a 1 story, 60 x 278 ft. foundry. F. D. Chase, Inc., 645 North Michigan Ave., Chicago, Archt. and Engr.

Wis., Spencer—The Spencer Condensory Co., c/o E. Isaac, Marion, is having plans prepared for the construction of a 2 story, 50 x 94 ft. condensory. Estimated cost, $40,000. G. Krasin, Marshfield, Archt. Noted Jan. 19.

General Manufacturing

Cal., Burbank—A. Jergens Co. has awarded the contract for the construction of a 2 story, 51 x 70 ft. soap factory. Estimated cost, $17,500.

Cal., Napa—The Union Ice Co. has awarded the contract for the construction of an ice plant. Estimated cost, including equipment, $50,000.

Conn., Allingtown (New Haven, P. O.)—D. E. Smith, Archt., 152 Temple St., New Haven, is receiving bids for the construction of a 1 story, 156 x 201 ft. textile plant and a 1 story, 40 x 50 ft. boiler house and garage, for the Velvet Textile Corp., P. O. Box 1962, New Haven. Estimated cost, $100,000.

Conn., Thompsonville—The Bigelow, Hartford Carpet Co., 58 Main St., will build a 1 story, 85 x 115 ft. addition to its brussel mill. Estimated cost, $10,000.

Conn., Waterbury—The Natl. Biscuit Co., 22 Spring St., has awarded the contract for the construction of a 2 story 60 x 120 ft. biscuit plant on North Liberty St. Estimated cost, $40,000. Noted Feb. 9.

D. C., Washington—The Amer. Dairy Supply Co., 218 Maine Ave., S.W., has awarded the contract for the construction of a factory. Estimated cost, $40,000.

Ill., Beardstown—The Gorman Ice & Coal Co. has awarded the contract for the construction of a 1 story, 30 x 42 ft. ice plant. Estimated cost, $25,000. Noted Feb. 16.

Ill., Chicago—J. Peterson, c/o H. I. Daisey, Archt., 2321 West North Ave., has awarded the contract for the construction of a 1 story, 25 x 125 ft. cabinet factory at 2447 North Crawford Ave. Estimated cost, $17,000.

Ill., Chicago—Marshall & Fox, Archts., 721 North Michigan Blvd., are receiving bids for the construction of a 7 story, 118 x 125 ft. office and printing plant on Ontario and St. Clair Sts., for the Popular Mechanics Magazine, 6 North Michigan Blvd. Estimated cost, $40,000.

Ind., Ft. Wayne—Goodman & Co., Bayer Bldg., plans to build a 2 story, 100 x 200 ft. hosiery factory. J. A. Goodman, Pres. Estimated cost, $50,000. Architect not selected.

Ind., Huntington—The Huntington Ice Co., Inc., plans to build a 2 story ice plant. Estimated cost, $40,000. Architect not selected.

Kan., Hutchinson—The Carey Fibre Products Co., manufacturer of fibre wall board, plans to build a 2 story factory to replace the one destroyed by fire. Estimated cost, $35,000. Architect not selected.

Mich., Detroit—The Mills Baking Co., 5165 4th Ave., is having plans prepared for the construction of a 2 story addition to its bakery plant. Estimated cost, $40,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts.

Mo., Columbia—The Columbia Bottle Wks., c/o R. Cassidy, is having plans prepared for the construction of a 1 story, 70 x 135 ft. bottling plant. Estimated cost, $35,000. Private plans.

The Searchlight Advertising in This Paper

is read by men whose success depends upon thorough knowledge of means to an end—whether it be the securing of a good second-hand piece of apparatus at a moderate price, or an expert employee.

The Best Proof

of this is the variety of this journal's Searchlight ads. Without a constant and appreciable *demand* for such machinery or services, by its readers, the market-place which these advertisements represent could not exist for any length of time.

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0207

Mo., Hannibal—The Bluff City Shoe Co. plans to build a 2 story addition to its shoe factory at 1201 Collier St. Estimated cost, $25,000. J. W. Logan, Secy. Private plans.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St., plans to build a 1 story warehouse and paint factory. Estimated cost, $40,000. Architect not selected.

Mo., Jefferson City—The Standard Crate & Filler Co., has awarded the contract for the construction of a 2 story, 100 x 220 ft. egg crate and straw board manufacturing plant. Estimated cost, $200,000. W. F. Winkleman, Treas. Noted Feb. 16.

Minn., Minneapolis—The City Dye House, Inc., 2627 Nicollet Ave., is having plans prepared for the construction of a 2 story, 120 x 122 ft. laundry on Nicollet Ave. and 29th St. M. Eisenstadt, Pres. Estimated cost, $75,000. P. R. Crosier, 915 N. Y. Life Bldg., Archt.

N. J., Beverly—J. A. Bidwell Co., 413 R.R. Ave., manufacturer of cotton specialties, plans to build a 2 story, 40 x 100 ft. addition to its factory. J. A. Bidwell, pres.

N. C., Kingston—H. C. Hines is having plans prepared for the construction of a 2 story, 30 x 100 ft. ice cream factory. Estimated cost, $50,000. K. W. Schantz, care of owner, Engr.

O., Cleveland—J. McKay, 1285 East Blvd., has awarded the contract for the construction of a 1 and 2 story, 30 x 90 ft. printing plant at 1449 Lakeside Ave. Estimated cost, $40,000.

O., Cleveland—The Thayer-Norton Co., 3136 West 63rd St., (meat packers), plans to build a 3 story addition to its beef plant on West 65th St. along tracks of the Cleveland, Cincinnati, Chicago & St. Louis R.R. Estimated cost, $100,000. Anders & Reimers, Erie Bldg., Archts.

O., Zanesville—The Pure Ice Co., Underwood St., is having plans prepared for the construction of a 1 story, 50 x 50 ft. ice plant. Estimated cost, $50,000. A. C. Bishop & Co., 427 Guardian Bldg., Cleveland, Archts. and Engrs.

Pa., Erie—The Mutual Ice Co. is having plans prepared for the construction of a 1 story ice plant. Estimated cost, $60,000. A. C. Bishop & Co., 426 Guardian Bldg., Cleveland, Archts. and Engrs.

Pa., Phila.—J. Blood & Co., has awarded the contract for the construction of a 2 story, 60 x 79 ft. hosiery mill on 7th and Norris Sts. Estimated cost, $35,000.

Pa., Phila.—The Gotham Silk Hosiery Co., 2nd and Norris Sts., has awarded the contract for the construction of a 10 story, 56 x 122 ft. and 20 x 20 ft. hosiery factory on 2nd and Norris Sts. Estimated cost, $500,000.

R. I., Providence—The Crompton & Knowles Loom Wks., 241 Harris Ave., has awarded the contract for the construction of an addition.

Va., Winchester—The American Gas Improvement Co., 2 Rector St., New York, plans to purchase the interests of the Winchester Gas Co., here, and is having plans prepared for the construction of an addition to gas plant, etc. Estimated cost, $150,000. D. B. Steinman, 25 Church St., New York, Engr.

W. Va., Belle—The Belle Alkali Co. plans to build 2 additions, one for the manufacture of caustic soda and the other for the manufacture of chlorine. Private plans.

Wis., Hartford—The Gehl Bros. Monument Co. has awarded the contract for the construction of a 2 story, 42 x 106 ft. marble factory. Estimated cost, $65,000. Noted Jan. 19.

Wis., Jim Falls—The Jim Falls Co-op. Creamery, c/o T. Sultsgarber, plans to build a 1 story, 50 x 170 ft. creamery. Estimated cost, $50,000. Architect not selected.

Wis., Manitowoc—E. Phillips & Sons, 8th and Quay Sts., have purchased a site on 8th St. and plan to build a candy factory. Architect not selected.

Wis., Milwaukee—The Mi Lola Cigar Co., 139 Sycamore St., has awarded the contract for the construction of a 1 story, 60 x 300 ft. cigar factory and a 2 story, 42 x 60 ft. office on Green Bay Road.

Wis., Milwaukee—The Phoenix Knitting Co., 208 Bway., has awarded the contract for the construction of an 8 story, 120 x 180 ft. dye house and finishing plant on Milwaukee and Buffalo Sts. Estimated cost, $500,000. Noted Feb. 2.

Wis., Sheboygan—The Sheboygan Gas Co., 618 North 8th St., is having plans prepared for the construction of a 1 story, 42 x 146 ft. gas plant. Estimated cost, $60,000. E. A. Stubenrouch, 629 North 8th St., Archt.

Wis., Spencer—The Spencer Condensory Co. is receiving bids for the construction of a 2 story, 50 x 94 ft. condensory. Estimated cost, $50,000. G. A. Krasin, Marshfield, Archt.

Wis., Stevens Point—The Pfiffner Lumber Co., 229 Franklin St., is having plans prepared for the construction of a 2 story, 60 x 100 ft. planing mill. Estimated cost, $25,000. F. Spalenka, Stevens Point, Archt.

Ont., Oil City—The Canadian Oil Companies, Ltd., plans to install an oil filtering plant. Estimated cost, $25,000. Private plans.

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Practical Points in Arc Welding

Keeping the Work Clean—Beveling the Edges—Allowing for Expansion and Contraction—Guarding Against Injury—Making Solid Welds

By J. A. WILSON
Foreman, Electric Arc Welding Dept., General Electric Co., Schenectady, N. Y.

THE high industrial value of electric arc welding depends as much upon the welder as upon any other element. He must know what he is about. If he realizes the value of a clean surface and how to get it, if he knows how important it is to gage accurately the gap between edges, if he is sure just when to preheat parts to be joined, and if he has in mind a good many other such points which are vital to good welding, the chances are that his work will be highly successful.

Good, strong welds are most readily made only when the metal to be welded is kept clean. Not only does foreign matter contaminate the weld and weaken it, but metal is made spongy due to locking up of the gas generated in making the weld.

Too much care cannot be exercised in preparing the surfaces to be welded, by keeping them free from scale, rust, grease, soot and foreign matter. Washing with gasoline or lye, boiling with lye, pickling (if parts are small), sand blasting, chiseling, scratch brushing and similar methods for cleaning surfaces have been satisfactorily employed, depending on local conditions. A simple method, and one in general use either alone or with any of the other methods, is scratch brushing. In this method, a steel-wire scratch brush is employed before commencing the weld, and also at intervals (usually when changing electrodes) during the welding.

It is just as important to keep the surfaces clean during the welding as it is to clean them before the

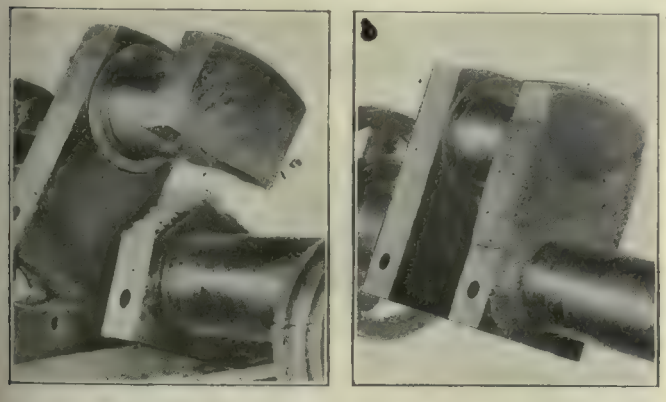


FIG. 1. WELD MADE IN BROKEN CRANKSHAFT

work is started. The introduction of impurities must constantly be guarded against, and to remove any possibility of contaminating the weld many operators avoid the use of flux. Experience has demonstrated that flux is unnecessary and that, if a good weld is to be obtained, the use of flux will not satisfactorily compensate for a lack in cleanliness of the surfaces. In welding heavy sections where it is necessary to deposit several layers of metal, the surface of one layer should always be cleaned before the next is started.

When sections which are $\frac{1}{8}$ in. or less in thickness are to be joined, the edges need not be beveled, but they should be separated a small distance. Thicker sections should be separated by $\frac{1}{8}$ in., and should be beveled so



FIG. 2. WELDING BOOTH AND USE OF EYE SHIELDS

as to produce a total angle of 60 deg. This angle is a safe average value, although the nature of some work may require almost any angle from 40 to 90 deg. Very heavy sections may be beveled from both sides, and to prevent warping, the weld should be made in layers alternately deposited on the two sides. In Fig. 1 can be seen the method of preparing a broken 6-in., six-throw crankshaft for welding, as well as the appearance of the completed weld.

In welding cracks in plates, forgings, or castings, the crack should be chiseled out to get a good bevel, entirely through to the back or to the bottom of the crack in castings or forgings. In boiler work, $\frac{1}{2}$-in. holes are sometimes drilled well beyond the ends of the crack, and the crack chiseled, beveled and welded.

Allowing for Expansion

When long seams are to be welded, provision should be made to take care of the expansion due to heating of the metal in the sheet, and also the contraction of the metal in the weld as it cools. At the point where the weld is started, the edges should be placed $\frac{1}{8}$ in. apart, while at the other end, the space allowed should be $\frac{1}{4}$ in. plus $1\frac{1}{2}$ per cent of the length.

Another method of reducing expansion is to put in a short section at the center, and then to add alter-

nately on each side of it other short sections spaced at intervals. All these sections are placed in the first layer. Subsequent layers are then added in such a way that the welded sections of any layer will not match those in the layer immediately below.

In a third method, work is started at some distance in from the edge of the plate, and the weld is made toward the nearest edge. Then a second weld is started the same distance ahead of the first and is welded back to the end of the first section. This method is called back welding. The length of each section depends on the total length and may vary from 4 to 10 inches.

Certain points of flywheels, complex castings or other

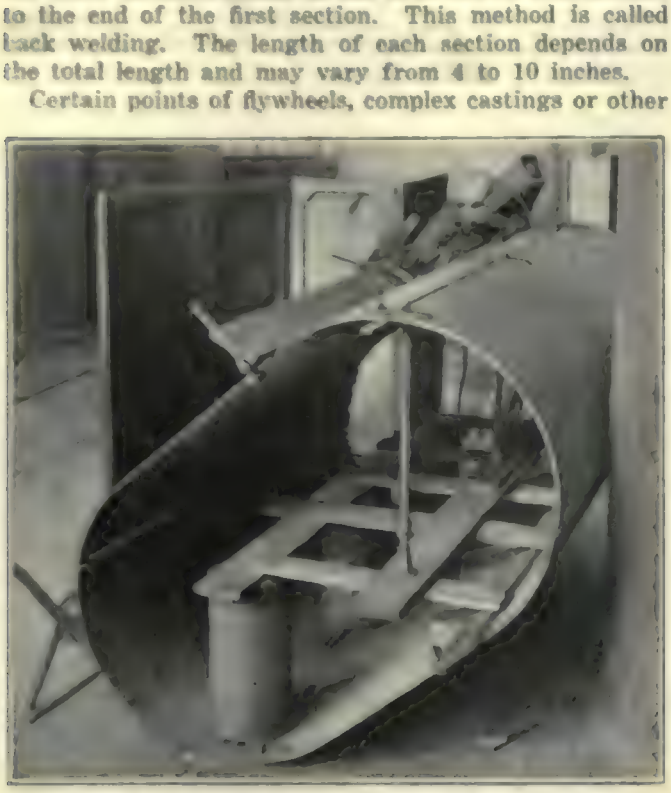


FIG. 3. ARC WELDING A SEAM IN A TANK

objects having complicated shapes may require preheating to produce an initial expansion sufficient to offset the contraction resulting from the cooling of the weld. In some cases, the entire piece should be preheated; in others, the whole piece should be annealed after welding. The desired result can be obtained by heating the piece uniformly, covering it with sand or asbestos, and allowing it to cool slowly.

Contact with Terminals

When work is placed on the steel-covered bench, the resulting contact will be sufficient to carry the current, providing the part to be welded is heavy enough to hold itself in contact. It will be found desirable for holding lighter parts to clamp them securely to the bench or hold them in a vise.

When large pieces are to be welded, the positive lead may be connected directly to them. A convenient terminal for the positive cable can be made by bolting to it a copper hook of proper size. This terminal can be laid on the work, or hooked on any projecting part or into any convenient opening. It is seldom necessary to clamp the terminal to the work, unless the metal is thickly covered with scale or dirt which acts as insulation. Even in such a case, it is easier to chip or brush off a clean place for the contact than to use a clamp.

If welding is to be done in a room where there are employees doing other work, it is advisable to use screens around the welding operator. The screens should be high enough to confine the upward light to a small part of the ceiling, so that its flickering will not affect the other workmen. While such light over a wide area would probably not be injurious, it is irritating to the other employees. Recent experiments indicate that flat battleship gray is the best color to paint ceilings and walls, as this color absorbs practically all of the dangerous light rays.

Safety of the Operator

It is necessary for the operator to take certain precautions against the danger of receiving flashes and burns from the electric arc. Properly protected, the operator is in no danger. Gloves are necessary, leather ones with long gauntlets having been found to give best results. Manufacturers of electric arc-welding equipment usually supply protective devices with their equipment, in the form of either a head or face shield. The welding glass protects the eyes, while the shield proper protects the skin of the face and neck from burns caused by the ultra-violet rays of the arc. Goggles, either clear or tinted, offer additional protection where a number of operators are at work. A welding booth, intended to be closed by a curtain, is shown in Fig. 2, which illustrates also the use of protective shields.

Before the work is started, care should be exercised to see that the electrode holder is connected to the negative terminal, and the pieces to be welded to the positive terminal. Reversed polarity occasions greater difficulty in maintaining the arc, and results in a poorer deposit of metal. Under certain conditions, however, it is advisable to reverse the polarity, such as when welding thin metal and certain grades of cast iron. In such cases it is desirable to reduce the amount of heat on the piece to be welded, this being accomplished by reversing the polarity.

In starting the arc, the electrode should be just touched to the work and immediately withdrawn, to a distance not exceeding $\frac{1}{8}$ in. The arc should be kept short, and to insure uniformity in the metal deposited, should be maintained constant in length. Since metal deposited in welding adheres only to that surface of the work upon which the arc actually plays, care must be used to bring the arc in contact with the whole sur-

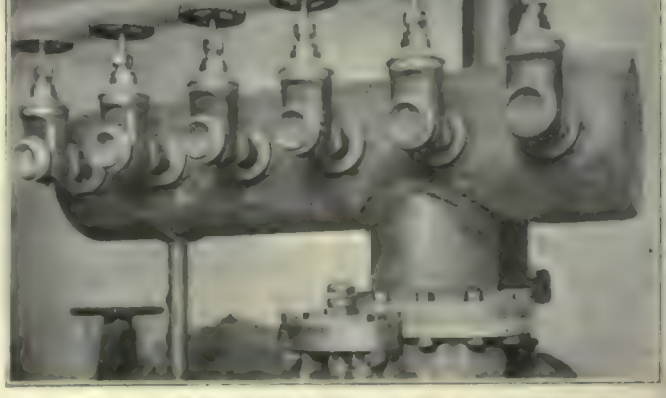


FIG. 4. ARC-WELDED JOINTS IN FEED-WATER MANIFOLD

face to be welded. The metal of the work is fused by the direct impact of the arc, and if the molten metal merely runs ahead of the arc over the solid metal of the work, a good weld will not result.

In welding a seam, the electrode should be advanced

along it in a zigzag or circular path. Where the weld must be smooth on one side, a flat piece of copper or carbon can be held against the weld and the metal filled against it. An iron or steel block can be used, if care is taken not to weld to it. The method of setting up and welding along a seam in a transformer shell is shown in Fig. 3.

In filling holes in castings or plates, a common method employed is to tack a piece of ¼-in. plate at the back of the piece to be welded, completely covering the hole. This plate greatly facilitates filling the holes, and can be readily removed with a chisel and hammer. If a copper or carbon backing-up piece is used, the metal should be flowed against the piece, care being exercised to prevent the arc from coming in contact with the copper or carbon, thereby contaminating the new metal.

Overhead Welding

Overhead welding with a metallic electrode is accomplished in the same manner as normal welding, and except for the difficulty of holding the electrode steady in the cramped position usually required, is just as easily effected. Metal will be successfully deposited if the length of the arc is kept constant, and this is simply a matter of practice. A rest for the arm will sometimes assist the operator to hold the electrode steady. It will be found desirable for the operator to use a head mask in making overhead welds, so that he will have both hands free.

The appearance of some overhead welds is marred by projecting drops of metal or by uneven thickness of the deposited metal. This can be prevented by a proper manipulation of the electrode. Fig. 4 is a good example of what can be done by arc welding, all the joints in the manifold being made in that manner.

If at any time, the electrode is held in contact with work so long that the two become welded, the circuit should be opened and the electrode knocked loose.

The Payment of Unemployment Relief

By C. J. Morrison

In an article under the above title on page 1001, Vol. 55, of the American Machinist, John S. Watts, gives a very comprehensive treatment of the question of payment of unemployment relief, but no solution of the problem is offered. Possibly Mr. Watts does know the solution. I am frank to say that I do not; and a number of very able statesmen, after devoting much time to the question, have acknowledged defeat. Yet the problem is of the utmost importance and a solution must be found.

Selfishness One of the Obstacles

There are many obstacles to be overcome, probably the greatest of which is the inherent selfishness of nearly all human beings. Most of us are willing to help others after we have provided for ourselves, and unfortunately this condition is progressive and the better we provide for ourselves the more we think we should have before being called upon to share with others. Especially do the thrifty object to being penalized to help those who are not thrifty. Consider two men in the same locality earning the same salary and supporting the same number of dependents; one spends all he earns and lives in luxury while the other lives modestly and saves part of his income. Then comes a business depression and both are thrown out of employment. The man who has spent all needs immediate assistance, while the one who has saved can get along for some time without help. The thrifty one does not like to see his savings eaten up by the necessity to live, but he particularly dislikes to have part of this money used to help his unthrifty neighbor.

If employers withhold a part of the earnings of each employee for unemployment relief, almost the same obstacle is encountered as the thrifty feel that they would prefer to handle their own funds, while the unthrifty want all of their earnings each week so that all may be spent; and both classes are discontented. This difficulty is real, not theoretical.

Great difficulty attends the setting of the amount of relief to be paid. An amount sufficient for one will not care for another. A single man requires less than a man with a family, but if men with families are allowed a larger amount than single men, another obstacle is added to the already great difficulties, as employers will object to hiring family men. In some places, employers give preference to single men on account of the accident compensations and there are other laws which discourage the raising of a family. In Massachusetts the income tax law seeks to prevent any increase in population by limiting the exemption for children to two.

Problems of a Relief Organization

Other obstacles are almost as difficult to surmount and a vast organization would be required to handle the unemployment relief. Who would support this organization? Men out of work in one place might be able to secure employment in another section of the country, but who is to pay for the transportation and, in the case of men with families, what is to be done? A man might not be able to support himself in one place and his family in another, and may not have the money to move them. Will money be supplied to move the family or will unemployment relief be paid until some other arrangement can be made? Also the family might refuse to move.

Who is to decide that a man cannot find suitable employment and what constitutes suitable employment?

Suppose a man works a number of years for one concern, then makes a change only to be thrown out of work within a few weeks. Which concern pays the unemployment relief?

Increased Industry the Solution

Who would pay the relief to domestic servants? When a large number of them are out of work it is because their usual employers are financially unable to hire them and consequently could not pay either wages or a compensation for unemployment.

There are innumerable ramifications of these and other difficulties, but it is needless to go into them as enough has been said to show the almost unsurmountable obstacles in the path of unemployment relief. At present the best procedure seems to be to attempt no payment of unemployment relief, but for our great leaders in business and finance to set manfully to the task of setting in motion the wheels of industry. There is more work to be done than all of us can do, but someone must solve the problem of how to start the machine. Once started it will quickly gain momentum and there will be no question of the payment of unemployment relief for some years to come, and possibly by that time someone will have solved the great problem of its administration.

Building Up Teaching Ability in Foremen

Why the Average Foreman Is Not a Good Teacher—Importance of Planning the Teaching Work—What Constitutes Good Teaching

By D. J. MACDONALD
Professor of Vocational Education, University of Cincinnati

SOME extremely significant statements having to do with the causes of low production have been made during the past decade or so. The truth of some of these should doubtless be questioned; but not so the majority. Allow as liberally as one cares to for the results of sinister influences during the stress of war, and he is still forced to admit that the charges must be more or less just. Productively speaking, we are far from what we might be or should be. And if reports are at all reliable, management is certainly much more to blame for this than labor.

The following statements indicate the need for increased managerial ability. The first is from Gantt's well-known book on "Organizing for Work." "It has been clearly proved that poor workmen are much more apt to migrate than good workmen, the natural conclusion being that if we wish to make workmen permanent, our first step must be to make better workmen of them. Our experience proves this to be correct. . . . Money spent in the proper teaching and training of workmen is a highly profitable investment for any industrial concern provided there is some means of measuring and recording the result. So beneficial have our training methods proved that we are inclined to believe that the practice of stealing good workmen from one's competitor will ultimately prove to be as unprofitable as stealing his property."

Cause of Inefficiency

The second is the oft-quoted statement made by the U. S. Training Service. "One of the principal factors in labor turn-over is the failure of manufacturers to obtain from their workers a full measure of efficiency. That this failure is chiefly ascribable to employers themselves is rather eloquently indicated by the results of a recent analysis of various causes of discharge in one of our big establishments. Only ten per cent of the dismissals, this study showed, were upon grounds of slacking. The other ninety per cent were attributable to shortcomings of one sort or another in the management. The same kind and degree of failure were responsible for ninety per cent of the quittances among employees according to another survey. Six general reasons may be assigned for inefficiency in production—and five of them are furnished by imperfect management. These reasons are (1) power failure, (2) failure of equipment, repairs, etc., (3) lack of instructions, (4) failure to supply material, (5) lack of training, (6) personal slacking."

The third is from the 1921 report of the National Association for Corporation Training. "There is no longer a need for argument in favor of training of skilled and semi-skilled labor. As a nation we are committed to a program for vocational and trade training. But the fact that the need for such training is generally recognized does not at all warrant the assumption that any considerable proportion of our industries have solved the problem. It is true that many concerns are undertaking to give their new men some introductory training and older men some additional training, but the fact still remains that few industrial or commercial concerns have attacked the problem in a scientific manner. *It is still true in most establishments that the only teaching or training which is given, is given by foremen and it is equally true that the average foreman considers that this teaching and training is the least important part of his job.*" (The italics are mine.)

The Gift of Imparting Knowledge

That one must know the thing he is to teach has long been an accepted fact; but not so the fact that knowing anything does not of itself qualify one to teach that thing successfully. To one who has studied methods of dealing with human beings, even though he has never given time to the study of psychology and pedagogy, this is easily conceivable; but to the practical man, the one who has made good because of steady work in the school of hard knocks such a statement carries little, if any, weight. Since practice makes perfect, according to his way of reasoning, does it not follow that years of experience in trying to teach those under him have necessarily caused him to become an expert teacher? The prevalence of this very fallacy has thus far proved to be one of the greatest obstacles in the way of training foremen to teach their men according to sound pedagogical principles. In the words of the humorist, "they know so damn much that ain't so."

To obviate misunderstanding I shall indicate briefly what is meant by developing teacher foremen. Brown is a typical foreman in a machine tool shop. On Tuesday, say, it falls to him to teach Jim, a new employee, how to turn out a certain piece of work. Being the usual type of foreman, Brown proceeds to show Jim just how to set up the machine, to adjust the work and so forth in order to turn out the right product. His demonstration is what might be called a running one, i.e., it consists of several distinct phases, each accompanied by more or less appropriate remarks. In due time he completes the work and, of course, expects Jim to proceed on the next piece without delay or difficulty.

But it so happens that Jim is typical in nature also—in other words, his mental machinery runs true to form, and as a consequence he cannot recall the various operations together with the numerous directions in their proper sequence. Because of this he is strictly "up against it," he cannot go on. What does he do? That all depends upon how human his foreman is or rather how human Jim thinks he is. To avoid what he expects, a "cussing out," he may try stalling for a few minutes until the foreman goes away, after which he may seek aid from a fellow worker; or, he may be bold enough to say he cannot recall all the points, etc. and ask the foreman to stay with him while he tries to go through the job. Obviously the number of possibilities is legion. The main point is that Brown's poor teaching is primarily to blame for the non-productive situation faced. Either Brown must be trained so that he knows how to teach Jim properly, or Jim must be transferred

to a special training department where there is some one who knows how to teach.

In the following paragraphs I shall attempt to indicate some important problems which have arisen since my department has been engaged in developing teaching ability in foremen; likewise, some of the questions which, so far as we are concerned, are still unsolved. It goes without saying that notwithstanding our firm conviction that the work may be made invaluable to both the foreman and plant manager it is not by any means to be looked upon as a panacea for all industrial ills. On the contrary it should be regarded as one of the many ways of helping to answer some of the great human relationship questions, those questions which it is now generally agreed are mainly responsible for our industrial ills. The time will soon come when that important phase of the foreman's job which has to do with managing men will be valued at its true worth. In fact, there is already a liberal sprinkling of industrial and commercial establishments which evidently fully accept Gantt's statement that "the era of force must give way to that of knowledge; and the policy of the future will be to teach and to lead to the advantage of all concerned."

In view of this small but praiseworthy beginning, one cannot be accused of being unduly optimistic when he says that in the not distant future, whether or not a man qualifies for a foremanship position will depend increasingly more upon his ability to manage men satisfactorily, and correspondingly less upon his ability to bully them into temporary submission. Running close competition to the foregoing qualification from which in reality it cannot be separated will be that of ability to teach, to put ideas over to the other fellow effectively.

Putting the Job Over

Necessary to success in building up teaching ability in foremen is an understanding of what may be termed the psychology of the foreman. It must be understood, for instance, (1) that, with few exceptions, since he was preferred over and above his former colleagues for the position he now holds, he has every reason to believe that he is a success. And this, it may be noted in passing, is equivalent to saying that in the mind of his managers he not only knows how to manage those under him but also how to put ideas over to them; (2) that a person with his schooling and practical experience is not likely to be a good analyst; that rather he is almost certain to be the type of person who bases his conclusions upon the results of unrationalized experience, (intimate contact with hundreds of foremen as well as the testimony of others has not given me reason to change the foregoing belief); (3) that practically every experience he has had for years influences him toward overestimating the value of practice and correspondingly underestimating the value of theory; (4) that almost invariably he has acquired numerous habits which must be located and eliminated before he can hope to teach acceptably; and (5) that because of his maturity, important changes in his habits will be accomplished only after long and persistent effort.

The foregoing principles, I repeat, must be understood; but more than that, they must be observed. That is to say, for the person undertaking this type of work to understand thoroughly any one or all of the above principles will avail little if anything unless he also reacts correctly to practical situations which involves these principles.

To carry through a program of this type requires time and much of it. Just as absent treatment is tabooed elsewhere so hurried treatment is here. Habits of all kinds and in all stages of development must be reckoned with. Correct habits can no more become established quickly than bad ones eliminated quickly. A campaign, well-organized and well-executed, affords the only possible ray of hope. Anything in the way of a "short horn" course, to borrow the agricultural term, is sure to result in failure.

What to Put Over

When men have been engaged for years in a type of business where nothing but production has been dinned into their ears; where, in fact, ability to get out a product in a stated period is the chief gage of their efficiency, and where, as is more often than not true, their superiors have considered policies in terms of their immediate rather than of their ultimate effect, it is not surprising that only occasionally can a foreman be found who has the faintest conception of what constitutes good teaching. In view of this, the first necessity is to try to make clear to them what teaching jobs are. This, on the face of things, might seem to be especially difficult, but such has not proved to be the case. In fact, it is rather easy when compared with the job of making clear how teaching ability is essential to highest success and wherein one kind of teaching is superior or inferior to another. I recall in this connection the experience a friend had when he suggested to a foreman of long standing that possibly a careful analysis of the jobs for which he was responsible might result in discovering improved methods of doing the work. The not unexpected response was: "Why, I've been working at this job for over eleven years. Do you think that you can tell me how to do it?"

But when my suave and politic friend replied that he had not thought for one minute that he could tell him how to do his job better, but that, since by careful analysis he and many others had had their eyes opened to unseen possibilities, he was wondering whether it would prove true in this case, the man "thawed out" and proceeded to demonstrate exactly how he inspected the work in his department. As he proceeded my friend carefully jotted down the various operations as they were performed. Imagine his surprise, after eleven minutes had elapsed, to see the man scrap the casting he had been inspecting with the remark: "There's no use going any further; that blow hole settles that." When asked to make an accounting of the eleven minutes consumed in finding that he didn't need to inspect the article he was at a loss as to what to say. But finally he admitted that the joke was on him. He had been working at the job eleven years without having discovered that one order of procedure in inspecting is better than others.

The point I wish to emphasize through the above incident is not that the foreman and those working under him had been working inefficiently for many years but that his outstanding weakness, his uneconomical method of inspection, was located by means of systematic procedure within the space of a few minutes. Also, that since his work had been considered favorably and since he had never acquired the habit of close analysis he would in all probability have continued his wrong method indefinitely. He lacked the ability to stand aside and get a new perspective of his job.

(To be continued)

Making the Mack Brake Shoe

Fixtures for Holding the Castings in Milling, Boring and Drilling Operations—Rivet Holes for Lining Drilled in Pairs—A Counter-Balanced Fixture

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE brake shoes are a particularly important part of any motor vehicle and particularly of a large truck. Those used in connection with the dual reduction axle on the Mack truck are manufactured in a rather interesting manner.

The first operation is straightening on a 50-ton press, after which the side is faced on a Bullard vertical turret lathe. The brake cam and brake pin bosses are then milled to size in a Cincinnati duplex milling machine provided with a special holding fixture, after which the brake pin hole is drilled and reamed and the casting sawed apart through the brake pin hole on a knee-type milling machine.

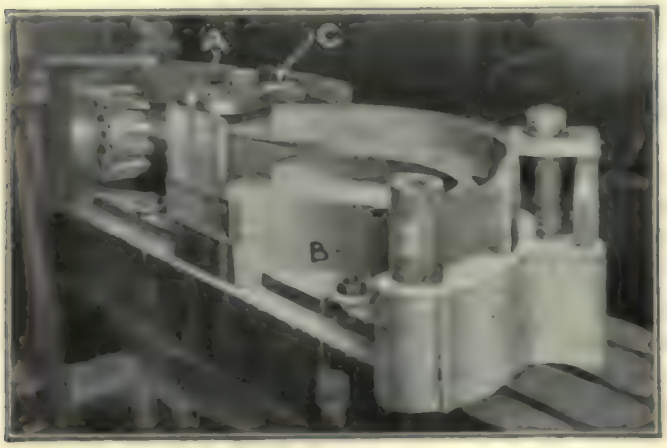


FIG. 1. MILLING THE CAM FACES

The webs which were cast in place to help hold the two parts together are also sawed off, and the cam faces are then milled on the Cincinnati automatic, single-head milling machine, shown in Fig. 1. This machine carries a double fixture so that both cam faces can be finished at one setting, as at *A*. The two halves of the brake shoe are located by means of the pin hole on the two studs, one of these being shown at *B*. Simple clamping fixtures, including a double compensating clamp at *C*, make it easy to put the brake shoes in place and to remove them with little effort, all of which assists in securing a satisfactory production.

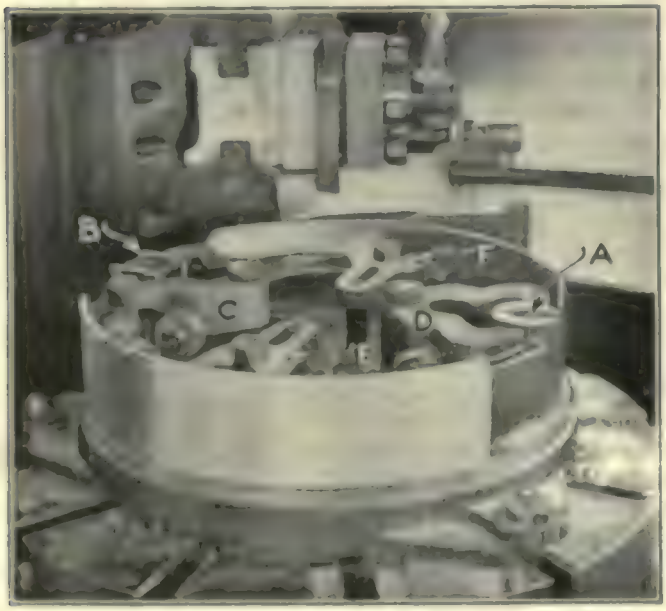


FIG. 2. TURNING THE OUTSIDE

The two parts are then taken to the Bullard vertical turret-lathe shown in Fig. 2 and positioned by a stud at *A* and the block *B*, which represents the brake cam in its release position. The clamps *C* and *D*, then draw the two parts firmly together against *A* and *B*. The other clamps, *E* and *F*, hold the brake shoes down on the face of the fixture for the turning operation. It will be noted that provision is made so that clamps *E* and *F* may slide easily toward the center, releasing the work and at the same time always being in position for immediate use.

The type of equalizing clamps shown at *C* and *D* are particularly useful where it is necessary to contend with the inequalities found in the average casting. There are many places where their use will save imposing unequal stresses on parts which are sure to spring after the pressure is released.

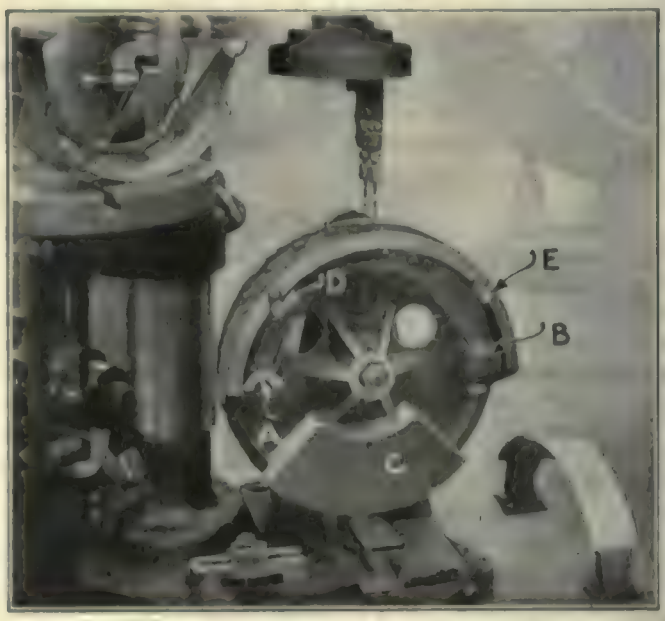


FIG. 3. DRILLING THE RIVET HOLES

The brake shoes are then drilled with eighteen No. 19 holes for the brake lining rivets. These holes are drilled in pairs, as can be seen in Fig. 3, by the special two-spindle drilling head shown. The shoes are here located both by the pin hole *A* and the cam face *B*, and as the fixture is counter-balanced at *C*, it is easy to turn it so as to bring any desired pair of drill bushings under the drill. The small swinging clamps *D* and *E* hold the brake shoes in place during the drilling operation.

The holes are then countersunk, all burrs are removed and the brake shoe is ready for inspection.

Waste Elimination Through Standardization

Reducing Manufacturing Costs—How Standardization Benefits Both Manufacturer and Consumer—Introduction of a Universal Numbering System—Multiplying Service by Six

By H. CAMPBELL and ALEX TAUB

WHAT is becoming one of the most important considerations in modern manufacturing from the point of view of both manufacturer and consumer, is the item of standardization. Apparently the first recognition of the benefits of standardization in manufacturing was shown by the Association of Licensed Automobile Manufacturers. During later years, the Society of Automotive Engineers has given to the automotive industry, through its members, a series of standards which have been widely adopted. It has remained, however, for the General Motors Corporation to greatly develop standardization.

There exist in the United States today 360 manufacturers engaged in the production of automotive parts. Among these are manufacturers who specialize in bolts, nuts and washers and who make these parts to conform to accepted standards which are used by general agreement and by recommendations from the various engineering societies. In the majority of cases these parts, usually grouped as standard parts, are thoroughly standardized as to diameter, head and fit, but vary in the matter of length. Thus, in spite of the splendid work of the S. A. E. and others, the benefits of standardization have not been felt fully by the ultimate consumer so far as service is concerned.

Without doubt the finest example of service through standardization is to be found in the building trades, whereby every hardware store has become, in effect, a service station. It is the opinion of General Motors engineers that to a certain extent the servicing of small parts for automotive use should be just as simple.

In the analysis of the situation, it was noted that 70 per cent of the parts used in an automobile were small parts that could be and should be standardized. On this basis data were prepared and placed before the engineers of the corporation to show how far it is possible to carry interchangeability.

Part Duplication Eliminated

Although it seemed that interchangeability could be accomplished without much difficulty, yet the actual tabulation of data required a tremendous amount of labor. There were many problems to be settled, among which was the apparently unimportant numbering system. It was necessary to devise a system that could be used by all divisions of the corporation without confliction with past history, and naturally the key system was thought to be the best. However, after considering the number of parts included in this group, it was found that the key would be equal in size to the volume containing the data, and therefore a straight numbering system was adopted. No division of the corporation was at that time using six-digit part numbers; therefore, six-digit part numbers from 100,000 to 150,000 were decided upon for the standard parts group and in this way a rather troublesome feature was eliminated. In the opinion of the standards department of the corporation a numbering system that could be successfully introduced into thirty organizations could be used without difficulty by every organization in the country.

Consideration was then given to the varying values of cars and the tolerances necessary to fit these different conditions. This problem was solved by the fact that where high production is in effect, fine tolerances are necessary in order that production will not be hindered by poor fits. On the other hand, where high value and small production exist fine tolerances are desirable.

When the tabulation of the data was completed and compared with the data at the various divisions of the corporation, it was found that many parts were duplicated. In one instance a division reduced the number of parts from 1,600 to 78; another division from 3,400 to 1,600. It was discovered that one plant used 349 kinds of nuts, an almost inconceivable condition, and these were replaced with sixty-five. In such a case the manufacturer could save in bins alone, to say nothing of the possibilities offered for better service to the public. This condition is bound to exist in every concern that does not create a self-imposed barrier, as parts that have become service parts are hidden from view and similar parts are brought out as new. And so we find in some instances as many as seven parts exactly alike under seven part numbers, in seven bins. Within the first year it was possible to decrease the number of parts listed in the book from 13,000 to 2,100.

Simplified Service

Many evils became automatically eliminated with the adoption of standards. For instance, in ordering parts it was necessary for the source of supply to secure specially rolled bars from the mill, and when these parts became service parts, they were no longer obtainable.

It is the intention of the General Motors Corporation to effect a maximum interchangeability of all small parts where it is possible to do so without retarding the development or efficiency of the unit; and to so record these parts that they can be readily used by any division without destroying their original identity. When these parts enter the field they will be available as service parts at no fewer than six sources of supply.

The corporation engineers have further recognized the possibilities for interchanging many parts not known as standard, and in order to facilitate every opportunity for standardization, have devised a universal numbering system. This is accomplished by using part numbers from 100,000 to 999,999, each division being allotted numbers sufficient to cover a period of thirty-five years. By this method a single part may have but one part number, regardless of how many divisions are using it, and that number indicates the division with which it originated.

Thus, such a part becomes standard and is available at every General Motors service station. Previously each of the company units designed its own parts which possibly differed but very little from those of another unit, but now all of these units use standard parts. This standardization means not only that one factory can supply all the others with a part, but that it will multiply service to the consumer.

The General Motors standard parts group includes

screws, bolts, nuts and similar parts for every possible use on an automobile. Pipe fittings, curtain fasteners, grease cups, ball bearings, nuts, taper pins, rivets, have been standardized, as have the chemical composition and physical properties of the various kinds of metals, together with the heat-treatment required.

Recent developments indicate that concerns outside of the General Motors Corporation are very much interested in this method of standardizing and one concern in particular has suggested that the corporation permit it to adopt the G. M. C. data as printed, inclusive of part numbers and that its sources of supply be allowed the same privilege. Several manufacturers who supply the General Motors with parts have shown their willingness to employ the G. M. C. data as printed, inclusive of part numbers, as also their sources of supply. Thus, it would seem that the system devised by the corporation is fast approaching universal usage. The standard parts today are being utilized by all of the General Motors divisions, which means that approximately sixteen manufacturers are using standard parts under the same part numbers. Therefore, it will become possible, under this system, to advertise the fact that the purchaser of the General Motors Corporation products will obtain universal service on such parts as are listed in the service parts book as having universal numbers. It is a big step toward very desirable standardization.

Special Boring Machine in the Pelton Shop

SPECIAL CORRESPONDENCE

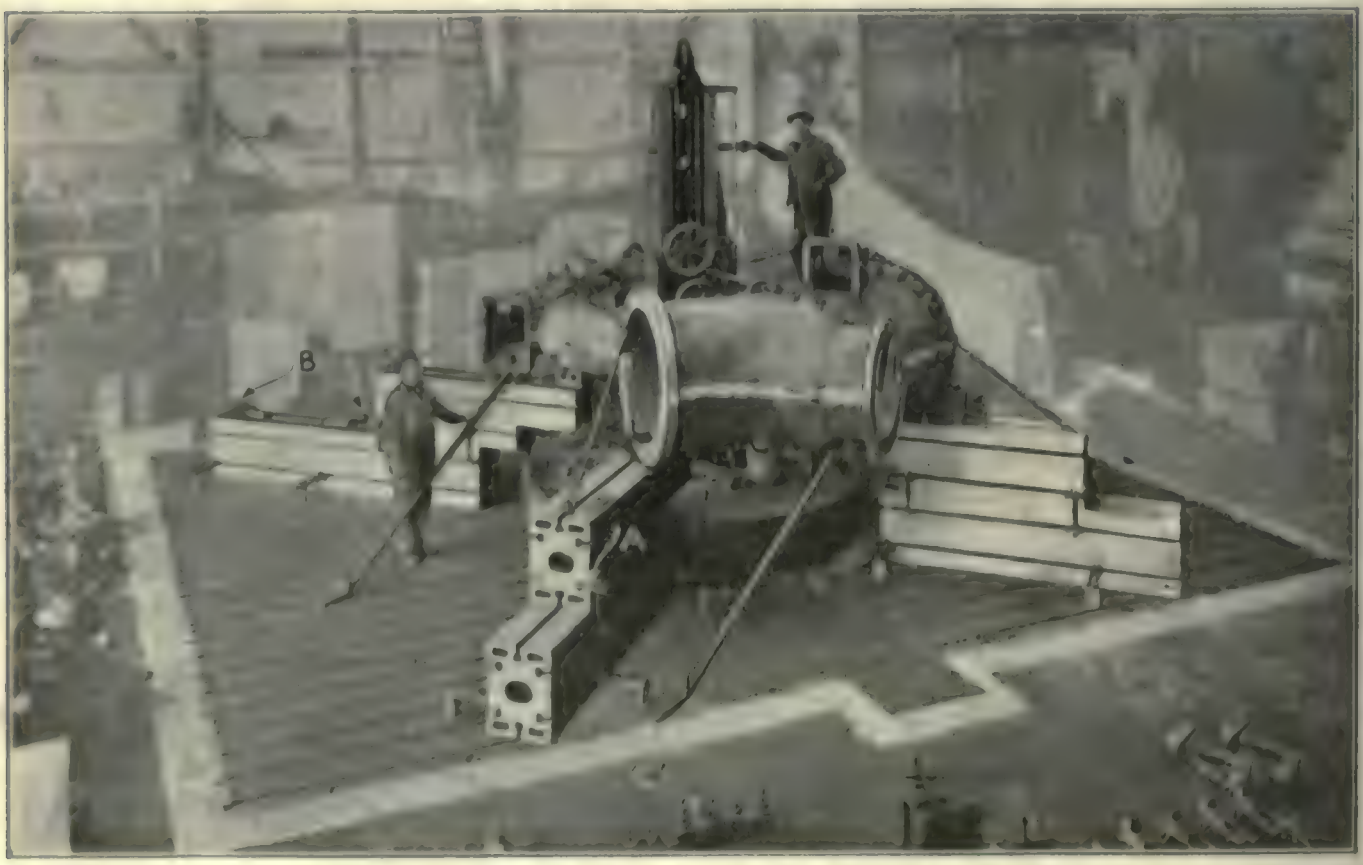
The illustration shows a new floor boring machine of special design, built by the Niles Tool Works, which has recently been installed in the shops of the Pelton Water Wheel Co., San Francisco, Cal. It was built to specifications for the economical machining of large turbines, both the boring and turning being handled in this machine.

The machine properly includes the floor plate of 25 x 30 ft., the long dimension being in the direction of the T-slots. The plate is 12 in. thick and rests on metal shims which are set on 14-in. I-beams, bedded in a solid block of reinforced concrete. The boring table is 10 ft. in diameter and of a substantial thickness to prevent distortion. The distance from the upper side of the table T-slots to the face of the table is 2½ in.

The column shown on the boring table is of heavy and substantial design and can, when mounted as shown, bore a hole 16 ft. in diameter and 7 ft. deep, with an undercut of 15 in. if necessary. The same column can be moved to any desired point of the floor plate and with the work clamped to and revolved by the table, the column can be used for turning and has a large capacity. The tool column is designed to machine faces which are parallel within 0.00025 in. and on diameter the tolerance is 0.0015 in. in the length of the column.

In the job shown the casting weighs 15 tons and has a bore of 66 in. which is the smallest size that can be handled with the tool column shown, but a smaller column is provided for work of less diameter. The boring machine is driven by a two-phase alternating current motor, speed changes being secured by a gear box running in oil.

The parallels shown are 18 x 24 in. in section and of various lengths, as can be seen. They are accurately made, the tolerance of parallelism of opposite faces being 0.002 in. Special T-headed forgings, shown at *A*, are used for bolting the parallels together when used in pairs as shown. The cleats shown at *B* are for lifting with the crane in moving from one point to another on the floor plate and take the place of the lifting pieces, shown at *C*, which were designed for this purpose.



LARGE SPECIAL FLOOR PLATE BORING AND TURNING MACHINE

Machine Shop Practice in Various Western Shops

Making Centrifugal Pump Castings—Some Operations on "Big" Work—How Bottle Molds Are Made—An Interesting Milling Job

BY FRANK A. STANLEY

SOME illustrations are here presented of a variety of work as handled in a number of different shops and foundries on the Pacific Coast.

One line of work carried on in numerous plants of the West is the manufacture of pumps of all kinds,

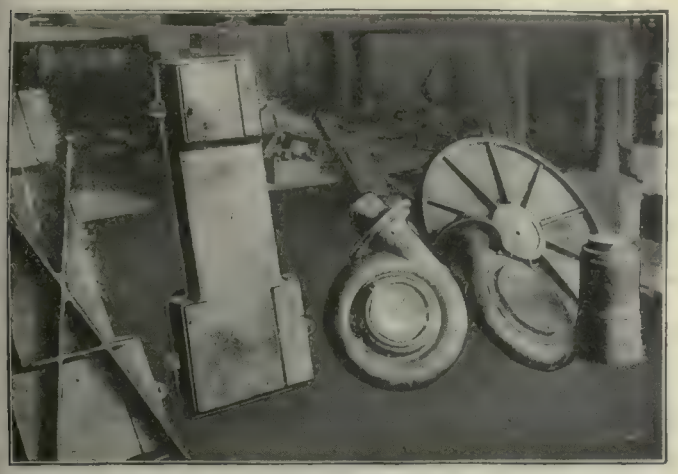


FIG. 1. A GROUP OF PUMP PATTERNS IN A SACRAMENTO FOUNDRY

particularly for irrigation and mining purposes. Many of these pumps are of the centrifugal type, some driven by direct connected motor, others adapted for belt drive from either motor or gas engine. The halftone, Fig. 1, reproduced from a photograph taken in the foundry of the Henneuse Manufacturing Co., Sacramento, Cal., shows a number of patterns for pump work, among which are included patterns for bases or frames and for casings or bowls. The making of castings for such members forms an important portion of the jobbing work handled in this foundry.

The pump base or bed is molded in a two part flask, one interesting feature being the coring of the small holes through the four lugs at the sides of the work. The core prints for these holes for the holding down bolts are distinctly shown in place on the pattern lugs.

The molding of the casing or bowl involves some very nice core work. The cores are made in halves in a wooden core box which is provided with a sweep on a central spindle for shaping the joint face of the core. For baking core work of all kinds, the cores are placed on metal trucks of which there are several for different sizes of work. These core trucks or cars are operated on rails leading directly into the ovens, which are heated by coke. For the brass department of this foundry oil fuel is used. The oil burner equipment and the air connections are in a pit under the foundry floor where a grating gives access to the apparatus in the pit. The furnaces are bricked in below the floor level and are arranged for ready reception of the crucibles which range up to 150 lb. or more capacity. Air is applied under pressure of 30 to 40 lb. The oil spray and air are controlled by convenient levers projecting upward through the grating. Oil is supplied from a large tank at the side of the foundry wall, the entire installation being not only compact but so arranged that none of the equipment is in the way of general operations carried on around the foundry floor.

The views in Figs. 2 and 3 show some heavy work in the shops of the Union Machine Co., San Francisco. The first of these illustrations represents a very unusual operation, the facing of a large rectangular bedplate on a vertical boring mill. This kind of work would ordinarily be handled on a planer, but in a shop doing a variety of machine work, jobs that come along in a hurry often have to be finished in the machine which is available at the time. This particular casting was required to be surfaced flat and true and the big boring mill was used very effectively on the work. The casting was of such size as to just clear the inner faces of the housings. The method of mounting the work on the table was to place it on a large parallel at the center with heavy parallels under either end and with inter-

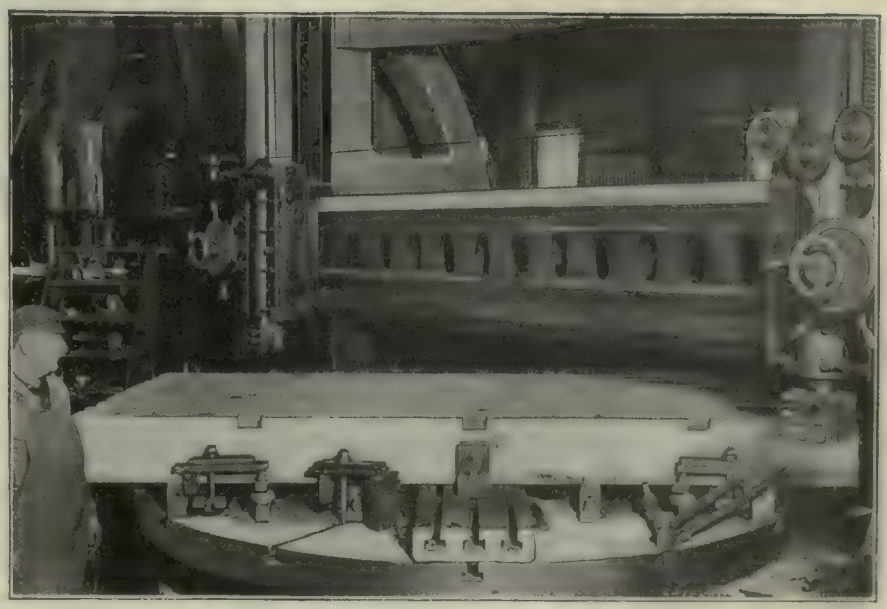


FIG. 2. A BIG BORING MILL JOB

mediate jack blocks between them. For applying the holding down straps, clamps were secured to the side walls of the casting to take the pull of the straps which were supported at the rear ends upon short jacks and

blocks. To brace the work against the side thrust, short struts with adjusting screws at their ends were applied at the corners, as clearly seen upon examination of the right-hand end of Fig. 2.

Another big job in the same shop, as illustrated in



FIG. 3. DRILLING A BIG ELBOW

Fig. 3, consisted of the drilling of the flanges of a big elbow measuring some 4½ft. in diameter by 8 ft. in height. This big casting was handled under a radial drill, and a templet jig was used for locating and drilling the holes. The jig itself was of such size that eye bolts were tapped in at opposite sides for convenience in slinging from the crane hoist for lifting into position at the top of the work. The lower end of this work was dropped into a corner of a floor pit and the main support at the back of the bend secured by jack screws mounted on heavy timber supports. These screws were applied at points under the flanges of the casting to give security and rigid support for the job.



FIG. 4. BOTTLE MOLDS

One of the most interesting features of a glass factory is the making of the molds for bottles and other glassware. Some of these molds, as made and used by the Illinois Pacific Glass Co., San Francisco, are shown in Fig. 4, which is reproduced from a view of one of the benches in this company's mold shop. Such molds are cast in the foundry with chills for cores, to give a hard close grained metal along the inner surfaces which are machined out for the forming of the bottle. The molds are made in halves, and after the milling of the joint faces they are turned on the body to an exact diameter for the reception of the clamp jaws which control their operation in the bottle blowing machine. This finished surface is shown clearly around the closed mold at the right in the photograph.

To finish out the bore to the desired size and form, the two halves of the mold are placed in a holding fixture on the faceplate of a lathe, and a series of tools carried in a special turret are then applied to the boring operations. The action of the tools is controlled by a forming bar at the back of the lathe, which is mounted in place of the regular taper turning attachment. The form in the mold must be very smoothly finished and polished to give the effect of a burnished surface, so that the bottle blown therein will be perfectly smooth at all points around its surface.

Bottles are manufactured in molds of this type in all

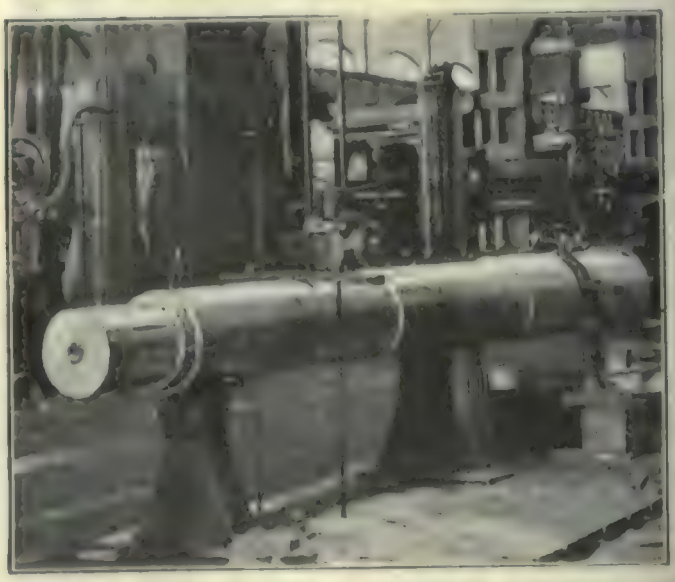


FIG. 5. MILLING KEYWAYS IN A BIG SHAFT

shapes and sizes, so that a great number of molds are required for the varied product of such a plant. The making of these molds requires an extensive force of skilled men and a large number of machine tools of different sizes. Some idea of the extent of the work in the one plant referred to may be gathered from the fact that something like 200 tons of mold castings are handled in this shop annually.

The final illustration, Fig. 5, shows an application of the draw-cut shaper in a railroad shop where heavy marine and other work is handled occasionally. This view is from the Southern Pacific shops at Sacramento. The operation consists in milling key seats in a big shaft where the work is held in heavy V-blocks and clamped down by straps over the top and bolts from the bedplate on the floor. The machine is here shown fitted with a milling cutter on the spindle passing through the ram, the feed for the cut being obtained by traversing the column of the machine along its bed.

The Railroads of Venezuela

Amount of Capitalization—Condition of Rolling Stock—Size of Repair Shops—Extent of Electrification—Value of Machinery Imported from the United States

By HARRY CHAPIN PLUMMER

MACHINE sale opportunities, equipment and tool conditions in the railway machine shops of Venezuela may be pretty fairly gaged by a consideration of the general mechanical facilities of the several lines, totaling altogether less than 1,000 miles, in their relation to the gross capitalization of the entire system, in which German and English investments predominate, with Venezuelan and French following. A railway in Venezuela, of course, means nothing like the railway systems or individual lines to which we are accustomed in the United States, that is, in point of roadbed and ballasting, locomotives and car equipment and machine shops and other mechanical facilities.

All of the railways of the country represent a total investment of about $39,000,000. To arrive at an idea of original construction costs, the figures for the several major systems are set forth in Table I.

TABLE I. AMOUNT OF CAPITAL INVESTED IN MAJOR SYSTEMS

	Invested Capital		Miles	Cost Per Mile
LaGuaira-Caracas	$3,508,740	English	22.8	$153,892
Caracas-Valencia	15,247,000	German	111.2	137,113
Valencia-Puerto Cabello	3,898,600	English	34.0	114,665
Tucacas-Barquisimeto	5,974,604	English	109.7	54,454
Ferrocarril Central de Venezuela	3,792,450	English	34.8	108,978
Ferracarril de Carenero	772,000	French	33.8	22,840

Not only do construction figures differ widely as between individual railway lines, but they differ materially within the compass of a single line, depending, of course, upon the degree to which each has been built to pass over or through mountain ranges.

The gages and weights of rails used by the several railways of the country are given in Table II.

TABLE II. GAGES OF RAILROADS AND WEIGHT OF RAILS

	Ft.	Lb. per ft.		Ft.	Lb. per ft.
Caracas-LaGuaira	3.0	21.66	Tucacas-Barquisimeto	2.0	16.34
Caracas-Valencia	3.5	15.60	Ferrocarril-Central de V.	3.5	18.83
Valencia-Puerto Cabello	3.5	18.34	Ferrocarril de Carenero	3.0	13.44

Upon all of the railways of the republic the system of traction employed is that of simple adherence. No cog systems are used except on a small stretch of four kilometers, more or less, on the Ferrocarril Valencia-Puerto Cabello, where there is an inclined plane of 6½ per cent mean gradient and 8 per cent maximum gradient, which is provided with cog rails of the Abt principle, to accomplish the unusually sharp declivity. The ordinary rails on the Valencia-Puerto Cabello road weigh 18.34 lb. on the inclined plane. This is the maximum weight of rails in Venezuela, with the exception of the type used on the electric tramways of Caracas (operated by a British corporation), the weight of which is 29.92 lb. per linear foot on the straight lines and 36.55 lb. on the curves. Although there is a gradient of 5.27 per cent on a spur of the Ferracarril Bolivar (Tucacas to Barquisimeto), no cog system is used.

Locomotive and general rolling stock on all of the railways of the country are of much lighter construction than those on the American railway systems and lighter even than those used on almost any line in this country devoted to regular passenger service. They more nearly correspond to the sort of equipment employed on narrow gage roads, such as the Boston, Revere Beach & Lynn Railroad and upon mining and industrial switching spurs in less populous regions of our land. The locomotive operating on the longest Venezuelan railway, as also the passenger and freight-cars, most clearly resemble the equipment that was in use on the old elevated railways in New York and Chicago before the conversion of those lines from steam to electric motive power.

The engines are kept cleaned and conditioned in the shops and yards of the more important lines, and while the "waggons" show the long service to which they were subjected during the war, when not only replacement, but adequate repair was rendered exceedingly difficult by lack of primary materials and essentials, they would pass inspection on a Northern second-class line in point of whole condition and safety and hygienic standards.

There are but few classes of special freight car equipment, which is divided principally into box cars and flat cars. Although producing cattle and oil, Venezuela has on her railways no specific cattle-carrying or oil-tank cars, such as we know on home railroads, and because of the absolute dearth of refrigerator service, the larger centers of population on the highland, scarcely a two-hour run from tidewater, are denied fresh fish, in which the waters of the nearby Carribbean abound, and are greatly restricted in their sources of fresh meats, vegetables and fruits.

The passenger cars are not only small, but they are antiquated. Hand-cars for labor gangs and the crudest sort of wrecking equipment complete the rolling stock on the larger lines.

Naturally, the railway machine shops are maintained on a scale commensurate with so restricted a policy of equipment operation and maintenance. Because of the cheapness (withal the mechanical efficiency) of labor, many tasks that in home railway shops would be accomplished by machinery or with the aid of electric tools, are performed by hand—but performed with surprising accuracy.

Caracas, the most important terminus of three lines—the Caracas-Valencia Railway (Gran Ferrocarril), the LaGuaira-Caracas Railway and the Ferrocarril Central—is the seat of the larger machine shops. The first two lines contrive to share a single small plant at the adjacent terminals of both. At Valencia, on the first-named road, and at La Guaira, on the second-named, there are shops quite as well equipped as those at the capital city, and at both Valencia and Puerto Cabello the English road operating between the highland industrial center and the seaport has shops and mechanical staffs.

There is no doubt that a drive studiously and consistently undertaken by any well-organized and well maintained railway machinery interest in the United States upon the several principal railway enterprises in Venezuela, for the purpose of introducing more modern apparatus and devices in the mechanical departments of those railways, would stand every chance of success.

Like all public utilities whose operations are conducted without the country wherein their directorate

and stockholders have their seat, the Venezuelan roads are governed by a much more conservative, if not reactionary, policy than are home carriers whose executives are in immediate touch with the area of operation. Despite this fact, however, one of the leading American electrical manufacturing corporations succeeded not long ago in convincing the directors in London of two railways long established in Venezuela—the line between Macuto, La Guaira and Maiquetia and that between Caracas and Petare (the latter now a subsidiary of the Ferrocarril Central) that electrical installation and operation would save them money and would net them greater earnings, with the result that it secured the contract for installation and all supplies and accessories over competing electrical interests in London and elsewhere in England.

Electrification Being Favored

The director of the Gran Ferrocarril de Venezuela was less successful, two years ago, in urging upon his home directorate at Berlin the advisability, indeed the necessity, of converting the 16.8 mile "commutation stretch" of that line between Caracas and Los Teques from steam to electric power. The greatly reduced position of the mark and attendant financial and economic conditions in the Fatherland at the time were such that his appeal went unheeded. This improvement will be effected, however, within the coming year, according to the best posted opinion in railroad and government circles in Venezuela; but it is a safe venture that when the time comes, German electrical interests will secure the contract for the electrification of the line and the installation of all electric apparatus and equipment.

Yet another notable instance of physical improvement was that begun three or four years ago on the La Guaira-Caracas railway and the examples subsequently followed by the corporation of the port of La Guaira, which maintains a small switching line, of exceedingly heavy traffic, the Ferrocarril Bolivar and a small railway terminating at La Ceiba in the State of Zulia, of which Maracaibo is the capital. This improvement consisted of the conversion of locomotives and other items of the entire road equipment to provide for the consumption of crude petroleum instead of Cardiff coal briquettes in use elsewhere upon the Venezuelan railways.

Not only upon the railways and in every mechanical department incidental thereto, but in every industry in Venezuela, fuel saving and conservation has become an imperative need of the hour. In the present stage of exploitation and development of the Venezuelan petroleum fields crude oil has become an expensive item and its physical condition, even when refined in the neighboring Dutch island colony of Curacao, is such that it does not produce all of the results hoped for in the larger industrial plants, although the boiler-room equipment of many of these of late has been converted into oil-burners. By denudation, vast areas of forest have been exhausted of fuel wood, and the government has placed severe restrictions upon the further employment of even the commonest woods. While an industrial bituminous, of lignite characteristic, has been recovered in the east of the republic, near the Orinoco Delta, as, also, in the western state of Falcon, this has not yet been developed to a stage where it serves ideal purposes for fuel use. Considerable English and American coal continues to be imported by the major plants.

Locomotives and rolling stock on the principal Venezuelan railways imported from England and Germany many years ago, have not been replaced to date. General machinery imports from the United States totaling, in 1920, $1,259,227 in which were included materials brought in for railway machine shop use, comprised the following specific items:

	1920	1919	1918
Air-compressing machinery	$1,832	$3,900	$1,164
Electric locomotives	.....	3,400	.....
Stationary gas engines	4,690	2,320	1,693
Gasoline traction engines	57,543	26,149	.....
Kerosene engines	11,490	250	203
Steam traction engines	5,827	3,200	.....
All other engines	15,719	1,400	1,377
Boilers	98,403	5,216	23,123
All other parts of engines	50,843	32,214	20,897
Lathes	11,352	11,351	705
Other machine tools	9,849	6,846	4,472
Sharpening and grinding machines	7,647	396	357
All other metal-working machinery	22,027	4,215	14,925
All other machinery and parts	358,574	187,426	156,695

Big Shops Versus Little Shops

By R. F. Moore

In looking over the article under the above heading, published on page 99 of the American Machinist, I note that W. D. Forbes desires the opinion of mechanics as to how they would go about the job described.

The job is a very simple one, but if I had it to do I should first ask: *How* evenly spaced must the ten holes be, and how concentric with the centerhole? Mr. Forbes gives very liberal limits on all other dimensions, but on the seemingly most important ones the limits are not given. "Evenly spaced" is the term he uses: does this mean within 0.001, 0.0005, or 0.0001 in.; or does it mean 0.005 in.?

We will assume that the holes are to be within 0.001 in. The method he describes will not bring them within this limit. In the first place he should have used a combination center drill in the milling machine to start the drills, as every mechanic knows that a twist drill will not start accurately in line with a spindle without a spot for it to start in. Even so I doubt if the holes would come within the 0.001 in. limit.

So the question arises "how will we do the job?" These ⅛-in. holes are pretty small to be bored and reamed; nevertheless it could be done, and I should say that by this means they would come within one, or even one-half thousandth, providing the dividing head was accurate. This, however, would consume more than three hours time.

Perhaps this is the reason the $40 shop would not be responsible for the job and seemed to charge such an exorbitant price, and perhaps the small shop "took a chance" and luckily the job was satisfactory.

I would like to hear more on this large and small shop question.

Cutting the Production Cost of a Difficult Part

Balancing Pressure of Cuts by Simultaneous Cutting of Opposed Tools—Two, and Sometimes Three, Tools Cutting at Once—The Fay Lathe Machines Its Own Parts

By H. A. LOUDON

THE line drawing, Fig. 1, shows a part of the standard Fay lathe that because of its shape, the amount of metal to be removed and the close requirements in the matter of finish and tolerances, proved a difficult proposition to handle in any way other than

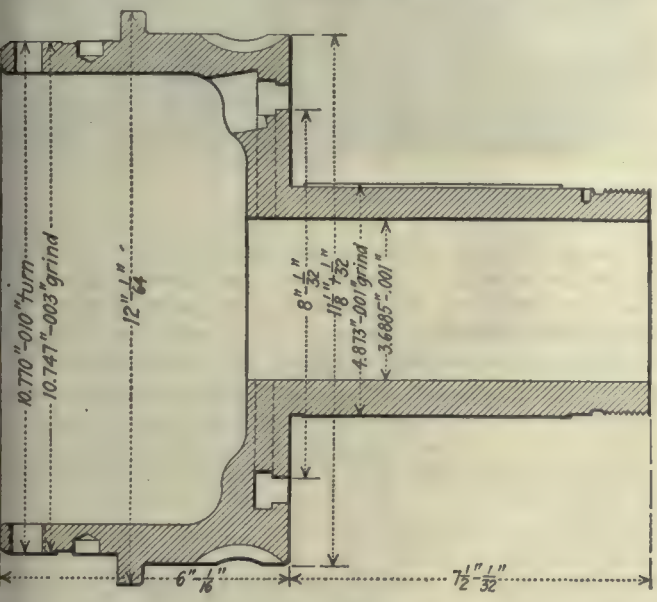


FIG. 1. THE CAM DRUM WORM FOR THE FAY LATHE

by holding on a mandrel between centers; and that method took altogether too much time.

It was desirable to complete as much of the outer surface as was possible in the same setting in which the bore was finished, and to do it with standard equipment so far as that could be accomplished; but the overhang was so great when the piece was held in a chuck, that long and consequently springy tools were necessary to reach the shoulder where the heaviest cuts were to be taken. Therefore, a compromise was effected by designing the special toolblock, shown in Fig. 2, for a Hartness flat turret lathe. There are many places where this can be done to advantage and these tool blocks have possibilities which have been overlooked in too many cases. A special tool block of this kind will frequently make a decided saving in machining time as in this case.

The openings between the bosses for holding the tools in this block permit the turret slide to be run under the work, the long hub on the latter projecting between the outer bosses, thus supporting the facing and slotting tools practically without overhang, while tools for facing and chamfering the end of the hub are rigidly held in the central boss, also close to the work.

Besides providing a more efficient means of holding the tools and better distribution of the cutting strain, this special block can be removed from the turret without disturbing the set up, and may be put away in the toolcrib until the next batch of work requires its use. It is held to the turret by six cap screws and its complete removal takes less time than would be needed to take out the tools separately.

Ordinary means of holding the work by chucking from the inside of the large end proved insufficient to withstand the pressure of the heavy cuts, and therefore

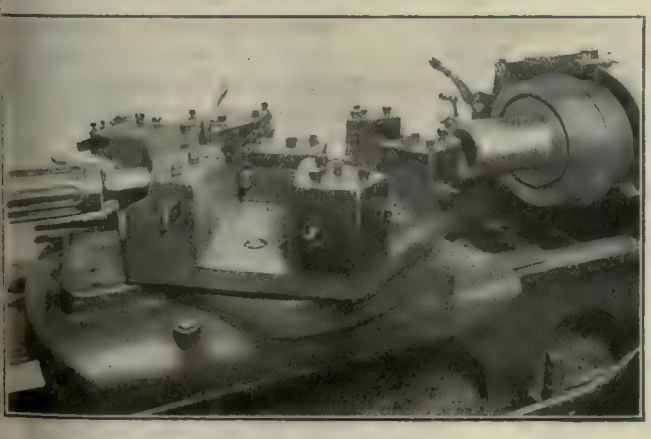


FIG. 2. FIRST SET-UP ON FLAT TURRET LATHE

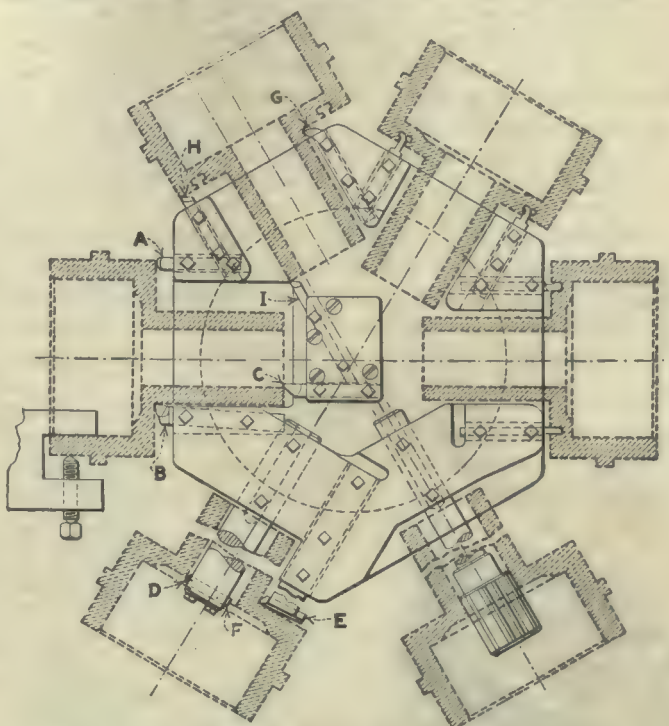
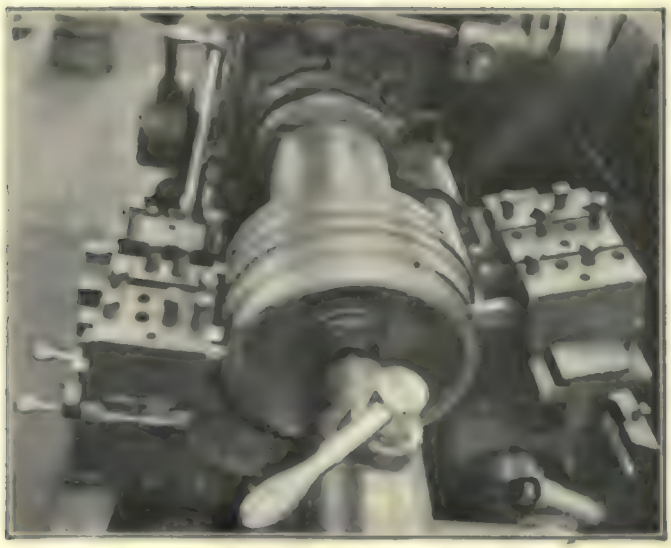
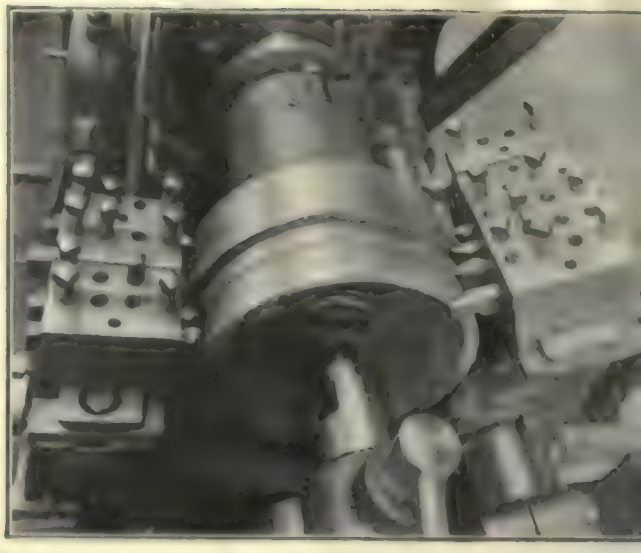


FIG. 3. SUCCESSIVE STEPS OF THE OPERATION

the chuck shown on the machine in Fig. 2 was used. This is an "inside" chuck with a lip on the outer end of each jaw through which passes a setscrew bearing upon the work. Thus a grip is provided at each jam, both on the inside and on the outside of the piece, holding it securely.

In Fig. 3 the tooling for all six positions is shown graphically. In the first position, tools *A* and *B* divide the facing cut between them, while at the same time tool *C* faces the end of the hub. Tool *A* is right side up while *B*, cutting behind the center line, is upside down; thus the cutting pressure is practically balanced. The lathe runs for this operation 20 r.p.m. with a feed of





FIGS. 4 AND 5. ROUGHING AND FINISHING IN THE FAY LATHE

1 in. in 40 turns. This is governed, of course, to suit the outer tools, while the cut at *C*, though performed at less than normal cutting speed, is clear gain. The cutting time is 2 min. 45 seconds.

In the second position, tool *D* rough-bores the hole at the same time that tool *E* turns the outside of the hub, *D* being inverted and thus balancing the pressure of the cut. Upon completion of this cut the cross-sliding head is moved back against a set stop in position for the finishing cut with tool *F*. Roughing time is 6 min. 45 sec. at a speed of 36 r.p.m. and a feed of 1 in. in 40 turns. This ratio is not changed for the finishing cut, but the speed is raised to 88 r.p.m. and the time is thus reduced to 3 min. 10 seconds.

The third position of the turret is used only for reaming, the slide being moved forward by hand and the rotative speed reduced to 13 r.p.m. Time for this operation is 30 sec. As the hole in the fixture is bored after the fixture is in place on the machine accurate alignment is assured.

The next operation is cutting the narrow annular groove that later becomes a T-slot. As will be noted in position No. 4 two tools work together upon opposite sides of the center, thus balancing the pressure. Because of the construction of the fixture, allowing the projecting hub to pass between the bosses, the tools are supported close to their cutting edges, eliminating vibration. This groove is ⅜ in. wide by ½ in. deep and is cut in 3 min. at a rotative speed of 17 r.p.m. and a power feed of 1 in. in 71 turns.

In position No. 5 the same principle of applying two tools is used to undercut the slot, one tool being inverted and working back of the center. The cross-slide is clamped after bringing the tools to position and the undercut made, both sides, at one movement by the cross movement of the head; time, 1 min. 15 sec., at a speed of 13 revolutions per minute.

In the sixth position, tools *G* and *H* again divide the facing operation between them; finish facing the shoulder in 2 min. 45 sec., while at the same time tool *I* finishes the end of the hub. This completes the sequence of movements in a trifle over 20 min. on a job that formerly required well over an hour.

Turning the outer contour of the piece at the large end is done on centers, using two Fay lathes one of which is set up for the roughing cuts and the other for finishing. There are no special features in this set-u except those ordinarily used on such machines. T roughing tools are shown in Fig. 4 and the set-up the finishing lathe in Fig. 5. By careful attention the placing of the tools, however, the time required f the roughing is but 4½ min. while the finishing operati takes even less, one operator attending both machines.

The piece is now returned to the flat turret lat where it is held upon a plug arbor while the outer e

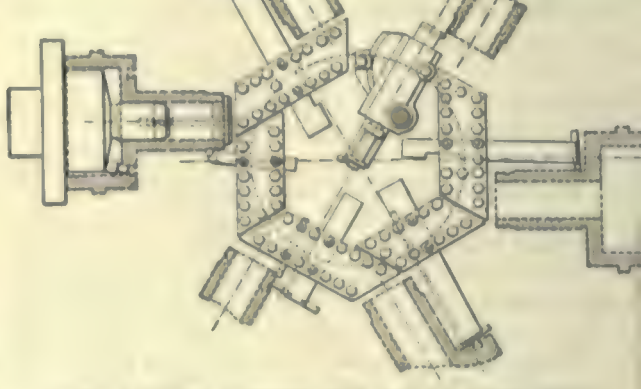


FIG. 6. TOOL LAYOUT FOR FINAL OPERATION

of the hub is reduced in diameter, necked and threade an undercut is made for wheel clearance in the grindi operation which follows. The tool set-up is shown Fig. 6, position No. 5 being the Hartness attachment f cutting the thread. Position No. 6 shows a tool f cutting an oil groove, which is done by holding the wo stationary while the turret slide is moved back a forth by hand. While the actual cutting time for th latter operation cannot be expected to compete with shaper, or oil grooving machine, it saves all of the tim that would be required to set up and dismount the wor

The piece under consideration is the cam drum wor of the Fay lathe, and while no especial outlay beyo some hard thinking was required for the tooling, t saving in production cost amounted to one dollar p piece. It is this kind of thinking which it pays a shop to encourage in any way which will secure t desired results. This is where real saving can be ma in the cost of production.

Electric Drive for Reversing Machine Tools

Reversing Mechanisms—Dynamic Braking and "Plugging"—Power Consumed in Reversing—Effect of Reversing on Production—Variation in Power Requirements—Torque

By A. L. HARVEY
Westinghouse Electric and Manufacturing Co.

MANY of the machine tools in common use are of such a nature as to require operation in both directions. This may be accomplished by crossed belts, clutches or reversing electric motors. When driven through belts or clutches there is a loss of power through slippage, and a loss of the cost of the maintenance of belts or clutch shoes. Of the various machines, and parts of machines, included in the classification of reversing applications may be mentioned: (1) Standard reversing planers; (2) plate planers; (3) tapping machines; (4) lathes; (5) grinding machine tables; (6) carriages; (7) cross-rails and toolheads; (8) traverse motion. In addition to these are other machines that can usually be classed in one of the above general groups. Thus, as far as the control equipment is affected, draw cut shapers, gear shapers and large key seaters come in the same class as planers. Such machines as crank shapers, while having a reciprocating motion are usually provided with non-reversing electrical equipment.

Calculation of Starting and Stopping Force

To start any machine power is required. This power must be supplied by the source of energy. Also, to stop the machine power is required, but in this case the stored energy in the moving parts of the machine may be utilized by means of dynamic braking if a direct current motor is used. All of the various moving parts such as gears, pulleys, shafts, motor armature and the work (in case of a lathe and planer) make up the elements that have to be considered in designing the machine and its drive, to make it suitable for reversing electric service. (This also applies to non-reversing machinery that must be started and stopped frequently, such as punches and shears). The amount of energy in any part is $\frac{1}{2}mv^2$. From this it can be seen that speed is a very important consideration, as the energy varies as the square of the speed. When weight (in pounds) is used in the above formula instead of mass, it becomes Energy $= \frac{W}{64.3} V^2$, where W is the weight and V is velocity in feet per second. For rotating parts of the machine, the energy must be based on that velocity that would store the same energy for the same weight moving in a straight line. The velocity at the center of a rotating element of a machine is zero, and is a maximum on its circumference. The radius at which the velocity is the same, with respect to energy, is that at which the weight may be assumed to be concentrated, and is called the radius of gyration. For different shaped parts, the radii of gyration can be obtained from text books on mechanics, and from mechanical handbooks. For convenience, some shapes are given in Table I.

TABLE I. RADII OF GYRATION

*Gear spoke—axis at end	$R = 0.5773\ l$
*Gear spoke—axis at mid-length	$R = 0.2886\ l$
Shaft or solid gear	$R = 0.7071\ r$
Pulley rim	$R = 0.7071\ \sqrt{r_1^2 + r_2^2}$

* For uniform section.
In the above l is the length; r, r_1 and r_2 the radii.

The substitution of radius of gyration and revolutions per second for velocity will change the energy formula to Energy $= \frac{WR^2(2\pi \times s)^2}{64.3}$, which may be reduced to $E = \frac{WR^2S^2}{1.63}$, where S is revolutions per second, R the radius of gyration and W the weight in pounds.

Stored Energy as an Element

In many cases, where a high-speed machine is used, the amount of stored energy to be started and stopped is a large factor in considering the size and type of motor and control equipment to be used. When the electrical manufacturer recommends the proper equipment for a given machine, the cycle of operation and kind of work performed is usually considered complete data. However, in such a case as we are now considering, the energy in moving parts may be a very large factor in the operation of the total equipment.

The more stored energy there is in a machine, the larger will be the power requirements for acceleration. If the power peaks are limited in value, the time of acceleration will be longer. Also, the time to stop a machine, assuming the value of braking force to be the average for the size of motor used, will be longer than in the case of a machine having less stored energy. In reciprocating machines, where the design of parts is such that the travel must be limited on account of clearances at the end of the strokes, it is important that the stored energy be kept down to prevent possible jamming of the moving parts with the parts that limit the travel. In standard planers, the shifting mechanism is such that it clears other parts after operating, and the table or platen can move any distance necessary to bring it to a stop. If planing up to a rib or shoulder, it is necessary that the stop be accurate so that the stroke will be completed without running into the projecting parts of the casting. The amount of variation is very small on slow speeds and may be slightly larger when on the higher speeds, due to the larger amount of stored energy and variation in friction.

That a machine will operate satisfactorily at a certain speed is not an indication that it will do so at higher speeds. An easy way to show what happens is to measure the distance required to stop a planer platen, from the time the shifting mechanism operates until the platen comes to rest. This should be done on the slowest cut speed and the highest return speed, to get the greatest variation in stored energy. On a planer geared for 25 ft. per minute slow cut to 100 ft. per minute fast return, the speed ratio is 1 to 4 and the stored energy 1 to 16. Neglecting the retarding effect of friction, the platen will move 16 times as far on high speed after the shifting mechanism has been operated, as it will move on slow speed, if no braking force were provided.

Effect of Reverse Speed on Production

A check on the effect of speed of a reversing machine on production can very readily be obtained in most shops on a reversing planer when working on short stroke.

On approximately 24-in. stroke and less, more strokes per minute will be obtained when working the machine at the slower speeds. On one particular planer with a 20-hp. motor, 12 per cent increase in production was possible on the slowest motor speeds, compared to the highest speeds, when working on a 20-in. cut.

The method of gearing the motor to the machine, and also the motor speed, may have a considerable effect on the operation. On a certain machine having a 50-hp., 750-r.p.m. motor geared to a shaft running 375 r.p.m. the stored energy of motor and gears was

Motor armature	14,800 ft.lb.
Motor pinion	1,640 ft.lb.
Gear on shaft	3,821 ft.lb.
Total drive energy	20,261 ft.lb.

By using a 375-r.p.m. motor, the stored energy of the gear and pinion are eliminated and the slower speed motor will have a stored energy of 6,880 ft.lb. There will be a coupling required between motor and shaft which will have approximately 1,200 ft.lb. stored energy for a flanged coupling, and approximately 800 ft.lb. for a sleeve type coupling. Using the flanged coupling, the total energy up to the shaft is 8,080 ft.lb. or 12,231 ft.lb. less than is obtained in the drive actually furnished. With a different bedplate, the motor could be geared direct to the machine shaft, eliminating the coupling and making a better mechanical arrangement.

The cost of the motor will be greater, due to its slower speed. The cost of the gear and pinion and one bearing will partly offset this. Also, there will be a saving in power due to having slower moving parts to accelerate, and the saving of gear losses. In addition there is a time saving due to the shorter time required to accelerate, stop and reverse the moving parts.

Acceleration of the parts of a machine requires a force sufficient to overcome the friction and to impart energy to the moving parts. If the force is only slightly larger than that required to overcome friction, the time of acceleration will be long. If the force is increased, the acceleration will be more rapid and the time decreased accordingly. The work of acceleration for uniform acceleration in foot pounds is

$$ft = \frac{1}{2}\frac{w}{g}v^2$$

where f is the force, t is time in seconds, w is weight in pounds and v is the final velocity. To this must be added the force to overcome friction. Where rotating parts are considered, the velocity is to be taken at the radius of gyration.

To stop the moving machine, the same amount of work is required as in acceleration. Friction helps stop the machine, so with the braking force equal to the accelerating force, the time of stopping will be less than the time of starting.

Power Loss in Mechanical Drives

In mechanical drives, such as by belts or clutches, there is no convenient way to measure the power requirements, except indirectly by maintenance costs, and by time lost while making repairs. This, while it does not give any engineering data, plainly indicates that there is a power loss in the transmitting devices. With electric drive, direct mechanical connections can be made, and meters can very readily be put in the circuit to indicate or record the power requirements of the machine.

During acceleration, the current of the motor increases as each step of the resistor is short circuited, and decreases as the motor speed increases. Part of the energy drawn from the line is dissipated in the form of heat in the starting resistor, and the balance is performing useful work of acceleration. The usual practice is to consider the useful power half of that drawn from the line. The average power must be found, which can quite readily be done if a graphic meter with proper paper speed for test purposes is available. During dynamic braking, all the power generated by the motor is dissipated in the form of heat in the braking resistor. As the speed decreases, the braking torque will be decreased, and the graphic meter can again be used to obtain the average value of the braking force. The greatest braking force is available when the speed is high and when the stored energy is the highest. As the speed decreases the stored energy decreases as the square of the speed, and thus the braking current is not decreasing as fast as the stored energy.

Having calculated the stored energy and the accelerating and braking forces, or obtained them by test, the time to start or stop the machine is

$$t = \frac{\text{Energy}}{HP \times 550},$$

where t is time in seconds, energy is expressed in foot pounds and the horsepower is the average during starting and stopping. This expression neglects friction. Also a uniform rate of acceleration or deceleration is assumed. Where a stop must be made in a specified distance, we can assume the average speed during braking will be ½ of the normal speed. We can then take the time to stop as equal to the time required to run twice the distance at normal speed. Then the braking force is to be made such as to obtain the required stop, and this is found from transposition of the factors in the last formula, which now becomes

$$HP = \frac{\text{Energy}}{t \times 550}$$

These calculations must be applied with judgment, as they do not take into consideration the strength of the machine parts or the commutating limits of the motor.

Mechanical Requirements of Motor

The mechanical requirements of the motor, besides having a low moment of inertia, call for a strong frame, shaft and bearings, in order to stand the reversals of the armature at frequent intervals. A substantial foundation or base is necessary in order to prevent the gears getting out of line when the motor is connected to the machine by gears. The motor brushes, commutator and armature winding must be sufficiently liberal in design to stand the additional heating due to accelerating and braking peaks of current during the most frequent cycle of operation.

The controller, of course, is necessarily of the contactor type, which is more substantial and requires less maintenance than any other type now available. There are two methods of stopping the motor at the end of each stroke, viz: dynamic braking, and plugging.

Dynamic braking is the method of stopping the motor by the generation of power, using the stored energy as the motive power, and dissipating the electric power in the dynamic braking resistor as heat. Plugging draws power from the supply line to stop the motor, and consequently the power cost per unit of output is greater. On a machine operating on a short stroke, such as a gear shaper or keyseater, the difference in power requirements will be considerable. There will

also be increased wear in the commutator and brushes when a plugging type of controller is used. There will also be a more abrupt stop, as when the motor slows down, more current will flow through the armature, due to lower counter electromotive force. As the motor slows down the stored energy is rapidly reduced and the torque increases, due to the increased current. The result may, in some cases, be such a rapid change in speed as to cause high maintenance of the machine parts.

The rate of acceleration on practically all machines of the reversing type must be sufficiently high to obtain full speed before the tool enters the work, and still have only a short overtravel. With a lower rate of acceleration a longer travel is required to give sufficient time to accelerate the motor and machine, which results in less production.

The contactors on the control panel are controlled by a master switch which is operated mechanically by a shifting mechanism on the machine. This mechanism must operate positively, so as to be sure of the proper motion being transmitted to the master switch. When used on a machine driven by an adjustable speed motor, the master switch must be operated satisfactorily at the slowest speed, and it must not be operated violently at the highest speed. The mechanism should also be designed so that after imparting the necessary motion to the master switch, no further motion will be transmitted to the master switch by the overtravel of the machine. Where this is not feasible, sufficient clearance must be provided so that there is no danger of jamming any of the moving parts. It is preferable that the tripping dogs be the only moving part after the master switch has operated. This condition is obtained in the reversing planer, which is very necessary, as it readily allows the platen to be run out to the end of the bed to remove and set up work.

Use of Limit Switches

It is desirable to furnish limit switches on some machines in addition to the master switch, in order that a failure of the shifting mechanism will not permit jamming a machine (such as running a plate planer carriage into the frame at the end of the ways) or to prevent a careless operator from running a planer platen off the bed when running the platen to the end of the bed, at which time the master switch may not be operable by the shifting mechanism due to the position of the dogs.

When it is necessary to use an alternating current motor, a special study of each case is required in order to select the correct equipment. The characteristics of alternating-current motors make them less suitable for reversing applications than direct-current motors. The starting torque is lower; the starting current is much higher; and dynamic braking is not obtainable without complicated equipment, including a source of direct-current for use in the motor windings during the braking period. The low starting torque necessitates a larger motor frame in order to obtain a reasonable rate of acceleration. The high starting current limits the frequency of operation due to the heating of the windings. As dynamic braking is not usually feasible, a plugging controller is necessary.

A careful consideration of the various details with respect to their effect on the operation on the machine and its rate of production will result in a more efficient tool, more satisfactory electrical equipment and higher production. This is especially important in the case of the older tools that are changed over to electric drive by the user.

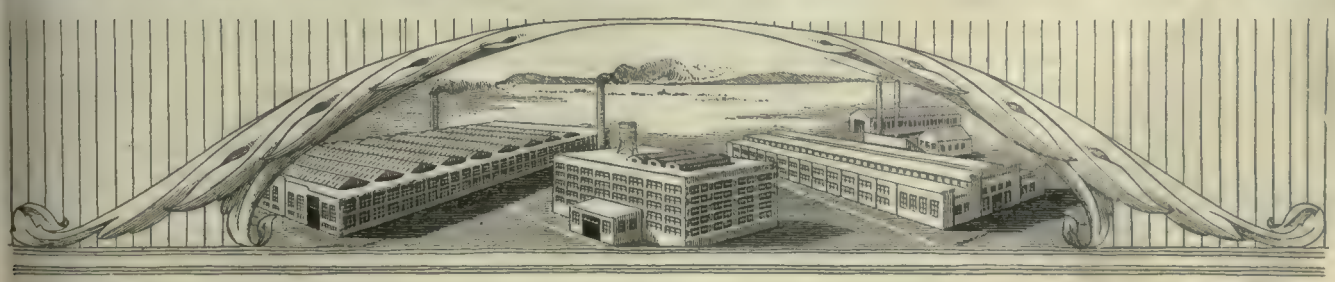
Using Trade Magazines to Capacity

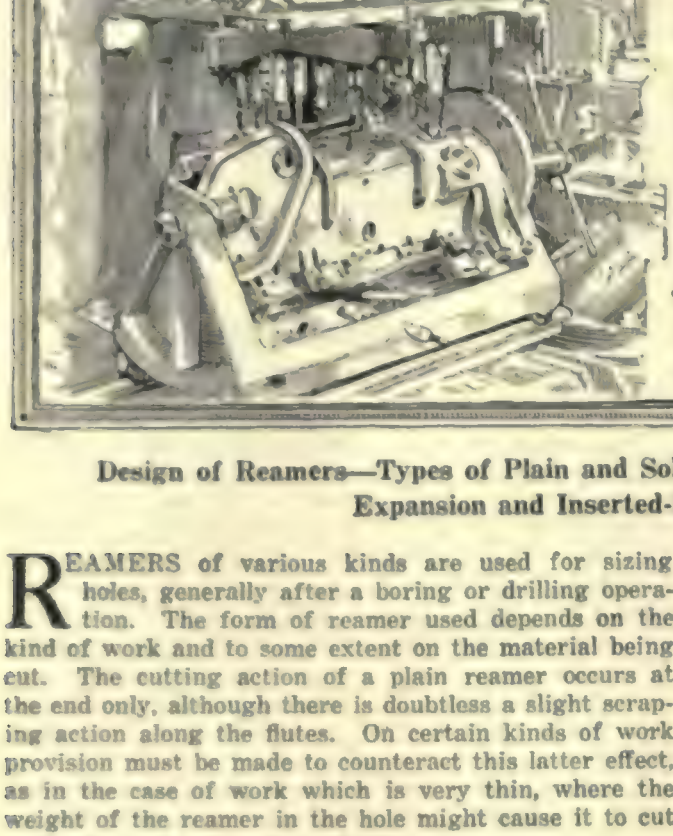
By Frank Szabo

The articles dealing with the use of trade magazines, which have appeared in American Machinist recently, are very interesting so far as they go. But why stop at the end of a list of executives who are to read the technical magazines? Why not be generous enough to give subordinates interested in technical subjects a chance to make use of these ideas? The magazines offer many good and worth-while suggestions which are of no interest to executives, but would be very helpful to tracers, detailers, machinists and electricians. Even though the suggestions are of no immediate use, they may be jotted down in a note book for future reference.

I remember an instance where technical magazines after making the rounds of executives, were torn apart and articles indicated for reference were marked, indexed and cross-indexed, while the balance was thrown away. But only a few remembered, when in need of information, that such a thing as a clipping file existed. Then one day, when a change in the office arrangement made it necessary to acquire additional space, the clipping file was discarded, together with a large number of unfiled magazines. Thus many articles valuable to a draftsman or machinist went to the paper baler. Among the articles that were not filed, because they did not interest executives, were series entitled: "Engineer's Study Course," "Principles of Magnetism and Electricity," "Electrical Study Course," from *Power;* and "Cam Design" in the American Machinist, and many others. How much these articles would have helped the ordinary employee seeking enlightenment on such subjects, I leave the reader to imagine.

Many of the articles that interest executives today are stale and of no use whatever in a very few years from now, for systems and methods seem to change as fast as fashions. But the simple drafting room or machine-shop kink printed in these magazines may be as helpful in ten or twenty years as it is today. Therefore, I suggest again, give subordinates a chance to receive some of the benefits derived from technical magazines.





Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
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Design of Reamers—Types of Plain and Solid Reamers—Core Drills and Rose Reamers—Expansion and Inserted-Blade Adjustable Reamers

REAMERS of various kinds are used for sizing holes, generally after a boring or drilling operation. The form of reamer used depends on the kind of work and to some extent on the material being cut. The cutting action of a plain reamer occurs at the end only, although there is doubtless a slight scraping action along the flutes. On certain kinds of work provision must be made to counteract this latter effect, as in the case of work which is very thin, where the weight of the reamer in the hole might cause it to cut and enlarge the diameter slightly.

A reamer must be considered not as a generating but as a sizing tool, and the accuracy obtained by its use is dependent upon a number of factors. The design of the reamer is influenced by the size of the hole, the material to be cut and the general conditions connected with the holding and driving of the reamer itself.

The following points are of importance in connection with reamer design:

(1) The diameter of the hole to be reamed has an effect on the design. For a small hole it may be necessary to make a solid reamer, while for a larger hole blades inserted in a body can be used and suitable adjustments provided. The size of the hole controls the number of flutes in the reamer, or the number of inserted blades which are used. The length of the hole which is to be reamed is likely also to affect the design of the reamer to some extent. A reamer used for a long hole may require a pilot, while a short hole can be reamed by means of a plain reamer without a pilot.

(2) The material to be cut affects the design, both as to the number of flutes in the reamer, the angle of the cutting edge, its relief, back taper and the method of support. A reamer may be straight or tapered; it may have straight or spiral flutes; the teeth may be equally or unequally spaced, according to the material being cut. The teeth on reamers used for steel and cast iron are generally on center, while for brass they are sometimes cut slightly ahead of center. Occasionally square reamers or scrapers are used for fine finishing, particularly when the material is brass. In reaming babbitt metal, the end of the reamer is often ground tapering for about ½ in., the taper starting at the diameter of the hole generated by the boring tool. By using this method a smooth hole free from lines and rings can be made. In order to avoid chatter, left-hand helical fluting is recommended.

(3) The reaming allowance, or the size of the hole into which the reamer enters, is quite important. In certain kinds of materials such as brass and malleable iron, a reamer should have more stock to remove than in steel and cast iron. Unless a sufficient amount is left for the reamer to remove the cutting action is not good, and after the hole has been finished it will shrink and be undersized. When using only one sizing reamer for steel or cast iron, the amount of metal removed varies from 0.005 to 0.015 in., depending somewhat on the diameter.

It must be remembered that the size of the hole in production work depends for its accuracy to a great extent on the finishing reamer having the same amount of stock to remove in each case. Hence, boring tools or other cutting tools used prior to the reamer must be so made that they will leave the hole the same diameter.

A roughing reamer should always be preceded by a single-point boring tool or its equivalent, in order to generate a true hole. On very accurate work, both roughing and finishing reamers can be used. When they pass entirely through the work, it is possible to place both reamers on one bar, although the first reamer should be entirely through cutting before the second one enters the hole.

(4) For convenience in calipering, reamers are usually made with an equal number of teeth. These teeth are spaced an unequal number of degrees apart in order to prevent "chatter." This is a very important matter, as only once in each revolution are all the teeth in duplicate positions. Reamers are often made with left-hand helical flutes, which construction prevents chatter to a certain extent, and at the same time prevents drawing in. This type, however, is much more difficult to grind.

(5) Adjustable reamers possess many desirable features, but there are few, if any, that can be adjusted to cut a given diameter of hole without grinding the cutting edges each time the adjustment is made. This fact should not, however, be considered as an argument against reamers of this type, as their economy is well known, and it is certainly easier to reset and regrind

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a reamer than it is to make a new one. There are several types of adjustable and expansion reamers on the market, and they can often be adapted for use with special bars in turret-lathe operations.

Reamer Details

Some of the points of importance in connection with reamer design are brought out in the various diagrams shown in Fig. 329. The example at *A* is a sectional view through a reamer *B* and clearly shows the cutting action of the tool. In this example, the reamer is a 6-flute type having flat-relieved teeth, as shown in the detail at *C*. The teeth may be relieved eccentrically, as shown at *D*, and it is claimed that this method of relief gives a somewhat stronger tooth. An additional advantage is that it reams a smoother hole, because there is no chatter. Reamers of this type are sharpened by grinding on the face of the flute; and, as the

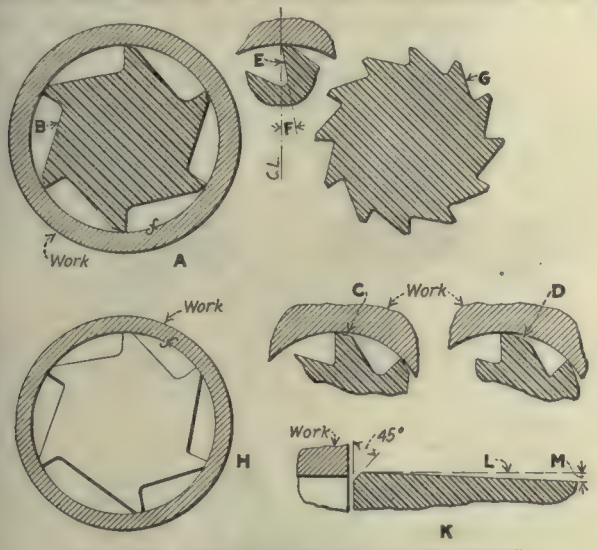


FIG. 329. DETAILS OF PLAIN REAMERS

relief is eccentric, a working size is retained for a longer period than on the flat-relieved type.

In the diagram at *E* the flute is shown in undercut form, as indicated by the angle at *F*. This practice is not generally followed, the flutes ordinarily being cut either on center or slightly ahead of center, depending upon the material which is to be cut. The number of teeth for a given size of hole must be proportioned according to the diameter of the hole. In the example at *B* there are six flutes, while in the sectional view at *G* twelve flutes are shown. In considering the number necessary, the purpose of the flute must be thought of. First, the flutes are made in order to provide a series of cutting edges; second, they allow space for chips, so that the latter will not roughen the work; third, they allow lubricant to pass between the teeth and assist in the cutting action. The number of teeth, therefore, should be proportioned so that sufficient chip clearance is provided, so that the reamer has sufficient bearing on the inside of the hole to produce a smooth piece of work, and so that there is sufficient depth to the flutes to enable lubricant to readily enter when necessary.

Manufacturers of reamers have established a more or less uniform practice in regard to the number of flutes in reamers to be used for various diameters. The designer can easily ascertain the number of flutes commonly used by reference to a small-tool catalog, and it is advisable to adhere closely to standard practice in this regard. In the example shown at *H*, the teeth of the reamer are spaced unequally in order to prevent chatter.

There are two methods in common use for spacing reamer teeth. One of them is to space all teeth a different number of degrees apart, from one to two degrees being considered a sufficient variation. There is an objection to this method on account of the difficulty of measuring the reamer, but this can be obviated by soldering a piece of brass in one of the flutes against the cutting edge. This piece will be ground with the reamer blades and measurements taken at this point. The other method is to make the teeth on one-half of the reamer unequally spaced, and follow out the same procedure on the other half in such a way that the teeth will be opposite each other.

The teeth of a reamer are usually beveled to about 45 deg. on the front end, as indicated in the diagram at *K*. For steel and cast iron the cylindrical portion of the reamer may be ground straight, as indicated by the line at *L*. For brass work or other soft materials, a slight back taper is often used, as shown at *M*. This construction prevents roughing up the hole, and gives a smoother result.

Different kinds of work require different types of reamers. Several forms are shown in Fig. 330. The example at *A* illustrates a plain type of hand reamer which is not generally used in a machine. It is practically square on the end, and is usually tapered for a part of its length so that it will enter the hole and center itself when in use. This tapered portion may extend from ½ to 1 in. from the end, according to the size of the reamer. Teeth in hand reamers are generally somewhat closer together than those used for machine reaming, as the amount of stock removed is small and chip clearance is not as important.

The tool shown at *B* is sometimes called a four-lip reamer, but as generally used, the term "core drill" is more nearly correct. This reamer is of the shell type and has a taper hole at *C*, so that it can be slipped on to a bar and driven by a key or tongue in the slot at *D*. The flutes are cut on a right-hand helix and a consid-

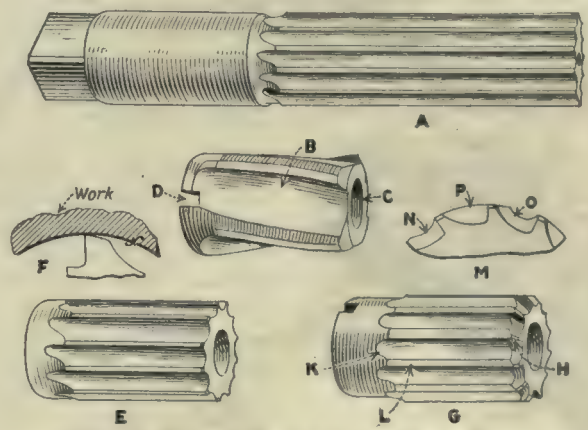


FIG. 330. TYPES OF SOLID REAMERS

erable amount of chip clearance is provided. In removing the stock from a cored hole, this tool is useful, but it is not intended to ream a hole accurately, although with careful usage very good results can be obtained by it. When properly used, it is preceded by a boring tool so as to generate the hole for a short distance.

The example shown at *E* is a plain shell reamer designed to be slipped on a bar and driven by a pin or

key. This form of reamer is commonly used for many kinds of sizing operations on turret lathes and other machines. The flutes may be either straight or helical, but if the latter, they are usually milled on a left-hand helix of long lead. Helical reamers are less likely to chatter than those which are straight, but they are

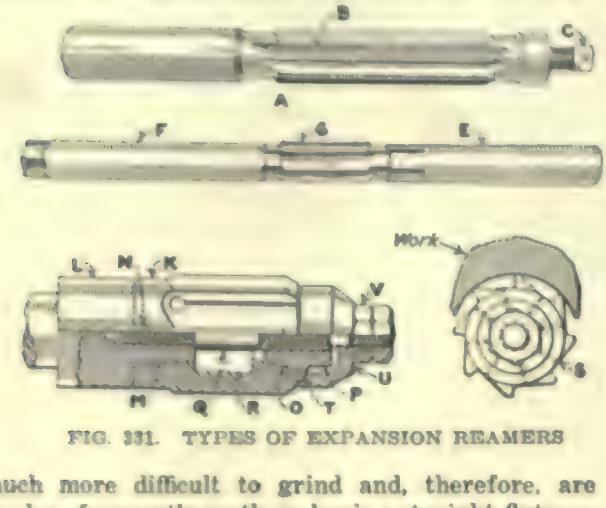


FIG. 331. TYPES OF EXPANSION REAMERS

much more difficult to grind and, therefore, are not used as frequently as those having straight flutes.

The cutting action of a reamer of the sort shown is on the end only, as previously mentioned. If ground properly, there should be no great danger of cutting holes which are oversize; but as there are several conditions to contend with, certain classes of work may require another type of reamer in order to preserve the sizes accurately. The diagram at *F* shows the position of the teeth in relation to the inside of the hole; and it is apparent that there is a possibility of a scraping action being produced here, which will naturally enlarge the hole slightly.

The "rose" type of reamer can be used on thin work when the hole must be held closely to size. An example of this variety is shown at *G*. The distinguishing difference between a rose reamer and a plain shell reamer is in the cutting of the flutes. In the rose reamer there are, strictly speaking, no flutes, but rather grooves through which lubricant and chips can be carried. The purpose of a rose reamer is to provide a tool which will positively cut only on the end, and which will obtain a cylindrical bearing inside the hole, without the possibility of any scraping or cutting action on the edges of the flutes.

Rose reamers are made in several ways, but their essential principles are the same. In the example at *G* the cutting lips at *H* are made at an angle of 45 deg. with the end of the reamer, and they extend back only a short distance. Shallow grooves are cut as indicated at *K*, these grooves being somewhat narrow so as to allow a land *L*, which acts as a bearing on the work between the grooves. In some cases, teeth are cut on the end of a rose reamer and grooves are provided at every alternate tooth only, instead of making them at every tooth.

The enlarged view at *M* illustrates the appearance of the end of the reamer when cut in this fashion. The grooves at *N* and *O* extend along the length of the reamer, but the portion *P* is solid and is cut away only at the end, as previously mentioned. The cylindrical surface of the body part is not relieved at all, but it is slightly back tapered. This taper should not exceed 0.001 in. per inch of length. Due to its cutting action, the rose reamer is likely to produce a hole slightly larger than the actual diameter of the reamer, and for this reason it is usually ground slightly smaller than the hole for which it is intended.

Expansion reamers are useful for cases when a hole very slightly larger than standard is to be reamed. In assembly work, when parts fit a trifle too closely this type of reamer is often used to remove a very small amount of metal, thus providing sufficient clearance in the hole. Ordinarily they are not considered as production tools, because the adjustment permissible is very small, and they are otherwise unsuitable. Fig. 331 illustrates several types of expansion reamers. They are usually hand operated, but it is possible to utilize them in connection with a holder, if this is found desirable.

In the example *A* several slots *B* are cut by means of a saw between the flutes of the reamer, in order to provide for a small amount of expansion. A taper plug which acts upon an angular surface at the center of the blade is controlled by movement of the screw *C*. By means of this screw the plug can be adjusted so that it will expand the diameter over the blades a few thousandths of an inch. Reamers of this kind may be made long and piloted at each end, as shown at *D*. When

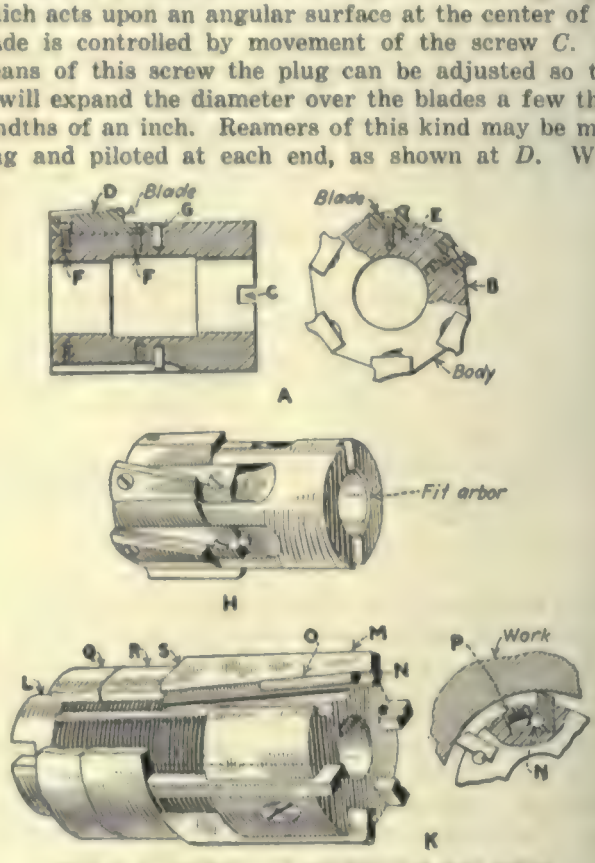


FIG. 332. TYPICAL ADJUSTABLE REAMERS

used in this way, the portion *E* is made to the diameter of the hole as it is before reaming, while that at *F* is proportioned to the size of the expanded part in the middle. For use in aligning two holes which are separated, reamers of this kind can be used. The method of expanding the portion *G* is similar to that previously described.

Various adaptations of these forms of expansion reamers can be made, the conditions under which they are used governing the design to some extent. It must always be remembered that the latitude of these tools is very small and that they should not be used in place of adjustable reamers except in cases of emergency.

Another type of expansion reamer having considerably more latitude than those previously described is shown at *H*. In this example the reamer body *K* is adapted for attachment to a shank *L*, so that it can be used for production work. The body is of shell form,

as shown in the sectional view. It is fitted to the pilot *M* and driven by means of a tongue and slot, as shown at *N*. The front end of the reamer is bored out to a taper at *O*. In this taper the conical plug *P* is carefully fitted. A stud *Q* extends through the hollow center of the reamer and is screwed into the holder.

The body of the reamer is relieved at *R* and split between each of the flutes, as shown in the end view at *S*. This is done to permit easy expansion. The end of the reamer is tapered at *T*, and a collar *U* fits over this taper. In adjusting the reamer for a given diameter, the collar and the two nuts at *V* are removed. The taper plug *P* is then screwed up by means of a spanner wrench until the proper diameter has been reached, after which the collar *U* is replaced and the nuts *V* set up and locked. This type of expansion reamer is capable of considerably greater adjustment than the others described, and may be used occasionaly for manufacturing or production work.

Adjustable Reamers

A solid reamer after it has been worn must be reground and used for a smaller diameter. Reamers with inserted blades, however, can be adjusted and reground to the same diameter for which they were originally made. Hence, this type of reamer is to be preferred on account of its upkeep, although the first cost may be slightly greater than the solid type of reamer.

Adjustments of inserted blades may be made in several ways. A very economical type is shown in Fig. 332 at *A*. The body of this tool *B* may be made up in any form, either as a part of a bar or as a shell like that indicated. In the latter case, it can be applied to a suitable bar and driven by means of the slot at *C*. The cutter blades shown at *D* are inserted in slots cut in the body of the tool at *E*. They are held in place by means of the screws *F*. A pin is provided at *G* to take the thrust, so that it will not be carried by the screws. When a tool of this sort is made, the blades are placed in position and firmly secured, after which the reamer is ground in the regular way. After they become worn, the blades are removed and paper or metal "shims" are inserted under the blades, which are replaced and reground to the right diameter.

Blades may be cut straight or helical, according to the requirements. An assembled view of a reamer of this type having helical flutes is shown at *H*. The advantages of this construction are the facts that the blades and bodies can be standardized and made up in quantity, the up-keep of the tool is excellent, and the cost is not excessive. Shims of various thicknesses, either of paper or metal, can be made up so that they can be slipped in when needed.

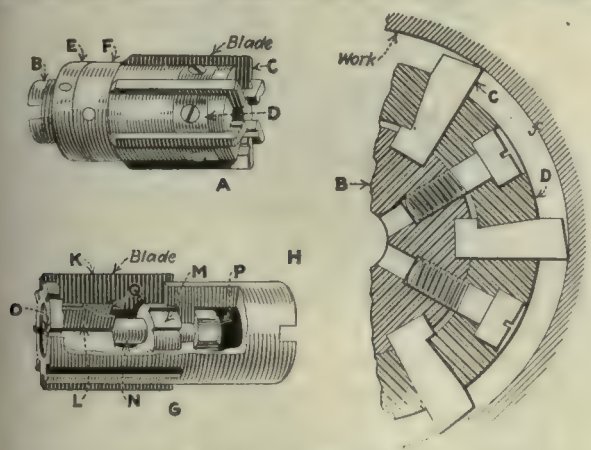


FIG. 333. OTHER ADJUSTABLE REAMERS

Another type of adjustable reamer is shown at *K*. In this example, the body of the tool *L* is of standardized shell form having an internal taper which fits a standard shell reamer arbor. Slots are cut in the outside of the body to receive the blades *M*. The slots are back tapered and the blades fit them accurately. On one side of each blade is a groove *N*, and in this groove a round hardened pin *O* is placed. This pin is forced over into the groove by means of the screw at *P*. The action not only tends to hold the blade down firmly, but also throws it over against the solid portion of the body, thus making a very rigid construction.

Adjustment is provided by means of the two collars at *Q* and *R*. The collar *R* is undercut at *S*, so that it fits over the beveled end of the blade and assists in holding down this end. The collars are set up in making an adjustment, thus carrying the blades of the reamer forward and at the same time outward. After this is done, the blades can be reground if desired. A decided advantage in this type of reamer is the fact that the blades move forward and are ahead of the body of the tool. There are no other projecting parts to catch chips or cause trouble. The blades always cut clean to the bottom of the hole.

In Fig. 333 are shown two other reamers of the adjustable type. In the example *A*, the body *B* is of shell form standardized to fit shell reamer arbors. Slots are cut in the body to receive the blades *C*. The method of holding the blades is by means of shoes shown at *D*, these being set in an annular groove around the body of the reamer. Their action when set up tends to pull the blades firmly down into their seats, and at the same time carry them over against the solid portion of the body. The construction is clearly shown in the large sectional view. Adjustment is obtained by means of the two locknuts at *E* and *F*, the latter being cut out in angular form so that it fits over the beveled end of the blade. The slots which receive the blades in this reamer are tapered toward the front end, so that smaller diameters are obtained by moving the blades forward and larger diameters by moving them backward. After setting, blades can be ground to diameter if desired.

Another type of adjustable blade reamer is shown at *G*. In this variety, the body *H* contains a number of slots which hold the blades indicated at *K*. These blades bear solidly on the hardened and ground cam faces at *L* and *M*. In adjusting the blades, the cam bolt *N* is revolved by means of the slot in the end, shown at *O*. This causes all the cams to act equally on both ends of all cutter blades. When the desired diameter is reached, the locknut *P* is tightened with a special socket wrench. The angular lug on each blade is acted upon by the under-cut portion of the cam bolt, as shown at *Q*. After tightening the locknut *P* the reamer is ready for use, or it can be reground if desired.

Adjustable reamers can be set without regrinding in some cases, but it is usually found advisable when great accuracy is required to set slightly larger than the required diameter and regrind to exact micrometer sizes. The various types of adjustable reamers shown here are thoroughly practical and extremely useful for production work. They are economical in use, and new blades can be purchased from time to time after the old ones have become worn to the maximum permissible amount.

Drilling Six Sides of Meter Frames

Twelve Duplicate Jigs Used in Batteries of Six—Machine Table Indexed—Jigs Turned Over and Accurately Located by Guides and Stops

By W. F. SANDMANN

ODD-SHAPED castings in which it is necessary to drill a number of holes from a half dozen or more sides many times become the production engineer's prize "white elephants."

The eastern plant of a large electrical goods manufacturing concern had just such a casting in the form of



FIG. 1. SPECIAL SET-UP ON MULTI-SPINDLE DRILLING MACHINE

a meter movement frame which was produced in large quantities. The frames have a total of fifteen holes of various sizes that are so scattered around as to make it necessary to drill different ones from all six sides of the piece. On account of the relationship of the various holes to each other, it is imperative that they all be drilled before the piece is removed from the jig.

When the problem was first taken under consideration it appeared that several drilling machines would have to be used in order to attain a satisfactory production, and the jig would either have to be passed along from one machine to the other or else each operator would have to make a number of drill changes to complete the piece. Floor space was at a premium at the time and the number of machines required would occupy a lot of valuable room. To pass the jig from machine to machine would entail considerable handling and for the operator to have to change drills after every two or three holes would mean that it would be impossible to set the machine to a stop for any drill, and yet it was necessary to do this in order to drill many of the holes to an accurate depth.

The engineers of a prominent machine tool manufacturer came to the rescue, and the unique set-up shown in Fig. 1 was installed to circumvent the difficulty. A multiple spindle drilling machine was used in connection with a rotating table and twelve duplicate box jigs. Six of these jigs can be seen under the drilling head of the machine while the other six are at the front, or loading position, of the table.

The six jigs that are under the head of the machine and in the drilling position each have a different one of their six sides turned upward. At every downward stroke of the drilling head a total of fifteen holes are drilled; which is the equivalent of one completed frame. When the drilling is completed the table is indexed 180 deg. which places the six jigs that have been in front at the back of the table and in the drilling position.

In Fig. 2 is shown a close-up view of the table with all the jigs on it. While the drilling operation is being performed on the rear six jigs the operator removes the jig from position six on the front of the table and unloads a completely drilled frame from it. The jig in position five is then turned a quarter turn to the right which drops it into position six; the jig in position four is turned a quarter turn into position five; the jig from position three is brought forward, turned and set in position four; jig two goes to position three, the jig in one goes to position two, and as a consequence position one is vacant. The operator loads an undrilled frame in the jig that he has just removed from position six and places this jig back on the table in position one. By this time the drilling on the rear side of the table is completed and the table is indexed 180 deg. again.

It can be readily understood, therefore, as each jig passes through all six positions before being unloaded, and as a different side of the jig is turned up in each position, that when the jig is removed from the table at position six the frame in it will be completely drilled on all of the six sides. As the table is indexed and a jig unloaded at each downward stroke of the drilling head it is evident that each stroke is equivalent to the drilling of one frame on all six sides.

In Fig. 2 the turning blocks *A* can be plainly seen. They are rounded to facilitate the easy turning of the jig from one position to another. The guides *B* locate the jigs and they are also pushed up against the back of the turning block which acts as a locating stop.

In Fig. 3 is shown the guides and stops from the side.

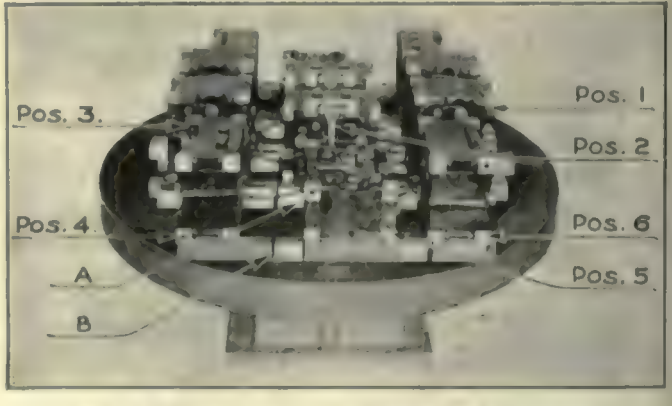


FIG. 2. HOW THE JIGS WERE ARRANGED

The frame before drilling is shown at *A*, and after drilling at *B*. The details of the compact box jigs can also be seen in this view. Hardened and ground feet *C* are located at each corner of the jigs and are ground so that there is about ten thousandths of an inch clearance where they fit in the guides at *D*. This clearance allows the jigs to have a chance to shift slightly when the drills enter the bushings so that if the distance from

the bushing centers to the feet are not the same in all cases there will be no chance of a drill being pulled to one side and broken.

It will be noted that the guides are spaced differently. This is done because the jig is turned end over end down one set of guides and side over side on the other set, and the length of the jig is greater than the width.

The frames are located in the jigs from the milled faces *E* and the lids are closed and locked by a quarter turn of the catches *F* engaging in the slotted locking posts *G*. The two thumbscrews *H* are then tightened down holding the pieces firmly in place against the drill thrusts from all the six sides.

The machine used is a "Natco" universally-adjustable

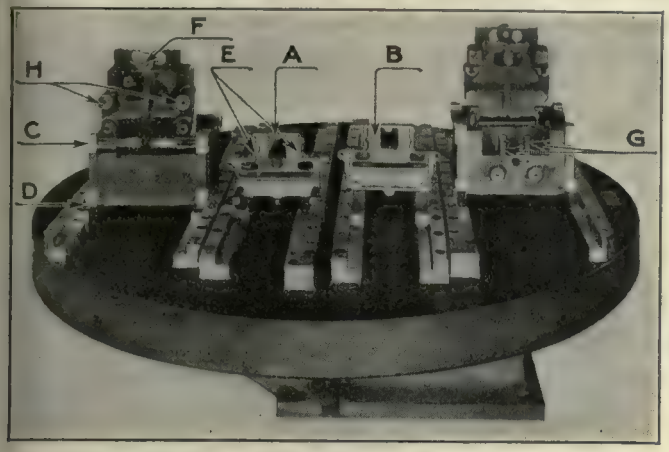


FIG. 3. THE JIG GUIDES AND STOPS

multiple-spindle drilling and tapping machine. The spindles of the machine have approximately 2 in. of vertical adjustment which takes care of the different drill lengths and hole depths, and each spindle is provided with an independent speed change so that the various drills run at proper speeds.

The drilling time is approximately 45 sec. which allows the operator time to perform the necessary unloading, loading, and turning operations. The indexing of the table requires about five seconds additional. A production of approximately seventy completely drilled meter frames per hour can be obtained with the equipment and set-up described.

Why Use High-Speed Steel in Hand Operated Tools?

By Harry Senior

From time to time I notice in your columns descriptions of reamers, taps and special tools, devised to meet emergency conditions and intended to be operated by hand, the blades or cutting points of which are to be made of high-speed steel.

For the edification of an old gray-haired veteran who "learned his trade" in the days following the close of the Civil War and who has spent the useful years of his life in chasing after the procession, will you explain to me why high-speed steel is always specified? Is the younger generation so swift in its movements that the temper of ordinary carbon steel will be drawn in hand operated tools; or is it laboring under the delusion that high-speed steel will longer retain its keenness of edge and consequent sizing and finishing capacity at slow speeds and under more severe usage than the old fashioned kind?

What Are the Worker's Prospects in the Machinery Building Industry?

By Carl Wischmeyer

Referring to an article under the above title on page 667, Vol. 55, of American Machinist, I cannot agree with the author, Mr. Forbes, in some of his ideas. He shows, by means of curves, the wages which he thinks may be expected by various types of men in the machinery manufacturing industry and he puts the technically trained man consistently lower than the non-technical man.

There is no doubt that the man who goes to college spends money for four years, while the other man earns money during this same time. Also it will be conceded that the college man, for the first few years after graduation, will earn less than the man who has had four years or more start in practical shop work. No technical college, I believe, claims to turn out a finished product. The college course is more in the nature of a foundation on which to build a successful career. But two or three years after graduation the college man's earnings increase rapidly, and I think the curve representing this should show a more marked tendency upward, toward the right; so much so that the college man's curve should cross and go above the non-college man's within the range of the chart.

In the comparison of college men with non-college men, the mistake is too often made of comparing one man who did go to college with another man who did not. By this method we can make the comparison show whatever we want it to show. If we are arguing in favor of a college education, we can pick out a successful college man and compare him with an unsuccessful non-college man. If we are arguing the other way, we can choose a successful non-college man and compare him with an unsuccessful college graduate. The true comparison should be made on the basis of averages of a large number of men in each group.

After all, the success attained by a man depends on the type of man he is. A good man without a college education will be successful, while a poor type of man will be a failure even if he has a diploma. But in the long run I believe that the technically trained man will earn more money than the man without this training, whether in the machinery-manufacturing industry or other lines of endeavor.

The curves shown in the article do not represent conditions as they are but represent the author's views as to what should be expected. It would be interesting to plot similar curves based on actual data, if such data could be secured, and it is my belief that the curves *B'* and *C'* would cross and go above the curves *B* and *C*.

Erratum

In "Practical Helical Spring Calculation," by Alex Taub, on page 179 of American Machinist, there occurred two typographical errors in giving the formula for *F*. This formula is correctly given in the left-hand column on page 182 as:

$$F = \frac{8 \times W \times (D - d)^3}{G \times d^4}$$

On page 181 in the left-hand column, the figure 8 should be inserted in the numerator. In the right-hand column, the letter *D* in the denominator should properly be *G*.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

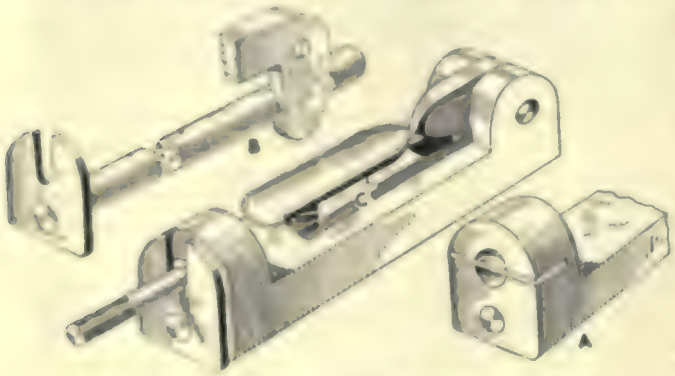
Holding Device for Re-threading Small Screws

BY CHARLES H. WILLEY

Having on hand several thousand gross of 10-32 round-head brass screws 1 in. long with ½ in. of thread, that were rendered useless by the discontinuance of the article for which they were intended, we sought a means of retrieving them for our regular product by running up the threads to the full length.

The little tool shown in the sketch was devised and made by one of our toolmakers, by means of which a boy was able to run up the threads at a rate of about two gross per hour. The tool was held in the hand and the die mounted in a high-speed tapping machine.

The recess in the end of the block *A* was fitted to the contour of the screw head and a steel blade inserted in the cross cut so that it would enter the slot of the screw. The sliding yoke *B* was operated by the bent



HOLDER FOR RETHREADING SMALL SCREWS

lever *C*, which was so placed in the assembled device that the long end came conveniently under the operator's thumb as he grasped the tool.

A coil spring opened the device when the thumb pressure was released and the operator could toss the completed screw into a box and bring the tool into position for reloading with practically a single movement.

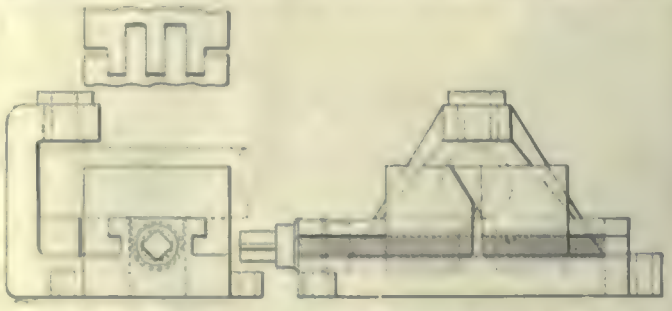
Jig for Drilling Crossholes in Round Stock

BY FRANK M. COAKLEY

On page 79 of AMERICAN MACHINIST, Gus Haessler describes a jig for drilling crossholes in round stock that is a pretty good scheme, but it has one failing in that unless the bushing is made eccentric or adjustable in some manner, the device will not enable the user to drill to center of any other size of round stock than the one it was made for.

Some time ago we had thousands of pins to make, each with a crosshole in each end, and the stock ranged all the way from ¼ to 2¼ in. in diameter. We got out several of the jigs as shown in the sketch, that would handle any size of round up to 3 in. and drill crosshole central without adjustment.

The base was at first made of cast iron, but later we used cast steel for the purpose. The jaws were forged and machined all over, being fitted carefully to the base. A square thread screw that was right-hand



UNIVERSAL VISE FOR HOLDING ROUND STOCK TO DRILL CROSSHOLES

at one end and left-hand at the other was made to operate the jaws, and when the fixture was ready to assemble, a piece of round stock with a crosshole in it was placed between the jaws centered with the drill bushing, after which the nuts were babbitted around the screw.

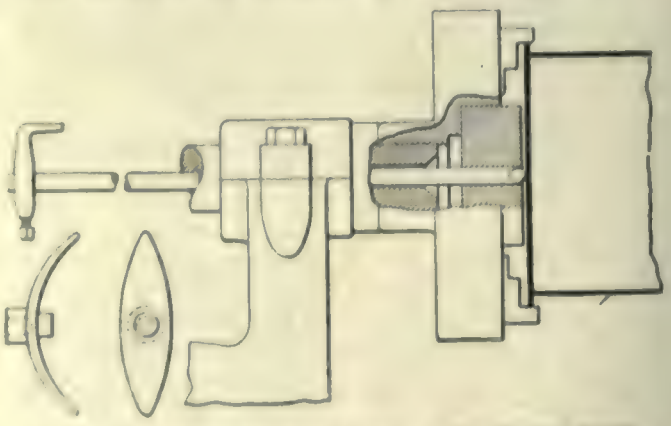
The interlocking jaws held the stock firmly and to center regardless of size, and no adjustment was necessary except to change drill bushings to suit different sizes of drills.

Boring Holes in the Back End of Work Held in a Chuck

BY J. W. THAYER

The sketch shows a method of boring holes on the inner side of work that is held in the chuck, an operation I believe to be unusual but which is effective. Many times work may be finished in one setting by means of this little kink that would otherwise require resetting.

The sketch of the trunnion for a polishing barrel is



DRILLING CHUCKED WORK FROM THE INNER END

an example. The hub can be faced off and the blind hole drilled in perfect alignment with the machined surfaces on the outside of the work, because the two operations are done at the same setting.

The sketch of the sheet-metal drum shows how I did another kind of a job very easily after wasting much time in trying to do it in some other way. The drums were 6 in. in diameter by 20 in. long and were made of 30-gage sheet metal. I had tried laying out, drilling with a small drill and counterboring to size, but this did not work as the drums were so much out of round that I could not get them true within the required limits. For the same reason a jig was out of the question.

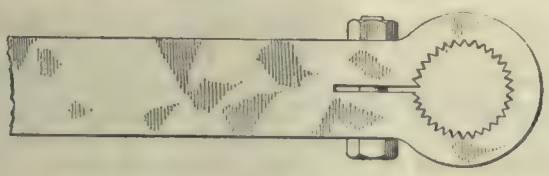
I first bushed the chuck with a brass bushing having a $\frac{3}{8}$-in. hole through it, drilled in position. Then catching the flange of a drum in the jaws of the chuck I would true it up until it ran as true as it was practical to make it. Next I made a $\frac{1}{16}$-in. drill point (left hand) on the end of a piece of $\frac{3}{8}$-in. drill rod that was about 6 in. longer than the lathe spindle. Pushing the rod through the lathe spindle and entering the drill point in the bushing and holding the rod by means of a lathe dog, it was but the work of a few seconds to drill through the wall of the shell, leaving a hole that was perfectly true with the axis of rotation.

By the use of suitable bushings and tools it is quite practical to face off small hubs in this manner and thus save an extra setting of the work.

Who Remembers This Bicycle?

By I. B. Rich

Some of my friends are trying to make me believe that shafts with multiple splines were unknown before the days of the automobile. I have recollections of



SPLINED BICYCLE CRANK AND AXLE

similar shafts at an earlier date but can't say just when.

I have a very distinct remembrance of a bicycle, a high wheel I think, in which the crank was held from turning on the axle by a series of V-shaped serrations. The crank was similarly grooved and pinched on the axle by a binding bolt as shown in the illustration. Who remembers this or a similar application of grooves or splines?

Changing the Drive on a Turret Lathe

By W. F. Honer

The constant manipulation of an overhead friction countershaft equipped with a forward and reverse belt when operating on fast production work, creates a severe hardship on the countershaft and is a continual source of trouble. When threading or tapping operations are conducted on a screw machine, the spindle must be reversed to back off the die or back out the tap, necessitating reversing the countershaft. This continous reversal of the countershaft soon plays havoc with the best frictions, and it was this condition that led the superintendent of the Coit plant of the National Acme Company, Cleveland, Ohio, to devise the following method of eliminating this trouble, making the operating of the machine easier and less tiresome and incidentally increasing production more than 30 per cent.

The output of this plant consists entirely of screw machine product, varying in diameters up to 4 in., and made in large quantities for almost every conceivable product. Many of the smaller parts made in the automatic screw machine department require one or more

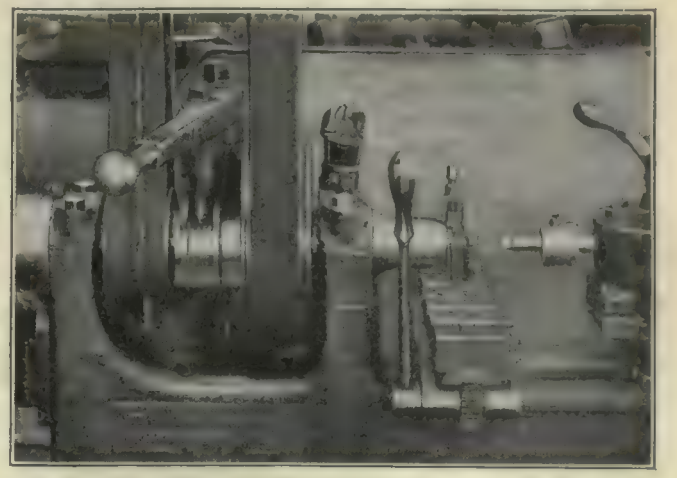


FIG. 1. REVERSING CLUTCH ON TURRET-LATHE SPINDLE

secondary operations on the back or cut-off end of the piece. These operations may consist of milling, slotting, drilling, tapping, threading, etc., and are of a nature requiring the work to be done in hand-operated turret lathes or auxiliary screw machines.

Frequently, these second operations are very speedy and in small brass parts the speed reaches as high as 500 parts an hour. From this can be seen the need of speed in shifting or reversing the countershaft as each part is tapped or threaded and the tools are backed out or off of the piece.

In the arrangement described, the cone pulley on the spindle of the hand machine was removed and in its place an attachment consisting of a Johnson friction clutch with hand lever and a large and small pulley of suitable diameters on each side, was mounted upon the spindle, as shown in Fig. 1. Both pulleys were belted to the countershaft, the smaller for the reverse rotation of the spindle, thus increasing its speed, and the larger for the forward movement. With this arrangement, the reversing friction is directly on the spindle, thereby eliminating the reversing friction countershaft.

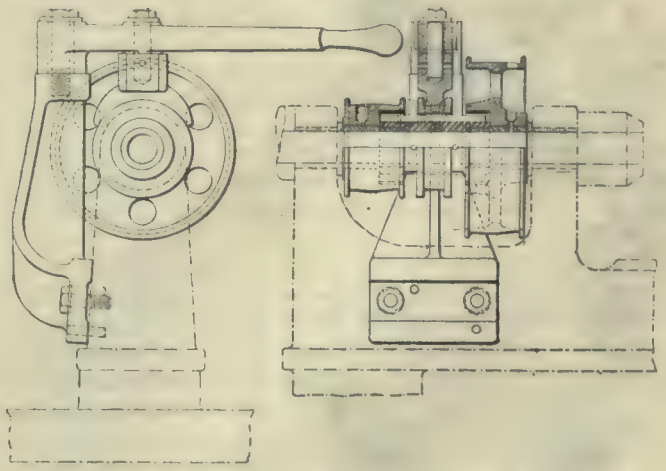


FIG. 2. DETAILS SHOWING APPLICATION OF CLUTCH

Details of the parts and method of application are shown in Fig. 2.

Among the benefits of this arrangement are: The reversing strain is confined wholly to the light spindle; the elapsed time for changing the direction of the rotation of the spindle is greatly reduced, due to the fact that the motion is directly on the spindle; the necessity for the operator to reach up to the shifter is eliminated.

The only drawback is that the operator cannot change the speed of the spindle on his machine. However, in certain second-operation departments in this plant, the nature of the product is such that many machines can be more or less permanently fixed in reference to spindle speed.

The Loose Pulley Nuisance Again

By J. A. Raught

Several articles have appeared lately in American Machinist regarding loose pulley troubles, and as I have had a great deal of experience with such, I feel it my duty to give the results of some of my experiments.

My first method of overcoming the difficulty was with a cast-iron floating bushing on the loose pulley of a speed drill. This scheme worked first rate but the bushing had to be oiled daily, a duty which I was trying to get away from.

My second experiment was on the ceiling countershaft of a heavy snagging grinder. I used a loose pulley with an extra large hub, recessing the hub for an oil chamber. Then I pressed in a cast-iron bushing with several holes drilled in it and filled the chamber full of sheep's wool. This method proved more satisfactory than the former one, as the wool allowed a slow but gradual feed of oil; but in either case if one expects good results the shaft and the bushing must be highly polished to start with.

The third and last method I tried, which proved to be far the best, was a bushing made of hard maple, oil-soaked and pressed in the pulley. With the hard maple bushing the shaft must also be highly polished, as a rough shaft will grind out the bushing in a very few hours. But under all circumstances oil plays the most important part.

Jig For Drilling Crossholes in Round Stock

By F. R. Hammond

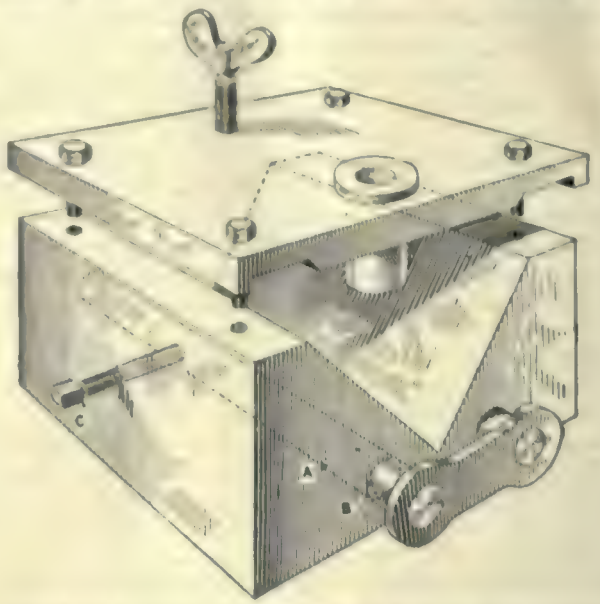
On page 79 of American Machinist there was shown a jig for drilling crossholes in round stock that, though simple and efficient, was limited to one size of stock and crosshole. Further, any variation from nominal size of stock would affect the relative position of the hole.

In the sketch herewith is shown a jig for the same purpose, but which may be used with any size of stock below its maximum capacity and which will enable the user to drill to center any piece it will take irrespective of its diameter.

Little explanation of the sketch is needed. The size of the V-block should be chosen with regard to the maximum size with which it is expected to be used. The cover should be nicely fitted, either by rabbetting as shown, or with dowels by the use of dowel pins so that its position with relation to the V-block may not accidentally be changed.

Bushings for various sizes of drills should be made, each long enough to reach down to the size of stock that is to be drilled, and should be a nice push fit in the cover. The clamp screw in the cover holds the stock.

A reamed hole *A* through the block, in a direction parallel to the V-groove, fits the shank *B* of the adjust-



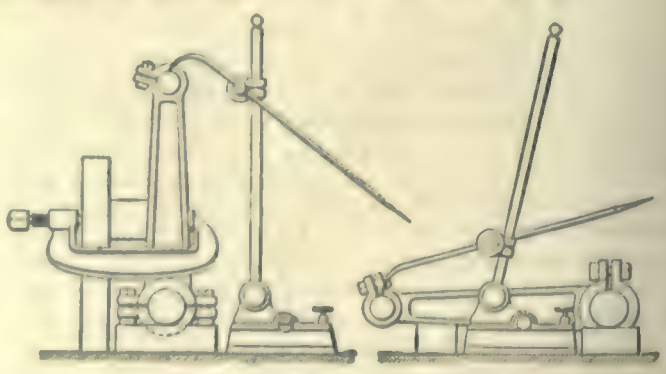
JIG FOR DRILLING CROSSHOLES IN ROUND STOCK

able stop, which may be set to gage the distance that the crosshole is to be drilled from the end of the stock in duplicate work. A setscrew *C* holds the stop to its setting.

Testing Connecting Rods

By G. A. Luers

Special jigs and devices for testing the straightness of connecting rods for engines, represent special and costly equipment which may be applicable to only one length of rod. A simple and satisfactory test for any length or size of connecting rod, may be made with a surface gage and surface plate, which are usually to be found in the smallest of shops. As shown in the attached sketch, two tests of the rod are all that is necessary. To make these tests two blocks of equal height are placed on the surface plate, a mandrel is clamped in the crank end bearing and a wristpin in the small end bearing of the connecting rod. The rod is blocked erect and the surface gage point is applied to opposite ends of the wristpin. For the other test, the rod is blocked in a horizontal position and the surface-gage point again used at the ends of the wristpin. This simple test will give an accurate account of the truth of the connecting rod bearings ends, without special equipment.



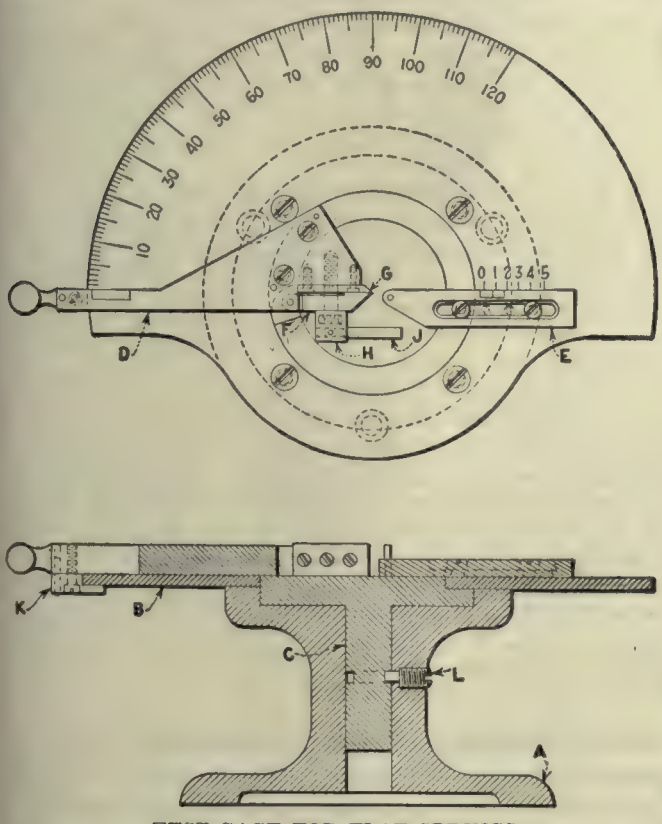
TESTING CONNECTING RODS

Test Gage for Flat Springs

By E. Wilmont LaRue

The design herein described is that of a gage for testing the tensile strength of a flat steel spring that is part of a small mechanism. The stock used for this spring is 2.15 mm. in width and 0.21 mm. in thickness. These springs to be wound tight must have a means of fastening at the ends and therefore have a hole pierced in each end. One of these holes is hooked over a small pin that is driven into piece *E* shown in the illustration.

The construction of the gage is not complicated. The base *A* is made of cast iron and is counterbored and reamed to accommodate piece *C* with a running fit. The machine steel screw *L* is used to keep piece *C* in place. The graduated piece *B* is of machine steel, pack hardened, and is screwed to the base by four fillister head screws. Part *H* is tapped all the way through at



TEST GAGE FOR FLAT SPRINGS

four different angles in the vertical plane, and the small piece *J* acts as a handle and is screwed into the most convenient tapped hole in piece *H*. Lever *D* is machine steel, pack hardened, and is screwed and doweled to *C* by two fillister head screws and two dowels as shown. Piece *K* is made of tool steel, hardened, and is screwed and doweled to lever *D* by one fillister head screw and one dowel. Parts *E*, *F* and *G* are tool steel, hardened.

As explained above, the hole in the end of the spring is hooked over a pin that is driven into piece *E*. The spring is then gripped between parts *F* and *G* by tightening the screw which pivots part *F* on a dowel pin. Piece *B* is graduated in degrees around the outside edge, and graduated into divisions 3 mm. apart horizontally. Part *E* has an elongated slot that fits two fillister head screws and makes adjustment possible. The lever *D* is turned in a clockwise direction which causes the spring or work that is being tested to tighten, and the breaking point is noted on the circular graduations. This test then is really a test of the spring around the hole, where in practice it would probably break.

Part *E* could readily be redesigned to hold work that is not pierced, such as plain, narrow ribbon stock and small gage wire.

A Different Method of Making a Loose Pulley Repair

By J. H. Carnfel

I have often noticed in the American Machinist articles in reference to troubles arising from loose pulleys and the methods employed to overcome them, and am impelled to send you an account of the way in which I effected a satisfactory repair upon a troublesome pulley.

The pulley in question was a cast-iron clutch pulley upon the countershaft of a heavy engine lathe. It was 14 in. in diameter by 4½ in. face and carried a 4-in. belt which had to be kept very tight in order to do its work. The shaft was 3⅞ in. in diameter and the pulley took its bearing directly upon it.

Because of the tightness of the belt the shaft would wear down very rapidly and then there would be difficulty in operating the clutch. To make the repair I necked the shaft down to 1⅞ in. at the place where the pulley had run. I next made a bushing of brass with a bore to run on the 1⅞ in. diameter and turned it outside to 2⅞ in. The pulley was bored to a running fit on this bushing.

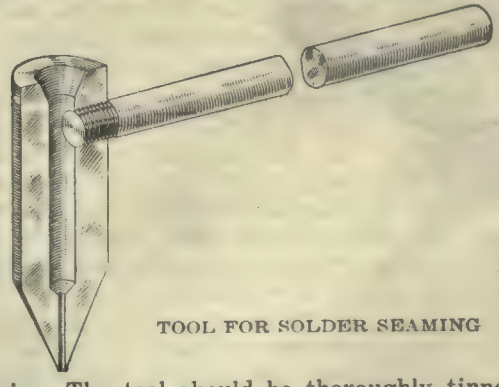
The bushing was then split and set into the necked part of the shaft, the pulley slipped over it, and the collar brought up and tightened to hold it against end movement. This job has now been in service for twelve years and is still doing duty. It is oiled once a week with machine oil placed in a cup in the pulley hub.

Soldering Iron for Seaming

By B. F. Wallace

Having occasion to solder a large number of seams in sheet-metal work, I devised the soldering iron shown in the sketch, which enabled me to do the work rapidly and neatly.

The hole through the center of the tool is about ⅛ in. in diameter, but the outlet at the point should be very small, not over a No. 50 drill, or the flow of molten solder will be too fast and a neat job will be difficult



TOOL FOR SOLDER SEAMING

to obtain. The tool should be thoroughly tinned both inside and outside before attempting to use it.

Though it is probably unnecessary to do so, I will for safety's sake call attention to the fact that soldering "irons" are made of copper.

EDITORIALS

The Cash Bonus Fever Is Checked

THERE is every indication that attempts to enact legislation for a general cash bonus will be unsuccessful. Steadily increasing opposition is having the desired effect on Congress. The feeling of the nation's commercial communities is plainly indicated by the recent referendum taken by the U. S. Chamber of Commerce, which resulted in 467½ votes in favor of, and 1,221½ votes against national legislation for a general bonus, whether paid in cash immediately or with payment deferred through use of certificates. Expressed in percentage, 72 per cent were against and 28 per cent for such legislation.

Some other facts brought out by this referendum cast more light on the state of the commercial mind. The total vote was heavy. Trade associations voted more strongly against the cash bonus than did the member chambers. More small organizations than usually take part in referendums voted. The underlying voting for the legislation was 92,455, against it 282,373, percentages of 25 and 75.

The proper inference is that the country is learning rapidly that the proposed legislation is not sound economically and would do more harm than good.

Data on Machine Fits

FEW who have not been actively engaged in committee work for the securing of data concerning machine practices, can realize the difficulty with which they are secured. This is not so much due to reluctance on the part of the manufacturers as to the inertia they must overcome in getting to work on collecting the data from their files and records. Most manufacturers are perfectly willing to give the desired information but do not always see just how to collect and transmit it.

There is at the present time a committee at work on securing data on the machine fits used in current practice, and they deserve the co-operation of all who wish to advance the standards of machine practice. This is an earnest attempt on the part of busy engineers, who at the request of the American Society of Mechanical Enginners in co-operation with the British Association of Engineering Standards are collecting and collating data which cannot fail to be of great value to the machine building industry.

We have led the way in the development of interchangeable manufacturing but we have not been as consistent in our methods of securing results as would have been desirable. Furthermore the lack of a standard method has added thousands if not millions of dollars to the cost of our products.

This committee has no desire to impose arbitrary standards of any kind. Its members are all practical engineers who appreciate the cost of doing work by various methods. They are giving their time to find the general practices in use, to make this data available in usable form, to the end that the best practice may be available for all who desire to use it.

In no way can the readers of the AMERICAN MACHINIST serve the machine building industry better at this time than to assist this committee by sending the chairman, Colonel E. C. Peck, General Superintendent of the Cleveland Twist Drill Co., Cleveland, Ohio, such data as they have available. Don't wait for perfect tables, send what you can *now*—and send more just as frequently as it comes to you.

A Word for Ship Subsidy

THE crutch now essential to our merchant marine may be forthcoming in the form of shipping subsidies. No one questions the necessity for a merchant marine. In order to have it, some form of help must be given to private ownership, government control having failed convincingly.

From a purely commercial point of view, we shall be vastly better off with than without a merchant marine. The immense over-capacity developed by American industry during the war can be utilized only by being provided with foreign markets for its products. Those markets must be quickly and surely reached, without dependence upon foreign bottoms.

It will take time to make a merchant marine pay. There will be times when ships will travel without cargo, because our merchant organization is incomplete. But, after we have finally recognized our dependence upon export, the merchants will branch out until they will be in every shipping port. In the meantime the ships, since we have them, must be kept ready.

The thought of spending some thirty millions or so per year with a return only distantly in sight, is not pleasant. But it should be considered as a form of national self-insurance.

Don't Overlook Personnel Problems Now

SHOP managers who have found it necessary to drop or greatly curtail their employment departments, will do well to give careful consideration to the personnel phase of management at this time. For while it is perfectly true that men can be hired on practically your own terms, it is well to remember the old saying that "well begun is half done."

Men who are hired in the right manner and with a friendly spirit will be much more content when employment becomes general once more. There is no time like the present to begin the cultivation of harmonious relations. Consideration and human understanding when employment is difficult to obtain, will have a good effect when conditions are changed.

The personal equation will always be the greatest problem in industry and will increase rather than diminish. Broad visioned managers are bearing this in mind, even with the present employment situation and will not make the mistake of antagonizing men, even at this time. A little tact and consideration now, and when re-employing men, will reap big dividends in future relations.

Buying Machinery at the Right Time

By Ernest F. DuBrul
General Manager, National Machine Tool Builders' Association

With the growing knowledge of the operations of business cycles, an increasing number of executives are now giving consideration to the planning of their businesses to run in accordance with the various phases of the cycle, instead of in opposition to those phases. One important element of executive policy is that of the purchase of equipment, which is generally done at the wrong time as a consideration of the cycles will clearly demonstrate.

A statistical study of the shipments of machine tools in relation to the business cycles of the past twenty-one years demonstrates that in years of depression orders for machine tools have been relatively below those of other metal-working industries. These statistics also demonstrate that only after machine tool users become fairly active do they place orders for replacements of old equipment; and they do not place orders for additional equipment until their need becomes very pressing.

Machine tool orders being among the very last demands to be thrown into the market, the machine tool industry has had to stand relatively idle for long periods, waiting for the effects of the rise in each cycle. The costs of these periods of necessary idleness must of course be collected from the buyers, or the machine tool builder would go out of business. This expense of idleness must also make the prices of machine tools relatively higher than prices of products that can be produced more steadily.

When the machine tool business does pick up to a point where its orders enable it to run to full capacity, the machine tool industry finds itself competing strongly with its own customers for material, and, of course, at much higher prices than existed at the bottom of the slump, which was always many months before the machine tool builder's demand came into the material market.

At precisely the time when he gets a fair amount of orders, the machine tool builder also finds himself obliged to bid for labor against his own customers, and his additional demand reacts on the labor market, pushing up wages still more. As prosperity continues or increases, costs rise at a rapid rate with every bid for labor, and with overtime and large bonus rates becoming prevalent. More serious still, the general efficiency of labor declines, and the newer employees are the relatively undesirable and shifting kind. At such times wastes become prevalent because managers are rushed to death, and cannot look after the economies they would desire; all being reflected in costs and prices.

Before prosperity reaches its crest, the new equipment installed becomes ample to supply the market for consumer goods, and machine tool orders fall off. There are some over-optimistic buyers who have over-ordered, and these cancel unfilled orders as soon as they find their own demand not continuing its anticipated increase. The machine tool shops may run for a time on old orders, but they find a serious restriction in new orders long before their customers' own demand falls off. There is a sharp contrast between sales conditions in the shops of the customers and in the machine tool shops; the sales curve of the machine tool industry shows much sharper peaks and longer depressions than that of industries producing metal goods for general consumption.

Cancellations are prevalent at the beginning of every great depression, and such cancellations leave the machine tool builder with large stocks of high cost machines on hand, through no fault of his own. Though he restricts his own production so as to fill only the actual orders that are not cancelled, he still has to suffer from the over-stock he had in process when the cancellations struck him.

According to economic law, the machine tool buyer, speaking generally, eventually pays for all this wasteful loss. If he did not, the machine tool industry would cease to exist. Much of this waste could be eliminated if the buyers of machine tools took reasonable care to anticipate their demands. If, when material prices are low and labor is available, buyers of machine tools would place their orders for their known replacement requirements, the machine tool industry would thereby give employment to men who cannot be employed in the consumer goods industries. Such employment would itself create demand for consumer goods on the part of such men and their families, and would thereby minimize the depression in consumer goods. The machine tool buyer would naturally get the benefit of lower prices.

If this policy were followed, the machine tool industry would save a lot of over-expansion now made necessary by more irregular operation. The larger investment required to take care of a peak demand makes necessary a peak profit, which must come out of the buyers of machine tools. From every point of view the machine tool buyer has everything to gain and nothing to lose by making his improvements and expansions in dull times, when he himself has more time to think about them and when all costs are relatively low.

Every dollar invested in such times is worth more than a larger sum invested later on, when the additional demand merely increases the excessive prices that come with booming.

From the above analysis of fundamental facts, it is plain that any industry that can now anticipate a necessity for improved and additional equipment should place its orders for machine tools before the next period of prosperity gets strongly under way.

What Is the Difference Between a Capitalist and a Labor Leader?

By K. B. Laidlaw

Several years ago we had a bad strike. It was brought about entirely through the efforts of two labor organizers who had a grouch against us for some reason or other. The men finally saw through these gentlemen and came back, while the organizers left town hurriedly.

We heard no more of them until about three months ago when one of them came in to see me one morning. I told him I admired his nerve in showing his face inside our shop. He said he admitted all that, but wanted to buy two of our smaller machines. Any purchaser is naturally welcome, but I advised this one not to let the boys in the shop see him.

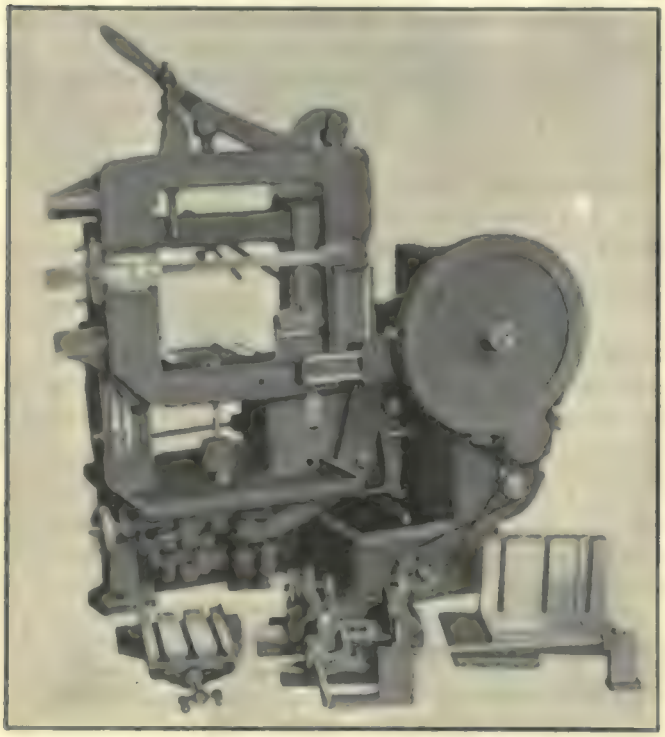
We talked a little and it came out that he had started a small shop on the other side of the town and was doing very well. He employed four or five machinists. "But," I said, "I thought you were a union organizer." "Oh, I was," he replied, "but I'm off that now, I'm a capitalist. I saved up five thousand dollars."

Apparently there isn't such a wide gulf between the labor leader and the capitalist as we are often led to believe.

Shop Equipment News

Peerless Universal Shaping Saw

The machine shown in the accompanying illustration has recently been developed by the Peerless Machine Co., of Racine, Wis., and is designated as a high-speed universal shaping saw. The machine employs a standard hacksaw blade, but incorporates many features, both in construction and method of operation, that are ordinarily found on heavy machine tools such as the milling machine. Accuracy in the construction of the machine and in the work that can be performed is especially stressed by the maker, as well as the adaptability of the machine to many jobs not possible with the ordinary hacksaw machine. Work 6½ in. square in section may be admitted under the blade.



PEERLESS UNIVERSAL SHAPING SAW

The saw blade is carried by a four-sided frame, which allows the obtaining of sufficient tension on the blade without danger of distorting the bearings. The saw frame is held in bearings spaced widely apart, and is reciprocated by a crank and connecting-rod mechanism. On the cutting or draw stroke, the connecting rod is always approximately parallel with the line of travel of the blade, no matter at what height the blade is cutting. As a result of this arrangement, the cutting stroke takes place with the cutting speed somewhat reduced. During the return stroke, however, because of the great angularity of the crank, the frame is returned to its starting point at high speed.

The stroke of the machine is 5½ in., and blades from 10 to 14 in. in length are employed. The speed of cutting is changed by means of cone gears placed in a box at the rear of the machine. Three speeds of 50, 85 and 132 strokes per minute are provided. The machine is ordinarily driven by belt on a 10-in. pulley running at 600 r.p.m. It can, however, be driven by a motor mounted on the rear of the machine back of the saw frame. A 1-hp. motor running at 1,700 to 1,800 r.p.m. is sufficient.

The machine is provided with a positive power-feed mechanism. It should be noted that the saw frame is carried on horizontal bearings or ways on another frame mounted on a vertical slide on the body of the machine. At the end of the draw or cutting stroke, a cam on the crankshaft so operates as to raise the two frames, and thus lift the saw blade clear of the work while it is returning. The cam then lowers the blade to the cutting position. At the same time, a second cam on the crankshaft becomes operative, and through a suitable mechanism, pulls the saw frame down so that a positive feed is given. Adjustment of the rate of feed is accomplished by turning the small handwheel seen in front of the machine near the floor.

When the cut has been completed, the mechanism is automatically disengaged, so that the feed stops and a spring lifts the saw frames to the upper position and stops the machine. It is thus not necessary for the operator to watch the operation of the machine. The machine may also be equipped with a yielding feed, so that if a hard spot is encounted in the work, a shallower cut is automatically taken.

The machine is equipped with a vise of the type ordinarily employed on milling machines. For the performance of angle-cutting operations, the angle fixture allows of placing the work in any desired position. A fixture which adds to the range of the machine is a crossfeed mechanism that may be placed on the table of the saw. Thus a piece of work may be secured to the fixture and fed transversely under the reciprocating saw, which acts very much as the tool of a shaper and produces a smooth finish on the rough surface. Thus, the second or final finishing operation may be made very easily on another machine.

A great variety of work is possible on the machine, and many jobs ordinarily performed on a shaper or milling machine can be quickly accomplished. The attachments aid in obtaining a variety of settings. The offset blade-holding fixture is of use on certain work. The cutting of irregular shapes and the slitting of parts to be clamped in place can easily be performed.

In the base of the machine, there is a reservoir for cooling solution, and a pump and piping are provided for delivering this coolant to the blade. The height from the floor to the vise is 28 in. The floor space is 24 x 43 in. When equipped with the standard vise, the machine weighs 750 pounds.

Monitor "Thermaload" Starter

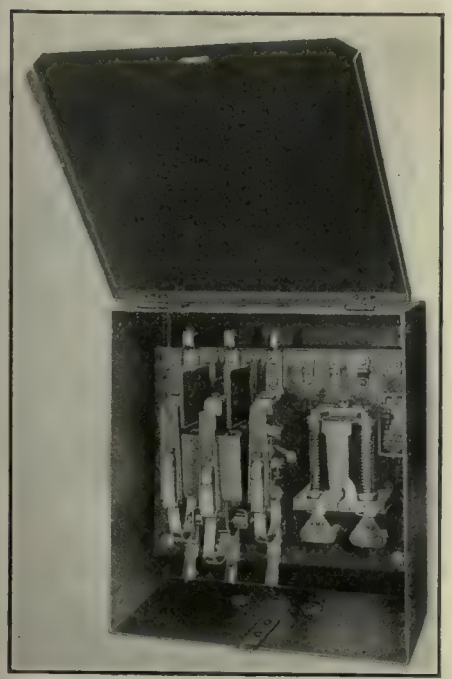
The Monitor Controller Co., Baltimore, Md., has recently developed a thermal-limit starting device for use with induction motors. The device, which is shown in the accompanying illustration, is known as the "Thermaload" starter. It consists of a three-pole magnetic contactor and a thermal-limit relay, both mounted on a

slate panel and inclosed in a metal cabinet which may be locked or sealed. The device is adapted to remote control, and is operated by means of push buttons from one or more points.

The starter gives over-load and low-voltage protection, prevents damage due to polyphase motors running as single-phase, and provides for starting at full current, voltage and torque. It is available in all sizes up to 3 hp. on 110-volt single-phase current, 5 hp. on either 220-volt single-phase or 110-volt polyphase, and 10 hp. on either 440-volt single-phase or 220-volt polyphase current.

The principal feature of the starter lies in the construction and operation of the thermal-limit relay. This relay consists of two expansion units between a fixed support and a hinged contact arm so arranged as to amplify the movement of the expansion unit several times at the contact points. Each expansion unit is a double-walled, tubular receptacle. The inner wall is smooth and closed at one end, while the outer wall is corrugated and closed at both ends. The space between the two walls is filled with tetra-chloride of carbon.

The thermal element which operates the expansion unit consists of a coil of asbestos-insulated wire attached to a piece of insulating material. Although the thermal element is in series with the motor, the voltage drop is slight, and the resistance is very low. Thermal elements of 9 amp. capacity and greater are made of copper wire, and those of a lower capacity of low-resistance alloy. The action of the thermal element in expanding and contracting is, naturally, rather slow and deliberate, and thus prevents breaks due to small fluctuations. Should the line carry too heavy a current, the element would become heated and the expansion member open the circuit. Very brief overloads greatly in excess of the rated load can be carried, as the thermal element requires sufficient time in which to act. Such overloads do not, of course, injure the motor. After the motor has been disconnected by the tripping of the relay, it cannot be started again unless the starting button is pressed.



MONITOR "THERMALOAD" STARTER

The device automatically cares for overheating of the motor that may occur due to the temperature of the room. It can readily be adjusted to open the circuit at the temperature desired. In order to change the apparatus from one rating to another, it is necessary merely to change the thermal element. Due to the simplicity of the construction and the arrangement, this change can be readily performed.

Osborn Stationary Flask-Filling Machine

A machine intended for use in the foundry for filling large flasks is shown in the accompanying illustration. It has recently been placed on the market by the Osborn Manufacturing Co., 5,401 Hamilton Ave., Cleveland, Ohio. The entire machine is self-contained, and stands without any outside support. The frame is made up of structural steel with suitable provision at each end for supporting sprocket wheels. Standard link chains carrying special shaped buckets run on the sprockets, so that sand can be raised from the floor to the top of the machine when the buckets are running.

The sprockets and chain are driven by an electric motor, the capacity of which depends upon the amount of sand to be handled. For lifting 2 cu.yd. of sand per minute, a 15-hp. motor is required. The sand may be taken from the floor level, or from a pit below the floor. The machine operates only during the time required to fill the flask. The amount of wear that occurs is thus slight. Both starting and stopping are easily under the control of the operator by the use of push buttons, located at the end of the discharge chute.



OSBORN STATIONARY FLASK-FILLING MACHINE

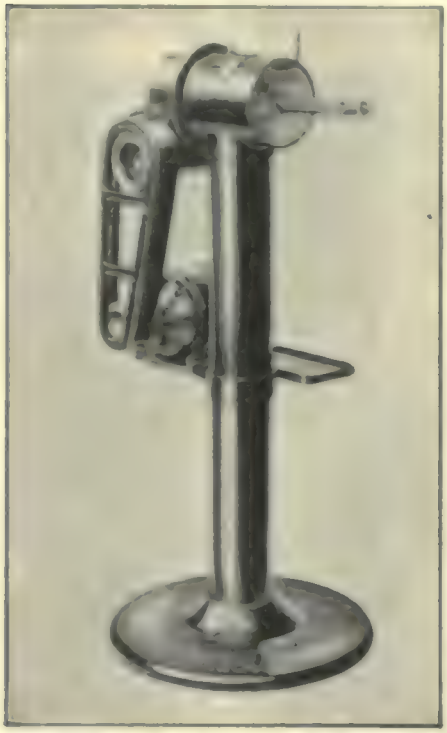
At the upper end of the machine is attached the flexible discharge chute, so located that sand may be spread to all corners of the flask after it has been lifted to the top of the machine by the buckets. Since the machine is stationary, the flasks may be brought to it on small cars. The machine may be made portable, so as to serve a row of molding machines, and thus keep it busy for a greater proportion of the time.

It is stated that a great saving in time is possible by the use of the machine. Since the machine, as shown, is capable of handling 2 cu.yd. of sand per minute, a large flask may be filled in two or three minutes. The time required for two men to shovel the sand into the flask by hand would be about an hour and fifteen minutes. The production of molds may thus be increased by the use of the machine. In one case, as the result of a test, it is stated that the production was increased from five to fifteen molds per day.

Blettner Reamer Driving Machine

The George H. Blettner Co., 1841 W. Jackson Blvd., Chicago, Ill., has recently developed for driving reamers the machine shown in the accompanying illustration. The machine is not intended to supplant larger machines, but rather to furnish power for the reaming operations that are ordinarily done by hand. It is claimed that not only is the reaming time greatly reduced, but also a hole reamed by the steady power drive is smoother than that finished by intermittent reaming as done by hand.

The machine will drive hand, expansion, adjustable or special reamers up to 1½ in. in diameter. The spindle speeds are 10, 20 and 30 r.p.m. The spindle is fitted with a 5-in. Cushman geared scroll chuck. The bearings are bronze bushed. The machine is motor-driven through a hardened and ground worm and wheel, and the end thrust of the worm is taken up by ball thrust bearings. The gear case is oil-tight, with a stuffing box on the wormshaft. Power is transmitted to the worm by a round belt running on a three-step cone pulley. The distance from the floor of the center of the spindle is 38 in., while the height overall is 42 in. The floor space required is 18 x 18 in. The weight is 145 lb. net, and 195 lb. crated. The motor has ½ hp. and can be supplied for either a.c. or d.c. of 32, 110 or 220 volts. The switch is mounted on the machine, and is of a self-contained, tumbler type. An extension cord and attachment plug are supplied. All running parts are enclosed. The finish is baked black enamel.

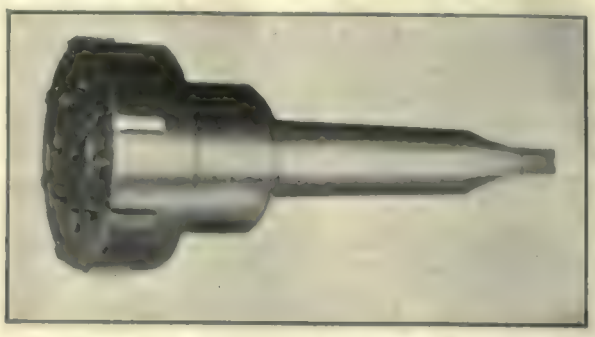


BLETTNER REAMER DRIVING MACHINE

Campbell Expanding Cylinder Reamer

The Campbell Auto Works, 238 N. El Dorado St., Stockton, Cal., has recently placed on the market an expanding cylinder reamer, shown in the accompanying illustration. The tool is intended for re-boring and finishing automobile cylinders. The head screws on a boring bar, so that it can be fitted to any type of cylinder boring machine. It may also be used for turret machines. It has an expansion of approximately ⅛ in. The only tools necessary for making adjustments are a screw-driver and a micrometer.

The adjusting mechanism is concealed inside the head, so that no dirt or chips can interfere with the action. In making adjustments, the blades remain in the same relation to each other as before, and it is stated that they do not need to be reground after adjusting, in order to true them up. The front plate is removed from the head by loosening the eight screws holding it in place. The plate is caused to rise by means of four coil springs



CAMPBELL EXPANDING CYLINDER REAMER

imbedded in the body under it, thus permitting the cutters to slide easily in the slots. By turning the large central adjusting screw, the blades may be forced outward or inward, as desired. The blades are held against the adjusting screw by means of four coil springs.

After the adjustment has been made, the eight screws are tightened into place and the blades thus locked in position. The tool is said to be capable of boring holes that are perfectly round and do not taper more than 0.00025 in. It is made in several sizes, the largest of which is 4½ in. in diameter.

Reed Inside Micrometer

An inside micrometer for obtaining internal measurements of cylinders and rings has been brought out recently by the Reed Small Tool Works, Cherry and Vine Sts., Worcester, Mass. The tool is of use as well in linear measurements, testing parallel surfaces, comparing gages and setting calipers. The diameters of the barrel, spindle and thimble are the same as those in the Reed outside micrometer. This construction affords a sturdy tool, adaptable to garage and repair shop use. The large surfaces allow for figures of a generous size on the sleeve and barrel, and for wide-spaced graduations to thousandths of an inch.

One feature of the micrometer is the opportunity to change the position of the detachable handle to make it convenient for right- or left-handed work, so as always to give a full view of the graduations on the barrel. This handle also makes it possible to take measurements in holes or other inaccessible places, or to



REED INSIDE MICROMETER

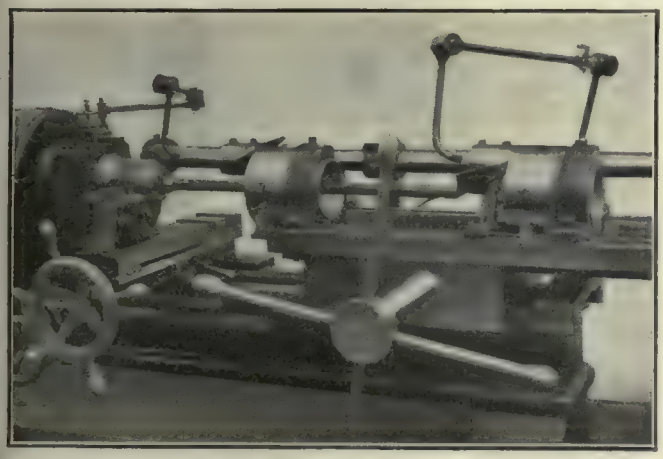
gage throughout the length of a cylinder bore for a better average measurement.

The range, or run, is 1 in. The extra rods, which unscrew from the threaded stud at the end of the barrel, allow for a quick change of length. Each rod is internally threaded and ground square at the hardened end, which sets squarely against the barrel. At the point of measurement it is fitted with a hardened tool-steel anvil with an adjustment for increasing the length when worn down. The anvil faces are ground on a comparatively small radius, thus rendering the micrometer adaptable to the measurement of either parallel or curved surfaces.

The standard set consists of the inside micrometer, an adjusting wrench and five rods, giving a range from 3 to 8 in. Additional rods can be furnished for measuring greater lengths, also a handle for gaging to greater depths in cylinders.

Warner & Swasey Staybolt Threading Machine

The Warner & Swasey Co., Cleveland, Ohio, has recently placed on the market a machine for use especially in a railroad shop for threading staybolts. The machine



WARNER & SWASEY STAYBOLT THREADING MACHINE

is made up of the standard No. 4 turret lathe with a special attachment instead of the regular turret slide and saddle. The accompanying illustration shows the attachment in place. When not used for threading staybolts, the regular turret slide and saddle may be replaced on the machine and used for the production of the studs and bolts ordinarily found necessary in a railroad shop.

The machine handles crown stays, button-head stays and swivel stays up to 40 in. in length, and cuts any size of thread. Self-opening die heads of the size necessary can be employed. On upset staybolt forgings, a taper may be formed under the head and threads cut on the end and also under the head, at the rate of about one bolt per minute. No previous machining is required for the thread on the end.

The rough forging is passed through the back of the forward die head to insert it in the square collet in the atuomatic chuck. The die head has an enlarged hole in the shank, and the chasers have an especially large opening movement, so as to receive the button-head stay. After the staybolt is chucked in position, the staybolt carriage is fed forward until the end of the bolt is supported in the steadyrest between the two heads. The head is then formed by a forming cutter on the cross-slide, while the other end is supported in the steadyrest. Then the staybolt carriage is fed forward, and the die heads, operated by the cams on the rear bar, close automatically and cut the threads.

The cams may be made to produce any type of thread desired, as the action of the head is dependent upon their contour. As soon as the die heads reach the end of the cams both die heads open. The carriage is then brought back and is ready for the next staybolt. The die heads are placed so that they cut the thread on the end and under the head in continuous lead.

Peerless Hand-Operated Valve Lathe

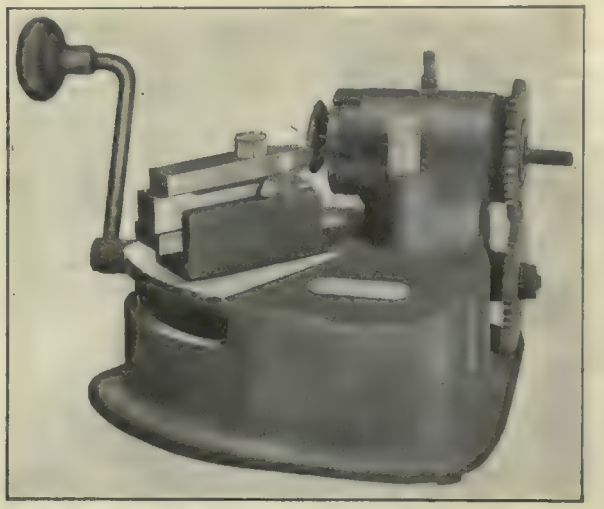
The accompanying illustration shows a small bench lathe built by Steiner Brothers, Lima, Ohio, for refinishing automotive poppet valves. The valve is held in place in the hollow spindle by means of a special self-centering chuck. This chuck consists of three contact points at each end of the spindle, the points being operated by means of three-lobe cams, so that they move toward the center or recede uniformly with the rotation of the cam.

The valve is rotated by means of the lever shown at the left, and the two spur gears at the right serve to transmit the motion to the spindle.

Valves having stems from $\frac{1}{4}$ to $\frac{9}{16}$ in. in diameter and heads up to 3 in. in diameter can be held. Valve stems having two diameters can be accommodated, since the two chucks operate independently of each other. The valve is rotated by means of the lever shown at the left, and the two spur gears at the right serve to transmit the motion to the spindle.

A high-speed cutting tool $\frac{1}{2}$ in. square in sections is employed. It can be easily removed and sharpened. It is mounted in a slide that can be swung through an angle of over 30 deg. Thus, at the central position 45-deg. valves are faced, while 30- and 60-deg. valves are faced at the two extreme positions. As the driving handle is turned, the toolslide is automatically fed inward. This action is accomplished by means of a worm and spur gearing connecting the driving shaft to the slide.

The worm wheel can be disengaged by means of the



PEERLESS HAND-OPERATED VALVE LATHE

knurled knob shown at the side of the spindle housing to permit of adjusting the position of the slide when setting up. When this knob is depressed, the tool slide

can be moved by hand to its starting position, in order to start another cut. In this way, very light cuts can be made; and if it is desired to increase the depth, it is very easy to return the tool to the starting position in the manner just stated.

The range of movement of the tool is controlled by a segment that disengages the movement before any jamming of the tool carrier occurs. Since the feeding mechanism is located inside the body, it is protected from dirt and injury. Due to the fact that the feeding motion of the cutting tool is uniform, a smooth finish is turned on the seat of the valve.

Rego "Little Six" Welding Outfit

In the acompanying illustration are shown the component parts of a welding outfit recently placed on the market by the Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill. The outfit is made up of standard units of Rego equipment. It is known as the "Little Six," and is intended primarily for use in garages for handling general repair work.

The welding torch is equipped with three copper one-piece welding tips. It will weld steel up to 1 in. in thickness, and is suitable for the ordinary range of repair work. Its construction is intended to prevent flashing back. By replacing the welding tip with a cutting tip, the torch can be adapted to the cutting of steel up to 1 in. in thickness. Any sort of brazing can be performed with the small tips that are furnished. Lead burning or welding, as in battery-repair work, can



REGO "LITTLE SIX" WELDING OUTFIT

be performed by the outfit with the use of a special tip furnished for this purpose. For repairing radiators, a tip 3 in. long is provided, so as to reach into the honeycomb of the cracked radiator.

For removing carbon from the combustion chambers of automobile cylinders, a decarbonizing torch is provided. This is a separate tool, and not an attachment to the welding torch. Other apparatus furnished with the outfit consists of the oxygen and acetylene regulators, hose, wrenches, spectacles, spark lighter, and an instruction book.

Saving Time in Looking for the Boss

BY W. A. SAILLER

The writer recently noticed a very good kink in a jobbing machine shop which apparently was a great time saver and convenience. Because of the nature of the work done it was necessary for the machine hands in various parts of the shop to consult frequently with the superintendent as to the details of the work, etc. Under the old arrangement, it became necessary for the operator to leave his machine and go to the shop office to see the foreman or superintendent unless he happened to be passing by. During all the while the operator was seeking the superintendent the machine, of course, was lying idle.

To eliminate this time and production waste, the shop was laid out into 10 convenient zones, and in a central place in each zone was placed a push button which connected with a call board in the shop office—each zone being identified by its own number. If an operator in Zone 9 wanted to consult with the foreman or shop superintendent instead of tracking the entire length of the shop to the shop office, he merely stepped to the push button for Zone 9 and signalled for the superintendent. If the superintendent was not in the office, the shop office boy sought him out.

It was the experience in this shop that this simple expedient resulted in a saving which amounted to about 2 per cent of the productive time—quite an important item in its effiect on profits. All big shops have good call systems, but many small ones do not.

Farm Machinery Needed in Latvia

Farm machinery is very much needed in Latvia, according to recent reports from trade commissioner H. Lawrence Groves. The Central Agricultural Co-operative Society, of Latvia, has issued a statement outlining these requirements, and states that this machinery should be furnished within the next two years. At present the intention is to replace only the machinery destroyed or removed as a result of the war. This does not cover the needs arising from the large number of farm units established in the last few months through the operation of the government's reform act.

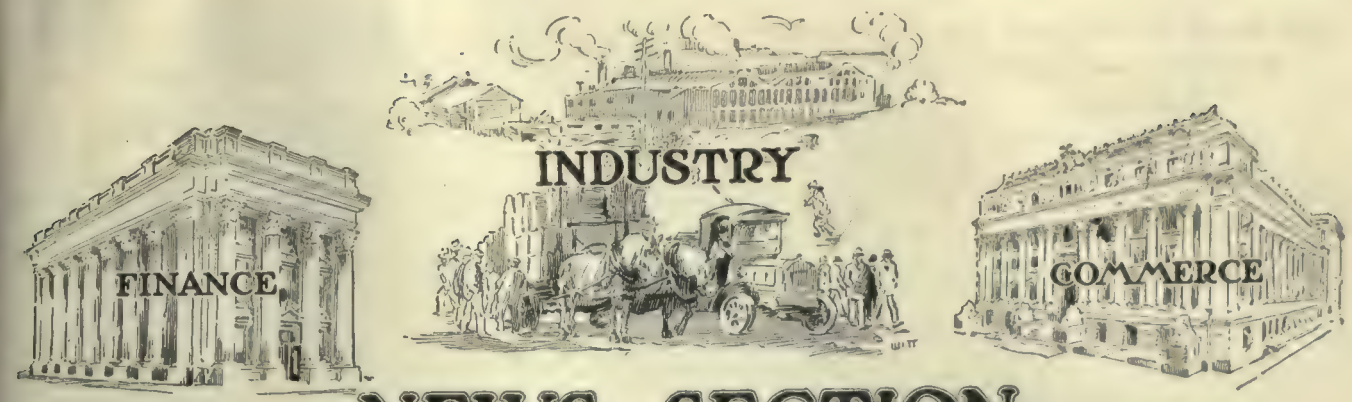
The machinery most needed is as follows: One and two bottom plows, 11,000; 2,500 harrows and pulverizers; 1,200 cultivators; 550 seeding machines; 3,000 grass mowers; 1,500 grain harvesters (probably "dump" reapers); 3,000 horse rakes; 500 potato diggers; 100 thrashing machines, with self feeder; 25 tractors.

In Latvia the farms are usualy small and light machinery enjoys a brisk market. The combined reaper and mower has not gained the confidence of the local agriculturists, who seem to prefer the reaper and mower as separate machines.

The importation of farm machinery in Latvia is now entirely in private hands, the government having abandoned its former activities in this line. Agricultural organizations are now making an effort to obtain financial assistance from the government in the form of subventions to assist the farmers in the purchase of needed machinery.

German and Swedish manufacturers are keen competitors in the Latvian market, and in the past the advantage has been on the side of the Germans. Of late, however, machinery of German make has not been of satisfactory quality, and there has been an increasing demand for American-made machinery. New agencies have been established and the local net price of American machinery compares favorably with that of the German machines.

Generally, the largest purchasers of machinery are the co-operatives, and in Latvia there are three important ones. Also many purchases are made through the central co-operatives in Lithuania and Esthonia.—*Commerce Reports.*



NEWS SECTION

Metal Industries Paid $457,-251,793 Tax in 1919

Companies engaged in metal manufactures in the United States in 1919 paid a total tax of $457,251,793. In all 13,188 companies were engaged in this industry. Of that number 9,689 companies had net incomes totaling $1,789,-212,574; the remaining 3,429 companies had deficits totaling $119,834,070.

The number of corporations and the total net income of each group is shown by the following: Crude and refined metal production, 158 companies, net income $38,266,652; stock products made in foundries or rolling mills, 2,158 companies, net income $449,896,677; agricultural machinery, steam appliances and construction machinery, 826 companes, net income $160,089,853; metal-working and paper-making machinery, heavy ordinance, rolling stock, safes and vaults, 445 companies, net income $122,516,791; general electric machinery, stationary and marine engines, and refrigerating machinery, 343 companies, net income $66,930,812; motor vehicles, airplanes and spare parts, 302 companies, net income $233,814,078; boot and shoe machinery, typewriters and calculating machines, gas and electrical fixtures, 335 companies, net income $73,237,804; metal furniture, ornamental iron work and sewing machines, 106 companies, net income $5,-695,385; fire arms, hardware, cutlery, hand and machine tools, and gages, 4,378 companies, net income $428,035,-834; all other metal products, 2,877 companies, net income $130,427,740; smelting and refining (base metals), 623 companies, net income $4,512,149; smelting and refining (precious metals), 567 companies, net income $26,285,275.

These figures are taken from a recent compilation made by the Bureau of Internal Revenue.

Secretary Hoover Talks to Business Paper Editors

The monthly meeting of the editors of the National Conference of Business Papers with Secretary of Commerce Hoover, was held in Washington on Feb. 27. Mr. Hoover discussed various national problems. At a luncheon meeting, Col. Nelson Gaskill, chairman of the Federal Trade Commission explained the purpose and work of the commission.

The editors met during the afternoon with the Chamber of Commerce of the United States.

Senate Has Screw Thread Commission Bill

The bill extending the life of the National Screw Thread Commission for a period of five years has been reported to the Senate by the Committee on Manufactures, with the recommendation that it be passed by that body. The committee also recommended that the legislation receive early consideration. The measure has already passed the House. In reporting the bill to the Senate, the committee quoted from the testimony of Secretary Hoover and Director Stratton, which was given before the House committee, no hearings having been held by the Senate committee.

Iron and Steel Exports

Exports of iron and steel in January amounted to 157,000 tons, the largest since April of last year. Exports of copper totaled 53,130,000 pounds, which was a decrease of over 8,000,000 pounds from December. Imports of tin increased to 8,103,000 pounds and were larger than for any month of 1921.

Safety Code for Grinding Wheels Approved by Standards Committee

The sectional committee appointed under the joint sponsorship of the Grinding Wheel Manufacturers Association of the United States and Canada, and the International Association of Industrial Accident Boards and Commissions, has made its report on a safety code for abrasive wheels. The code has been approved as tentative American standard by the American Engineering Standards Committee.

The code contains rules and specifications considered necessary to insure safety in the use of abrasive wheels operating at speeds in excess of 2,000 surface feet per minute. It consists of sections dealing with scope, types of protection devices, storage and inspection of wheels, general machine requirements, protection hoods, work rests, protection of wheels, flanges, mounting, speeds, operating rules and general data.

Copies of the code may be secured from the American Engineering Standards Committee, 29 West 39 St., New York City, for ten cents.

Exports to China Still Below 1920

Exports from the United States to China for the year 1921 were $108,290,-435, in value, which is an enormous increase over the $24,872,745 of 1913-14, although a considerable drop from the $145,737,321 of 1920, when the high price of silver tended to increase the buying power of the Chinese and to stimulate imports of all kinds. When the drop in silver occurred, it became extremely difficult for the Chinese purchasers to pay for the goods already ordered, and the ports were congested with imports, which have been absorbed only very slowly, as the return to normal trade conditions was greatly delayed by the famine in northeastern China, and by unsettled political conditions in many places. It is surprising under the circumstances that the decrease in our exports to China was not greater, and the situation is a proof of the fundamental soundness of the economic conditions in China, which enabled the business of the country to resist so many unfavorable tendencies.

Reductions in Idle Freight Cars Continues

Reports received by the car service division of the American Railway Association show that on Feb. 15, a total of 449,819 freight cars were idle because of business conditions, compared with 467,997 on Feb. 8, a reduction of 18,178.

Surplus cars, that is cars in good repair and immediately available for service if necessary to meet traffic conditions, consisted of 278,481 cars of the total, while the remaining 171,338 represented the number of idle freight care needing repairs in excess of the number normally in bad order.

Surplus box cars numbered 104,513 on Feb. 15, a reduction within a week of 17,015 cars, while surplus coal cars totaled 112,050 which was a reduction of 11,069 within the same period.

Maryland College To Teach Foremanship

A course in foremanship training, under the Smith-Hughes Act, has been established by the School of Commerce of the University of Maryland, Baltimore, Md. It provides training for men, without expense to them or to their employers.

The Trend of Business Improvement—Plants Resuming

The Studebaker Corporation, South Bend, Ind., manufacturer of automobiles, has increased its working force from 6,000 to 8,500 employees, the largest number of operatives ever at the plant.

The Freeland Bobbin Works, Freeland, Pa., manufacturers of textile equipment, is arranging for the immediate resumption of operations at its plant, which has been idle for a number of months past. The company has taken an order for 35,000 bobbins and other equipment.

The Conners Steel Co., Birmingham, Ala., has resumed operations at its steel hoop and band mill, following a period of curtailment.

The Bateman Companies, Inc., Grenloch, N. J., manufacturer of agricultural implements, has resumed production at its local plant on a full-time basis, following a curtailment for about three months. Practically all of the former operatives are employed at the plant. An extra hour has been added to the regular working day.

The Newport News Shipbuilding and Drydock Co., Newport News, Va., will add from 1,500 to 2,000 men to its working force about the middle of March, following the arrival of the "Leviathan" at the plant, for which a reconditioning contract has been received from the Government.

The Baltimore & Ohio Railroad Co., has re-opened its heavy repair shop at Cumberland, Md., following idleness for about two months past. Employment will be given to approximately 300 men.

The Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has resumed production at its structural steel mill at Fairfield, Ala., following a period of curtailment.

The El Paso & Southwestern Railroad Co., El Paso, Tex., has resumed operations in all departments at its local shops, following a shut down for a number of weeks. Employment is being given to about 325 men.

The American Locomotive Co. is maintaining active operations at its Brooks Locomotive Works, Dunkirk, N. Y., giving employment to a large working force. Production is concentrated on twenty-five large locomotives for the Northern Pacific Railroad and a quantity of repair work.

The Erie Railroad Co., 50 Church St., New York, has leased its repair shops at Meadville, Pa., which have been closed for some time past, to W. S. Schlafge, head of the mechanical department, who has secured a leave of absence to operate the plant. The shops will be reopened at once for full capacity production, under the private management, giving employment to more than 800 men. Contract work will be handled for the railroad.

The American Car & Foundry Co. has received an order for the repair of 500 cars for the Delaware, Lackawanna & Western Railroad, and will handle the work at its Berwick, Pa., plant.

Sotter Brothers, Inc., Pottstown, Pa., manufacturers of boilers, tanks, stacks, etc., has resumed operations at its plant under a regular eight-hour day working schedule, following a curtailment of a number of weeks.

The Transue & Williams Steel Forging Corporation, Alliance, Ohio, has adopted a double-shift working basis at its local plant to handle production for recent orders. The company resumed operations at the plant in January, following a period of curtailment.

The National Cast Iron Pipe Co., Birmingham, Ala., has received an order for 1,200 tons of pipe for use at St. Paul, Minn., and for 1,000 tons for delivery at Port Arthur, Tex.

The American Bushings Co., Marysville, Mich., manufacturer of brass piston bushings for automobile engines, has placed its plant on a double-shift operating basis. A record volume of orders has been received recently.

The Western Steel Car & Foundry, Chicago, a subsidiary of the Pressed Steel Car Co., Pittsburgh, Pa., has secured an order for 500 gondola cars from the Great Northern Railway Co., and will handle the work at its Hegewisch shops.

The Chesapeake & Ohio Railroad Co., Richmond, Va., will soon place orders for about 18,000 tons of steel rails.

The H. H. Franklin Co., Syracuse, N. Y., has arranged a fund of $5,000,000, for the establishment of a new plant to be devoted exclusively to the manufacture of a light four-cylinder, air-cooled automobile. The proposed works will be designed for a capacity of 50 complete cars a day under one-shift operating schedule, and 100 cars with double-shift operation, giving employment to more than 2,000 men. The company is reported to be negotiating with the receivers for the Willys Corporation for the purchase of the nearly completed plant on Newark Avenue, Elizabeth, N. J., including the former works of the Duesenberg Motors Co., adjoining. The Willys plant is said to represent an investment in excess of $5,000,000, and was laid out for the manufacture of a six-cylinder automobile, to be known as the Chrysler Six.

The Baltimore & Ohio Railroad Co., has added about 100 men to the working force at its shops at Keyser, W. Va., placing the plant on a full operating schedule.

The McIntosh & Seymour Corporation, Auburn, N. Y., manufacturer of engines, has received a contract for the construction of ten 150-hp. Diesel engines, for use on the State barge canal.

The American Rolling Mill Co., Middletown, Ohio, has resumed operations at its Central Works, which have been idle for some time past. All of the mills of the company are now in service for the first time since Jan. 1921.

The Denver & Rio Grande Railroad Co., Denver, Colo., will soon place orders for the construction of twenty Pacific type locomotives.

The Slatington Steel and Iron Co., Slatington, Pa., has resumed operations at its bar mill, following a shut down of several months.

The Hyatt Roller Bearing Co., Harrison, N. J., is increasing operations at its plant and adding to the working force. Preference is being given to former employees and notifications are being issued for the men to return to work.

The New York, New Haven & Hartford Railroad Co., New Haven, Conn., is planning for a fund of $3,000,000, for extensions and improvements to road, shops and other property; and $2,066,000 for the purchase of new equipment. Application for approval has been made to the Interstate Commerce Commission.

The Houde Mfg. Co., Buffalo, N. Y., manufacturer of shock absorbers for automobiles and other automotive equipment, is increasing production at its local plant, and is now giving employment to about 150 operatives.

The Great Northern Railroad Co., St. Paul, Minn., will expend about $7,000,000 for track extensions and building and shop additions and improvements during the present year. An appropriation of $4,000,000, also, has been arranged for the purchase of new equipment.

The Harrisburg Machine and Electric Welding Co., Eighteenth and Chestnut St., Harrisburg, Pa., has adopted a capacity production schedule in all departments.

The United States Cast Iron Pipe and Foundry Co., East Burlington, N. J., has secured an order for 9,000 tons of pipe from the Peoples' Gas Co., Chicago, Ill.

The Lacey Manufacturing Co., Bridgeport, Conn., is operating its plant to capacity six days per week, and has sufficient business to keep fully occupied for a year upon the present schedule. The company makes special tools, dies, fixtures and machinery on contract.

The Grant Manufacturing and Machine Co., Bridgeport, Conn., through its manager, Mr. Kingsbury, reports a steadily and consistently increasing volume of business for the last four months and looks for a complete return to normal conditions in all lines this spring. The concern builds riveting and wire machinery.

The Haskell-Barker plant at Michigan City, Ind., recently taken over by the Pullman Co., according to reports from Chicago, is operating on full time.

The New Departure Manufacturing Co., Bristol, Conn., is reported running full time with a force of 2,000 employees. Since this company normally employed about 1,100 persons in 1914, the present figures are a good sign of prosperity. It is said the company is operating almost 100 per cent in excess of pre-war business.

The Charles H. Besly Co., of Chicago, Ill., reports it has received more orders for Besley disk grinders and accessories during February, than during any given period since November, 1920.

Stinnes to Operate Ships on the Danube

Edwin C. Kemp, American Commissioner at Budapest, reports to the Department of Commerce that owing to numerous obstacles to the expedious handling of rail traffic through the succession states, the Stinnes group of Germany is reported to be placing orders for barges of 800 to 1,000 tons, both in Germany and abroad, for use in transporting German goods to states bordering on the Danube. It is also reported that a shipbuilding firm of Budapest is working to full capacity on orders for Roumania and Czecho-Slavakia, for whom twelve barges and four cargo steamers are said to have been completed during last summer. The opinion is expressed that the Stinnes group will shortly have a fleet of ships on the Danube.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, eNw York

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A reader of these articles writes me that he finds them discouraging because they tell so glibly of the millions raised for corporations and governments in the money markets of the world, while he finds it so difficult to borrow the few thousands that he needs in the conduct of his business.

I sympathize with him for I well remember how angry I was when as a young man in business in a small city I read of the low rates at which the money, for which I was paying usuriously, seemed to be lending in New York. But with experience I came to understand that there is properly a wide difference between the rate at which money can be borrowed in large amounts on security that is instantly convertible, and the charge made for loans that are either unsecured or secured by collateral which though its value is undoubted cannot be sold by telephoning the Stock Exchange, as can stocks and bonds.

Only last week an old friend sent me a considerable sum requesting that I should invest it "safely." Although I generally decline such requests I could not refuse this one and being anxious to put the money where it would be absolutely secure I suggested a farm mortgage or a loan upon improved real estate in a growing city, than which no investment is in my opinion safer. The suggestion was instantly rejected by my friend, who insisted that he wanted a security that he could sell without trouble whenever he wanted his money back.

Interest Rates

I tell of the incident to explain the disparity in interest rates so much complained of just now. In all the larger money markets of the United States, as well as those of England, Holland, and some other countries, there is now much capital that is seeking a semi-liquid investment. Its owners will not lend it on real estate or merchandise because such loans are not quickly convertible; nor will they buy commercial paper because they cannot get their money back until the paper matures. The community is therefore dependent upon the banks or the limited few who specialize in lending on unsecured or slow security for the credit that commerce and agriculture require, and as the supply of such funds is relatively restricted the market rate for them is correspondingly high.

As the convertible investments are absorbed the return from them declines and investors who desire a higher rate of income are gradually compelled to accept securities or loans which, though perfectly good, cannot be so quickly resold. To bankers all this is trite and it is written not for them, but to allay the widespread discontent that is plainly evident among many otherwise well-informed business men who feel that they are being unjustly dealt with.

During the week ending last Saturday the redistribution of the world's unemployed capital has proceeded apace. In all the major financial centers the demand for investment securities has been enormous. In Paris people stood in line all night that they might have a chance at a new issue of Paris Lyons & Mediterranean Railway securities that was enormously oversubscribed; and in London, Amsterdam and New York the market for both new and seasoned securities of the first-class seemed almost insatiable.

This somewhat sudden revival in the demand for bonds and high grade stocks may be due in part to the accumulation of investment funds while buyers hesitated in fear of a bonus bill that would necessitate a huge government loan; but for the most part it reflects the release of capital hoarded by the timid who are now becoming bolder as the world seems to be gradually finding itself again. In time the money thus put in circulation will reach the remoter fields of agriculture and industry, and the disparity in interest rates will not be so great.

This is the classical sequence always to be observed during a period of business recovery but in the present instance it will be somewhat hastened in the United States by our continued accumulation of gold. The supply held by the Federal Reserve Banks increased another $5,000,000 last week, despite which the reserve ratio dropped 1.4 per cent to 76.7, chiefly because there was an aggregate gain of $71,000,000 in circulation and deposits.

The developments of the week were not otherwise important. The coal strike set for April 1 still threatens, but the threat seems to have lost its terror. A few of the markets have been reactionary but none of them have shown any weakness. Some of the speculators who had substantial profits in their holdings of stocks, wheat, corn, cotton, etc., have been realizing but their offerings have been well taken and the position in each case has probably been strengthened by the redistribution. Sugar, is however, one commodity that has advanced and granulated is now up to 5.20, at which price the quantity for sale is relatively small. Coffee has been somewhat easier upon a report that the Brazilian government has determined to abandon "valorization" because it was no longer necessary. This is probably true and if the artificial support hitherto given coffee is withdrawn, higher prices are likely when the market is left to itself. Copper is a shade steadier and continued improvement in the demand for and output of iron and steel is reported. It is attributed chiefly to the railroad buying, but an improved inquiry from building contractors is also to be noted.

Cotton and wool have been quiescent at previous levels. There is nothing new in either market, but the fertilizer companies say they can sell all the cotton fertilizer they are willing to put out on credit. The trade is now prepared for a crop of 10,000,000 bales this year and present prices are predicated upon the expectation of that yield. The jobbing trade is good but the full effect of the advance in wheat and corn upon the farmer's purchasing power will not be felt until April or May when buying for the fall trade commences.

Railroad traffic is gaining and some officials predict a car famine this summer.

Foreign Exchange Market

In the foreign exchange market sterling and francs have maintained the advance of last week, and sterling at one time sold as high as 444⅜, but marks fell to .41 upon a statement showing that there were 116,280,969,000 paper marks outstanding as of Feb. 23. Swiss francs are selling at 19.58, which is slightly over their gold value 19.3. This due to the accumulation of German capital in Zurich and Berne where taxes are low. The result is a great plethora of money in Switzerland and the bank rate has been reduced to 3½ per cent, while good bankers acceptances are selling in Zurich at 2 per cent.

The proposal to pass a bonus bill that would make most of the soldiers borrower and be chiefly a bonus to the pawn brokers need not be seriously considered. It is already killed by ridicule.

The State of Missouri has, however, just sold $15,000,000 of its bonds, the proceeds of which will be distributed among the soldiers enlisted from that state. It is probable that at least $300,000,000 will have been disbursed among the soldiers by the various states before the summer is over.

Great opposition to the ship subsidy is developing among those who maintain that it is inconsistent to refuse the soldiers a bonus and give one to the ship owners who compose a much smaller and less necessitous class. It is also pointed out that the proposed subsidy will cost more than will be obtained for the ships whose sale it is expected to facilitate and that we would save money by giving the ships away.

This leaves an appeal to our pride in an American merchant marine and its national utility as the only arguments in favor of the subsidy. The issue will not be decided in a hurry and a weary Congress is meantime considering an adjournment which if taken will probably be the signal for an instant and widespread resumption of business activity. The stage is set, the actors are ready and the fear of Congressional interference or foolishness is the chief reason why the performance is not already in progress.

Engineering and Civic Bodies Pay Honor to Ericsson and De Lamater on Anniversary of "Monitor-Merrimac" Battle—Four Bronze Tablets Unveiled in New York

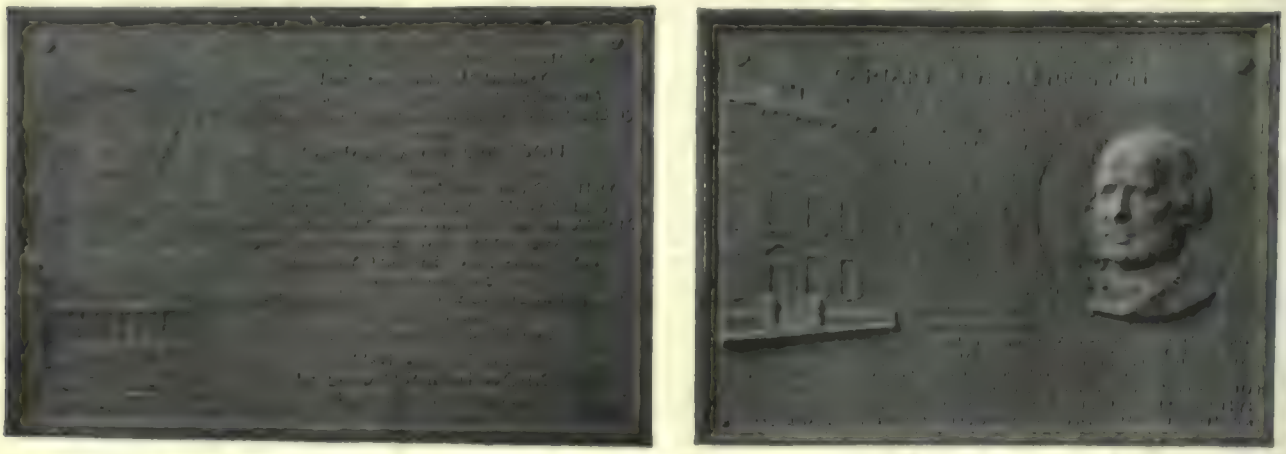
The sixtieth anniversary of the battle between the "Monitor" and the "Merrimac," was celebrated on March 9 by the unveiling of four bronze tablets in honor of the two men who built the vessel that won the famous naval battle of the Civil War. The ceremony was arranged by the DeLamater-Ericsson Commemoration Committee, composed of representatives of various engineering and civic organizations in New York.

The tablet shown on the right was set up at Captain Ericssons' old home at 36 Beach St., New York City, and was unveiled by representatives of the American Society of Swedish Engineers. The one shown on the left was placed upon the site of the Phoenix Foundry, where much of Captain Ericsson's early work was done. This ceremony was conducted by the General Society of Mechanics and Tradesmen.

Of the two other tables, not shown here, one was unveiled by the Associated Veterans of the De Lamater Iron Works, on Cunard Pier No. 54, at the foot of West 30th St., New York City, the site of the old De Lamater Iron Works; the other was unveiled at the Continental Iron Works, West Calyer St., Brooklyn, N. Y., by Thomas F. Rowland, president of the works.

The tablet on the Cunard pier was accepted by Mayor Hylan for the city of New York, while the others were accepted by Dr. George F. Kunz, for the American Scenic and Historic Preservation Society.

In the evening, a banquet was held at the Waldorf-Astoria Hotel, at which representatives of the United States and the Swedish governments, of various historic, civic and technical organizations, and ordnance, shipbuilding and shipping interests were present. The diners were in communication by cable with a simultaneous banquet in Stockholm, Sweden, at which members of the Royal family and the American minister and consul did honor to the memory of Ericsson and De Lamater.



TWO OF THE TABLETS UNVEILED IN MEMORY OF CAPTAIN JOHN ERICSSON AND CORNELIUS H. DE LAMATER

Foreign Trade Council to Study Export Problems at May Convention

Americans engaged in foreign trade or connected with any factor of our international commerce, agricultural, commercial, industrial, financial or transportation; all chambers of commerce, boards of trade, national and state associations and other commercial and industrial organizations, as well as firms and individuals, are invited to participate in the ninth national foreign trade convention, to be held in Philadelphia on May 10, 11 and 12, under the auspices of the National Foreign Trade Council.

A feature of the three-day conference will be the trade adviser service. This service is intended to provide information on any foreign trade problem and to give advice as to how best to handle the problem. A special delegation of government experts, consuls, commercial attaches, trade commissioners, economic and statistical experts will be at the disposal of the delegates.

A few of the vital subjects that will be discussed have just been announced. The financing and expansion of foreign trade will be the main topic. It will be studied from every point of view by leaders in commerce, industry and finance. They will seek the solution of the problems of unemployment and the stagnation of business. One of the principal topics of the first day's meeting will be "A Foreign Loan Policy That Will Enable Our Idle Factories to Get Work."

"The Merchant Marine, an International Problem," is another of the major subjects that will be studied at this meeting. Another interesting transportation topic will be "Inland Waterways as Developers of Traffic." Other topics will be: "A Practical Method of Putting Our Surplus Gold to Work in Financing Foreign Trade;" "The Exporter's View of the Present Attitude of Banks Toward Foreign Trade;" also the bank's view of this latter question. Taxation, exchange rates, sales promotion and advertising will also be given some attention.

Arrangements for attending the convention can be made with the secretary, O. K. Davis, at 1 Hanover Square, New York City.

Baltimore To Have Vocational Training School

Plans are being made by the board of school commissioners, Baltimore, Md., to establish a part-time vocational training school which will be attended by employees of Industrial plants for one or two sessions each week. A number of the plants are supporting the plan, including the Baltimore Car Works, Curtis Bay Copper and Iron Works, Davison Chemical Co., U. S. Alcohol Co., U. S. Industrial Chemical Co., Prudential Oil Co., Maryland Car Wheel Works and U. S. Asphalt and Refining Co.

Westinghouse Makes Changes in Personnel

Several changes in personnel have been announced recently by the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Pa. Among them are transfers of various managers in the district offices.

R. L. Rathbone, branch manager of the Cleveland office, will take up special duties in connection with merchandising matters, with headquarters in Cleveland.

J. Andrews, Jr., manager of the industrial division, Pittsburgh office, has been appointed manager of the Cleveland office; C. D. Taylor succeeds Mr. Andrews in the Pittsburgh office.

R. Seybold has been appointed manager of price statistics. He will also act as secretary of the domestic sales committee and will assist W. S. Rugg, assistant to the vice-president in general duties connected with the vice-president's office.

W. R. Keagy has been appointed office manager of the Cincinnati office; and J. R. Deering, office manager of the Los Angeles office.

H. S. Walker succeeds M. E. Lanning as promotion manager in the Denver office, and I. G. Cline takes up the promotion work vacated by R. A. O'Reilly in the Chicago office. K. L. Graham succeeds H. C. Hopkins as promotion manager in the San Francisco office.

GTD Code To Simplify Telegraphic Orders

A carefully compiled and comprehensive telegraph and cable code has just been published by the Greenfield Tap and Die Corporation, of Greenfield, Mass. Although the code was originally intended for the company's overseas customers, it is equally suited for its domestic trade and is expected to prove a means of reducing the cable and telegraphic expense of those who have occasion to order goods by wire.

The code as now published represents several years of work in classification of cables sent and received by the home office. It is a five-letter code, and so arranged that it can be combined with the majority of standard commercial codes. The technical nature of many GTD products makes it impossible to economically describe them by any standard code.

This new GTD code covers every item of manufacture, quotations and financial matter; also exchange, technical terms of the trade, etc.

The code is included in the new No. 46A catalog just issued by the Greenfield Tap and Die Corporation and copies may be obtained from the home office.

Detroit Letter

The Paige-Detroit Motor Car Co. is working on a production schedule calling for the building of 13,170 cars during the first six months of 1922. Seven thousand of these will be Paige models, while the remainder will be the new light-six Jewett model. If this schedule is met it will mean the shipment of 4,000 more cars during that period, than were shipped during the entire year of 1921.

The King Motor Car Co. is reported to have received foreign orders from England and Belgium, which call for several carloads of King models. Local orders are also increasing, dealers in Erie, Pittsburgh and Cleveland having doubled their quotas. President Weber states that King will produce 7,500 cars this year, instead of the contemplated 2,500.

The new Kess-Line car will be on the market by June 1. The car will be built in the old Liberty plant in Detroit, and officials of the company state that orders are now being booked up to capacity. The new car will be built from the Kessler patents. The motor, a four-cycle machine with eight small cylinders is said to embody some new and interesting features, among which are less piston displacement, low fuel consumption and absence of carbon deposit in the cylinders. Tests recently conducted in Detroit were entirely satisfactory. The new car, fully equipped, will be marketed around $2,000.

American Machine & Foundry Co. To Make Gurney Elevators

The American Machine and Foundry Co., of Brooklyn, N. Y., has acquired a substantial interest in the Gurney Elevator Co., of New York. It it understood that hereafter Gurney elevators will be manufactured in the plant of the American company, in Brooklyn.

This arrangement was brought about to provide increased manufacturing facilities for the Gurney company.

Steel Treaters Hold Sectional Meeting in New York

The American Society for Steel Treating has inaugurated a new plan by which sectional meetings are held under the auspices of one of the sections or chapters, as they are called. This gives the members in different localities, who may perhaps be unable to attend the annual or semi-annual meetings, an opportunity to keep in touch with the work of the society and of the members. These local meetings are really a part of the work of the society as a whole.

The first of these sectional meetings was held on March 3, in New York, at the Hotel McAlpin, and was well attended by members from a radius of 250 miles. I. H. Cowdrey, chairman of the Boston Chapter and instructor of mechanical engineering at the Massachusetts Institute of Technology, presided.

Among the papers presented were those by E. J. Janitzky on the influence of mass in heat treatment; G. R. Brophy on a new heat-resisting alloy called "calite"; R. G. Hall on stainless steels for use in cutlery and similar articles; V. E. Hillman on cold-headed bolts, their metallography and heat-treatment, A. V. de Forest on magnetic testing of small case-hardened chain, and J. H. G. Williams on perfecting a drop forging. Extracts of some of these papers will appear in coming issues.

In nearly every case the papers evoked extended discussion from the floor and the keen interest shown in the various subjects augurs well for the future of the society. Many lines of manufacture were represented and there was every indication that the sectional meetings are bound to be a success. An informal dinner followed the meeting and aided in bringing the members and guests into closer contact.

Machinery Wanted for Guatemala Industry

It is reported that a company has been formed in the Republic of Guatemala with the object of establishing plants for the manufacture of jute fabrics, gunny sacks and allied products. Those interested should address the Central and South American Export Company of Guatemala, Guatemala, Central America.

Machinists' Union To Present Bill to Congress

Officials of the International Association of Machinists are at work on a bill, to be presented to Congress as soon as possible, which is designed to provide relief for the thousands of navy yard employees who were thrown out of work on account of the cessation of work due to the provisions of the armament conference.

The bill provides that all work of the government departments which can be done in the navy yards and arsenals, be allocated to them instead of to private firms. Its aim is to keep the government navy yards and arsenals in operation and thereby provide employment for the thousands of workmen who are now idle because the yards are closed.

Taylor Society Meeting in Philadelphia

The mid-winter meeting of the Taylor Society will be held at the City Club, Philadelphia, on March 16, 17 and 18. A preliminary program has been arranged which includes some interesting subjects for discussion. Some of the papers scheduled for presentation are: "A Case of Sales Research," by John M. Holcombe, Jr., manager sales research division, Phoenix Mutual Life Insurance Co., Hartford, Conn.; "Problems of General Management," by Henry P. Kendall, Boston; "Super-Standards," by Frank B. and L. M. Gilbreth, Montclair, N. J.; "Budget Control," by George E. Frazer, Frazer & Torbet, Chicago; "Mills, Minds and Men," by Arthur Pound, Flint, Mich.; "String-Board Graphics," by Percy S. Brown, works manager, Corona Typewriter Co., Groton, N. Y.; "The Work of the Balance of Materials Clerk," by Thomas W. Mitchell, Philadelphia.

Chicago Letter

Inquiries and general interest in the iron and steel products market during February indicate a considerable improvement, but actual business placed was disappointing. Machine tool dealers report a continued increase in the amount of inquiry, and although large business has been noticeably absent, February has been a good month, considering the aggregate of small buying.

Much truth is seen in the statement that mechanics out of work are combining their interests and starting small shops for which they are seeking equipment, also that in most cases they have little resources and expect more credit than can be extended.

The machine tool employment situation in this section of the country compared with that of last year this time shows a decrease of about 39.5 per cent.

Railroads, which are now in the midst of a program of car purchasing and are the most active buyers of steel, continue to stay out of the machine-tool market and although much hope has been placed upon their activities in this line, it is thought that because the greater part of their car repairing is being done in outside shops, they will not buy tools heavily for some time. However, the Santa Fe continues to make additional purchases from its outstanding list from time to time, and the most recent machines purchased by them were a 48-in. x 48-in. x 12 ft. planer and a 15-ton overhead traveling crane. The C. B. & Q. R.R. is preparing a large list which is expected to be issued shortly. The Rock Island has done nothing with the large list issued some time ago.

There is a noticeable demand for additional manufacturing space. The National Phonograph Company has leased from the Hoffman Company for ten years the three-story factory building containing 30,000 sq.ft. of floor space, located at 2837-47 North Ashland Ave. This company also purchased $15,000 worth of woodworking machinery from the Hoffman Company. The Bassick Manufacturing Company, makers of automobile accessories, purchased the manufacturing plant at the southwest corner of Crawford and Shubert Avenues, for $260,000.

Prize for Glider Test in Germany

German aviation interests have offered a prize of 100,000 marks for a test flight in a motorless airplane. This type of air vehicle has attracted great interest in Germany of late and the contest has been arranged to stimulate further improvement in design.

The prize will be awarded only if the successful competitor remains in the air forty minutes, returns to the starting point and after recrossing the starting line between two marks one hundred meters apart completes the flight with a five-kilometer straightway flight.

Business Items

The Whiting Corporation, Harvey, Ill., has established its own branch sales office in New York City, at 136 Liberty St. This company was formerly represented by the Wonham, Bates & Goode Trading Corporation. J. R. Bates, is in charge of the new Whiting offices. The Whiting company has also opened offices at 305 Merchants' Bank Bldg., Indianapolis, Ind., in charge of J. E. Stout.

The Sebastian Lathe Co., of Covington, Ky., has been incorporated under the laws of the State of Ohio, with a capital of $100,000. The incorporators are: E. E. Stokes, Clara E. Sebastian, Ethel S. Stokes, Frank H. Kunkel and Dorothy Sebastian.

The Syracuse Metal Products Co. and the Colonial Machine Co., both of Syracuse, N. Y., have been merged in a company to be known as the Colonial Metal Products Co. This company will make special tools and machinery. E. A. Klein has been elected president; Henry McCarthy, first vice-president; William F. O'Donnell, second vice-president; John F. Moran, treasurer; D. O. Macken, secretary.

The Midwest Engine Company, Indianapolis, Ind., is being reorganized and will shortly apply for incorporation privileges. The company is now running on a reduced operating schedule.

The Franklin Tractor Co., of Greenville, Ohio, was sold in a bankruptcy sale on Feb. 21. H. E. Bullock, of Chicago, was the purchaser.

Officials and superintendents of the Aluminum Company of America held a five-day conference from Feb. 21 to 25 at Massena, N. Y. Among those present were fourteen officials from subsidiary branches of the parent company.

Directors were re-elected at the annual meeting of the stockholders of the Youngstown Sheet and Tube Co., Youngstown, Ohio, as follows: John L. Severance and George L. Cameron, Cleveland; J. A. Campbell, Richard Garlick, A. E. Adams, E. L. Ford, J. G. Butler, Jr., Robert Bentley and C. H. Booth, all of Youngstown. The board organized by electing the following officers: President, J. A. Campbell; first vice-president, H. G. Dalton; vice-presidents, C. S. Robinson and W. E. Manning; treasurer and assistant secretary, William J. Morris; secretary and assistant treasurer, W. F. Meub; comptroller, W. N. McDonald.

The stockholders of the Hadfield-Penfield Steel Co., Bucyrus, Ohio, at the annual meeting re-elected the board of directors as follows: R. C. Penfield, of New York; L. W. Penfield, of Willoughby, Ohio; H. A. Gillis, of Washington, D. C.; R. E. Crane, of New York, and W. E. Parker, of Sheffield, England. The board of directors will meet later and elect officers.

The executive offices of the Willys-Overland Co. will be moved from New York to Toledo, Ohio. This announcement was made last week by John N. Willys, president of the company.

The Oldroyd Machine Co. has been incorporated in Delaware for $250,000 and has acquired the property of the Oldroyd Mining Machine Co., in Cincinnati, Ohio.

The Associated British Machine Tool Makers, Ltd., London, England, have appointed the A. R. Williams Machinery Co., Ltd., of Toronto, Canada, as their sole agents in Canada.

The Birmingham Steel Corporation, Birmingham, Ala., has been sold to the United States Shipping Board. The sum involved is said to be $130,000. The plant was used during the war to manufacture fabricated steel for shipbuilding.

The H. H. Franklin Manufacturing Co., Syracuse, N. Y., will issue stock to the amount of $5,000,000. Half of this amount will be spent on plant and equipment and the other half in financing the new four-cylinder Franklin car.

At the annual meeting of the stockholders of the Gilliam Manufacturing Co., of Canton, Ohio, the following officers were elected: B. T. Steiner, president; P. K. Davis and G. L. Miller, vice-presidents; W. H. Steiner, treasurer; S. G. Zimmerman, secretary. The company manufacturers roller bearings.

The Murphy Die Co., Worcester, Mass., has recently been incorporated under the laws of Massachusetts, to manufacture dies for gaskets, etc. John F. Murphy, is president; John W. Murphy, vice-president; W. L. Hubbard, secretary and treasurer. The new concern is a consolidation of the Greendale Manufacturing Co., of Worcester, and the John F. Murphy Co., also of Worcester.

At the annual meeting of the Automatic Machine Co., manufacturers of automatic machinery, etc., Bridgeport, Conn., the following officers were elected: Frederick J. Kingsbury, president; James Coulter, vice-president; Alfred J. Porter, secretary; Norman Leeds, treasurer and general manager. Directors chosen were: F. J. Kingsbury, Henry A. Bishop, M. F. Burns, William E. Burnham, William R. Webster, Norman Leeds, James Coulter, Stiles E. Goodsell.

The general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., recently announced the following additions to its sales force at the Los Angeles, Cal., district sales office: T. J. Lockhard, W. B. Levings and R. H. Kerns.

The Fabric Machine Co., 307 Center St., Bridgeport, Conn., has recently been incorporated to take over the machinery manufacturing plant of the A. L. Adams Estate, of the same address. The capital stock is $50,000. The incorporators are Joseph J. Musante, Clifford J. Lewis, Arthur E. Bromley and Arthur Sullivan. The company manufactures fabric machinery, such as cloth cutting and winding machines.

The city of Holyoke, Mass., has awarded the contract for the electric hoist and machinery in the new municipal lighting department, to the Shepard Electric Crane and Hoist Co., of Montour Falls, N. Y.

The Wallingford Plating Co., Inc., of Wallingford, Conn., recently filed a certificate of incorporation under the laws of Connecticut, to engage in buffing and plating metals, etc. The capital stock is $10,000; the incorporators are Charles J. Benham, 48 Academy St.; R. L. Del Rosso and Charles A. Gardner, all of Wallingford.

The Dale Machinery Co., Inc., announces the removal of its executive and sales offices from 54 Lafayette St., to 17 East 42nd St., New York City.

Personals

E. G. ALLEN, formerly engineer with the Westinghouse Electric and Manufacturing Co. at So. Philadelphia, has joined the engineering department of the Philadelphia Electric Co.

W. C. BRUMBLE, equipment engineer for the Durant Motors Co., Long Island City, N. Y., has accepted a similar position in the plant production and engineering department of the Chevrolet Motor Co., Detroit, Mich.

C. M. DAVISON, who has been connected with the Poole Engineering and Machine Co., Baltimore, Md., as general superintendent, has been appointed assistant vice-president of that company.

THOMAS F. DUPUY, formerly superintendent and manager of the General Drop Forge Co., Buffalo, N. Y., is now general manager of the newly incorporated Canton Forge and Axle Co., which has purchased the forging plant in Canton, Ohio, formerly owned by the Standard Parts Co. of Cleveland.

REAR ADMIRAL R. S. GRIFFIN, U. S. N. (retired), formerly engineer-in-chief, of the United States Navy, announces that in association with COMMANDER WILLIAM L. CATHCART, U. S. N. R., he is now prepared to undertake consulting work in marine and naval engineering. Their office is located in New York City.

MARK S. JAMES has resigned his position as engineer of rolling mill sales, Birdsboro Steel Foundry and Machine Co., and has become second vice-president of the Treadwell Engineering Co. at Easton, Pa.

EDWARD C. MAGDEBURGER, who was for many years associated with Busch-Sulzer Bros. Diesel Engine Co., St. Louis, Mo., and was lately chief engineer of the St. Marys Oil Engine Co. of St. Charles, Mo., is now connected with the Navy Department as an aide on Diesel engines in the Bureau of Engineering at Washington, D. C.

W. J. MAGUIRE, formerly eastern district sales manager for the Pacific

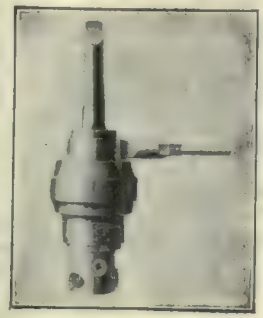
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Tapping Device, Friction, Jarvis

Geometric Tool Co., New Haven, Conn.

"American Machinist," October 18, 1921.



The device is intended for use when tapping small holes in tough metal, its purpose being to prevent the breakage of taps and the stripping of threads. It is provided with a friction cone, at which point slippage can take place in case the tap should become lodged in the work. The driving force is controlled by the pressure placed on the spindle of the machine. The tap itself can be started and stopped while the spindle is rotated. The device has a tapping range up to ¼ in.

Lathe and Screw Machine, Tilted Turret, Power Crossfeed

Wood Turret Machine Co., Brazil, Ind.

"American Machinist," October 20, 1921.

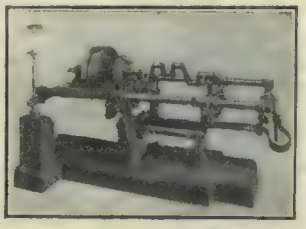


A power crossfeed to the cut-off slide has been developed for the Nos. 2, 3, 4, 5 and 6 tilted turret lathes and screw machines. The single-lever control allows of feed engagement in either direction. Six feed changes, ranging from 0.003 to 0.023 in. per revolution of the spindle are provided, any feed being instantly available without stopping the machine. The bronze feed nut is of the solid flanged type and is held in place by two capscrews. Positive screw stops are mounted at the front and rear to control the depth of the cut when using forming tools.

Balancing Machine, Crankshaft

Precision Balancing Machine Co., 3020 E. Franklin Ave., Minneapolis, Minn.

"American Machinist," October 20, 1921.



The machine gives complete dynamic and static balance by two single corrections, individually measured and located near the ends of the body. A spring-mounted and pivoted frame carries a special type of headstock and adjustable rollers to support the work. All revolving parts are mounted on ball bearings. As a critical speed of about 100 to 110 r.p.m. is said to give the best results, the machine can be manipulated by hand or by an electric motor suitably mounted. The machine is adapted to balancing automotive crankshafts, flywheels, and parts readily mounted on arbors. It will receive bodies up to 24 in. in swing and 32 in. between bearings.

Instrument, Timing and Signaling

Stromberg Electric Co., Chicago, Ill.

"American Machinist," October 20, 1921.



This electrically operated timing and signaling instrument is intended chiefly for timing the length of a process. It is for use in all manufacturing processes where the element of time is a factor, such as in the heat-treatment of steel, enameling, plating and etching. The mechanism consists of an electric motor and gearing. The instrument will indicate the total length of a process, the length of time a process has been in operation, and how much longer the process is to continue; and then automatically operate the signal when the process is completed. The signal, which may be either a bell, a light, or both, will continue to operate until stopped by the person in charge. Weight 9 lb.

Drilling and Boring Machine, Light Heavy-Duty, No. 121

Baker Bros., Toledo, Ohio.

"American Machinist," October 20, 1921.

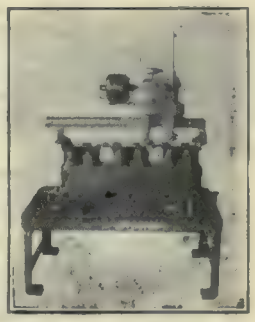


The machine is intended for driving drills from ⅜ to 1¼ in. in diameter, as well as for such work as boring and facing. It can be furnished as either a single-purpose or a quick-change drilling machine, the former lacking the gearing of the latter. The machine can be furnished in gangs with a dimension of 18½ in. between the spindles. It is stopped and started by means of the tight and loose pulleys, a spring device holding the belt in place. Various attachments and modifications can be provided, such as a tapping reverse, multiple-spindle head, motor drive and oil pump. Floor space, 22 x 36 in. Weight 2,100 lb.

Boring Machine, (Re-), Cylinder, Portable

Bridgeport Cutter Works, Inc., 50 Remer St., Bridgeport, Conn.

"American Machinist," October 20, 1921.

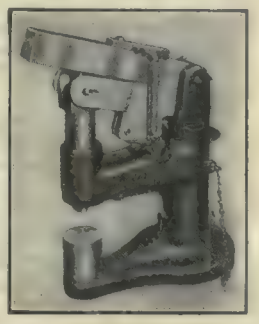


The machine is electrically driven and portable; it is said to be adapted to all makes of automobile cylinders, and to be very speedy in its operations. It consists essentially of a sliding head supported on a guiding way that is carried on the top of the cylinder block by means of suitable brackets. Provision is made for adjusting the way in line with the center of the cylinder. The head carries a cutter bar, and a clamp is provided for supporting the head close to the point where the cutter is working. The bar is driven at slow speed through reducing gearing, by means of an electric motor connected to a lighting circuit. The cutter employed consists of two herringbone cutters, the teeth of which are staggered.

Staking Machine, "Trip-Hammer"

H. C. Giles Corporation, 303 Cox Bldg., Rochester, N. Y.

"American Machinist," October 20, 1921



The machine is intended for staking cupped or drilled rivets, studs, screws, and other small screw-machine products. It can be mounted on a work bench or on a separate pedestal. It is actuated by the foot of the operator, a rod extending through the base to the treadle. The spindle houses the hammer and the pad carrying the staking set. By a suitable mechanism, the bar at the top of the machine serving as a hammer is tripped when the staking set has been brought to position.

Universal Joint

Borgeson Manufacturing Co., Torrington, Conn.

"American Machinist," October 20, 1921.



The sockets of the joint are of cold-rolled steel milled from the solid bar, while the working parts are of carbonized and hardened milled steel. The "ball" is a cube with the corners rounded, and is made in two parts, held together by a bolt, nut and cotter pin. The pins upon which the ball swivels are driven into the wings of the sockets, and are staked in place. The bearing surfaces of the pins are tapered, and each pin has a small head or shoulder to preclude the possibility of its working loose. To compensate for wear, the bolt is withdrawn and the flat mating surfaces of the two parts of the ball are ground slightly.

Coast Steel Co., is now in the sales department of the Lande Air Products Co., New York City.

PROFESSOR EDWARD F. MILLER, head of the department of mechanical engineering at the Massachusetts Institute of Technology, has been made a colonel in the Ordnance Reserve Corps, U. S. A., in recognition of the work he did for the government during the war. Professor Miller invented the steam driven tank which was later replaced by gasoline driven tanks, and he organized many schools for training marine engineers under the Shipping Board.

F. E. ROGERS, in addition to his work as publicity manager for the Davis-Bournonville Co., Jersey City, N. J., is now proprietor of the Rogers Machine Co., and president of the Service Engineering Co., New York City.

JOHN A. STEVENS, power plant specialist of Lowell, Mass., is at present abroad, making a review of recent developments in power plant engineering in Egypt, Italy, France, Switzerland and England.

STILLMAN SHAW announces the formation of the firm of Stillman Shaw & Associates, Inc., with offices in Hartford, Conn., for the practice of general consulting engineering, specializing in the design of special and automatic machinery.

C. A. TONNE, formerly with the Niles-Bement-Pond Co., Rochester, N. Y., is now with the Tonne Re-Grinding and Machine Co., Cincinnati, Ohio.

CHARLES B. WILSON, formerly vice-president in charge of operations of the Willys-Overland Company, has been appointed general manager of the Willys-Overland and associate companies.

GEORGE W. ATKINSON recently joined the Gilbert & Barker Manufacturing Co., Springfield, Mass., as superintendent of the maintenance department. Mr. Atkinson, was formerly electrical and consulting engineer at the Springfield, Mass., armory for the U. S. Government.

B. G. ROOS has resigned as chief engineer of the Pierce Arrow Motor Car Co., and has returned to his old position as chief engineer with the Locomobile Co., at Bridgeport, Conn.

MARTIN E. KERN has resigned as a director of the American Bosch Magneto Co. Mr. Kern is now traveling in Europe.

CLIFFORD EGAN succeeds his father, the late Thomas P. Egan, as president of the J. A. Fay & Egan Co., Cincinnati, manufacturers of wood-working machinery. Other officers are S. P. Egan and Fred T. Egan, vice-presidents; W. M. Green, secretary; A. A. Faber, treasurer; R. W. Egan, general manager.

J. HARVEY WILLIAMS, president of J. H. Williams & Co., drop-forge manufacturer, of Brooklyn, N. Y., has been elected president of the American Drop Forging Institute.

HENRY HARNISCHFEGER, president of the Pawling & Harnischfeger Co., of Milwaukee, Wis., is in Europe on an extended business trip. Later he expects to visit China, Japan, the Philippines, Burma, Ceylon and India. Mr. Harnischfeger will also represent the Associated Machinery Corporation, of which he is president.

Obituary

HORACE G. A. TARR, formerly vice-president of the Pullman Company and of the Otis Elevator Co., died on Mar. 2. He was seventy-eight years old.

CHARLES STUART, vice-president of Fagan Iron Works, Jersey City, N. J., died at his home in Weehawken on March 1.

HUGH JAMES MCKEOWN, eighty-one years old, founder of the H. J. McKeown Co., manufacturer of hoisting machines, formerly located in Cincinnati, died at his home in Newport, Ky., on Feb. 14. When he retired from business in 1910, he sold his interest in the company.

LOUIS F. PHIPPS, chairman of the board of directors of the American Frog and Switch Co., Hamilton, Ohio, died at his home in Cincinnati on Feb. 20. Mr. Phipps was formerly with the Globe Rolling Mill Co.

EDMUND N. SMITH, for forty-seven years treasurer of the Pennsylvania Steel Co., now merged with the Bethlehem Corporation, died on Feb. 20 at his home in Philadelphia, Pa. He was 75 years old.

WILLIAM C. GRAVES, president of the Graves Machinery Exchange, dealers in used machinery, of 50 Church St., New York City, died suddenly on Feb. 27.

Book Reviews

Tool Engineering—Jigs and Fixtures. By Albert A. Dowd and Frank W. Curtis, president and chief engineer, respectively, of the Dowd Engineering Co., New York, N. Y. First edition, 293 pages, 232 figures, 6 x 9 in., blue cloth-board covers. Published by McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price $3.

The volume, the first of three on the subject of tool engineering, furnishes practical and usuable information on jigs and fixtures. It is very comprehensive, and should serve as an excellent text book or reference work. The important points of design are covered with regard chiefly to the principles involved. The details can thus be supplied or fitted to the conditions of each particular case encountered.

The illustrations give graphic examples of the principles and methods. By their use, in conjunction with the subject matter, both the theory and the practice are very well presented. The treatment of each topic is clear, concise and complete. The material is well arranged and subdivided, so that each topic is complete in itself and may be easily referred to.

The volume treats of all sorts of drilling and milling jigs and fixtures, as well as vise-jaws and broaching and riveting fixtures. Details of design and proportioning are covered. In analyzing problems, causes of trouble are shown and both correct and incorrect methods illustrated. The examples are drawn from cases encountered in the actual experiences of the writers in tooling work. The volume should be a very practical help in tooling parts for manufacturing operations, as it shows the practice that is recognized as the best and the latest in the field of tool engineering.

The Design of Steel Mill Buildings and the Calculation of Stresses in Framed Structures. By Milo S. Ketchum, C. E. Director of the Department of Civil Engineering, University of Pennsylvania. McGraw-Hill Book Co., 370 Seventh Ave., New York and 6 and 8 Bouverie St., London, E. C. Flexible covers, 650 XVI. 6¾ x 9-in. pages, sixty tables, 410 illustrations in the text and four folding plates. Price $6 net, postpaid.

This book covers the calculation of the stresses in framed structures and the design of buildings having self-supporting steel frames. In this, the fourth edition, the book has been rewritten and enlarged, the type reset and the plates recast. Some of the new matter covers a concise discussion of the calculation of the stresses in statically indeterminate trusses and frames, several problems in framed structure, and detailed designs of a crane girder, a roof truss and a mill building having a steel frame.

The book is divided into three parts and an appendix.

Part I covers the calculation of stresses in simple beams, trusses, portals, etc., and contains forty problems.

Part II covers the calculation of the deflections of structure; stresses in girders, trusses and frames. This part also contains data on problems in building construction and is preliminary to a study of bridges of the movable, arch, cantilever and suspension types.

Part III covers the design and construction of steel-framed buildings for various classes of industrial plants, also a full discussion of the design and construction of floors, roof coverings, foundations, windows, doors and other details.

The appendix contains a complete specification for a steel-framed mill building.

The author is to be congratulated for the clear manner in which he has treated his subjects. While the book was orginally written for the use of students, engineers of experience will find in it much matter of interest, especially in the demonstration of theories to young assistants.

Forthcoming Meetings

Taylor Society: Mid-winter meeting, Philadelphia City Club, Philadelphia, Pa., March 16, 17 and 18. Secretary's headquarters, 29 West 39th St., New York City.

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

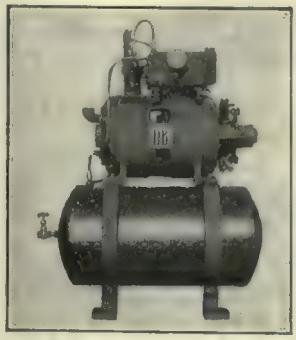
American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

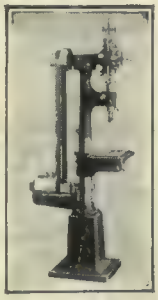
Patented Aug. 20, 1918

Compressor, Air, Automatic
Hobart Bros. Co., Troy, Ohio
"American Machinist," October 20, 1921



The unit is especially intended for use in garages and service stations where it is necessary to keep a constant pressure in the air lines. The device is compactly made, the compressor unit being mounted on top of the supply tank. The pump is of the rotary type and driven directly from the motor, which is mounted on the same shaft. No gears are employed and the shaft runs on ball bearings, so that the unit is quiet in operation. The magnetic pressure release enables the motor to start without load. An air and oil filter, safety valve, gage and tank are standard equipment.

Tapping Machine, Automatic, "Hy-Speed"
Cincinnati Hy-Speed Machine Co., Cincinnati, Ohio
"American Machinist," October 27, 1921



The machine has a patented spindle lead and automatic reversing mechanism. With the use of the spindle-lead device, the tap is brought forward and returned in a positive way, without the necessity of attention from the operator. One half turn of the stop plunger at the side of the control handle changes from semi-automatic to fully automatic operation. The spindle can be stopped at any point, reversed, and again brought forward by the use of the control lever. Adjustable dogs on the trip rod regulate the depth of tapping. S.K.F. ball bearings are used throughout. The machine is built with from one to three spindles in two sizes, the maximum capacities being ¾ and ⅞ in. in steel.

Dresser, Grinding-Wheel, Desmond-Hex
Desmond-Stephan Manufacturing Co., Urbana, Ohio
"American Machinist," October 27, 1921



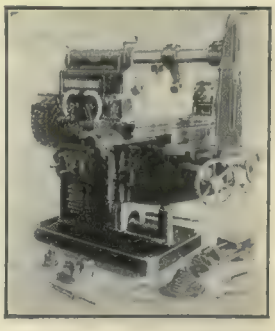
The principal feature of the dresser is the fact that it provides a number of interchangeable bearings for the pin carrying the cutters. The handle is channeled on the inner sides of the head to hold removable, hardened hexagon nuts having six holes drilled partially through each. The blind holes in these nuts serve as bearings for each end of the spindle carrying the cutters. When the holes in which the spindle is running become worn, the nuts are removed by loosening the screws, and the hexagon is turned so that the next pair of holes comes into use. The dresser is made in two sizes for cutters 1⅛ and 2⅜ in. in diameter.

Reamer, Expansion, Adjustable-Pilot, Piston, Critchley
Chadwick & Trefethen, 32 Bow St., Portsmouth, N. H.
"American Machinist," October 27, 1921



This Critchley expansion aligning reamer is especially adapted to the reaming of piston-pin holes in automotive-engine pistons when making repairs that involve oversize pins. The tool carries upon an extension of the body three shoes that slide in the same grooves as the blades, the shoes forming an adjustable pilot to align the reamer when entering the hole. In addition to the pilot, the upper third of the cutting blades is ground to a circle of a size to just fill the newly reamed hole, thus providing a bearing both before and behind the cutting blades. The reamer is made in ten sizes ranging from a minimum of ⅛ in. to a maximum of 1 1/32 in., each reamer expanding 1/16 in.

Milling Machines, Constant-Speed Drive, Ohio
Oesterlein Machine Co., Cincinnati, Ohio
"American Machinist," October 27, 1921



A complete line of milling machines of the constant-speed-drive or all-geared type is made, the line consisting of Nos. 1, 2, 2 heavy, 3, 3 heavy and 4 sizes, each size being made in both plain and universal types. The No. 3 heavy-duty universal machine is illustrated. The speed-change mechanism consists of but fifteen gears, from which sixteen speeds may be obtained without stopping the machine. Automatic lubrication is effected without pumps, employing a system of three reservoirs. The operation of the machine is controlled by tight and loose pulleys. A brake for quick stopping of the spindle is incorporated in the belt-shifting mechanism.

Buffing Machine, Ball-Bearing
J. G. Blount Co., Everett, Mass.
"American Machinist," October 27, 1921



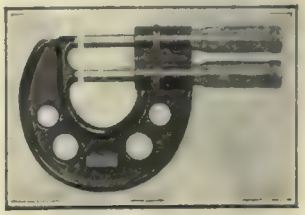
These ball-bearing buffing machines are built in three sizes. The illustration shows the No. 5 machine, which is of medium size. The machine is equipped with S.K.F. ball bearings in dust-proof mountings. The bearings are secured to the spindle by light drive fits and also by locknuts. The spindle is of high-carbon steel, and a taper point is fitted to the right-hand end for use with small wheels. The head is regularly mounted with the pan on the column, the parts being bolted together.

Press, Broaching, Power, Bench
American Broach and Machine Co., Ann Arbor, Mich.
"American Machinist," October 27, 1921



The machine is operated by a 2½-in belt on a 10-in. pulley, the pulley revolving continuously in one direction. Power is transmitted through a worm and worm gear of 30-to-1 speed ratio. The ram is 2 in. in diameter with the rack teeth cut directly on the back of it. The worm automatically disengages at a predetermined point in the stroke. The return of the ram is effected automatically by means of a weight and cord. The length of stroke is 14 in. The machine is suited for operating push broaches, for pressing mandrels in and out, for pressing in bushings, and for numerous operations often performed by hand.

Micrometer, Double, Snap-Gage
J. T. Slocumb Co., Providence, R. I
"American Machinist," November 3, 1921



The tool is in reality a micrometer with two measuring screws, each of which can be locked in any desired position. It has a range of 1 in. When the tool is used as a snap gage, the screws are set to the desired high and low limits, respectively. When used in the machining of work, it may be advantageous to set and lock the lower or "no-go" screw only. On inspecton work, the lower screw may be locked at the rejection point for minimum diameter, and the upper screw used to measure the large diameter. The frame is of forged steel.

The Weekly Price Guide

THIS WEEK'S MARKET

PITTSBURGH mill price of soft steel bars, shapes and plates quoted at $1.35@$1.40 per 100 lb. Structural shapes were quoted in October, 1913, at $1.85 and in January, 1915, at $1.10 per 100 lb., Pittsburgh. Chicago quotes steel shapes at $1.50@$1.60 f.o.b. mill. Galvanized steel sheets, base size, quoted in New York warehouses at $4.75 in 25 bundle lots and at $4.90 in smaller quantities as against $5 per 100 lb. one week ago. Openhearth spring steel (base size) quoted at 4c. as against 4½c. per lb. Cold finished shafting and screw stock (rounds) quoted at $3.35, reduced from $3.45 and flats, squares, hexagons, etc., at $3.85, down from $3.95 per 100 lb. Pig iron shows improvement in demand; mostly small orders.

New York warehouses quote a reduction of ½c. on tin; ½c. on copper sheets and ½c. per lb. on copper wire. Copper market tending toward recovery, with increased sales; zinc firmer. Reductions of ½c. in copper sheets and rods; brass sheets, rods and tubing and 1½c. per lb. in copper tubing quoted in Cleveland.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.00
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	20.34
Virginia No. 2	26.24
Basic	19.84
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	20.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.60	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
1 to 3	71	58½	⅜ to 1¼	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	69	57½	⅜ to 1¼	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.25	3.40
Cold finished flats, squares	3.85	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.53
Soft steel bar shapes (base)	2.53	2.36	2.53
Soft steel bands (base)	3.13	....	3.13
Tank plates (base)	2.63	2.46	2.63
Bar iron (2.00@2.10 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛"	8.50		12@13
5/32"	7.15		11@12
¼ to ½"	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	30.25
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 4.77½; New York	5.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	20.25	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (⅓ and ½), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	10.50
Copper, heavy, and wire	9.50	9.50	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.13
Cotton waste, mixed, per lb	.055@.09	.09	.11
Wiping cloths per M., 13¼x13½	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.99	.91
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	3.75@4.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3 50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.43
Cone heads, ditto (net)	3.60	3.35	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Bay Minette—The Bay Minette Mfg. Co., Inc., O. H. Ertzinger, Pres.—two-color veneer printing machine.

Ala., Birmingham—The Benoit Coal Mining Co., 1917 Jefferson County Bank Bldg., O. L. Davis, Purch. Agt.—small drill press suitable for drilling and reaming up to 2 in. holes.

Ala., Birmingham—S. Jacobs & Co., 234 Brown Marx Bldg., S. Jacobs, Purch. Agt.—one gyratory crusher for limestone, capacity 50 tons per hr., and one steam shovel, 2½ yds.

Ala., Birmingham—The Tennessee Coal, Iron & R.R. Co., Brown Marx Bldg., Le Ray Holt, Purch. Agt.—steel foundry machinery of all kinds, also heavy duty lathes, Gisholts, board and steam hammers and wood-pecker hammers.

Ala., Birmingham—The Woodward Iron Co., J. T. Leonard, Purch. Agt.—one motor driven drill and reamer with flexible cord, for 1 in. and smaller drill; one lathe for company garage with attachment for thread cutting.

Fla., Chuluota—D. G. Ziegler, Columbia, S. C., purchasing architect for Petrous Mfg. Co., Chuluota—concrete mixer, brick machine, tile and roofing tile machine, elevator equipment, moulds for moulding concrete blocks, small steam shovel (new or used).

Ga., Wrightsville—The Southern Ice & Coal Co.—one 6 x 6 duplex belt driven air compressor which will lift water from deep well which has water level of about 60 ft.

Ia., Muscatine—Lew & Stein—refrigerating machinery including mechanical freezers.

Ill., Chicago—The Alto Mfg. Co., 1801 Cornelia Ave.—one No. 21 Bliss punch press or equivalent also large tumbling barrel.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., A. Walker, Purch. Agt.—one Atkins No. 7 power driven hand saw or equivalent; one Fay & Egan No. 62 or equivalent, universal woodworking machine arranged for belt drive.

Ill., Chicago—W. J. Combs, 7524 Constance Ave.—complete set of sheet metal workers machinery, (used).

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave., Purch. Dept.—one stone crusher, capacity 3 to 7 tons per hr., (used).

Ill., Chicago—F. W. Mateer & Co., 226-32 West Ontario St.—one 14 x 8 lathe, one No. 2 Universal miller and one 16 in. shaper.

Ill., Chicago—C. H. Stoelting, 3047 Carroll Ave.—bench hand milling machine, (used).

Ill., Decatur—The Builders Lumber Co., 722 North Monroe St.—woodworking machinery for proposed lumber factory.

Ill., Joliet—The Union Coal Transfer & Warehouse Co., A. Lindberg, Genl. Mgr.—ice machinery sufficient to manufacture 40 tons per day.

Ind., Evansville—The International Steel & Iron Co., 1243 Edger St.—one 2½ in. upsetting machine.

Kan., Newton—The Imperial Laundry, J. W. Morgan, Prop.—laundry machinery for proposed laundry on East 5th St.

Md., Baltimore—The Hudson Cement & Supply Co., 1803 Whitmore Ave., G. H. Haines, Treas.—concrete block machinery.

Md., Vienna—R. H. Baumgartner—mill equipment and machinery including conveyor for flour and feed mill, flour bleacher, corn meal burs, chicken feed mill, Midget Marvel mill, corn sheller, kerosene engine, etc.

Mich., Detroit—The International Mchy. Co., 2527 Grand River Ave., A. Colman, Purch. Agt.—one No. 60 Heald cylinder grinder.

Mich., Detroit—The Precision Tool Co., 5465 Lincoln Ave.—miscellaneous machine shop equipment.

Mich., Gladstone—Ludwig & Kranz—shoe making machinery, power operated.

Mich., Saginaw—The Saginaw Products Co. (motor plant), F. W. Mowbray, Genl. Supt.—machine tools, drill presses, etc.

Minn., Odessa—A. M. Semrau—lathe or turret lathe for general garage repair shop, (used).

Mo., Carthage—The Leggett & Platt Spring Bed Mfg. Co., C. B. Platt, Purch. Agt.—punch press.

Mo., Fulton—The State School for Deaf and Dumb—laundry machines for proposed laundry.

Mo., Carthage—The Pioneer Oil & Refining Co., F. B. Oswald, Purch. Agt.—oil filtering equipment.

Mo., North Kansas City—The Standard Steel Co., 1720 Tracy St.—air compressor to take care of four riveting hammers, (used).

Mo., Kansas City—E. A. Hall, 215 West 12th St., (printer)—press, 10 x 15.

Mo., Neosho—The Ozark Creamery—belting, shafting, hangers, bearings and pulleys.

Mo., Pierce City—F. Keunchel—grinding lathe, drill press, small blacksmith tools, shafting, etc.

N. J., Camden—The Standard Tank & Seat Co., 314 North Front St.—woodworking and metal working machinery.

N. J., Moorestown—The Inter State Safety Appliance Co.—woodworking machinery and stamping (metal) machinery.

N. J., Palmyra—The Palmyra News, F. Chambers, Purch. Agt.—one 6-7 Col. quarto cylinder press.

N. J., Pleasantville—The Taylor Packing Co., Pleasantville, W. Taylor, Vermont and Melrose Aves., Atlantic City, Pres.—meat packing machines also conveyors and ice manufacturing machines.

N. Y., Black River—Carpenters Bus Line Inc.—power hack saw and electric post driller.

N. Y., Boonville—The Bd. Educ. machine tools for manual training class.

N. Y., Brockport—The Wright Factory, c/o W. D. Wright—machinery for the manufacture of mission and grandfathers clocks, ladders, cabinet work, etc.

N. Y., Buffalo—The Clifton Connor Corp., 895 Niagara St.—all kinds of machinist tools.

N. Y., Carthage—The Braman Stalker Co., Inc., O. H. Braman, Purch. Agt.—woodworking equipment.

N. Y., College Point (Flushing P. O.)—The Cox Klemin Aircraft Corp., two circular wood saws; three beading machines; two rivet punches; two foot shears; one circular metal saw and two bench shears.

N. Y., Croghan—J. H. Smith—small drill press, (used).

N. Y., Henderson Harbor—J. Bassett—wood lathe and 1½ ton triple chain hoist for boat building shop.

N. Y., Mechanicsville—The Fuffney Brick Co.—machinery for the manufacture of pressed brick.

N. Y., Mechanicsville—T. C. Luther—lumber and planing mill equipment.

N. Y., New York—The Ward Baking Co., Southern Blvd.—one threading machine (bolt cutter); one 20 in. shaper; one 26 in. x 12 ft. lathe; two 18 in. stationary head drill; one 11 in. x 6 ft. speed lathe; three 16 in. four-jaw chucks; two sets Armstrong lathe tools; one No. 5, No. 3 and No. 2 emery grinders; one 24 in. jointer and one Buffalo No. 45 combination punch and shear.

N. Y., North Tonawanda—G. H. Milliman & Son, 108 Sommer St., G. H. Milliman, Purch. Agt.—wood turning lathe.

N. Y., Schenectady—The Woodcraft Mfg. Co., A. H. Scraeffer, Purch. Agt.—woodworking machinery and equipment.

N. Y., Syracuse—H. H. Franklin Mfg. Co., 302 South Geddes St., made inquiry of Pittsburgh house for list of 20 machine tools.

N. Y., Theresa—O. P. Eggleston—forge and 16 in. back geared engine lathe.

N. Y., Watertown—G. A. Aber Mfg. Co.—general equipment to manufacture gasoline motors.

N. C., Charlotte—The McClaren Rubber Co., P. O. Box 36—bench lathe, ¾ in. through collet chuck, equipped with slide rest and turret attachment.

N. C., Lexington—G. W. Smith, 310 East Center St.—self feed rip saw, jointer, band saw, cut-off saw, and sander.

O., Bedford—B. T. Wright, Village Engr.—one concrete mixer.

O., Cleveland—The Consolidated Iron Steel Co., 1200 East 53rd St.—drill press.

O., Cleveland—The Sterling Brass Co., 4612 St. Clair Ave., E. M. Collins, Purch. Agt.—ten air sweezer moulding machines, 10 in., 12 in. and 14 in. Warner and Swasey turret lathes; 10 ball bearing polishing and bufling double end machines.

O., Columbus—The Central Refractories Co., Ferris Bldg., A. N. Spencer, Vice-Pres.—brick and tile making machinery including stone crushers, presses, dryers, etc., for plant at Union Furnace.

O., South Charleston—E. P. Kelly, 1618 East Broad St., Columbus, has taken over the plant of the Houstonia Creamery & Ice Co., here—equipment for creamery and ice manufacturing including cream separation machinery.

Okla., Commerce—The Powell Cycle Lever Co., c/o A. L. Powell, Purch. Agt.—belting, shafting and drill press.

Pa., Chester—The Scott Paper Co., Market St.—additional machinery for new addition to plant.

Pa., Chester—The Textile Mfg. Co., Montgomery Bldg., D. Coulter, Pres.—general machinery for silk manfacturing including winders and cones.

Pa., Collegeville—L. Ball—one small printing press, 5 x 7 or larger.

Pa., Monessen—The Bd. Educ.—equipment for automobile shop, foundry, lathe room and woodworking department.

Pa., Phila.—The Concordia Silk Hosiery Co., A and Courtland Sts.—additional automatic full fashion hosiery machines.

Pa., Phila.—The H. B. Coyle Iron Wks., Inc., 622 Filbert St., H. B. Coyle, Purch. Agt.—additional punches, drills, etc. for new addition to plant.

Pa., Phila.—The Delphine Hosiery Mills, 3rd and Dauphin Sts., A. Strain, Treas.—automatic full fashion machines.

Pa., Phila.—The General Processing Co., Willard St. and Trenton Ave.—conveyors, shafting pulley, etc., and additional dyeing and drying machines.

Pa., Phila.—The Girard Cycle Co., 1022 West Girard Ave.—small lathes, cutters, drill and machine tools for proposed repair shop on Hutchinson and Thompson Sts.

Pa., Phila.—A. Leebovitz, 1002 North Marshall St.—fillers, conveyors and other bottling machinery.

Pa., Phila.—The McArdle & Cooney, Inc., 519 Arch St., (pipe and steam fitters supplies)—additional machinery and tools.

Pa., Phila.—The Typewriter Headquarters, 524 Walnut St.—one screw cutting lathe, about 4 ft. bed.

Pa., Phila.—W. I. Underwood, Keystone and Cottman Sts., W. I. Cottman, Purch. Agt.—additional machinery for woodworking mill.

Pa., Phila.—The S. S. White Dental Mfg. Co., Wingohocking and Unity Sts., S. S. White, 211 South 12th St., Purch. Agt.—shaftings, metal and wood machinery, conveyors, belting, etc., for new factory.

Pa., Pittsburgh—The Greenwood Constr. Co., Carson and 24th Sts., refrigerating equipment—equipment for new assembling and machine shop now under construction.

Pa., Sharon—The Salvage Arms Corp., C. A. Calleson, 50 Church St., New York City, Purch. Agt.—press and planer.

Pa., Warren—Klenck Bros.—one 14-20 in. engine lathe, shaper, drill press, emery grinder, electric drill, arbor press, bench vises, tools and all kinds of equipment for repair shop and garage.

S. C., North—E. C. Johnson—light equipment for operating short line railroad, including light locomotive, rails, switches, etc.

S. C., Olanta—The Dyson Bros. Hardware Co., W. M. Myers, Purch. Agt.—small machine for turning handles, spokes, etc.

Tenn., Clarksville—Farnsworth-Stacker—complete machinery and equipment for the manufacture of plain double cane chairs, etc., (new or used).

Va., Norfolk—L. F. Hobbs, 115 East 12th St.—one 250 ft. span cableway to handle 1 yd. clam shell bucket; one 200 to 250 cu. ft. capacity air compressor, gasoline driven; rock crushing outfit, complete with screens, elevators, etc.; one bag filling machine; 100 factory platform trucks about 2 x 5 ft., (used).

Va., Winchester—The Winchester Lumber Corp.—complete planing machinery and dry kiln equipment.

W. Va., Buckhannon—The Buckhannon Brick Co.—dry kiln equipment consisting of doors, etc., also (new or used) 60 double-deck steel dryer cars, 24 in. gauge.

W. Va., Buckhannon—C. E. Hines—complete woodworking machinery outfit.

W. Va., Charleston—The Bd. Educ.—equipment for vocational department of proposed Junior High School.

W. Va., Princeton—The Bd. Educ., J. V. Woodson, Pres.—equipment for vocational and manual training departments of new high school.

W. Va., Rainelle—The Sewell Valley R.R.—one 36 in. planer; 250 ton wheel press; universal milling machine and 1200 ton steam drop hammer.

W. Va., Wheeling—C. L. Hills, 403 Natl. Bank Bldg., C. L. Hills, Purch. Agt.—two class 14 and one class 24 Bucyrus dragline machines also 20 to 30 four-yard Western, 36 in. gauge, steel draft sill dump cars.

Wis., Algoma—The Algoma Wood Products Co.—woodworking machinery.

Wis., Antigo—The Amer. Dairy Products Co., c/o J. Fronek, Route 2—belt driven separators, mixers and vats, for making cheese.

Wis., Casco—The Casco Milling Co., W. E. Drossart, Purch. Agt.—feed grinding machinery, operated by gasoline engine or electric motor.

Wis., Greenville—E. Schroeder—auto repair equipment for proposed garage.

Wis., Hustisford—The Hustisford Ice Cream Co., Lock Box 42—100 to 200 gal. pasteurizing machine.

Wis., Kewaunee—J. Svoboda—woodworking machinery for proposed furniture factory on Main St.

Wis., Madison—J. A. Brady, 219 East Washington Ave.—equipment for auto repair work.

Wis., Madison—The Madison Gas & Electric Co., 102 East Main St.—monorail crane.

Wis., Marshfield—Blum Bros., 135 West 9th St., P. Blum, Purch. Agt.—one 12 in. jointer; swing cut-off saw, boxboard matcher; stave planer; crozing machine; trusser; equalizer turning lathe all to be with individual electric motor drive.

Wis., Menomonie—The Menomonie Oil Co.—machinery for use in trucks and auto repair shop.

Wis., Milwaukee—The Argo Tool & Machine Mfg. Co., c/o C. E. Helm, Purch. Agt., 345 25th Ave.—two No. 2 milling machines and one Detroit drill.

Wis., Milwaukee—The Barkdoll Candy Co., 924 Center St., J. A. Barkdoll, Purch. Agt.—motor driven beating machines, dippers, coolers, etc.

Wis., Milwaukee—C. Bielefeld, 1161 Grant St.—one 30 in. or 32 in. band saw, boring machine, and 12 in. jointer.

Wis., Milwaukee—T. Dammann, 3115 Clybourn St.—polishing machines, carving machines and saws, (power) for monument work.

Wis. Milwaukee—The Interior Woodwork Co., 521 Park St.—additional woodworking machinery.

Wis., Milwaukee—C. Krusemark, 153 Williams St.—limestone grinding machinery, gasoline or steam engine driven.

Wis., Milwaukee—The Novelty Mfg. Co., c/o O. J. Habbegger, 114 Grand Ave.—machinery for the manufacture of novelty brushes.

Wis., Milwaukee—The Werner Knitting Wks., 397 11th Ave.—laundry machinery including a belt driven ironing machine.

Wis., Omro—A. J. Ihrke—gasoline storage tank and pump for garage.

Ont., Parkhill—Allen & Eagleson—complete equipment for garage and service station.

Wis., Sun Prairie—Chase & Son, F. A. Chase, Purch. Agt.—coal handling machinery.

Wis., Tomah—C. W. Dickover Mfg. Co., C. Dickover, Purch. Agt.—lathe, drill press and motor.

Wis., Watertown—The Klinger Buick Co., 212 South 1st St., F. J. Klinger, Purch. Agt.—lathe, drill press, motor and grinder.

Wis., Watertown—Klinger & Mayer Co., 200 1st St.—equipment for repair shop, including drill, lathe and press.

Ont., Brampton—The Pease Furnace Co.—foundry and general equipment for furnace plant to replace that which was destroyed by fire.

Ont., Markdale—F. T. Hill & Co.—modern flour mill equipment to replace that which was destroyed by fire. Estimated loss, $35,000.

Que., Montreal—The Central Machine & Welding Co., 38 Bronsdon Lane—welding machine and small lathe.

Que., Montreal—The Magnolia Metal Co. of Canada, Ltd., 39 Shannon St.—foundry equipment.

Metal Working Shops

Cal., Burbank—The Amer. Aluminum Metal Products Co., has awarded the contract for the construction of seven 1 story factories covering 60,000 sq.ft. of floor space. Estimated cost, $88,000. Noted Aug. 18.

Cal., Oakland—M. Elsaser, c/o S. Heiman, Archt., 57 Post St., San Francisco, will soon receive bids for the construction of a 1 story, 75 x 100 ft. machine shop on 41st and Washington Sts. Estimated cost, $15,000.

Conn., East Hartford (Hartford P. O.)—F. C. Walz, Archt., 407 Trumbull St., Hartford, is receiving bids for the construction of a 1 story, 80 x 100 ft. garage and service station on Connecticut Blvd., here, for T. Shannon, Russell St., South Manchester. Estimated cost, $40,000.

Conn., Wallingford—H. L. Judd & Co. 42 South Cherry St., has awarded the contract for the construction of a 5 story, 80 x 100 ft. hardware factory on Cherry St. Estimated cost, $125,000. Noted Jan. 26.

Conn., Waterbury—G. W. Russell, 263 Bank St., has awarded the contract for the construction of a 1 story, 60 x 135 ft. garage and salesroom on Cottage Pl. Estimated cost, $40,000. Noted Oct. 27.

D. C., Washington—The Salvation Army, 521 13th St., N.W., will soon award the contract for the construction of an industrial home, garage, baling and repair shops. Estimated cost, $200,000.

Ill., Chicago—A. Johnson, 2812 North Ave., is having plans prepared for the construction of a 4 story, 50 x 138 ft. ice skate factory on North and Francisco Aves. Estimated cost, $100,000. H. A. Anderson, 3116 Sunny Side Ave., Archt.

Ill., Freeport—The Arcade Mfg. Co., 1 Columbus Ave., will receive bids until March 14 for the construction of a 3 story, 56 x 98 ft. factory for the manufacture of hardware specialties. Estimated cost, $35,000. C. E. Wolfley, 610 Stewart Bldg., Rockford, Archt.

Ill., Shelbyville—M. O. Finks plans to build a 1 story, 62 x 80 ft. garage to replace the one destroyed by fire. Estimated cost, $40,000. Private plans.

Ill., Sterling—E. L. Reed Mfg. Co., 10 South Mill St., manufacturer of hardware specialties, has awarded the contract for the construction of a 3 story, 40 x 90 ft. factory. Estimated cost, $500,000.

Ill., Watseka—The Fanyo Garage Co plans to build a 1 story garage. Estimated cost, $40,000. Architect not selected.

Kan., McPherson—The Pioneer Motor Co. is having plans prepared for the construction of a 1 story, 75 x 140 ft. garage. Estimated cost, $50,000. C. W. Shaver, 159 North Santa Fe St., Salina, Archt.

Mass., Cambridge—The Natl. Bottling Co., 28 School St., Boston, has awarded the contract for the construction of a 1 story, 75 x 135 ft. garage and service station on Washington St., here. Estimated cost, $45,000.

Mass., Holyoke—R. Magna Auto Co. is having plans prepared for the construction of a 2 story, 75 x 100 ft. garage on Northampton St. Estimated cost, $50,000. Private plans.

Mass., Salem—The Hygrade Lamp Co., 60 Boston St., is having plans prepared for the construction of a 4 story, 50 x 100 ft. factory on Boston St. Estimated cost, $75,000. Monks & Johnson, 99 Chauncy St., Boston, Archts.

Mass., Westfield—H. B. Smith Co., 57 Main St., is having plans prepared for the construction of a 1 story, 30 x 140 ft. machine shop. Private plans.

Md., Baltimore—The Continental Garage & Service Corp., 111 North Charles St., has awarded the contract for the construction of a 5 story garage and service station on Monument and Howard Sts. Estimated cost, $275,000. Noted Dec. 22.

Minn., New Prague—The Gopher Mchy. Co. is having plans prepared for the construction of a 1 story, 78 x 100 ft. factory (1st unit). Estimated cost, $40,000. J. C. Niemeyer, 643 Endicott Bldg., St. Paul, Engr.

N. J., Camden—The Standard Tank & Seat Co., 314 North Front St., has awarded the contract for the construction of a 3 story, 32 x 78 ft. metal and woodworking factory at 316 North 4th St. Estimated cost, $30,000.

N. J., West Hoboken—J. Keavy, 357 Palisade Ave., will build a 1 story, 75 x 100 ft. garage on Malone St. Estimated cost $42,000. Noted Dec. 29.

N. Y., New York—M. I. St. John, c/o G. Keister, Archt. and Engr., 56 West 45th St., is having plans prepared for the construction of a 4 story, 125 x 150 ft. garage on the Grand Concourse and 174th St. Estimated cost, $125,000.

O., Cleveland—Coe & Baeher, 1795 East 90th St., have had plans prepared for the construction of a 2 story, 37 x 62 ft. commercial building and garage at 8212 Carnegie Ave. Estimated cost, $40,000. Private plans.

O., Cleveland—C. W. Fessenden, c/o W. J. Wefel, Archt. 624 Union Bldg., has had plans prepared for the construction of a 1 story, 40 x 141 ft. garage at 2993 East 116th St. Estimated cost, $40,000.

O., Cleveland—The Perfection Tire & Repair Co., 3618 West 25th St., is receiving bids for the construction of a 1 story, 66 x 82 ft. garage on Archwood and West 25th Sts. Estimated cost, $40,000. J. L. Cameron, 10406 Euclid Ave., Archt.

Pa., Phila.—L. Blumberg, 235 North 4th St., has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage and a 1 story, 70 x 100 ft. theatre at 510 North 4th St. Estimated cost, $90,000.

Pa., Phila.—Hexfer & Kahn, Morris Bldg., have awarded the contract for the construction of a 1 story, 40 x 237 ft. store and service station at 5931-35 Broad St. Estimated cost, $90,000.

Pa., Phila.—C. Kohn, Morris Bldg., has awarded the contract for the construction of a 2 story, 125 x 300 ft. factory on Glenwood Ave. and Oxford St., for the manufacture of boilers and radiators. Estimated cost, $55,000.

Pa., Phila.—I. W. Levine, Archt., Liberty Bldg., will soon receive bids for the construction of a 2 story, 50 x 66 ft. repair shop on Hutchinson and Thompson Sts., for the Girard Cycle Co., 1022 West Girard Ave. Estimated cost, $30,000.

Pa., Phila.—H. T. Paiste & Co., 32nd and Cherry Sts., has awarded the contract for the construction of a 4 story, 104 x 108 ft. addition to its factory for the manufacture of electrical supplies. Estimated cost, $100,000.

Pa., Phila.—A. W. Pusey, West End Trust Co. Bldg., has awarded the contract for the construction of a 3 story, 40 x 50 ft. and 3 story, 35 x 120 ft. garage on Girard Ave. and Watts St. Estimated cost, $60,000. Noted March 2.

Pa., Phila.—G. H. Thirsk, 4305 Horrocks St., has had plans prepared for the construction of a 3 story 43 x 289 ft. garage and storage plant on Adams St. and Wingohocking Ave. Estimated cost, $100,000. Private plans.

Pa., Pittsburgh—J. C. Forster & Son, 3519 Penn Ave., are having plans prepared for the construction of a 2 story, 50 x 100 ft. plant for the manufacture of tinware. Estimated cost, $40,000. Private plans.

Pa., Sharon—The Wilton Tool Co., 2121 Grand River Ave., Detroit, Mich., has awarded the contract for the construction of a 1 story, 20 x 100 ft. and 50 x 100 ft. plant here, for the manufacture of tools. Estimated cost, $50,000. Noted Dec. 29.

R. I., Hillsgrove—The Rhode Island Malleable Iron Wks. plans to build a 1 story, 70 x 250 ft. addition to its plant. Estimated cost, $75,000. Private plans.

Wis., Greenville—E. Schroeder has purchased a site on Main St. and plans to build a 1 and 2 story, 50 x 90 ft. garage. Estimated cost, $40,000. Architect not selected.

Wis., Madison—J. A. Brady, 219 East Washington Ave., has awarded the contract for the construction of a 1 story, 61 x 127 ft. garage on Park St. Estimated cost, $40,000. Private plans.

Wis., Menasha—The U. S. Tractor & Mchy. Co., 6th St., plans to build a 2—3 story, 160 x 190 ft. tractor factory. Estimated cost, $200,000. Architect not selected.

Wis., Omro—A. J. Ihrke plans to build a 2 story, 60 x 90 ft. garage. Estimated cost, $40,000. Architect not selected.

Wis., Racine—W. J. Redden, Archt., 2819 Arlington Ave., will soon receive bids for the construction of a 1 story, 85 x 100 ft. garage on West 6th St., for the Jacobson Auto Co., 1712 West 6th St. Estimated cost, $45,000.

Wis., Watertown—Klinger & Mayer Co., 208 1st St., plans to build a 1 and 2 story, 104 x 120 ft. garage and repair shop on 1st St. Estimated cost, $45,000. Architect not selected.

Ont., Brampton—The Pease Furnace Co. plans to rebuild its factory which was destroyed by fire. Estimated loss, $150,000.

Ont., Parkhill—Allen & Eagleson plan to build a garage and service station. Estimated cost, $40,000.

General Manufacturing

Cal., Paso Robles—G. Jacobs, c/o Miller & Warnecke, Archts., Perry Bldg., Oakland, has had plans prepared for the construction of a 2 story baking plant. Estimated cost, between $115,000 and $120,000.

Cal., San Francisco—The Los Angeles Soap Co., 350 Front St., is having plans prepared for the construction of a 3 story, 100 x 160 ft. soap factory on 2nd and Brannan Sts. About $150,000. W. H. Crim, Jr., 435 Kearny St., Archt.

Cal., San Francisco—The Real Estate & Development Co., Hearst Bldg., has awarded the contract for the construction of a 1 story factory on 16th St. near Kansas St., for the Natl. Fibre Form Products Co. Estimated cost, $20,000.

Conn., Hartford—The Imperial Dyeing Wks., 214 Park St., is having plans prepared for the construction of a 1 story, 125 x 130 ft. dyeing plant on Park St. Estimated cost, $50,000. Berenson & Mosca, 1028 Main St., Archts.

Ia., Davenport—L. H. Hass, 2103 Greenwood Ave., and C. L. Kruse, have awarded the contract for the construction of a 3 story, 26 x 120 ft. bakery and office building, on 3rd and Brady Sts. Estimated cost, $75,000.

Ill., Decatur—The Builders Lumber Co., 732 North Monroe St., is having plans prepared for the construction of a 2 story, 24 x 170 ft. lumber factory. Estimated cost, $25,000. Private plans.

Ill., Decatur—The Decatur Lumber & Mfg. Co., 666 North Water St., is having plans prepared for the construction of a 2 story factory and warehouse. Estimated cost, $50,000. Brooks, Bramhall & Dange, 208 Natl. Bank Bldg., Archts.

Ill., Jacksonville—The International Shoe Co., c/o A. Hume, 15th and Washington Sts., St. Louis, Mo., is having plans prepared for the construction of a 3 story shoe factory, here. Estimated cost, $50,000. H. Rinehardt, 13th and Mullanphy St., St. Louis, Mo., Archt. Noted Nov. 24.

Ill., Joliet—The Union Coal Transfer & Warehouse Co. plans to build a 1 story, 50 x 160 ft. ice plant and warehouse on Henderson St. Estimated cost, $40,000. A. Lindberg, Genl. Mgr. Private plans.

Ill., Olney—The Sexton Mfg. Co., Fairfield, plans to build a 2 story knitting factory here. Estimated cost, $30,000. Private plans.

Ill., Rockford—The Shurtleff Ice Cream Co., 103 South Main St., is having plans prepared for the construction of a 2 story, 50 x 110 ft. addition to its ice cream factory. Estimated cost, $50,000. F. A. Carpenter, Brown Blk., Archt.

Kan., Newton—The Imperial Laundry has awarded the contract for the construction of a 3 story, 40 x 145 ft. laundry on East 5th St. Estimated cost, $52,000. J. W. Morgan, Prop.

Mass., Attleboro—R. Wolfenden & Sons will build a 1 story, 60 x 280 ft. addition to their dychouse. Estimated cost, $60,000.

Mass., Canton—The G. Grow Tire Co., 321 Columbus Ave., Boston, has awarded the contract for the construction of a 1 story, 41 x 102 ft. addition to its tire factory, here. Estimated cost, $45,000.

Mass., Graniteville—The Abbot Worsted Co., Westford, has awarded the contract for the construction of a 3 story, 90 x 215 ft. mill, here, for the manufacture of worsted goods. Estimated cost, $150,000.

Mass., Malden—The Yale Knitting Co., Sherman St., is having plans prepared for the construction of a 4 story addition to its knitting mill. Lockwood Greene & Co., 60 Federal St., Boston, Archts. and Engrs.

Mass., New Bedford—Tait Bros., 103 North Front St., plan to build a 2 story ice cream plant. Estimated cost, $40,000. Architect not announced.

Mass., Newtonville—The Security Mills, Inc., West Newton, will build a 1 story, 60 x 150 ft. addition to textile mill on Monroe St., here. Estimated cost, $50,000.

Mass., Peabody—The Danvers Bleachery Co. has awarded the contract for the construction of a 3 story, 60 x 250 ft. bleachery. Estimated cost, $150,000.

Me., Kittery—The Turner Centre Creamery plans to build a 2 story creamery. Estimated cost, $60,000. Private plans.

Me., Springvale—The Goodall Worsted Co. is having revised plans prepared for the construction of a 5 story, 240 x 280 ft. spinning mill and storage building on River St. Lockwood Greene & Co., 60 Federal St., Boston, Mass., Archts. and Engrs.

Md., Baltimore—The Erlanger Underwear Mfg. Co., 527 West Pratt St., has awarded the contract for the construction of a 1 story, 80 x 110 ft. factory on Federal and Castle Sts. Estimated cost, $25,000.

Md., Baltimore—J. H. Geis & Co., Brooklyn (Baltimore P. O.), is having preliminary plans prepared for the construction of a 1 story, 63 x 100 ft. planing mill, here. Estimated cost, $30,000. W. A. White, 2024 North Smallwood St., Archt.

Mo., Fulton—The State School for Deaf and Dumb is having plans prepared for the construction of a 1 story, 50 x 80 ft. laundry. Estimated cost, $25,000. C. I. McNamee, Pres. M. F. Bell, Fulton, Archt.

Mo., Joplin—The Miners Ice & Fuel Co., 318 Main St., plans to build a 2 story ice plant on 10th St. and Kentucky Ave. Estimated cost, $15,000. Private plans.

Mo., Leeds—The Wilson Slaughtering Device Co., 511 Amer. Bank Bldg., Kansas City, will build a 2 story, 30 x 140 ft. steam plant, here. Estimated cost, $50,000. Noted Feb. 9.

N. J., Pleasantville—The Taylor Packing Co. has awarded the contract for the construction of a 2½ story, 100 x 145 ft. meat packing plant. Estimated cost, $75,000.

N. C., Gastonia—A. M. Smyre Mfg. Co. will soon receive bids for the construction of a 2 story, 125 x 300 ft. yarn mill. R. C. Biberstein, 614 Elizabeth Ave., Charlotte, Archt. and Engr.

O., Cleveland—The Brooklyn Ice Co., 3323 Henniger Rd., has awarded the contract for the construction of a 1 story, 35 x 100 ft. ice plant at 3307 Henniger Rd. Estimated cost, $40,000. H. C. Miller, Treas.

O., Cleveland—H. Soeder & Sons Co., 1635 East 38th St., has awarded the contract for the construction of a 2 story, 48 x 105 ft. dairy plant at 1649 East 39th St. Estimated cost, $40,000.

O., Dayton—The Holland Bread Co., 443 West 3rd St., has awarded the contract for the construction of a 2 story, 170 x 250 ft. baking plant on South Ludlow St. Estimated cost, $200,000.

O., Sandusky—The Sandusky Portland Cement Co., Bay Bridge, is receiving bids for the construction of factory buildings. Estimated cost, $100,000. Private plans.

O., West Carrollton—The Amer. Envelope Co. has awarded the contract for the construction of a 2 story paper mill. Estimated cost, $75,000.

Pa., Chester—The Irving Worsted Co. has awarded the contract for the construction of a 1 story, 64 x 100 ft. and 1 story, 52 x 64 ft. weaving factory. Estimated cost, $49,000.

Pa., Chester—The Scott Paper Co. is receiving bids for the construction of a 2 story, 45 x 86 ft. paper factory. Estimated cost, $50,000. Private plans. V. C. Darlington, Chester, Engr.

Pa., Phila.—A. Leebovitz, 1002 North Marshall St., has awarded the contract for the construction of a 2 story, 18 x 65 ft. addition to bottling plant at 999 North Marshall St. Estimated cost, $5,000.

Pa., Phila.—The Lester Piano Co., Lester, has awarded the contract for the construction of a 3 story, 85 x 144 ft. piano factory, here.

Pa., Phila.—Sheplan, Sabol & Palmer, 15th and Wallace Sts., have awarded the contract for the construction of a 4 story, 127 x 153 x 154 ft. factory on 43rd St. and Lancaster Ave., for the manufacture of knitted wear. Estimated cost, $95,000.

Pa., Reading—Lockwood Greene & Co., Archts. and Engrs., 60 Federal St., Boston, Mass., will soon award the contract for the construction of a 3 story, 50 x 400 ft. addition to cotton mill for the Reading Cotton Mills. Estimated cost, between $175,000 and $200,000.

R. I., Westerly—The Westerly Textile Co. will soon award the contract for the construction of a 5 story, 32 x 50 ft. mill. Estimated cost, $40,000. C. T. Main, 201 Devonshire St., Boston, Engr.

Tex., El Paso—Friejo Bros., Magoffin and Williams Sts., have awarded the contract for the construction of a 1 and 3 story, 36 x 120 ft. flour mill. Estimated cost, $10,000.

Va., Pulaski—The Paul Knitting Mills has had plans prepared for the construction of a 2 story, 40 x 77 ft., mill, a 1 story, 40 x 77 ft. dyeing room and a 1 story, 30 x 40 ft. stock room. F. S. Stone, Roanoke, Archt. and Engr.

Wis., Kewaunee—J. Svoboda plans to build a 2 story, 50 x 95 ft. furniture factory on Main St. Estimated cost, $30,000. Architect not selected.

Wis., Milwaukee—H. J. Esser, Archt., 82 Wisconsin St., is receiving bids for the construction of a 2 story, 65 x 160 ft. and 70 x 100 ft. factory and storage plant on Park St., for the Interior Woodwork Co., 521 Park St.

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Selling Machine Tools in Dull Times

How a Progressive Sales Department Is Going After Business in Dull Times and Getting It—New Outlets for Machine Tools

By L. K. BERRY
Domestic Sales Manager, Warner & Swasey Co.

IN THESE days the job of the machine-tool sales manager isn't what it used to be by any means. It is no longer even remotely possible for the star salesman to take orders for $800,000 worth of turret lathes in one year, as one of our men did when the boom was at its height. Neither is it the principal occupation of the sales office to apologize to irate customers for the unavoidable delays in filling their urgent demands for machine tools.

There is a keen fight on for every order placed. If you don't believe it drop a hint that you might possibly be in the market for a lathe or a milling machine or a shaper and see what happens. Four different men from our sales force visited one man in six weeks. I was the fourth and he gave me an order for two machines on condition that we would all stay away from him for a while. He wanted the machines all right, and they have been working at full capacity ever since we set them up, but he had economized so long that he thought he could get along a while longer with his old equipment.

THOROUGH CANVASS of the machine shops of the United States produces a list of carefully investigated prospects three times as big as the old list.

Sixty per cent of 1921 business came from new customers, a good sign for the future.

Lending time-study men and production and planning engineers to customers during hard times is a scheme that produces good results for everybody concerned.

One of the first things we did when we realized the probable extent of the business depression, was to make a thorough survey of the possible market for turret lathes. We began by checking over all available prospect lists. They showed the names of twenty-five hundred machine shops or manufacturing concerns which either used turret lathes, and therefore would probably be buyers of more such tools in the future, or else did work which could be handled by turret lathes. This didn't look very encouraging and, what was more, did not seem to check up very well with our ideas of what the field really held for us.

We went back over what statistics were available and discovered that the total sales of turret lathes by all manufacturers for the year 1918 were approximately $30,000,000. That year was, of course, an abnormal year but we estimated that, even with all foreign business eliminated there ought to be a market for half the quantity sold during that period, as soon as industry began to get into its stride. Then we took stock of the competition. Careful investigation showed that this was not so serious as it seemed, due principally to the fact that some of the companies had turned their efforts to the perfection and sale of other types of machine tools which were not directly in competition with our turret lathe.

This was reassuring, but did not help much in the current situation. We might all starve to death before any of these promising prospects reached the ordering point. We continued our intensive sales methods on the prospects listed, but in addition we started a canvass of every shop in the country. The reason for starting the canvass was the receipt of several orders from companies which had never been thought of as possible prospects. Investigation showed that each of them had a more or less well-equipped machine shop where one or more turret lathes could be used to advantage.

The results of the canvass were surprising. Twenty-seven men combed the country and as a result we wound up with a prospect list containing more than seven thousand names. And there was no dead wood on this list, because each shop had been visited and we knew exactly what its situation was. On the Pacific Coast, for instance, the canvassers found some four hundred shops, of which more than a hundred were good prospects for turret lathe sales. Here is about as good an indication of the progress of industrialization west of the Rockies as you could want.

Another surprising fact about the machine-tool market, as far as we are concerned, is that 60 per cent of our 1921 business came from buyers who had never been on our books before. From what I can learn from other machine-tool builders their experience during the past year has been much the same. Here, certainly, is an encouraging factor. With all this new business in sight the industry should prosper when the old customers, whose good will has been secured through efficient service, recover to the point where they can begin to replace their obsolete equipment.

In going after immediate business we have hammered away at the idea that what the buyer should consider is not the price of the equipment he buys, but the cost of the product of the machine as applied to his needs. There is nothing new about this thought but a lot of manufacturers have never heard of it.

Several months ago I got into a shop where I was

sure, because of information volunteered by men in neighboring shops, that we could make big savings if our turret lathes could be introduced. The works manager was a young engineer who had grown up in the plant and whose knowledge of manufacturing methods in other plants was limited. He was a live citizen all right, but he was cursed with the complacency that is all too common in American shops. He told me with some pride that, although he had only been on the job a year, he was getting out the same amount of work as had his predecessor, and with a hundred less men on the payroll. As a result he felt that the acme of efficient management in that particular plant had just about been reached, and he was inclined to look on my claims for our machine with considerable condescension.

The Time To Play Trumps

He was using our brass-working machines in his brass department and he assured me that they were so satisfactory that he wouldn't have anything else in the place. But when it came to handling iron and steel we just weren't in the running. Had he ever used one of our turret lathes? No, he hadn't, but he was positive that they could not equal the production of his present machines. I saw there was nothing to do but play trumps so I made him the offer we sometimes make to first-class shops where we are unusually anxious to break in. I offered him a machine all tooled for his hardest jobs to use as he saw fit for a year if he desired with the understanding that it could be returned to us at the end of that time if it failed to live up to the claims I made for it, and that it would cost his company nothing for the trial.

He thought I was joking at first but when he found I was serious he accepted the offer, for he really was a live citizen. He thought I was crazy, but I hadn't made that offer until I was certain of my facts and it really was a sure thing as far as we were concerned. Inside of four months he was satisfied and we had an order for more turret lathes. Now he is one of the best boosters we have among our customers.

So much for the plan of action when you are trying to break into a shop. The other side of the question faces you when a competitor tries the same plan to replace your machines. We have been up against this several times and the best defense we have found so far has been to lend one or more of our time-study and production men to the customer to show him how to speed up his present equipment by redesigning the tooling, changing speeds and feeds, etc.

To my mind, this use of production and planning department men during periods of depression like the present, is advantageous to everybody. Their own company gets the benefit of the missionary work they do and the good will they create and is able to keep them on the payroll. They, themselves, grow in experience as a result of their work in outside shops. And the customer benefits from the more efficient production methods which their skill and experience introduce into his shop. Some of us were a little skeptical of the idea when it was first suggested, but after several of our engineers who specialize on outside jobs had been turned loose in our own production department, we were convinced. I am not going to say what savings they made in departments that were thought to be about the last word in efficiency. Pride forbids.

Now a word as to some of the new fields for machine-tool sales. One that opened itself up for us recently is the musical instrument industry. More by good luck than for any other reason we got an order for a small machine for turning up bugle mouthpieces. The customer was near by and although his shop was small he made good money out of his purchase. In order to get more business from others in the same line we took photographs of the machine and its work and sent them out to a selected list of musical instrument makers with a good strong selling letter. There was no wasted effort in this list; we knew exactly to whom we were talking and we were able to talk their language by reason of our experience in satisfying the requirements of a man in their field. We got results.

The same methods have been used on prospects who made bottle molds and lamp bulb molds, and with equally pleasing results. In one case we increased production six times and broke a strangle hold which a local union of the old-fashioned kind had had on a plant for years.

The Passing of the Old Salesmen

One more factor in the present selling situation and I am through. The easy order days which began with the war and lasted for some months after the armistice had their effect on the older machine-tool salesmen. Some of them cleaned up so much during the prosperous times that they were able to retire from active selling. Others couldn't stand prosperity and went to pieces. Still others contracted the bad habit of trying to stand on their reputations as order getters and became of little use for keenly competitive selling, as it exists now.

The upshot of it all has been that most of them have been succeeded by a new generation of younger men who are aggressively ready to fight for every order and who are possessed of a brazen persistence that is unsquelchable. Most of them have no great accumulation of laurels to point to and are willing to be judged on present performances. Their achievements will be worth watching.

On the whole the future for the sound concerns in the machine-tool industry looks anything but gloomy to me—even the immediate future. The sales forces have thrown off the lethargy of the seller's market and are on their toes. New uses for the tools are constantly cropping up. There is much to be done in educating users to the most efficient employment of the equipment they have. The new tools that most of us have to sell are far and away better than anything we have ever had before and consequently easier to sell on their merits. Competition is keen and will continue to be, but what red-blooded American dislikes competition? We are willing to take our chances.

Railroad Shop Methods and Tools

Pump for Testing Gages—Reclaiming Air Pump Gaskets—Slotting Machine Arranged for Gear Cutting—Machining Crown Brasses—A Steam-Heated Layout Table

By S. ASHTON HAND
Associate Editor, American Machinist

A PART of the toolroom work in the Norfolk & Western Railway shops at Roanoke, Va., is the repairing of all the steam and air gages used on the system. Not only are the gages repaired, but the cases are first thoroughly cleaned from the grease and dirt baked on them and then dipped in acid so that they look like new when put back into service. In Fig. 1 is shown a very convenient test pump with its stacks of weights —some on the plunger at *A* and others at *B* within easy reach of the workman. The gage mounted on the test pump is a duplex air-gage and it will be seen that a siamese connection is used for attaching it to the pump. By this arrangement the Bourdon springs of both the train line and the reservoir sides of the gage can be tested and the indicating pointers set without breaking the connection. At *C* is the small screw jack used for pulling off the pointers.

All of the lathes used in the toolroom are equipped with swinging cranes to aid in removing and putting on the chucks and to hold them when not in use. A

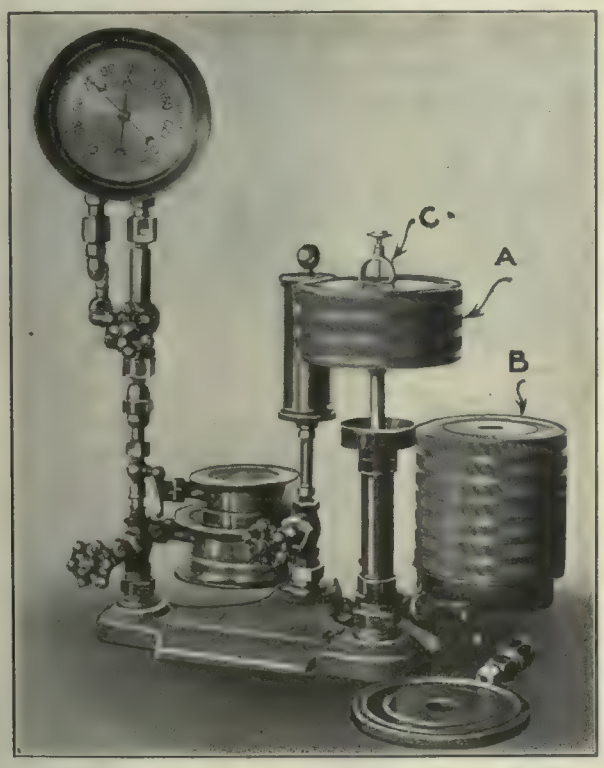


FIG. 1. TEST PUMP FOR GAGES

chuck with an uncompleted job in the jaws is shown in Fig. 2, suspended from the crane on one of the lathes.

The article represented by Fig. 3 is not a drum, as might at first be supposed. It is a pulley for a grinding stand. The criss-cross grooves keep the belt from running against the pulley flanges and curling up at the edges, as everyone who has had to do with high-speed belts knows is apt to be the case. The grinding stands in several shops of the system are equipped with these pulleys and from all reports they appear to be making the belts attend strictly to business.

The punches and dies used in boiler and sheet-metal

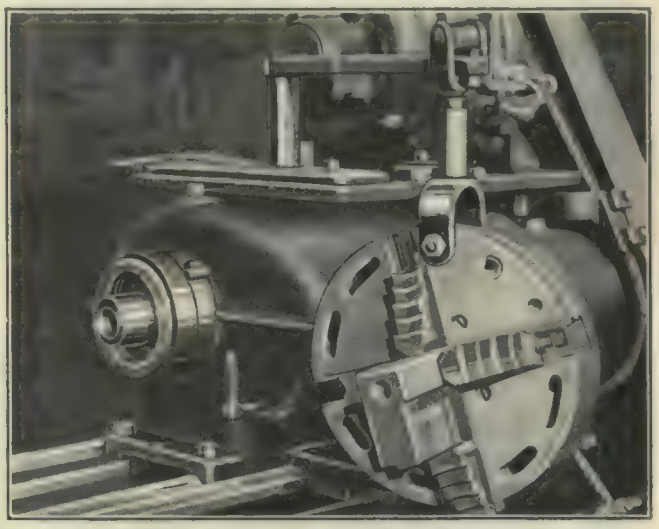


FIG. 2. CRANE FOR HANDLING LATHE CHUCKS

work, together with the fixtures for holding them in the presses, have been standardized and are all made in this shop, both for its own use and for distribution to other shops of the system. Fig. 4 is a chart containing drawings of the various parts and tables of the standard dimensions of the sizes in use.

The copper gaskets used under the cylinder heads of air pumps are beaded or corrugated on each side of the bolt holes and to make the joints steam-tight the beads must be squeezed down. When pumps are taken apart for repairs, the gaskets have to be rebeaded in order to make them serviceable for use again. After cleaning and annealing, the gaskets are rebeaded in the dies shown in Fig. 5. As both ends of the pump cylinders are not alike, two sets of dies are required. The gasket at the right has been rebeaded between the dies *A* and *B*, and the one at the left between the dies *B* and *C*. Fig. 6 shows the dies without the gaskets and gives a better view of their construction. Both mating dies have half round grooves cut in them at the beading lines and round steel wire is caulked into the grooves of one die for a "force." With a pair of gaskets in place and the dies closed as shown in Fig. 7, a few blows from a heavy sledge will rebead the gaskets and make them ready for service. The forged ring

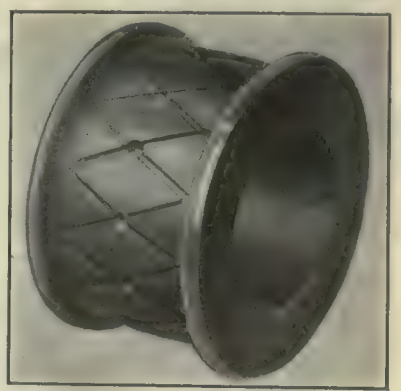


FIG. 3. AN IMPROVED PULLEY

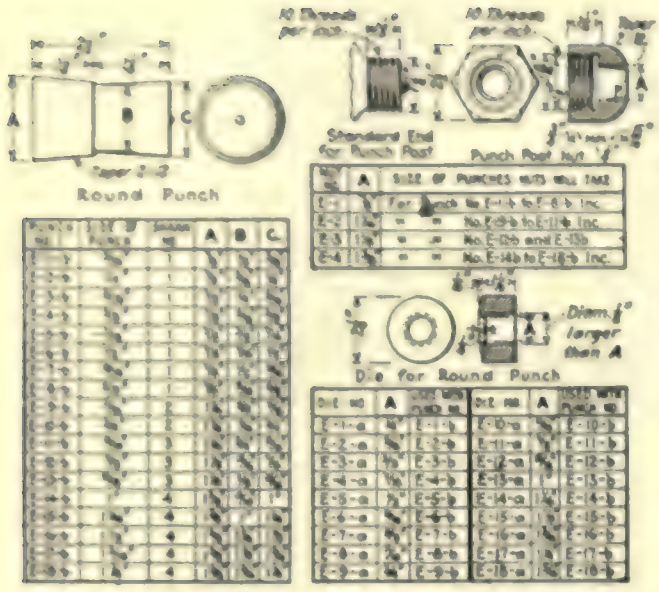


FIG. 4. STANDARDS FOR PUNCHES AND DIES

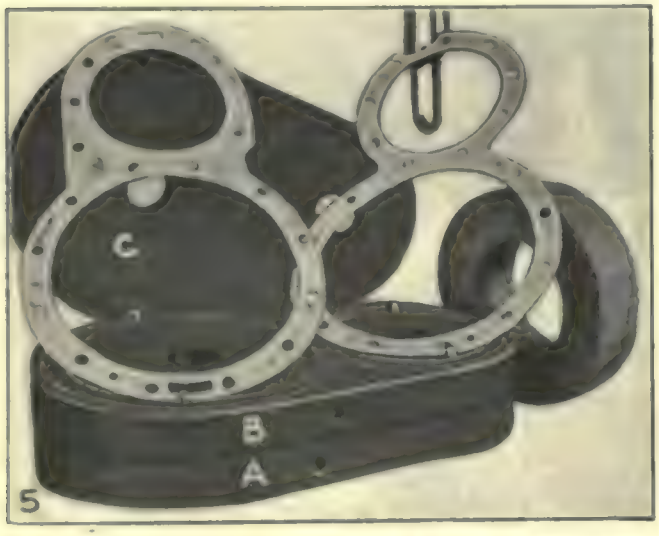
a very creditable job of gear cutting can be accomplished.

Grinding the holes in various locomotive parts is somewhat of an innovation in railroad repair work, but in this shop the Heald planetary grinding machine to be seen in Fig. 9 is in almost constant use.

While the horizontal boring machine shown in Fig. 10 was never intended for a portable machine, it is so used on the job to be seen in the illustration, where the holes for the swivel yoke in the frame of a Mallet compound locomotive are being rebored. The frame is leveled upon blocking and the boring mill put in place. The drive is by belt from a portable motor.

Machines converted to uses other than originally intended are shown in Figs. 11 and 12. The machine in Fig. 11 is an old Niles car-wheel boring machine. It has been fitted with pneumatic clamping devices and is now used for boring driving boxes.

The machine in Fig. 12 is a Bement cotter-drilling machine of the vintage of 1883, or thereabout, and has been converted for use in milling crosshead key slots in piston rods. The double-shanked milling cutters lean-





FIGS. 5 AND 6. DIES FOR BEADING AIR PUMP GASKETS

A shown on top of the dies is used as a buffer to take the blows of the sledge and prevent them from being battered.

In making repairs to the shop machinery it is occasionally necessary to do some gear cutting, so an indexing device has been put on one of the slotting machines as indicated in Fig. 8. With a tool of the proper shape ing against the piston rod in the machine will, however, be recognized as quite modern tools. It will be noticed that the clamping jaws *A* and *B* are of different lengths and hold the rod out of alignment. The purpose of this is to so mill the slot that one end will be at an angle to match the taper of the key. A hole for the insertion of the cutter is bored through the rod and the slot is



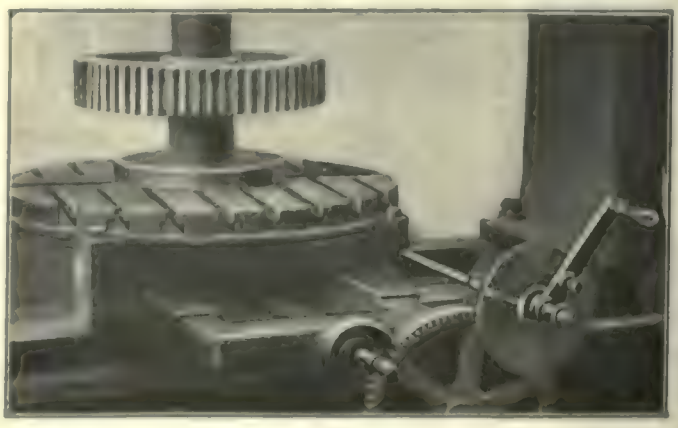
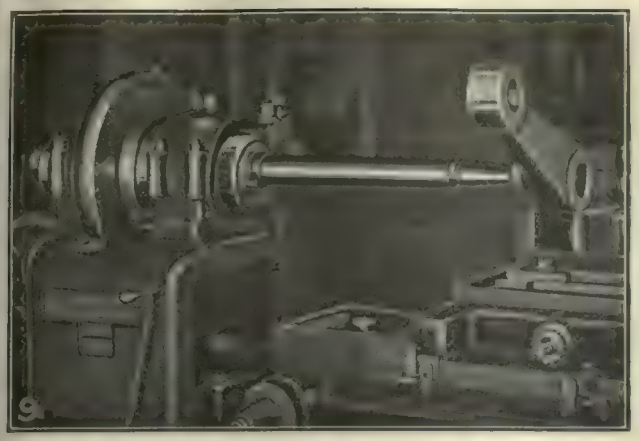


FIG. 7. BEADING DIES CLOSED. FIG. 8. INDEXING ARRANGEMENT ON SLOTTING MACHINE



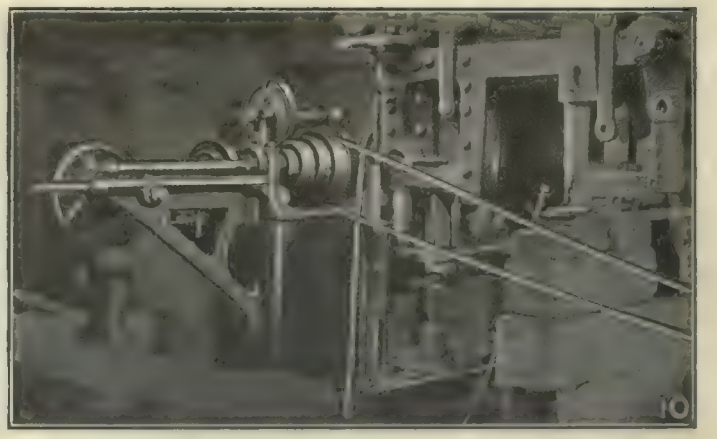
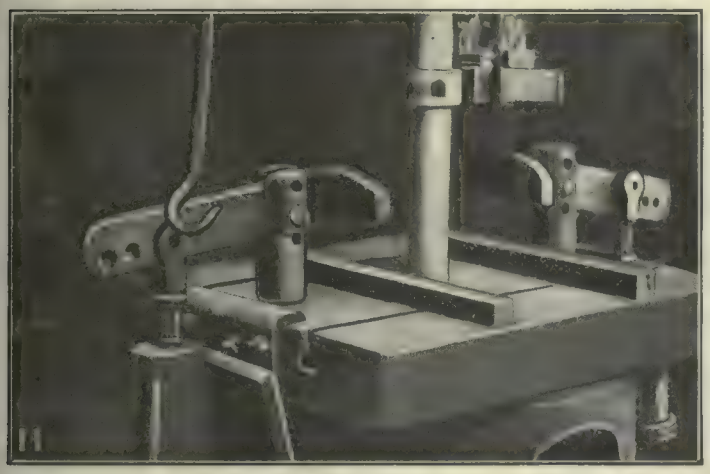
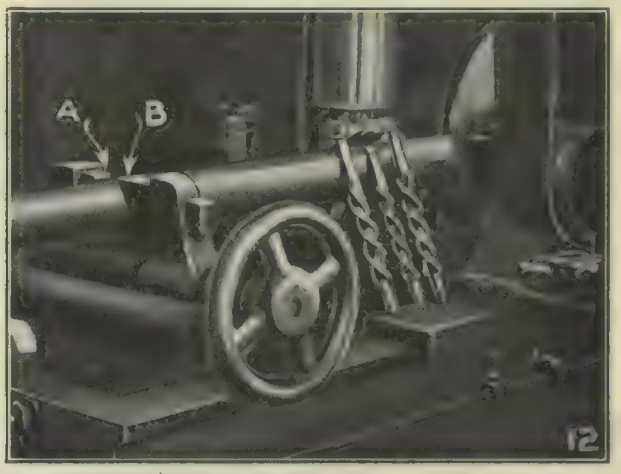


FIG. 9. GRINDING HOLES IN AN ECCENTRIC CRANK. FIG. 10. BORING MILL CARRIED TO THE WORK

roughed out from the solid metal in one cut. A second cut with a finishing cutter completes the slot.

A special fixture for use in machining eccentric straps in a vertical boring mill is shown in Fig. 13. Screws set at a slight angle are used not only for positioning a key is inserted so that the throw will always be in a certain relation to the keyway. The fixture is mounted on a sub-base so that it can be moved into different positions for turning eccentrics having different amounts of throw. Holes for dowel pins at *C* and *D*



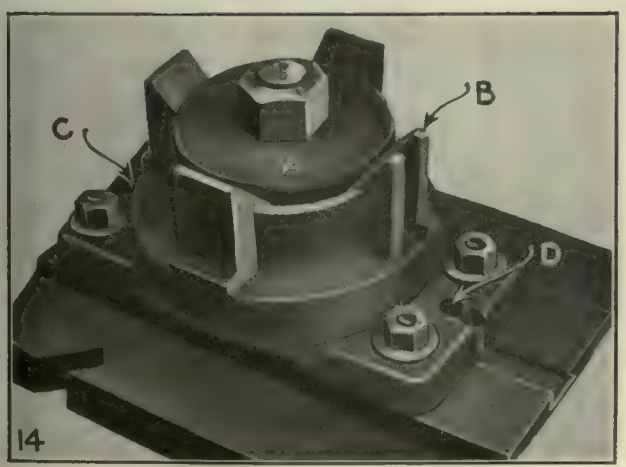


FIGS. 11 AND 12. OLD MACHINES CONVERTED TO NEW USES

the work but for holding it and forcing it down to the bottom of the fixture as well.

For turning the outsides of eccentrics, the expanding fixture, Fig. 14, is used. The beveled edge of the washer *A*, pressing on the correspondingly beveled tops of the jaws, expands them in the hole of the eccentric, holding it firmly. The jaw *B* is slotted to match the keyway in the bore of the eccentric and when turning in connection with a series of mating holes in the base allow the insertion of pins for predetermined positions.

Crown brasses are machined to fit the driving boxes in a Morton draw-cut shaper, using the fixture shown in Fig. 15. The brasses are held between the semicircular plates to be seen in the illustration. The mandrel is intermittently rotated through worm gearing driven from a ratchet so that the feed is circular. The adjust-



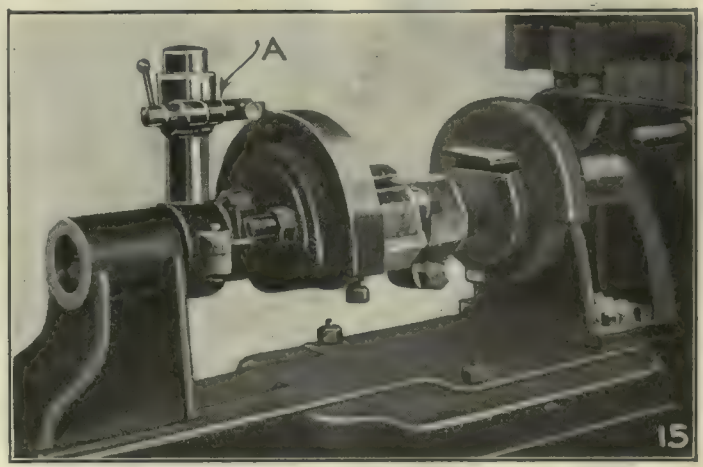


FIG. 14. FIXTURE FOR HOLDING ECCENTRICS. FIG. 15. FIXTURE FOR HOLDING CROWN BRASSES

able gage at *A* can be swung around the projecting end of the mandrel and can be used either in setting the work to a scribed line, or in setting the tool for the finishing cut. When not in use it is turned to the left so as not to interfere with either the tool or the work.

In laying out rough work, it is the general practice to rub chalk on the surface so that scribed lines and punch marks can be more plainly seen. In this shop a different method is used. The work is simply given a coat of ordinary whitewash and the laying-out tables, one of which is to be seen in Fig. 16, are steam-heated so that the work is warmed and the whitewash dries quickly.



FIG. 13. FIXTURE FOR HOLDING ECCENTRIC STRAPS



FIG. 16. STEAM-HEATED LAY-OUT TABLE

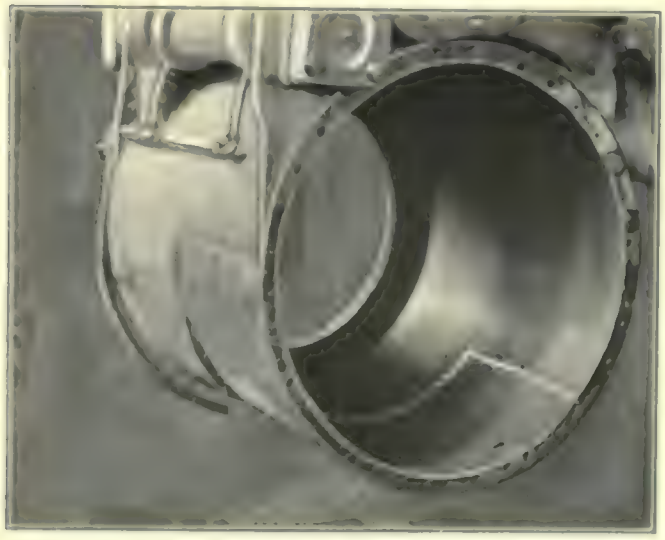


FIG. 17. A PATCHED CYLINDER

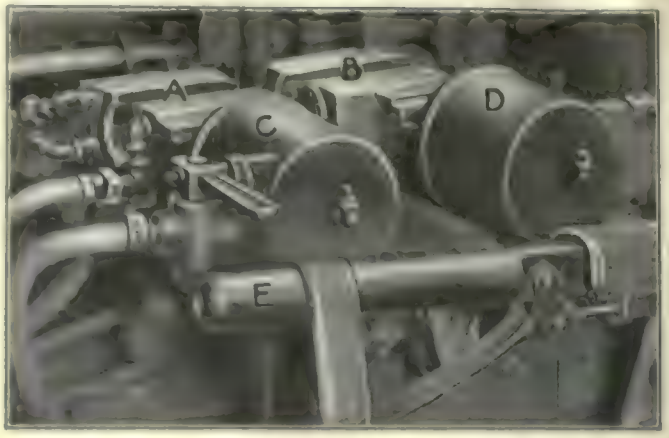


FIG. 18. MACHINE FOR SAFE ENDING FLUES

Autogenous welding is used to a great extent in repairing broken parts, and Fig. 17 gives a good example of such work. The patched cylinder belongs on the front or low pressure end of a Mallet compound locomotive and is 40 in. in diameter. The patch can be plainly seen on the outside of the cylinder and its extent is indicated by the chalked lines on the interior.

Flues are safe ended by electric welding in the machine shown in Fig. 18. The flue is countersunk at the ends and is held at one end in the jaws at *A*. The piece to be welded on is beveled to fit the countersink in the flue and is held in the jaws at *B*. Both sets of jaws are closed by air pressure through pistons in the cylinders *C* and *D*. Downward pressure on the lever *E* brings both parts of the work together, establishing electrical contact and completing the weld. The strap looped over lever *E* forms a stirrup so that the lever can be operated by the welder's foot, allowing him the use of both hands. After the completion of the weld at one end, the flue is reversed and the operation repeated on the other end.

The foreman of the cab department, J. D. Mayo, has utilized a locomotive cab for his office, which may be seen in Fig. 20. The interior is nicely fitted up with a desk and a cabinet for blueprints, and presents a very cozy appearance



FIG. 20. CAB CONVERTED INTO AN OFFICE

Press Tools for a Flanged Cover

By Herman Schmid

The cover, Fig. 1, was made of 0.025-in. brass and produced in three operations at the rate of 1,000 to 1,200 per day. The first operation die, Fig. 2, for blanking, drawing and perforating has no unusual features, though care has to be taken that the perforating takes place at the last movement, as otherwise the holes would be drawn out of shape, especially the big one. The drawing and perforating plug *C* is fastened to the cast-iron die shoe *A* by two screws and two dowels (not shown). Blanking die *B* is seated in the die shoe and held by four screws and two dowels. *D* is a draw plate, resting on four pressure pins and held back by two screws. Punch *F* is seated in the cast-iron punch holder *E* and held by four



FIG. 1. THE FLANGED COVER

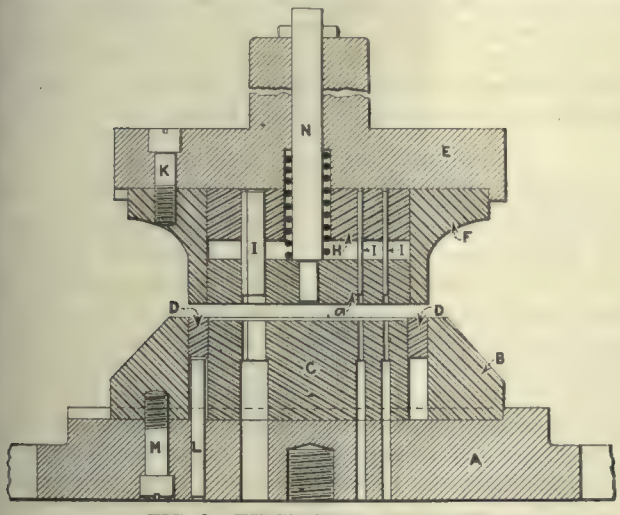


FIG. 2. FIRST OPERATION DIE

screws and two dowels. Punch plate *H* is fastened to the punch holder by two screws (not shown) and holds the perforating punches which are riveted over on the back side.

At *a* is a knockout and stripper plate, which is a sliding fit in punch *F* and on punches *I I*, and is held down by a light spring around *N*. The second operation die. Fig. 3, reverses the flange. The forming die *B* is fastened to the cast-iron shoe by four screws and two dowels. Hardened center plug *C* slides up and down in die *B*, rests on four pressure pins *H H* and is held by two screws *I I*. Pins *H H* in turn rest on a regular pressure pad (rubber or spring) which has to be very stiff. Punch *D* is seated and fastened to cast-iron punch holder *E* by two screws and one dowel. *F F* is a positive stripper. Punch *D* is 0.050 in. and recess in die *B*, 0.100 in. larger than plug *C*. The operation of this die is self-explanatory (see the work on the third operation die).

The Third Operation

The third operation die, Fig. 4, flanges the cover and letters it. Die *C* is seated in the cast-iron die shoe *B* and fastened by four screws and two dowels. As this operation needs a very fair blow I found it safe to put a machine steel plate under the die shoe, giving at the same time more length and life to the four springs *F*.

Hardened center plugs *D* sliding in die *C* rest on springs *F* and is held back by two screws *E*. Observe that dimension *a* has to be the same as *b*, and *d* the same as *c*.

Hardened punch *H* which fits nicely in top of the so

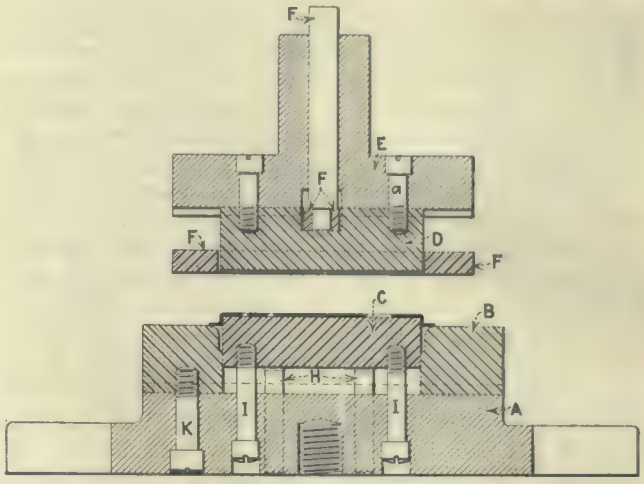


FIG. 3. SECOND OPERATION DIE

far advanced cover is seated and fastened to the cast-iron punch holder by two screws and one dowel and has in the center a lettering block or stamp *a* which in turn is held by a screw through the shank. Hardened punch plate *J* slides on punch *H* and works on four fairly stiff springs and is held back with four screws *O* which in turn are kept from loosening by setscrews *P*.

Operation on the Downstroke

When on the downstroke, the punch plate is forced back so that punch *H* enters the work and forces it, also plug *D*, downwards into the die. The long edge of the cover will butt against the recess in the die and by further pressure be forced out to a flange, for which there is room, half in die *C* and half in punch plate *T*. When the punch goes up, spring *F* will force the work out of the die. The springs acting on punch plate *J*

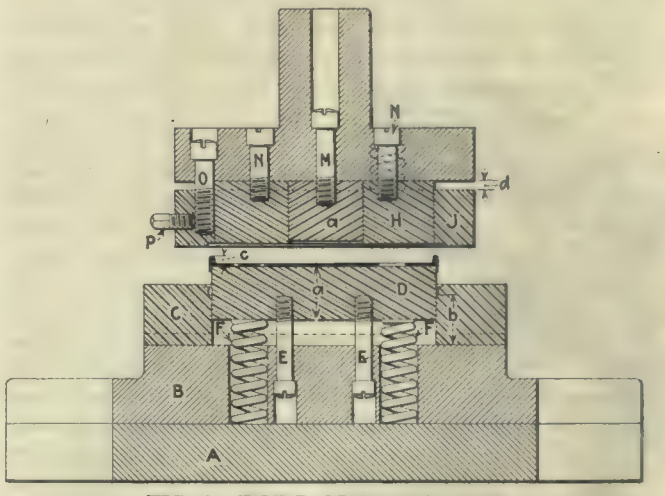


FIG. 4. THIRD OPERATION DIE

force it off of punch *H*, and as bottom of cover is now even it will be free on *D*, ready to be removed. This die works exceptionally well and smoothly and gives a clean impression for the lettering.

The Training of Workers in Manufacture

IV. Co-operative Employment of Engineering Students—Length of Shop Period—Courses on Technical Subjects—Advanced Shop and School Instruction

By J. V. L. MORRIS

THAT engineering students benefit by gaining some practical experience before completing their course has been increasingly recognized by educators in this field. Commonly, it is provided by the student securing whatever job is obtainable, in the line of work he hopes to follow, during his summer vacations.

There are several advantages advanced for this practice. It aids him in deciding whether he really has a taste for the work he had previously contemplated and whether he is at all suited physically and mentally to it. It helps him also in the choice of studies, during his final years of electives, which will best prepare him for the work to which he finds he is adapted. It gives him some experience both with the mechanical conditions involved and in dealing with the men with whom he must later earn his living, both rank and file and foremen and executives.

In the belief that this experience is of equal importance to the technical instruction of the school, the co-operative method of engineering school organization has been developed at the University of Cincinnati. By the plan the students are organized in pairs, and each pair arrange for employment in one of the co-operating corporations. Thus, there were eighteen employed in the National Cash Register plant, nine being at the plant while nine are studying at the university. Every two weeks the pairs shift their positions, those at the plants returning to the university and their alternates taking their places at work in the industry concerned. The courses on this basis are five years in length, the school work being given for eleven months of the year.

If there is a genuine co-operation on the part of the industry, so that the student is shifted through various departments and to such operations as will add to his equipment of "skills," he undoubtedly will later utilize the training in his engineering or supervisory work. The difference between this co-operative method and that of utilizing summers is, of course, chiefly in amount.

Co-operative Schools

Other developments of the plan are found, one being in the small engineering department recently established in the municipal University of Akron, where the practice is identical. In the University of Pittsburgh engineering school a modified form is practiced. The year is divided into four terms corresponding to the seasons, four of which during the four-year course must be spent in industrial establishments at practical employment. In the Massachusetts Institute of Technology a co-operative plan has just been inaugurated during the past year (1919-20) with the General Electric Co. This started with thirty students, and now provides for forty from each class during the junior, senior, and graduate years. The plan is arranged with alternate terms in the plant and at the school of thirteen and eleven weeks, respectively. In the new Harvard Engineering School the plan is to be tried in the junior year only.

As the plan seems to be somewhat slowly spreading, it is a pertinent question if it will ever become the general practice. The practical difficulties involved would seem to demand a negative reply. Cincinnati is at the center of a considerable number of large industrial plants, which could probably utilize all that might wish to follow an engineering course based upon the plan in that institution. The dean of the engineering school at Akron reported that there were openings in the local plants and engineering fields for several times the present number of students upon that basis in his school. There are, however, large and useful engineering schools to which no important industrial plants are accessible, that of Cornell University being a good example. In fact, it is by no means clear that the plan possesses sufficiently greater merits than that where the student-engineer spends his summer vacations and the year or two followering his graduation on such a basis as will insure the widest possible practical experience.

Length of Shop Period

The bi-weekly transfers from school to plant should be compared with the plan of alternating by terms. It is argued for the former that with the shorter periods the student more closely relates his shop work to his technical instruction than if the shop work extended through thirteen weeks. Also, by the shorter breaks, he is not so likely to lose the continuity of the educational subject-matter. The advantages of the two-week period over one week were, on the other hand, held to be that there was less lost motion in readjusting from school to shop and again from shop to school, if those readjustments occurred only thirteen times a year instead of the twenty-six, which would be required with alternating periods of one week only. From the administrative standpoint there seem to be obvious advantages in the three-month term for the alternating periods.

(1) It permits the instruction of the co-operative students in the same classes as the regular full-time students, as it is fairly easy to reorganize the instruction so as to divide the academic year into three terms instead of two.

(2) Students may be placed at employment several hundred miles or more from the educational institution. The desirability of this has been pointed out in connection with schools not located with suitable plants immediately contiguous. In railroad and mining employment the desirability is equally evident. A mining school located, let us say, in New York City might find it desirable to place some of its students for practice in Canada, Upper Michigan, or Montana. Railroads, which should offer a profitable field for experience to civil, mechanical, and, doubtless, soon for electrical engineers, would hesitate to guarantee employment within one hundred miles of the engineering school, a distance limitation which would seem desirable with the bi-weekly schedule.

(3) The term period obviates the necessity for ab-

solute pairing, which is always an awkward matter to administer. One member of a pair may show ready adaptability to the work and become sufficiently experienced to warrant a generous increase in remuneration, while the work of his alternate would only warrant the payment of the minimum wage scale. Again, an alternate may withdraw, making it necessary to pair an experienced man with a thoroughly green man.

(4) Three months is a reasonably satisfactory period for a working unit, as well as for a teaching unit. It is the period worked out as satisfactory for teaching milling machine operation under intensive training, and for assignment to the electrical winding department for students in the technical training course. It would probably be equally suitable for assignment as chain-man or assistant transit-man for a civil engineer.

Co-ordinating the Work

Moreover, where a considerable number of students are employed in the same plant or on the same engineering undertaking, it would probably be possible to get them together occasionally, perhaps one or two evenings a week, for co-ordination purposes; as is the case in the General Electric plant for the Institute of Technology students. This would probably be possible in plants employing ten or more students, or where a like number were employed in a given locality or city.

If the plant had a man capable of handling the matter in its educational department (presuming that it possesses such a department), it would probably be in its interest to take care of the matter itself, or at least in co-operation with the educational institution. It is found that, without this linking up of the student with the plant's organization, the work is, in general, looked upon as a wholly temporary arrangement to be terminated at graduation. Of course, the student should be free to leave, if he chooses, when he desires; but men well suited to the corporation's work might thus be saved as valuable additions to its personnel. As at present conducted, the acceptance of co-operative students seems too often to be considered as purely a concession to the university and to the students employed, with no accruing benefits to the corporation.

The conclusion of this study is, then, that if co-operative instruction is to be more generally adopted by educational institutions of university grade, the term rather than the bi-weekly arrangements will be better suited to the larger number of institutions. This does not, however, presume that the Cincinnati plan is not working well under the conditions there prevailing.

Training Engineers in the Plant

For an American corporation to provide both practical experience and applied technical instruction for young men selected to recruit the engineering force, is not as common as apprenticeship; but, still, it is a very frequent practice and one which seems on the increase.

Those to whom the opportunity is offered are ordinarily high-school graduates and preferably those who have had a technical course. As such they have had, under more favorable conditions, some training in drafting, a year or more of instruction in each of the two sciences most useful for the purpose, physics and chemistry, and probably a four-year course of mathematics. It is also to be expected that they have had at least some rudimentary shop practice. They are ordinarily, then, about eighteen years of age and are willing to start at ten to fifteen dollars a week, which is probably all their production will warrant at the beginning. It should be recognized that they consider the training provided a large part of their remuneration. The usual course is three years.

In one plant these young men are indentured in the same manner as are the trade apprentices, and start with the latter for a year to a year and a half in the apprentice training shop to obtain a varied experience at regular machine production. Some are enrolled to become draftsmen, others to become electrical testers; and there is a course scheduled for technical clerks, but apparently this is not much developed.

Draftsmen, in particular, should benefit by the machine shop experience, as the utility of a tool or machine design depends in part on its practicality from the standpoint of economy and production. After the initial experience in the machine-shop training department, the draftsmen then enter the drawing office; and the testers, for the remainder of their three-year course, shift by three- to six-month periods in a regular schedule through the winding department, the drafting office, and the assembling and testing departments for electrical machinery.

In what is called the engineering school, all receive about an hour and a half of instruction each day in mathematics, mechanics, electricity, machine and dynamo design, chemistry and metallurgy, drafting and business English. The success of the course is attested by the number of graduates who have become engineers in their fields, tool and machine designers, testers, draftsmen, or have been selected for supervisory positions.

Shop Technical Training

Another electrical instrument company has recently instituted in its engineering office a somewhat similar course for the large number of assistants which can there be utilized. An electrical cable company has organized during the past year a class among its high-school graduates and others with sufficient preparation, for a technical course. One electrical manufacturing company has maintained for its employees a voluntary evening school in the fundamental principles of engineering, during the past eighteen years. That of the nearly two hundred graduates, about one-half should already have reached responsible technical or supervisory positions suggests the value of the course.

Two companies are working out educational programs on the principle of alternative weeks at instruction in a company school and at production. One is in a shipyard for national draftsmen, the other in an important manufacturing plant, as a means for recruiting the design, sales and supervisory staffs. It is, however, at least open to question if this alternative-week plan, where the company furnishes both the instruction and productive experience, will ever develop to any degree. In the shipyard, for example, might it not be more economical, from the learning standpoint, to have the future nautical draftsmen go into the mold loft or pattern shop for a predetermined period, rather than attempt to alternate between shop and drafting room?

A considerable number of companies provide more or less formal instruction for their draftsmen, as it is readily recognized that a man's value in that field depends largely on his technical and practical knowledge. The latter can, of course, best be obtained by a temporary shift to regular production, and preferably under such conditions as will permit the greatest possible variety of useful experiences in the limited time which can be thus utilized. This would suggest the use of the shop training department, if available.

The Goodyear Tire and Rubber Co. has organized its provision of supplementary instruction as an Industrial University. While the instruction is for all types of workers, some of the instruction is arranged to facilitate the promotion of non-technical men to such positions as are ordinarily recruited from the engineering colleges. The Ford Motor Co., has just announced a Technical Institute, which will confer degrees on those who complete the courses to be provided in this field.

Technical Schools

It is difficult to estimate the number now under organized training on this basis; but it is safe to say that it is but a drop to a bucketful compared to the number who are pursuing their technical training in the schools of technology and in engineering colleges. Probably, also, the number is far short of the worthy graduates each year coming from the technical high schools who would gladly avail themselves of the opportunity, were it more generally offered.

It is a pertinent question whether a company can thus afford to provide the supplementary technical instruction and subject its production departments to the inconvenience of being troubled to train for a short period a young man who will not be a permanent acquistion to its working force. Experience seems to answer in the affirmative. The young man who, at the start, is more concerned with getting a wide experience than a large salary will willingly work for much less, if he has provided for him a well laid out training program; and he can probably earn at varied production the relatively small amount paid him.

As regards the draftsmen, it should be recognized that design for each industry is to a considerable degree particularized. The regular technical school, day or evening, in general only provides the fundamental training, after which there is often a considerable amount belonging to each individual industry which can best be learned therein. While it is possible that the better men will obtain this information on their own initiative, the special instruction helps to insure this result.

In considering the utilization of the plan in a drafting office, it should, however, be borne in mind that in many plants there is wide fluctuation in the size of the personnel. Usually there will be a small permanent force, which at times will be greatly augmented to get out some new designs or to provide for an expansion of business. Usually this demands expedition which will only warrant employment of draughtsmen already competent. Any scheme of systematic training is chiefly useful, then, in recruiting the permanent personnel, which would presume a department of some size in a plant warranting a large engineering office where design is a major interest.

Corporation Technical Night School

The advantages of the technical night school for future engineers under company auspices have already been suggested. The faculty can be readily recruited from the company's engineering staff, the instruction can be adjusted more readily to suit the company's products and requirements for future promotions, and such a school can probably be made to develop a company *esprit de corps*.

That we do find company technical night schools does not, of course, warrant the assumption that there is no need of engineering university extension or of the institutes and public evening technical schools, which in some cities have proved their large usefulness. As a matter of fact, a major part of the technical instruction in this field is now provided by these institutions, and will doubtless in the future in increasing measure continue to be so provided.

One should not ignore, also, the possible contribution of correspondence instruction in this field of supplementation for work in the technical departments. The high-school graduate, it may be expected, has sufficient educational background to assimilate what is clearly presented in a book and, if he has sufficient application to stick to a course, he should benefit thereby. It doubtless assists if some one in his department is delegated to help him over difficulties, offer him encouragement, and provide recognition for accomplishment. This is a possible function of one delegated by the company's education department.

The through development of a corporation school in this field will probably be limited to the larger corporations and in particular to such occupations as require large units of instruction peculiar to the industry, or where public or endowed educational institutions are undeveloped or unavailable. Isolated plants belong in particular to this category.

The shop experience of trade apprenticeship coupled with the supplementary instruction of drafting mechanics given in the better apprentice schools, is clearly excellent preparation for work in design. This has led in some plants to the practice of recruiting the small drafting departments from the trade apprentices who showed an inclination to enter that field. This is probably a commendable arrangement, if the small number of draftsmen required does not warrant organizing a separate training department for that field; but it is believed that, in general, the preliminary education presupposed by high-school graduation is a desirable prerequisite to drafting.



Machining an Unusual Crankcase

Tools and Fixtures for Machining a Crankcase of Unusual Design—Duplex Boring Head Used on Drilling Machine—An Extension Milling Device

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

EVERY automobile driver who tours to any extent knows the Reo Speed Wagon. It usually passes him on the road when some farmer or truckman, who drives one, is in a hurry. Just where it gets its speed is not clear, but it has a motor with a crankcase of such unusual design as to make the tools and fixtures for its manufacture of special interest.

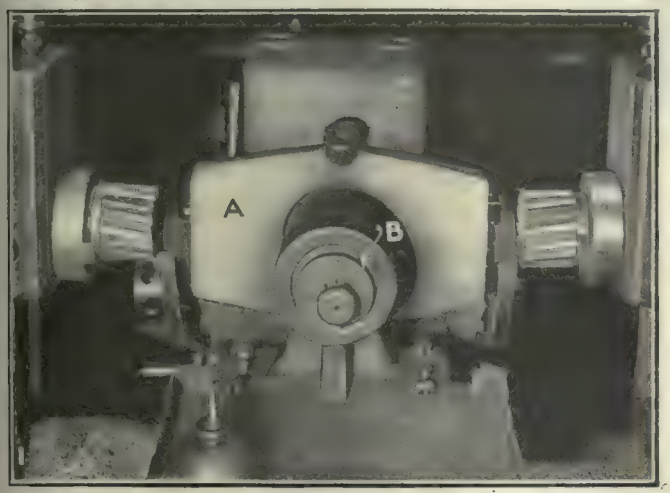


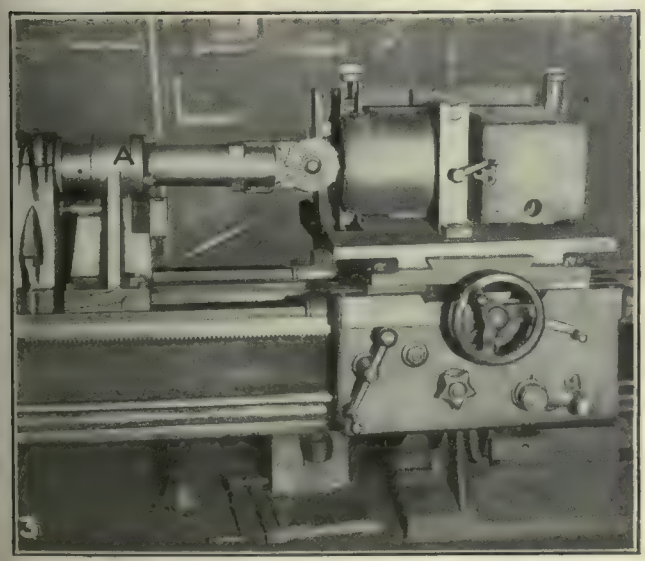


FIG. 1. MILLING THE SIDE ARMS. FIG. 2. BORING BOTH ENDS

After snagging, chipping and filing, the supporting arms are milled, using the fixture and milling cutters shown in Fig, 1. The case is held against the angle plate *A*, an open washer *B* making it easy to save time in handling.

Locating by the arms which have just been milled, the case is held face down on the fixture shown in Fig. 2. The locating and clamping are done on the back side as at *A* and *B*. The special boring heads *C* and *D* both bore and chamfer the hole, the chamfering being done by a special blade which can be seen in each cutter. The design of the cutter head is worthy of study as an example of successful practice. The boring is followed by boring and reaming the camshaft hole, milling the hand hole and magneto pad, drilling, counterboring and facing the oil-pipe return hole and reaming the valve-stem guide holes.

The center bearing is cast in the crankcase and has to be faced with a milling cutter which goes in from the end, as shown in Fig. 3. This device is rigged up on an engine lathe, the fixture being supported at *A*, the lathe spindle driving the milling cutter by an internal shaft and bevel gears. The case is mounted in a special fixture on the lathe carriage and is fed in past the cutter which faces the bearing ready for the cap.



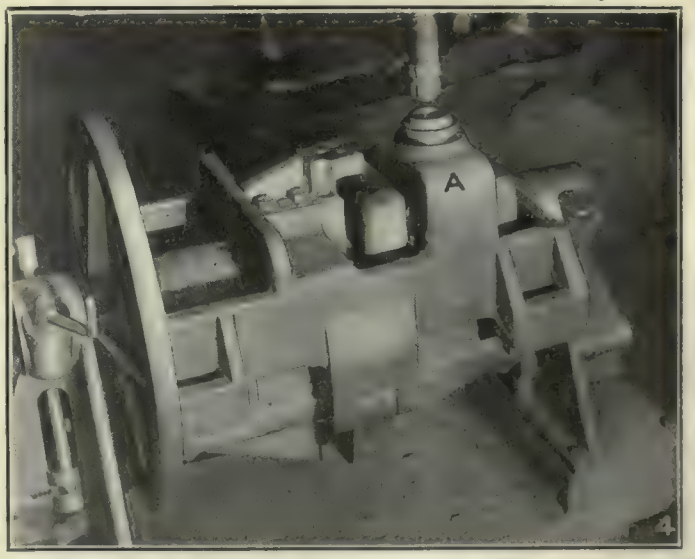


FIG. 3. MILLING FACE OF MAIN BEARING. FIG. 4. ROLL-OVER DRILLING FIXTURE

The drilling is done in the trunnion fixture, Fig. 4. The reamer shown at work is piloted in the heavy

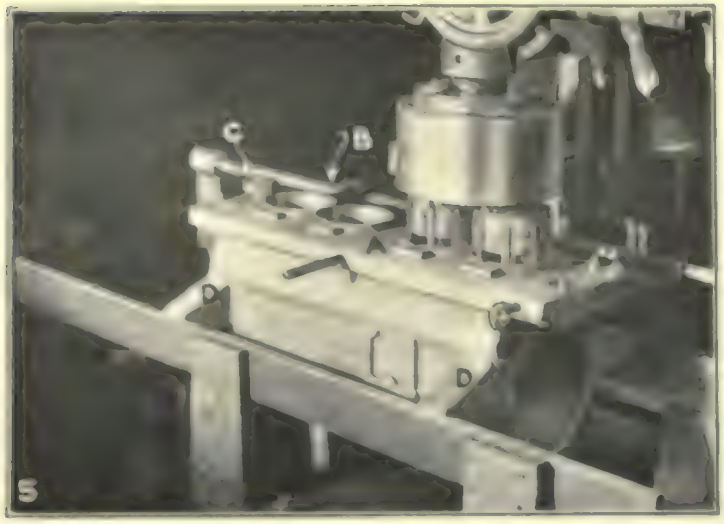




FIG. 5. BORING FOR PISTON CLEARANCE. FIG. 6. THE MOTOR TEST ROOM

arm *A*. This fixture is used for drilling fifteen holes in various positions, the control of the indexing pin and the method of locking the fixture in any position being the same as previously illustrated.

The Piston Clearance

The piston clearance and cylinder location are next bored with a special two-spindle boring head on a Baker drilling machine, Fig. 5. These holes position the cylinders, which are cast in pairs. The guiding plate *A* is hinged on the bar *B* so that it can be readily swung up out of the way when changing cases. The knurled knob *C* locks the plate on the crankcase. The whole thing is moved along for boring the next two holes. The supporting arms *D*, resting on the steel ways, guide the crankcase as it is moved along and also locate it sidewise with the drilling and boring spindles.

A number of the completed motors are shown in the test room in Fig. 6. Here they can be first run in either by electric motors or under their own power and use the motors as generators to give them a load. The test stands are very complete and compact.

Romances of Metal Working—Two Famous Armorers

By H. H. Manchester

In the 15th Century the two great schools of armor making were the Italian and the German, which had by this time surpassed in quantity, if not in quality, the famous Toledo blades of Spain.

In Italy the armorers were located in all of the principal cities, with those of Milan, Florence, and Venice perhaps the most famous. A representative armorer of Venice was Vittore Camelio, who also developed a rather important step in metal working.

He lived in the latter half of the 15th Century, and was noted for his light steel armor of a very high temper, as well as for the elasticity and indestructibility of his swords.

Camelio was not only an armorer, but a medal maker and an engraver. One day, so the legend runs, he used one of his swords to slice off a bar of gold which had been sent him for medals. This was done so easily that he realized more than ever the fact that he could produce steel which would cut the other metals. From this idea, he developed a steel die, which he used at first to cut out the blanks for medals, and later, it is said, to stamp the face of a coin. At any rate, the senate of Venice in 1509 gave him a patent for this device for five years, which is comparatively good proof that there is much truth in the story.

A fair representative of the German school of armor making was Conrad Seusenhofer, who lived in the last of the 15th and the first of the 16th Century.

In 1504 we find him enlarging his workships at Innsbruck with money advanced from the government, but later we find that this was to be deducted from his pay.

He developed the fluted style of armor, which was for some years the height of fashion, and evolved a number of special tools to produce this. Another tool of importance which he is credited with improving, is the heavy shears which could cut thin plates of iron before they were hardened. The shears were fastened at an angle in a huge wooden block.

He developed several new methods of armor plate construction, but these were not at all in favor with Maximillian, the emperor, who said to him: "Make my armor only in accordance with my instructons, for it is I, not you, who must wear it."

In 1511 Seusenhofer complained that the mine master, Kugler, was sending him poorer metal, and suggested that the armor plate from it be called Milanese, which indicates that he thought the Innsbruck steel better than the Italian. It also shows that at that time the quality of the steel produced could not be altered at will by the smith, but depended largely on the nature of the iron with which he had to work.

One of Seusenhofer's suits of armor was presented by Maximillian to Henry VIII of England, and still hangs in the tower.

The armorers of the time were always having trouble collecting the pay for their work, and frequently the only method of assuring it, was not to deliver the armor until paid for. Seusenhofer was apparently using this method to collect from Maximillian, or his government, during one of the wars of the period. This finally led to there being a shortage of armor, whereupon Maximillian in wrath sent word that if the armor were not forthcoming that the armor makers would be put in the front rank without armor, so that they could appreciate for themselves how it felt to fight without proper protection.

Grinding and Testing Level Vials

Grinding Tubes to Curves of Long Radii—Formula for Curves To Produce Determined Sensitiveness—Automatic Machine for Grinding Level Vials

By GEORGE N. SAEGMULLER
Vice-president, Bausch & Lomb Optical Co.

AT ONE period cylindrical tubes of glass were selected for the purpose of being converted into levels, without further preparation than being hermetically sealed after the alcohol had been enclosed in the proper quantity to form a suitable bubble; and frequently some one face of the glass was found on trial to be so uniform in curvature as to form quite a good level.

The majority of levels thus made, however, are very inferior and can be used only where accuracy is not required. All the better levels are ground on the inside to a curve, and it is obvious that the greater the radius of the curve the more sensitive is the level. Thus, if we give the curve a radius of about 30 ft. the bubble will run about $\frac{1}{10}$ in. for an elevation of *one minute of arc*. But if we give the curve a radius of about 1,700 ft. the bubble will run about $\frac{1}{10}$ in. for an elevation of *one second of arc*.

The sensitiveness of a level is generally determined by an instrument called the "level-trier," which is a grooved metal bar, furnished with two feet at one end and a micrometer screw with graduated head at the other. Knowing the length of this bar and the pitch of the screw, it is an easy matter to find the value "in arc" corresponding to one division of the divided head.

By placing the level to be tested on the grooved bar, the turning of the screw will show whether equal quantities of elevation will produce equal spaces of run in the bubble, and at the same time show how many inches on the scale are equal to one minute of arc. This value being known, the radius of the curve to which the interior face of the level has been ground, is easily determined.

Let r denote the radius of the curve, 21,600 being the number of minutes contained in the circumference of the scale, d the distance in inches and parts run over by the bubble in one minute of elevation, and $2\pi = 6.2832$ being the measure of the circumference to the radius 1, then

$$r = \frac{21{,}600\ d}{6.2832}$$

For instance, take a level in which we find $d = \frac{1}{10}$ in., then the radius of curvature will be

$$\frac{21{,}600 \times 0.1}{6.2832} = 343 \text{ in.} = 28.6 \text{ ft.}$$

In like manner, when the radius of curvature is known, the value of the scale of any level may be determined by transforming the above formula into

$$d = \frac{6.2832\ r}{21{,}600}$$

It is to be observed, however, that owing to the adhesion and friction of the fluid the values of the curvatures thus found are always a trifle smaller than they are in reality.

One way of giving the requisite curve to the glass tubes which have been selected as suitable for levels, is by grinding the inner surface by means of emery and water on a metal mandrel to which the required curve has been given. Another way is by means of a metal cylinder used with emery and water, on which the level tube is moved backward and forward. The degree of curvature obtained in this operation will depend on the relative lengths of the cylinder and the glass tube. If these are of the same length and the movement is continued throughout the whole length of the tube, the curve thus obtained will generally be too great, but working with a shorter cylinder will increase the concavity and lessen the curve. As in all hand operations, experience is required to turn out a good level at reasonable cost, especially levels of great sensitiveness and

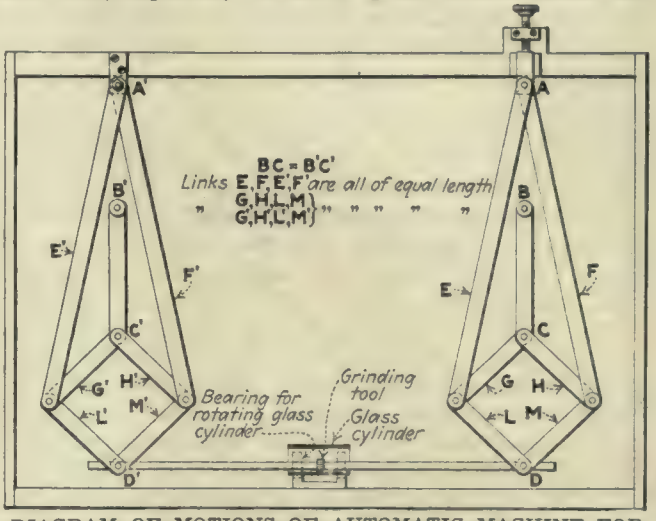


DIAGRAM OF MOTIONS OF AUTOMATIC MACHINE FOR GRINDING LEVEL VIALS

uniformity in curvature throughout the entire length, as for instance, levels used in astronomical instruments, where an elevation of one second of arc must be clearly shown by the movement of the bubble, and the amount of this movement must be alike throughout the entire length of the scale.

The writer has constructed a machine which will grind accurate levels automatically. The underlying principle of this machine is the "Peaucellier" cell, shown in the annexed schematic sketch.

If the distances AB and BC are equal, the movement of the lower point D (all things being as shown in the sketch) will be in a *perfect straight line*. But if the distance AB is greater or less than BC the point D describes a curve.

Two such "cells" being united by the grinding bar (as shown in the sketch), the grinding tool moves forward and backward in the desired curve, while the level turns on its axis, to a small extent, at every movement. Thus the entire interior surface of the level is ground out barrel shaped, which, for reversion levels, used in engineering instruments, is absolutely necessary.

The greatest difficulty after grinding the interior of the level is encountered in sealing the ends without deforming the curve. This requires a great deal of experience, as, if heated too much, a level truly ground from end to end becomes deformed at the ends.

Building Up Teaching Ability in Foremen

Continuing the Discussion of Foreman Training—What to Teach and How Far to Go—the Importance of Patience—Some Examples

BY D. J. MAC DONALD

THE first essential to success in teaching, as in anything else, is effective planning. I care not how much a person may know nor how clever he may be, the fact remains that unless he faithfully makes his plans, thoroughly analyzes his problem and endeavors to provide for all contingencies, he can no more hope to qualify as a success in teaching than he could in business if he did not observe this order of procedure. Trusting to the inspiration of the moment to carry one through may have worked at one time but not any more.

Our experience in trying to get foremen to accept this idea of planning the teaching job carefully, of thinking a thing entirely through before trying to teach another that thing, is about what might have been expected in view of what has been pointed out heretofore regarding the psychology of foremen. Due to the fact that his training has been largely in the school of hard knocks, and to the additional fact that he has an almost instinctive aversion to theory, it is next to impossible for him to attach adequate significance to careful analysis. Moreover, it is only with extreme reluctance and very slowly that he abandons the position that knowing how to do a thing well is equivalent to knowing how to teach another to do that thing. And it must be recognized that from his angle of vision his position seems rather tenable. For is there not a close analogy between the situation in which our foreman finds himself and that of young persons who are being cajoled and threatened into using better English? Is not the outstanding fact and obstacle in each case that what both have been doing heretofore apparently met every requirement?

What thinking the matter entirely through signifies in the field of teaching may be illustrated as follows: Suppose, for example, that the foreman's job is to teach a green hand in patternmaking what draft is, or in other words, why he needs to allow for it, how he should allow for it, etc. The questions which such a foreman must face and answer at once are:

1. What are the facts which I must get over to this man in order that he will know what I wish him to know about draft?

2. How much do I wish him to know about draft at present?

3. What are the various possible ways of getting this information over to him?

4. Which of these various ways will be best for this occasion?

Now when he comes back, as he must to question number one, he will find, or at least should find, that he knows much more about draft than it would be wise to try to put over to the new man during the first teaching period; and that as a result he must, through process of elimination, reduce the total number of possible facts in his possession to those which will meet the needs of the present situation. Putting the same thought in other words, he must not only consider his total knowledge on draft but he must also, following a careful examination of this knowledge, select only those facts which will serve his purpose at this time. It goes without saying that he must have thoroughly analyzed the immediate problem before he can make any decisions regarding what facts to retain and what to reject.

I can illustrate this by referring to the common experience of giving a stranger directions regarding how to reach a certain place. Usually the informant knows more than one way of directing the inquirer. What must he do therefore? If he is to qualify as a good informant, must he not think about like this and then act accordingly? "There are four possible sets of directions I might give to this person. But he is a total stranger and I must therefore give him the information needed in the simplest possible form. It would be better, for example, to direct him to take a slightly longer route than to confuse him by means of such additional statements as would be necessary for directing him to a shorter route, etc. But whichever way I direct him to go," he would reason, "I must, if possible, give my directions correctly the first time. I must be sure that they are understood correctly, and I must avoid irrelevant statements." While the foregoing illustration is very simple in character it nevertheless contains all of the elements which enter into any situation where planning is essential. Accordingly whether the foreman faces a production job or a teaching job his manner of procedure must be similar to the above. Immediately below appears a thorough analysis of a teaching job which is more or less familiar to all shop men. Note (a) definite determination of the end in view, (b) the selection of all ideas which might be useful, and (c) the separation of the essential from the nonessential.

IDEAS CONNECTED WITH TEACHING HOW TO USE A HAND SAW

Essential Ideas	Basic Idea	Non-Essential Ideas
1. Piece of wood must be held in firm position. 2. Hold saw at proper angle to insure ease in operation. 3. Hold handle of saw loosely rather than tightly. 4. To start saw: Place end of free thumb at point where cut is to be made, hold side of saw close to end of thumb, and push saw down sharply and firmly until cut is well started. 5. Draw saw up and down with easy motion. 6. Exert pressure only on downward stroke.	Handle saw in such a way that satisfactory results come quickly and easily.	1. Information regarding the making of saws. 2. The various kinds and makes of saws. 3. Different qualities of saws. 4. Various uses to which saws are or may be put. 5. How to file saws so as to meet the demands of different kinds of woods. 6. Pointers on how to care for saws properly.

Assuming that effective planning embraces only what has been covered so far, an unwarranted assumption I grant, the next essential is that of determining the exact order of procedure in teaching, the sequence in which the various ideas, illustrations, comments, etc., which constitute the entire teaching job shall be presented. The implication is that there is one best way to teach a worker how to turn a taper or to inspect a casting the same as there is one best way to turn a taper or inspect a casting. And to a large degree this is true especially if the job is not simple in character. Let us look for a moment at the job of inspecting a casting. To complete such a job one must, among other things, check all dimensions, examine the finish of all surfaces unless otherwise instructed, note carefully the consistency of the casting as revealed by the presence or

absence of blowholes, etc. The question which at once arises, or at least should arise, after the various operations necessary to accomplish the work have been listed is: What is the best order for carrying through these necessary inspection operations? Thus, should the casting be inspected first for finish, second for dimensions, third for blowholes, etc.—or should the order be reversed? Then the question of standards enters in. Need equal care, for example, be exercised in all cases where dimensions or finish are under consideration, or shall practically no attention be given in some instances and much in others? It is unnecessary to point out such an obvious fact as that each job would have to be analyzed and treated in accordance with what the analysis revealed, this despite the fact that the similarities in operations in different jobs would doubtless far outnumber the differences.

Real Test of Teaching Ability

It is in connection with the above step, i.e., putting ideas over to the other fellow in proper sequence and with proper emphasis, that one of the true tests of teaching ability enters. Accordingly it is here that the teacher-trainer must do careful work with foremen. It will be found that the average foreman can easily be taught to analyze jobs well enough to enable him to prepare standard instruction sheets indicating in proper order the steps which make up the production job; but that he finds difficulty in analyzing these steps from the angle of learning difficulties. To illustrate: Let us assume that in making a certain type of screw twelve distinct operations are required. For convenience let us number these operations in the order they are performed, one, two, three, four, etc. Now let us suppose that the operations known as grinding the tool and setting it properly, operations four and five, are the most difficult in the list and that operation two, sinking the centers, is one of the easiest. We then have a situation somewhat as follows: The foreman must face the fact that getting ideas four and five over is much more difficult than getting idea two over and must organize his forces accordingly. He may find that a more thorough demonstration of operation four than of operation two will meet the needs or that several repetitions of the former may be necessary. Again he may find that his explanation of the former must be more elaborate. But whatever his analysis reveals it is incumbent upon him, as stated above, to make such preparation as necessary for putting his ideas across.

Since this task of recognizing learning difficulties, determining the learning difficulty order, and acting in accordance therewith is so difficult for foremen it may be well to mention the most important factors entering in. First among these is the attitude of the learner's mind toward the job as a whole or toward some particular operation in the job. Has his experience been such as to help him to an easy understanding of the task or an easy mastery of the necessary movements? Or is the opposite true? A second determinant is the success with which the teacher explains necessary details or demonstrates how to do certain operations, etc. All too often this is not included among the difficulties which the learner encounters. But to omit it is a great mistake for so far as the learner is concerned the teacher must be considered a part of the entire process. Third on the list may be mentioned the standards which must be met, or, in other words, the degree of accuracy, neatness, speed, etc., necessary. It is easy to see that a high standard or quality of work would exclude many, while the same in quantity would shut out another large group. It might be put this way: the greater the degree of accuracy, neatness or speed required the more difficult the job or the special operation in the job. A fourth one is the complexity of the job. By this is meant the number of different ideas which go to make up the entire job together with the difficulty connected with mastering each element or phase of the job. Thus, learning to run a gasoline engine is easier than learning to run a traction or railway engine, etc. As a fifth and final one I mention the degree of hazard involved in the job. No more confusing factor is known, when one is learning a new piece of work, than fear that a wrong lever will be moved or an oil cup missed or something else equally vital forgotten. Necessary caution ever acts as a deterrent when speed is the objective; and to a less degree this is true when accuracy is desired.

In the preceding paragraphs several important principles have been pointed out, namely, the necessity of thoroughly analyzing the lesson to be put over in order to determine, first, the exact object or end in view, second, the various ideas which are essential to putting this over properly, third, the approximate if not the exact order in which these ideas are to be presented during the teaching period, and fourth, the determination of the learning difficulty order. While it is granted that these principles constitute the backbone of teaching it is easily conceivable that a person might faithfully observe all of these and yet be a mediocre or even a poor teacher. It is because of this possibility that I call attention to other fundamentals that must be gotten over in a course of this kind.

The first of these has reference to the method of helping the learner. It is almost universally true that teachers, especially untrained or poorly trained ones, sin on the side of telling their pupils too much rather than too little. To do this continuously cannot result otherwise than to develop a spirit of dependence in the pupils, unless perchance they have unusual initiative and resourcefulness to start with. The key to successful teaching, assuming that both the material and the manner of organizing it have been determined, consists in knowing how to assist the learner in such a way that he thinks his way through his difficulties. As some one has well said, "The good teacher is the one who makes his services less necessary each succeeding day." It is perhaps unneccessary to add that the one and only means of stimulating the learner to solve his own problems is ability to ask questions properly. In fact, evidence of this ability tells more quickly than any other one thing whether or not a person is, or may be developed into, a good teacher.

How to Put It Over

Before attempting to enumerate what experience has taught us to date, I wish to say that it is too early in the game for definite rules and regulations to be formulated. Since the work is only in its initial stages presumptuous indeed would be the person who would attempt to speak authoritatively regarding it. Before this can be done the field must be cultivated much more thoroughly. However, there are a few points in the way of method and objectives that seem unquestionably worth while, points which our better judgment says to recommend to others.

It may be well also to remark that when giving these

points I have in mind the foreman's job as a whole even though I am referring specifically to the teaching phase of it. That is, I am thinking not of the special teacher-foreman found in a few plants but of the average foreman who must put things over to his men along with all of his other numerous duties. For, as has been pointed out earlier in this article, all foremen must and do go through the formality of teaching or trying to teach.

The first point is one that cannot be overemphasized for work of this character cannot be effectively done at long range. To adopt an appropriate movie term, it must be a "close up" job. He who attempts to get it done by means of a series of evening lectures or even conferences is sure to fail. Likewise will that one who relies upon printed matter, however well-prepared it may be. Of this we may rest assured, that when our objective has to do with the establishment of desirable, and the correction or elimination of bad, habits, we must work intensively. In other words, *we must train the foreman on his job and for his job.* We must work with him, plan with him, execute with him, etc.

The second point is that whoever undertakes to do this type of work must never forget that he is establishing connections with a going concern rather than with one which is about to start and that, as a consequence, he must plan accordingly. It will not be safe, for example, for him to assume that all of the foremen are totally ignorant of good teaching methods even though they do not know them as such; and, on the other hand, it will be equally unsafe for him to assume that they have anything in the way of an organized background of information regarding how to teach. He should rather assume that his group is made up of men with various degrees of ability to teach, some having much, others little, but that for the most part they never think of their work as resembling teaching in any way. Another thing the leader will do well to keep in mind is that since the establishment is already running he must somehow find a way of fitting into it, of modifying himself, his material, and his method rather than trying, especially at first, to modify plant conditions. In short, he had better adopt the evolutionary rather than the revolutionary method of selling himself and his ideas.

The last point I shall mention is that if there is any one place where patience is indispensable to success this is the place. Let him who lacks it, therefore, leave this work alone. The foreman with fifty other important things to take care of during the forenoon is not likely to respond kindly to any elaborate program along teaching lines. The most that can be expected is to "get under his skin" at occasional intervals. If these vulnerable points are remembered and future attacks governed thereby, results in the way of changed methods will come slowly. But be it known, once and for all time, that patience and proper personality are indispensable to putting this type of job over successfully.

One Way of Selling Machinery in Japan

The accompanying illustration shows an automatic machine on demonstration in the plant of the Kyushu Electric Light and Railway Co., at Hakata, in the Island of Kyushu, south of Japan proper. The job being machined is a bracket for a 5-hp. motor. The photograph was sent by Arthur Jackson, representative of the Potter & Johnston Co. in Japan. He advises that the machine was shipped nearly a thousand miles for the demonstration in accordance with the belief of the Japanese in their saying "Hundred times hearing is inferior than one seeing." The shipment was made by the Yamatake Co., agents for Potter & Johnston, National Acme and Gridley automatic machines.

Our correspondent further advises that the demonstration caused great interest and was the means of securing good orders; that the leading manufacturers in Japan are now well aware of the advantages of using automatic machines, and that when the present depression is over there will be fairly large orders given out for both chuck and bar working machines.



DEMONSTRATING A P & J AUTOMATIC IN JAPAN

Planing Flat Gibs—Discussion

BY FRANCIS PAQUIN

In the article "Planing Flat Gibs," page 219 of AMERICAN MACHINIST, Tell Berna advises that the gib should be tapped lightly on a block of babbitt, to cause a slight curvature. When the gib is laid on the table the middle is in contact and the ends slightly raised. The ends are then pulled down by clamping. This procedure may be correct, but on releasing the ends may return to their former position. In that case the gib would be parallel but not straight. On finishing the gibs where the full contact of the table and gib is necessary, Mr. Berna does not give any method to obtain this contact. The gib is probably not straight and the chances of the middle not touching the table are increased.

I think that the bending would be made unnecessary by placing tissue paper at the ends and middle. After clamping, the papers are given an easy pull and if they hold, contact is assured.

Rolling the Teeth in Hot Gear Blanks

Process Eliminates Cutting Gear Teeth—Rolling Bevel Gears in Fifteen Seconds—Saving 20 to 40 Per Cent of Metal

BY FREDERICK E. WALKER, JR.

AS EARLY as 1872 John Comley attempted to mold gear teeth on a blank heated to forging temperature by a knurling process. His efforts were unsuccessful because of the neglect to take into consideration the inevitable slippage between the die roll and the heated blank, if the rotational motion of either was dependent on that of the other.

The one factor vitally necessary to the successful perfection of gear rolling was overlooked until H. N. Anderson, of the Anderson Rolled Gear Co. Cleveland, Ohio, some ten years ago conceived and developed the idea of positively actuating both of the functioning shafts and accurately synchronizing their rotation by driving them through independent timing gears. This improvement entirely eliminated slippage between the die roll and gear blank and the resulting tooth distortion and inaccurate spacing which had caused the failure of previous attempts to roll gears from a heated blank. Mr. Anderson's original idea in developing this method and constructing his first machine was to replace the gashing operation (used as a preliminary step in the prevalent method of gear production) with the rolling process and then to finish the gears in the usual manner.

The first machine, completed in 1911, not only established the soundness of his idea, but also produced gears with teeth so perfectly and precisely formed that any further finishing operations on the teeth were unnecessary. This achievement won for Mr. Anderson the award of the John Scott Legacy Medal by the Franklin Institute, in 1915.

The perfection of the process then resolved itself into a question of developing a system of gearing that would permit of the use of accurately formed die rolls which could be produced at comparatively low cost and could be redressed when necessary without destroying the precision of the molded tooth profile during the life of the dies. The accomplishment of this and of the next step—adaptation of this system of dies for use in a machine operating on the principle evolved—has completed the dream of the theorists as to the practical production of gears by a process of true molding.

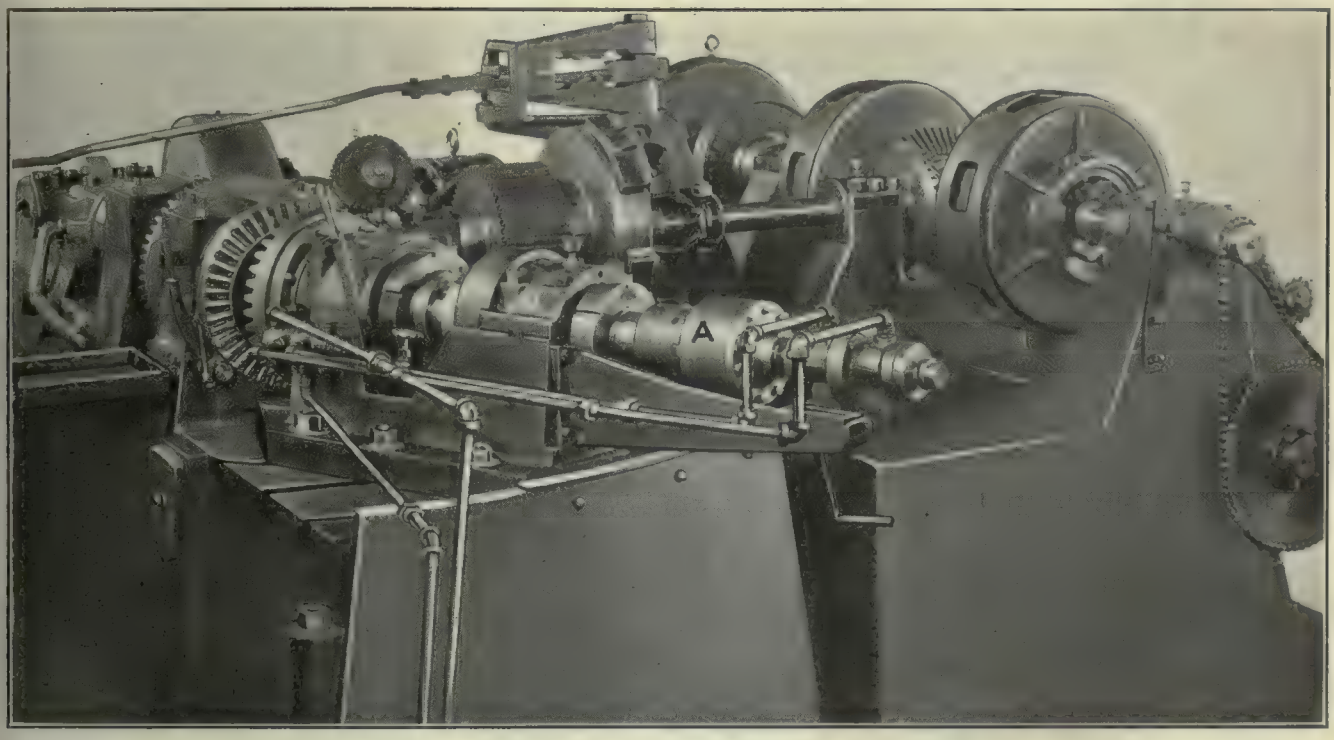


FIG. 1. ANDERSON GEAR TOOTH ROLLING MACHINE

The high cost of producing die rolls with a maximum degree of precision made it a primary necessity to devise a form or shape of tooth for the die rolls which would minimize this first cost and also make possible economical and accurate redressing. This proved to be no very difficult problem as the plane sided tooth of the standard involute rack and the characteristic tooth of the standard crown gear, provide in each case forms which can be easily and cheaply produced with a very high degree of precision and which can be reproduced or redressed with equal ease and accuracy.

For the production of standard, helical and herringbone gears of the spur type, a die of the involute form could not be used; first, because of the practical impossibility of cutting a die of this form with absolute precision at a reasonable cost, and second, because the curve profile of the standard spur tooth could not be accurately redressed when worn. The rack form of tooth in the involute system of gearing, however, avoided these drawbacks and was adopted as the standard for die rolls for the production of all spur type gears.

The master form of die tooth is applicable to the

formation of helical or spiral spur gears by making the tooth spaces of the die in the form of oblique straight cuts across its face, although the resulting tooth spaces are somewhat deeper at the center than at the ends. On the gears molded from die rolls of this form the teeth are, of course, somewhat shorter and heavier at the ends than in the center. The gearing so formed is actually stronger than gears of the same pitch with teeth of uniform dimensions, as the greater central tooth depth tends to increase the arc of contact at the center of the face.

Herringbone gears may be as accurately and cheaply produced as the other types by the simple expedient of a compound die roll, made up, to enable easy redressing, of two helical die rolls of opposite spiral angle, keyed and securely bound together when functioning, and readily taken apart for separate dressing of the two halves.

Not only can perfect herringbone spur gears be formed by this method, but application of the same principle to bevel gears by forming compound dies of two helical bevel gear dies, will produce, as rapidly and as cheaply, a perfect herringbone bevel gear as in Fig. 6. This form of gear has never before been possible of practical production.

In the actual process of rolling the gears, the blanks heated to a temperature of between 2,000 and 2,100 deg. F., are mounted on the work arbor of the machine shown in Fig. 1 and securely clamped in place by means of a powerful automatic chuck, mechanical, pneumatic or hydraulic as at *A*. The set-up is shown in Fig. 2, where *A* and *B* are the driving gears, *C* is the die and *D* the gear being rolled. The arbor carrying the blank and that carrying the die roll, having been adjusted to the proper angle in respect to each other as required by the type and dimensions of the gears to be rolled, the blank and die are then rolled in precisely synchronized contact under a rolling pressure of from 10 to 20 tons.

The die roll is automatically advanced to positive contact with the blank as the rolling commences. As the rolling continues at high speed the die roll is advanced until the teeth of the die have penetrated to nearly full depth in the plastic blank. The advance is then slowed somewhat until the formation of the gear is completed and die and gear are in full engagement. This movement of the die roll is automatically produced by means of a smooth positive cam mechanism which accomplishes a regular and constant progression in the first stage and a gradual retardation as the die approaches full depth. This cam mechanism is also designed to assure full penetration of the die teeth before the heated blank has cooled below its critical temperature and then continue the rolling with no die advancement until the blank has cooled somewhat below this point.

As the rolling is done as a rule at speeds varying from 400 to 700 r.p.m., depending on the size of machine and the size of the gear rolled, it is apparent that advance of the die per revolution is very slight. This assures a very thorough kneading and working down of the metal of the blank and permits the metal to flow evenly and freely. The fact that both die and blank are positively driven and accurately synchronized assures the die teeth penetrating the blank radially in exactly the same position on each revolution, and entirely eliminates any slippage or tooth distortion in the finished product.

During operation the die is cooled by a stream of water directed against its face at a point farthest from contact with the hot blank. Through the entire process, consuming only a few seconds, the temperature does not rise above a heat easily bearable to the hand. The chilling effect of the comparatively cold wet die on the heated blank causes a sudden contraction and consequent loosening of the scale formed, which is then thrown off by the centrifugal force resulting from the high speed of operation. Since the rolling is continued until the blank has cooled below the critical temperature, or in other words until after the formation of forging scale has ceased, the finished product of the process is entirely free from scale and the formed teeth are not only perfectly shaped but are also higly polished on all contact surfaces. This fact, of course, eliminates any necessity for further finishing operations, except on the bore and faces of the hub and on the ends of the teeth. For these operations, which may be easily and semi-automatically performed, the gears are chucked on



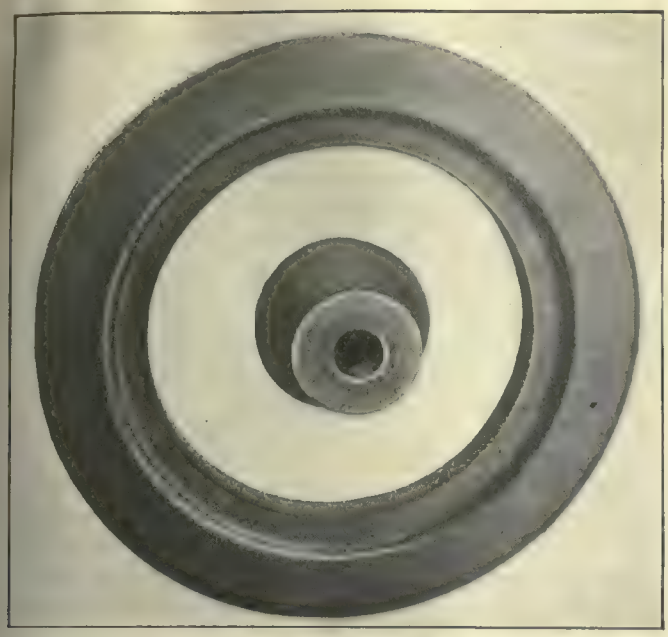
FIG. 2. THE TIMING GEARS, THE DIE AND THE WORK

the accurately rolled teeth, thus assuring perfectly accurate centering.

In order to assure the highest possible degree of precision of tooth form, machines designed for the production of extremely accurate and perfect gears are equipped with additional mechanism for frequently and automatically reversing the shafts carrying the die and blank. This frequent automatic reversing or oscillation, at somewhat reduced speed, (varying from about 80 to about 200 r.p.m.) during the forming of the teeth and nearly to the point of full engagement, assures displacement and building up of the metal to an equal degree on both sides of the teeth, producing an absolutely symmetrical tooth. The full cycle of operations of the oscillating type machine, automatically controlled, is as follows:

High-speed direct rolling, the die roll advancing to positive contact with the gear blank.
Oscillating rolling at reduced speed until the teeth of the die-roll reach within about 0.010 in. of full depth.
Planishing by high-speed direct rolling until the die-roll teeth engage the gear to full depth.
High-speed withdrawal of the die roll.

The die rolls are somewhat narrower than the gear blanks and the effect of this is the production of gears which are partially or fully shrouded. Blanks are shown



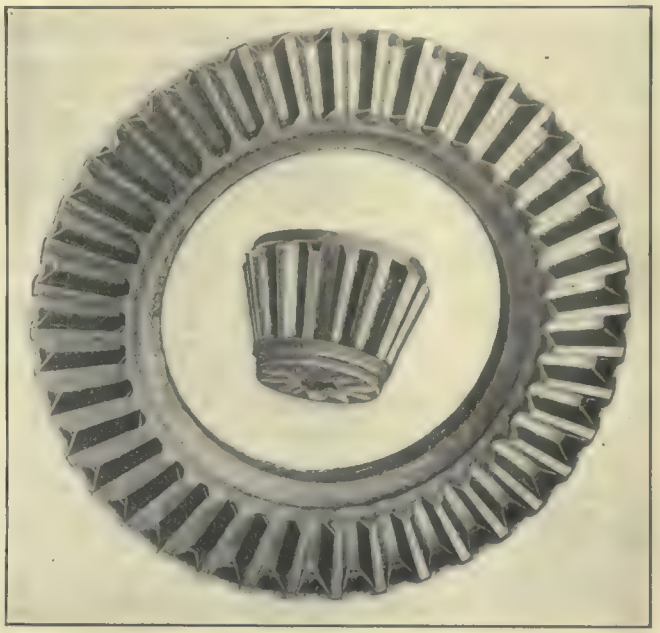


FIG. 3. GEAR AND PINION BLANKS. FIG. 4. AS THEY COME FROM THE MACHINE

in Fig. 3 and the rolled gears in Fig. 4. Consequently if it is desired to strengthen the weaker member of a pair of gears, the shroud may be left on, either entirely or partially, or the shrouds on the two gears may be so proportioned as to equalize the strength of the two and greatly increase that of the combination. The degree of this increase in strength cannot well be accurately determined, but considering the greater inherent strength of rolled teeth, it would probably be a conservative estimate to assume that rolled shrouded gears have at least double the strength of ordinary cut gears of the same pitch, permitting the use of rolled gears of half the pitch for the same purpose.

As the actual operation of molding the plastic gear blank ceases when the heated blank has cooled below its critical temperature, and before there is any appreciable increase in the temperature of the die roll, it is of course necessary to design and proportion the die rolls for molding gears at that temperature. Consequently the dies must all be somewhat oversize as compared with the finished gears at normal temperatures. Die rolls properly made and proportioned should as a rule permit of the production of at least 500 accurately formed gears before any redressing becomes necessary, and should also permit of a considerable number of redressings during their lives.

All types and sizes of die rolls having the master-form gear teeth can be very easily redressed whenever wear or dulling makes it necesary. It might at first appear that this refinishing, especially in the case of

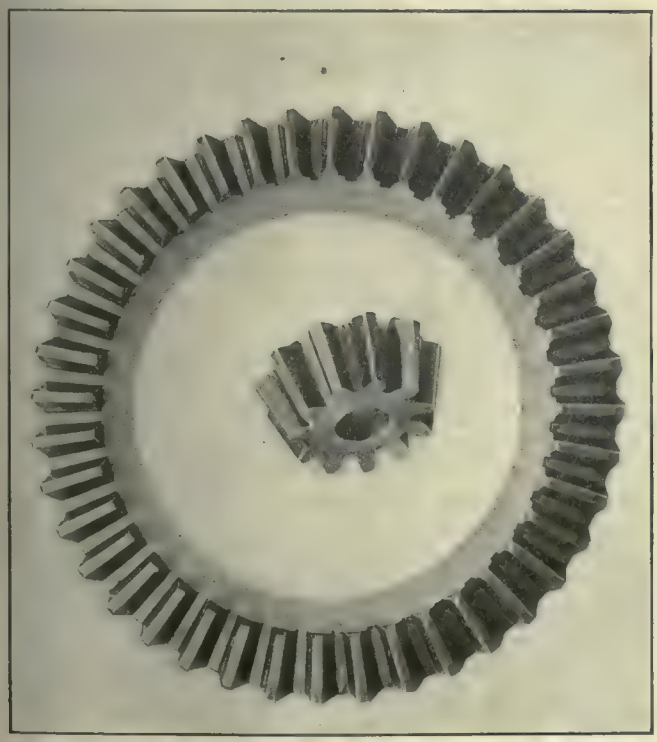




FIG. 5. AFTER BEING TURNED, FACED AND BORED. FIG. 6. HERRINGBONE BEVEL GEAR AND PINION

gears of the spur type, would immediately introduce appreciable inaccuracies in the product due to the inevitable slight reduction in the diameter of the die roll, which must result from each refinishing. It must be remembered, however, that both the gear blank and the die roll are mounted on shafts which are positively and independently driven and whose rotations are exactly synchronized by separate timing gears. Thus the angular distance between the teeth molded on the blank is controlled and maintained constant, regardless of any slight reduction in the diameter of the die, or the size of the die teeth. The only effect of this reduction in diameter, if it is appreciable at all, would be a very slight creep between the die and blank when in motion. This creep would be held uniform and constant by the timing gears and, as the thickness of the molded teeth is dependent on, and controlled by the width of the tooth spaces of the die, even a considerable amount of creep may be readily counteracted by simply reducing the thickness of the die roll teeth that slight degree necessary to maintain constant the width of the die roll tooth spaces. This modification of die roll proportions, however, is entirely unnecessary in the case of the crown or flat bevel type of dies used in the molding of any type of bevel gears. With these forms the grinding of the teeth does not affect the diameter of the die rolls.

The greater inherent strength of rolled gears is due to the effect on the structure of the metal by rolling under high pressure. This pressure and the thorough kneading action of the die teeth on the metal while in the plastic state, in addition to building up and compressing the metal into the formed teeth, gradually breaks up the coarser crystalline structure and produces a dense, thoroughly worked and more fibrous structure. The minute crystals are rearranged in a trussed formation, thus tying the teeth to the body and equalizing structural strains. The elimination of internal structural strains is so marked that no distortion whatever occurs in subsequent heat-treatment, and it has even been found entirely unnecessary to use any clamps to hold the gear true in quenching. Exacting laboratory tests amply confirmed by service tests under the most severe operating conditions, have shown a superiority for rolled gears over the best of cut gears, averaging 25 per cent in strength and 20 per cent in hardness, as shown in the accompanying table.

CHARACTERISTICS OF MACHINE-CUT AND HOT-ROLLED GEARS

	Machine-Cut Gears	Hot-Rolled Gears
Normal condition:		
Yield point	6,470 lb.	7,918 lb.
Ultimate Strength	12,260 lb.	13,645 lb.
Hardness	22	26
Case Hardened:		
Yield point	13,529 lb.	14,750 lb.
Ultimate strength	17,260 lb.	19,130 lb.
Hardness	87	85
Penetration of case	0.027 in.	0.035 in.

The hot-rolling process makes possible quantity production of gears at a far lower unit cost than by the cutting method and the inherent characteristics of the process permit of considerable savings in material and labor costs, and in overhead and equipment investment as well.

As the teeth are formed on the finished gears by displacement and building up the metal, rather than by cutting it away, the gear blanks are so proportioned as to require cutting away of waste metal only in finishing the hubs and removing the shrouds. It is thus possible to make a saving in the actual weight of metal required in a gear blank by an amount ranging from 20 to 40 per cent of that required in the blank for the same size of cut gear.

The largest size machine so far developed can easily be handled at a high production speed by two men, an operator and a helper. The operator can easily tend the running of the machine, leaving the helper to tend the furnace, heat the gear blanks, and feed them to the machine. Either job can be efficiently handled by intelligent laborers under the direction of a capable foreman. The actual time of rolling the largest gears so far produced is under 15 seconds, so that it is apparent that the saving of labor time-costs is very large, and is only limited by the degree of dexterity and speed attained by the crew. A production rate of eighty or ninety finished gears per hour can be readily attained and maintained. The time saving in actual tooth forming over the fastest method of accurate gear cutting is from 90 to 95 per cent or even higher, the time saving in the production of completed gears ranging from 25 per cent to as high as 80 per cent under varying conditions. There is also a saving in equipment estimated at 50 per cent or more of the total. For the tooth forming alone the saving is estimated at 70 per cent.

Big Shops Versus Little Shops

BY HARRY SENIOR

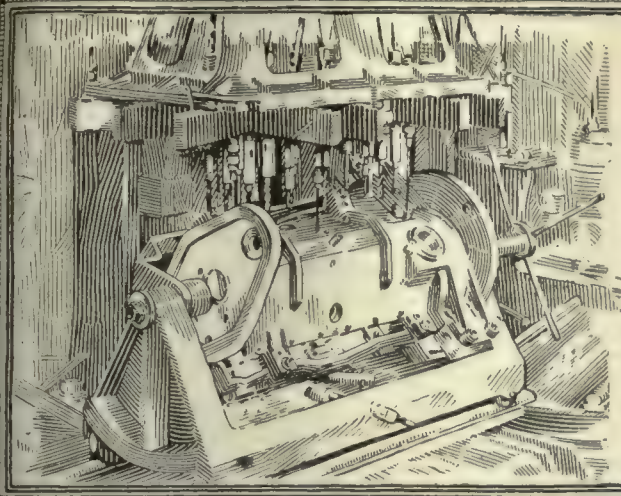
An article on page 99 of AMERICAN MACHINIST, entitled "Big Shops versus Little Shops" and written by the late W. D. Forbes, attracted my attention for several reasons.

The first reason is this: Either your type has betrayed you or else Mr. Forbes was a joker and was trying to catch somebody napping. If holes of any size are to be drilled in a circle of 1½-in. pitch diameter through a disk of metal the outside diameter of which is also 1½ in. (these dimensions are from the printed specifications) then one-half the diameter of each hole will be "in air" and the job not so simple as it at first seems.

Dismissing this as a typographical error, the question immediately arises as to the limit of accuracy desired. The specifications promptly suggest to the mechanical mind an index plate. The extremely liberal tolerances specified on outside diameter and thickness do not in any way controvert this conception, as these dimensions have nothing whatever to do with the functioning of such a plate; but the matter of concentricity and accuracy of spacing, which Mr. Forbes dismisses with a casual "evenly spaced," are of vital importance, as it is easily to be conceived that the slightest error in this respect might make the difference between a valuable tool and a piece of junk.

It is not my intention to discuss methods of making. It is not a question of big or little shops but of looseness of specifications. If the job turned out by the little shop for $5 was good enough, then it was well paid; my apprentice boy could have completed it in an hour. If, on the other hand, the allowable limit approached 0.0001 in., the work would have to be buttoned, bored and reamed, calling for accurate and expensive equipment and the highest degree of toolmaking skill; and the shop that could get away with it for $40 is exceptional—overhead or no overhead.

The firm that made the $40 quotation played safe and was probably prepared to furnish a job that would qualify under the most rigid inspection; the $5 shop "took a chance." If Mr. Forbes wanted a $5 job he should have said so.



Tool Engineering

By

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Tapered Reamers for Roughing and Finishing—Principles of Floating Reamer Holders for Turret Lathes—Pin-Type and Full-Floating Holders

BEFORE reaming a tapered hole, it is necessary to provide a true-running hole. To accomplish the latter, it is advisable first to bore straight several steps of the taper. On very shallow tapers it is obvious that the hole should be bored straight, entirely through the work; but on tapers having considerable angle and on large sizes, the method first suggested will be found of advantage. There is considerable trouble caused by "chatter" when using taper reamers, and it is advisable to look into the reason for this so as to counteract it in the design.

A Common Form of Chatter

The most common form of chatter when reaming a tapered hole is that caused by the reamer tending to pull into the hole. If the tool works to one side, it has different amounts of material to remove on opposite sides, so that it cuts unequally. The consequence is that it either breaks or starts to chatter. If it is possible to pilot a tapered reamer, this is a great advantage; but it cannot always be done. If considerable stock is to be removed from the hole, as in the case of a rather abrupt taper, it is well to use several tools in the hole. The first tool should be a boring tool having several cutters, which will generate two or three steps of the taper. The second tool can be a taper roughing reamer of the form shown at *A* in Fig. 334.

The design of tools for roughing out taper holes is controlled to a great extent by the angularity of the taper, and the condition of the hole before it is reamed. Assuming that a given piece of work has been previously bored, as mentioned, and that all scale has been removed from the inside, the tool *A* can be made up with three or more lips, the number depending upon the size of the hole.

For comparatively small sizes three lips are sufficient, and there is a distinct gain in the cutting action, because the stock is removed much more easily and with less pressure. For large diameters more lips can be used, but a general principle is to use as few flutes in a roughing tapered reamer as possible. Many times lubricant is necessary, and deep wide flutes allow it to enter readily and permit the chips to be washed out freely. For abrupt tapers the roughing reamer can be made with a right-hand helix, but for shallow tapers it should be straight or with a slight left-hand helix, in order to prevent "drawing in." For roughing out the hole the taper reamer should first be formed, and after this it should be broken up into a series of steps *B*. A groove having a lead of from ¼ to ½ in. should be cut at the end of each step, as shown at *C*. The steps and groove can be considered helical in form if the taper be disregarded, although they resemble a spiral when the taper is viewed from the small end. This groove allows cutting teeth to be formed, as indicated at *D*. Each of the steps should be back tapered slightly in order to permit free cutting. This is illustrated clearly in the enlarged detail at *E*. If the groove *D* is cut on a right-hand helix, it will automatically relieve the ends of the teeth, so that they will cut freely. The teeth should be relieved eccentrically on a relieving attachment and then hardened, after which the flutes may be ground to give a cutting edge.

The finishing taper reamer shown at *G* usually has more flutes than the roughing reamer. The flutes may be straight or with a left-hand helix angle, but never with a right-hand angle, as this would cause the reamer to draw in and chatter. In reaming steel, a narrow helical groove can be cut with a lead of ¼ in. or so, the entire length of the reamer. When this is done, one tooth overlaps the other and no grooves are apparent in the finished work. At the same time, the chips are removed much more easily, because the cutting action is considerably relieved. On very long surfaces, this groove will be found to assist materially in making the cutting action easier.

Floating Reamer Holders

When holes are reamed by hand, the reamer naturally follows the generated hole; but when held rigidly in a machine, improper alignment may cause the reamer to cut oversize or otherwise incorrect holes. Some of the causes of failure of reamers to cut true to size can be attributed to the method of holding the reamers, while others may be due to an incorrectly generated hole or one which does not allow sufficient stock for the reamer to remove. A great deal depends upon the way in which the work is held, and the preliminary work which has been done in the hole before reaming.

We shall consider the application of floating holders

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to turret-lathe work, and the reasons which make it necessary to use holders of the floating variety. Fig. 335 shows a piece of work A which is to be sized by the reamer B. The latter is held rigidly in a holder C fastened to the face of the turret. We shall assume that the hole in the work A has been generated, so that

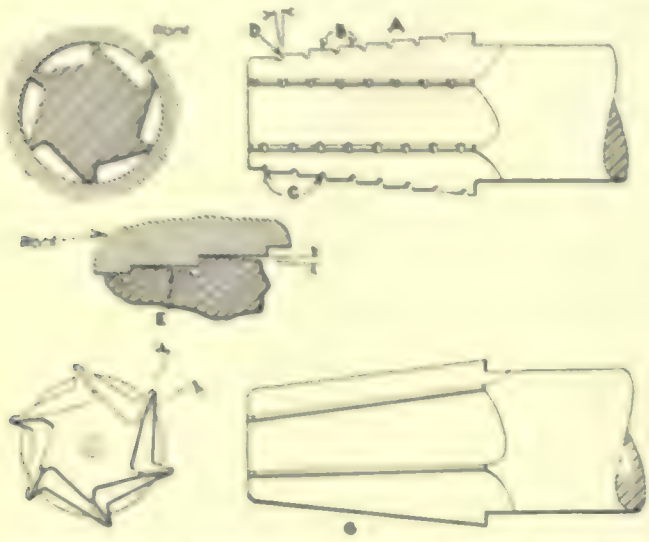


FIG. 334. ROUGHING AND FINISHING TAPER REAMERS

it is true with the center of rotation of the work. If then, every part of the machine is in perfect alignment, and if the reamer is located directly on the center line of rotation, the hole should be of correct size after reaming.

In actual practice it seldom happens that all parts of a machine are in perfect alignment, and therefore the reamer would be more apt to cut unequally if held rigidly in the holder as shown. If the turret has been used considerably the center line of the holder is likely to be several thousandths of an inch below the center of the work, which would naturally cause the reamer to take a position, as shown, considerably below the center line. The result would be an over-size hole if the reamer were to be held rigidly. This condition is frequently found in turret lathe work.

Less common is the condition shown at D, in which the center line of the holder and work do not correspond, due to an inaccurate setting of the holder E on the face of the turret, so that the reamer F is off center on one side an amount indicated between the arrows at G. The hole would also be over-size if reamed in a rigid holder under these conditions. The example at H shows a turret which does not index correctly on account of considerable abuse or overhauling by unskilled labor. In this case, the reamer would take the position shown at K, and the result here would also be an oversized hole. The angularity between the center line of the work and the center of the reamer is shown at L.

Of the three conditions, the most common is that shown at A, in which the turret slide has been worn by use so that the center line of the turret is slightly lower than the center of the work. In order to counteract all the conditions just mentioned, it is necessary to hold a reamer in some type of "floating holder," so that it can automatically align itself with the center line of rotation and follow the generated hole correctly. In theory, a holder must be devised for this purpose which will permit the reamer to float in all directions.

An example of a holder intended to provide this floating is shown at M. The reamer N is mounted on a shank O which is enlarged at P and slotted on the end, as shown in the detail at Q. The member R has tongues on both sides at right-angles to each other, so that it freely fits the slot Q and another slot in the member S. The latter member is pivoted at T so that it will swing freely. The shank U is held in a holder at V, which is fastened to the turret. Excess movement of the reamer is prevented by a small amount of clearance in the restraining collar W, which is pinned to the member S. The reamer is prevented from pulling out by an adjustable threaded sleeve X. A holder based on this principle will allow the reamer to float in any direction and align itself with the center of rotation of the work. This particular example is not intended to show anything more than the principles which are involved in the con-

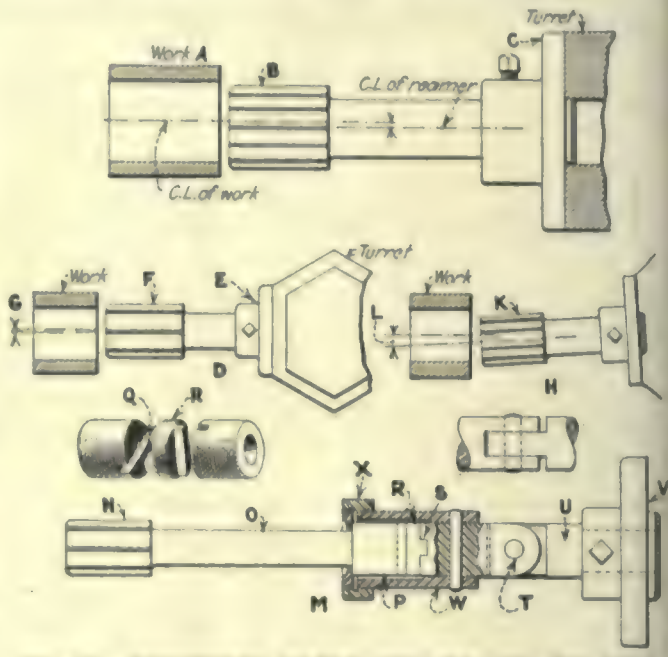


FIG. 335. PRINCIPLES OF FLOATING REAMER HOLDERS

struction of a true floating reamer holder. It can be modified and developed to suit a particular case if desired.

Pin-Type Holders

Many writers have discussed methods of obtaining a true floating reamer holder. While we do not wish to differ from many of the statements made on the subject, we shall simply state that there are many cases when a very simple type of holder which is theoretically incorrect, will produce a commercially true hole of a diameter determined by the size of the reamer. This is largely due to the fact that the error in alignment between the turret and the work is usually in an up and down direction, so that a float in this direction will take care of the majority of cases. Fig. 336 shows in simple form several types of floating reamer holders. Many of them are more or less objectionable from the standpoint of theory, but at the same time they are often used successfully.

In the example at A, the shank of the reamer B has a pin C driven through it. The holder D is located in the turret by some convenient method. A hole E in the holder is made slightly larger than the pin, and the shank E is somewhat smaller than the hole F in the holder. By this means the shank is permitted to float up and down freely, and a certain amount of side motion

is also permissible. Furthermore, the shank rocks on the pin so as to take care of slight angular errors. This holder is not theoretically correct, as will be shown later, and yet it is a type very commonly used in many shops and producing more or less satisfactory results.

The example shown at *G* consists of a holder *H* of

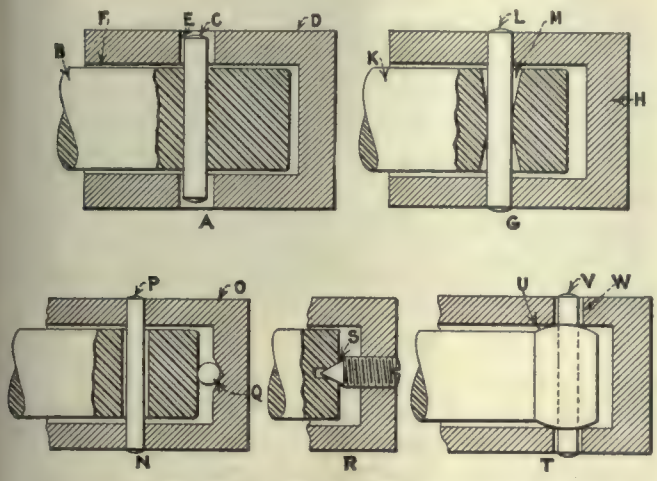


FIG. 336. SIMPLE TYPES OF FLOATING REAMER HOLDERS

suitable size to fit the turret of the machine. The shank of the reamer shown at *K* is slightly smaller than the hole in the holder. The pin *L* is a driving fit in the holder itself. A hole through the reamer shank is countersunk on both sides and tapered, as shown at *M*. The center of the hole fits the pin snugly. The theory of this type of holder is that a slight spring or rocking action will take place when the reamer enters the generated hole in the work. The reamer may move up and down slightly on the pin. Although not strictly correct in theory, this holder is simple and very fair results can be obtained by its use.

Another example is shown at *N*, in which the holder *O* has a pin *P* driven through it. The reamer shank is drilled slightly larger than the diameter of the pin, and the thrust on the reamer is taken by the ball *Q* which rests in a countersunk hole in the holder. This method of holding permits the reamer to float up and down, while a certain amount of angular movement is also allowed. In the example *R* a center *S* is used in the end of the reamer shank. This method is objectionable, as it centers the reamer and does not allow it to parallel itself to the generated hole in the work.

A very old type of floating reamer holder is shown at *T*. Many factories use something of this kind as a floating reamer holder, but it is open to numerous objections. The shank of the reamer is turned in spherical form at *U* to a diameter slightly smaller than the inside of the holder. The pin *V* is used as a driver, and is allowed to float in the oversize hole *W*. If sufficient clearance is provided between the spherical end *U* and the inside hole, this type of holder can be made to produce very good results. If the turret is considerably out of alignment, however, and there is only a small amount of clearance in the hole, the reamed hole is likely to be "bell-mouthed."

The diagram shown in Fig. 337 illustrates the reasons why a reamer using a pin driver does not always work out as satisfactorily as it should. In the first example a sectional view of the holder is shown at *B*. The reamer shank *C* has a pin driven through it at *D*, and clearance is provided for this pin in the hole *E*. If the center of the reamer holder is slightly below the center of the work, as shown at *F*, the shank of the reamer will float until it takes a position like that shown at *G*, and the pin will drive against both sides of the hole. The reamer, however, will find the center of the generated hole without difficulty, as is shown by the fact that the center line of the pin *H* crosses that of the holder.

If we assume another condition in which the turret hole is off center an amount shown at *K*, the driving pin *L* must take a position like that shown in order to have the reamer parallel itself to the hole. This is all very nice as far as it goes, but the moment that the pressure of the cut is applied under a condition of this sort, the pin immediately is thrust over and acts as a driver

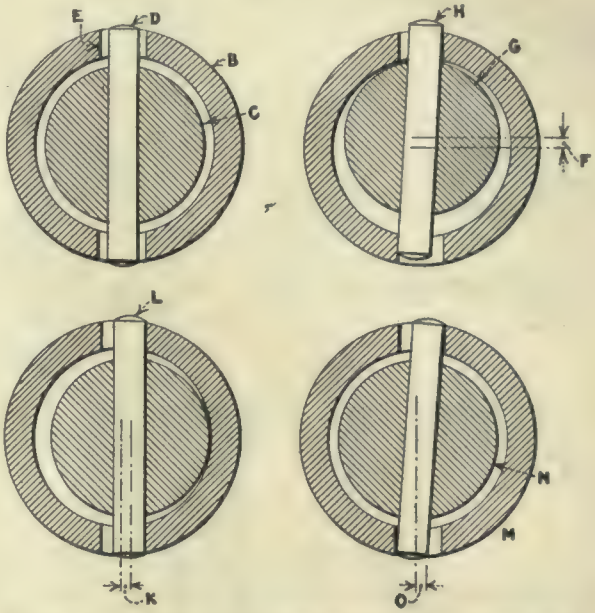


FIG. 337. ACTION OF PIN-TYPE FLOATING HOLDERS

against the two sides of the hole, as shown at *M*. This action causes the shank of the reamer *N* to assume a central position in the holder, which position differs from the center line of the work by an amount indicated between the two arrows at *O*. From these examples, it can be readily understood that a very simple type of floating holder will take care of variations in the vertical position of the holder and work, but will not give good results when there are other inaccuracies in alignment.

Full-Floating Holders

In Fig. 338 is shown at *A* a type of holder designed to overcome the ordinary difficulties found in floating reamer holders. The body *B* contains a floating member *C*, which is tapered to receive a taper-shank reamer. A ball thrust bearing is provided at *D*, and all the thrust is taken at this point. The driving action is by means of a pin *E*, which floats freely in the shank as shown. It is restrained by the setscrew *F* so that it does not have too great a movement, and at the same time it is perfectly free to take a central position with respect to the work. In action, the tendency is for the reamer to parallel itself to the hole, the action being assisted by the wide thrust bearing mentioned.

Another type of floating reamer holder designed to correct misalignment is shown at *G*. The shank *H*

is held in the turret and the reamer shank K is permitted to float in several directions. The shank H is threaded to receive the nut L, which is screwed up against the shoulder as shown. On the outside of this nut a retaining collar M is screwed. The front end of this collar is threaded internally to receive an adjusting nut N, which controls the amount of float permissible in the reamer. The shank of the reamer is fitted with a nut O that is intended to prevent the reamer from pulling out of the holder. Hardened pins are inserted at P and Q, and against these pins the thrust of the reamer is taken through the ball R which is interposed between them. The driving is accomplished by means of a floating member S, which is cut out as shown in the end sectional view. Each of the collars L and O has two lugs on it, as shown at T and U. There are four balls V interposed between the driving members. When in operation the reamer enters the hole and parallels itself to it by means of the floating action, which at the same time permits a driving movement that is not influenced by the location of the center

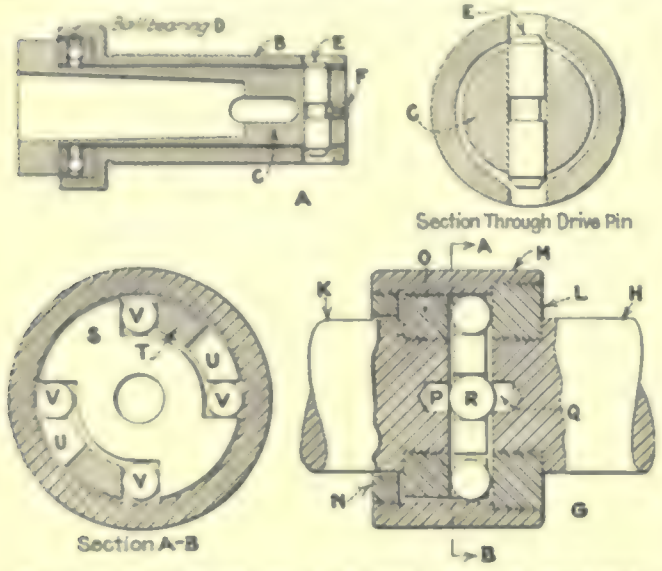


FIG. 338. TWO TYPES OF FLOATING REAMER HOLDERS

of the holder. A floating action is thus obtained which takes care of errors in alignment, both vertical and horizontal.

Applying the Broach to External Surfaces

BY MILTON WRIGHT

The part shown in Fig. 1. is a section of the feed roll of a spinning frame used in textile mills. The rolls are not more than 1¼ in. in diameter at the largest part, which is the notched or serrated portion, and many be anything up to 20 ft. in length according to the width of the machine on which they are to be used.

It is necessary that the serrated surfaces be hard in order to resist wear, and the finished roll must run true. As it would be practically impossible to make and harden a rod of this length and section to meet the requirements, it is standard practice to make them in lengths of 24 in., as shown, and join them together after finishing; the squared end to the right entering a correspondingly shaped socket in the end of the next rod so that when a full length roll is joined up it presents the appearance of a single rod.

The serrations are much like pinion teeth, but are

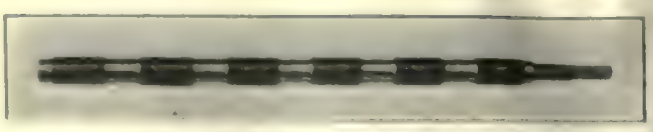


FIG. 1. THE FINISHED PRODUCT

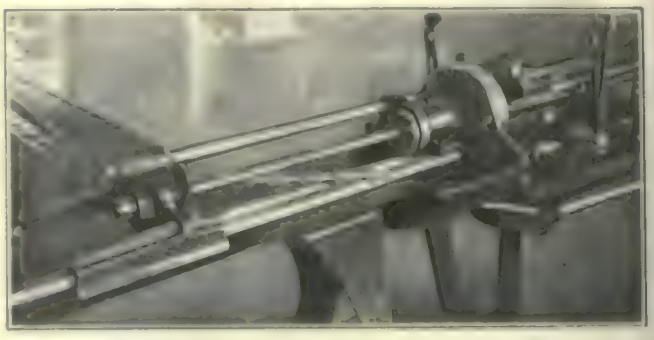


FIG. 2. THE BROACHING MACHNE

not teeth in fact, as the roll runs against a larger roll, the surface of which is covered with leather. To avoid wearing corresponding depressions or serrations in the leather, the teeth are irregularly spaced so that as the larger roll revolves against them the teeth do not come successively in contact with the same place each time and the leather surface consequently remains smooth.

The usual method of notching the sections is by planing them, and in any shop which manufactures textile machinery may be seen gangs of specially designed planers handling four, six, or even more sections at a time, indexing the pieces around one notch upon an index plate at each stroke, and feeding the cutting tool down a little at each complete revolution of the work, so that the depth of all the teeth increases practically in unison until the work is finished.

A method has, however, recently been put in operation by which these sections are produced complete at one pass, so far as the serrations are concerned, and at a speed of production approximately five times that of the planers. The tool cost of the new method is higher, but that is offset by reason of the reduced investment, for a standard broaching machine does the work of five special planers and occupies but little more floor space than one.

In Fig. 2 may be seen the broaching machine with one bar in place ready to go through the broaches, and a finished bar lying on the shears. The work is supported at the outer end by the crosshead, and is both pushed and pulled through the broaches. Seven broaches, shown in Fig. 3, constitute a set, and are held to the faceplate of the broaching machine by a special holder which locates them by the notches in the periphery. The locating notches are a very important feature;



FIG. 3. THE BROACHES THAT DO THE WORK

the more so because of the irregular tooth spacing which allows but one right position for each broach.

The face of each broach is beveled to an angle of about 10 deg. to give the requisite shear to the cutting edges. The broach holder is open at the top and a flood of oil is delivered upon the broaches during the cutting stroke.

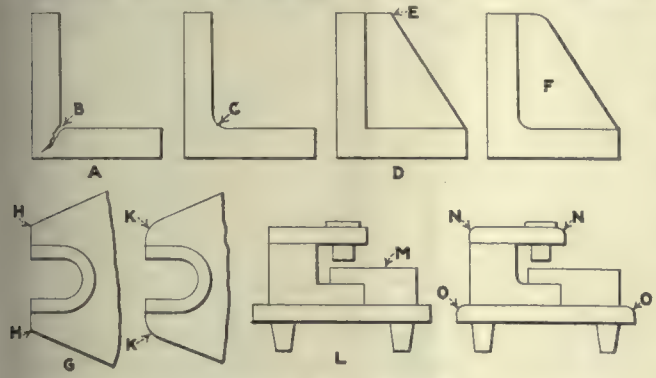
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Rounded Corners

By Alex Dowel

In pattern work, especially for jigs and fixtures, we frequently hear the argument advanced that "it costs too much money to make the pattern with rounded



SHARP AND ROUNDED CORNERS ON PATTERNS

corners." It is a question whether this policy is a good one or not, as there are several things to be considered. In making up an angle plate, such as that shown at *A* in the illustration, if the corner *B* is left square there is a possibility of a fracture at this point when the casting is made. On the other hand if made as shown at *C* the patternmaker is obliged to put in either a leather or wax fillet. A wax fillet is considerably cheaper than one made of leather, but it is not as serviceable. However, the wax is plenty good enough for jig work where only one or two castings are required. There is some extra labor involved in putting in a leather fillet, and on a complicated jig or fixture the extra time might increase the cost several dollars. The resulting fixture however would be very much better and stronger.

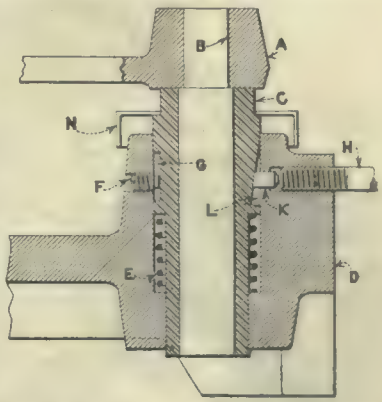
In the angle plate shown at *D* the rib *E* is used to stiffen the plate. The cheap way of making this would be as shown, but it certainly would not cost much money to round the corner as shown at *F* and the plate would then be much easier to handle. Rounded corners on the outside of a pattern cost very little and are usually a considerable improvement over sharp corners. An example which illustrates this point is shown at *G* in which the U-lug corners at *H* are left sharp. Is is much better to make them as at *K* even though the actual requirements of the work do not necessitate it. We might say that it looks better any way and the extra cost is nominal. Consider the man in the toolcrib who is obliged to handle the fixture and put it away and remember that a sharp corner is apt to injure his hands. Of course when the fixture is placed on the machine it does not make any difference whether the corners are rounded or sharp. It is interesting to note the difference in handling a fixture with sharp corners and one where they are rounded so that they do not injure the hands. A workman will place a well smoothed, rounded fixture in position on the machine very rapidly as he is not afraid of cutting or injuring his hands. If he picks up a jig with sharp corners and handles it he is inclined to be cautious, which causes delay and therefore it takes him longer to do the work than would otherwise be the case.

A built-up type of jig is shown at *L*. This jig is made entirely of steel and the corners are not rounded at all. It is therefore an unpleasant jig to handle and an actual test will show that the workman is much slower in loading and unloading the pieces *M* than he would be if the corners of the jig were rounded as shown at *N* and *O*. I have seen jigs which were turned out from the toolroom with corners so sharp that the workman could easily cut his hands on them and there is certainly no good reason for any such condition as this in a modern shop, where the operator must be considered as well as the work which he is doing. The conclusion a reasonable man should draw from the foregoing is that *it pays to round corners*, at least sufficiently so that the workman can handle jigs and fixtures without injury to his hands.

Spring Jack for Supporting Work

By C. W. Frank

Spring jacks are generally made with solid plungers or plugs, but if it is desired to locate a piece of work, for a drilling operation, directly over the plunger, it is necessary that the plunger be hollow. A draftsman drawing a tool requiring a spring jack very often offsets the jack when this condition occurs or probably uses some other means of supporting the work and condemns the use of a jack when it should be employed. The accompanying illustration shows a jack with a clearance hole through the plunger, permitting it to be located directly under the part of the work to be drilled. In addition, the jack has a few features which differ from common practice.



SPRING JACK FOR SUPPORTING WORK

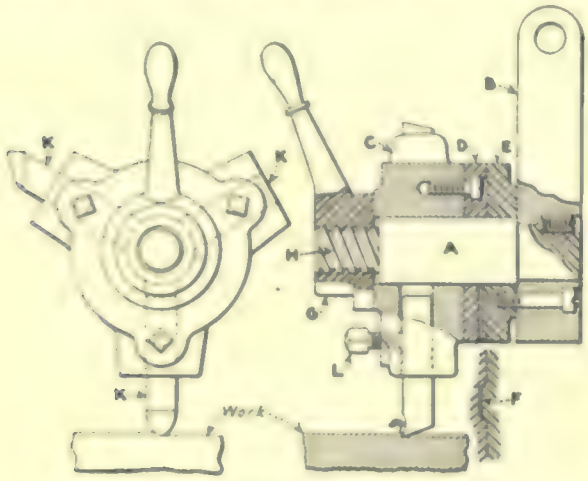
The portion of the work *A* to be drilled at *B* is shown in position. The plunger *C* fits into the body of the jig *D* and has bearing surfaces at both the upper and lower portions of the jig which add to the rigidity and wearing qualities, due to the length of the bearing in relation to its diameter. A spring *E* is provided to keep the plunger in an upward position and a setscrew *F* keeps it from turning and also limits its perpendicular

movement by fitting into the slot *G*. The locking of the plunger is done in the regular manner by means of a screw *H* which has a knurled knob on the outer end (not shown in the illustration). This screw forces a soft metal pin *K* against the angular surface *F* which prevents the plunger from moving downward under pressure when drilling. There is no danger of any chips interfering with the mechanism through the hole of the plunger, although chips would be apt to lodge around the outside and get into the bearing, therefore an inverted sheet metal cup *N* is provided over the upper end of the plunger to cover the opening.

Turret Toolblock for a Shaper

By Gene Phelps

In machining small quantities of work it is often necessary to use more than one tool, and the changing and setting of these tools require care in order to avoid spoiling the work. The toolblock shown in the illustration will be found advantageous for work of this kind, as it accommodates three tools which can be set up to size and then turned around in the various positions for the cuts required. The attachment can be easily fastened to a shaper head and affords a saving in



TURRET TOOLBLOCK FOR A SHAPER

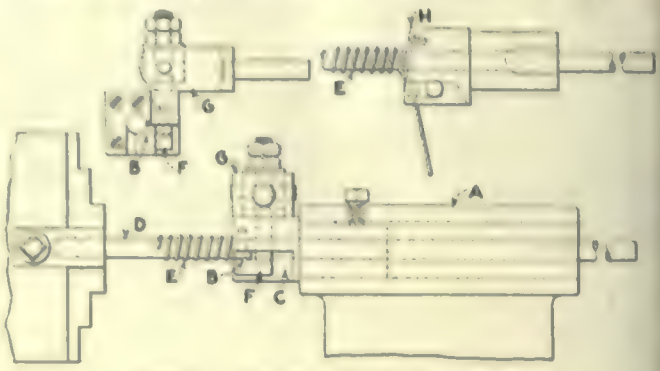
machining time which will soon pay for its cost. In place of the toolpost which is supplied on shapers, the post *A* is used and is held on the clapper *B* which in turn is mounted in the clapper box. The body of the toolblock *C* fits over the post and has a lockplate *D* fastened to it which engages with the stationary lockplate *E* attached to the clapper *B*. These plates interlock as shown at *F*, having three tongues and slots. A locknut *G* is used for binding the block in the required position and operates by turning it on the quick-lead thread *H* which is machined at the end of the post. The required tools are placed in position as shown at *K*, and are held securely by setscrews as at *L*. In operation, the work is suitably located on the shaper and the first cut is taken. Then the locknut *G* is released allowing the toolblock to be revolved into the next position, at which time the locknut is tightened up, thus locating the toolblock rigidly. Care should be taken in setting the central post that the lever of the locknut will be in a vertical position when the block is locked so that it will not interfere with the work. While the tool shown is provided to accommodate three tools it is possible to make a tool-block that will carry four tools if necessary.

Self-Feeding Spring Winding Attachment For a Speed Lathe

By Arthur Amende

The attachment shown in the illustration was made to produce a large quantity of coil springs of 0.032-in. wire, ⅞ in. inside diameter and 2 in. long.

The springs were wound the full length of the lathe



SPRING WINDING ATTACHMENT

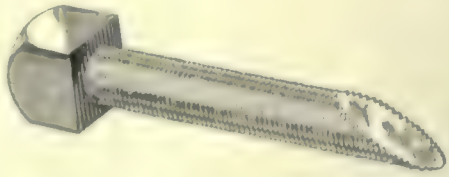
and then cut to size on a bench fixture. In applying the attachment, the tailstock *A* had the spindle and screw removed and was arranged to slide freely on the lathe bed. When in use a coil of wire, not shown, is carried on an arm attached to the tailstock. The wire is first threaded through the hole *B* in bushing *C*, given a half turn around arbor *D* and bent over into hole *E*. After bringing up the adjustable tension clamp *F* by means of cam *G*, the lathe is started. As this wire is being wound on the arbor it exerts pressure on the face of plate *H*, thereby carrying the tailstock along with it. When finished the spring is stripped from the arbor by releasing the chuck and pulling the arbor through the tailstock.

Any pitch of spring can be made with this device by changing the thickness and inclination of the gage plate *H*.

Removing Fire Clay from Tapped Holes

By Walter C. Schmidt

Many toolmakers, when hardening dies or similar tools, plug all the holes therein with fire clay to forestall the tendency to crack or break out through the hole.



TOOL TO CLEAN THE CLAY OUT OF THREADED HOLES

To clean the clay out of the threads after the die has been hardened is no easy matter, and I have seen many taps ruined by being used for this purpose.

A safer tool, and one that will accomplish the desired result as well and as quickly, can be made by filing or milling the end of a capscrew to an angle as shown in the sketch. It takes but a few minutes to prepare a screw for this purpose and, as the scraping edge can be renewed by a stroke or two of a file, one screw will serve for a long time.

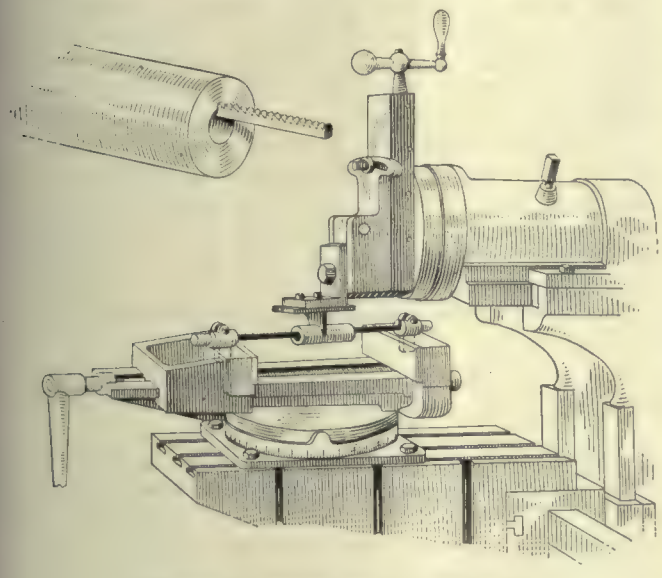
A Difficult Job of Splining

By R. Grant

A difficult job that fell to our lot some time ago was the cutting of small slots, resembling keyways, in the hubs of some aluminum brackets, as illustrated in the sketch. The hubs were 3⅛ in. long and the diameter of the bore was ¼ in. The slots, which will be referred to as keyways, though they were not such in fact, were to be 3/64 in. wide by 1/16 in. deep. After studying these relative dimensions the reader will, I think, agree that it was "some" job.

Following a discussion as to ways and means, the decision was reached that broaching was the only practical way to do the work, and we set about preparing a set of broaches by sawing a slot in the side of some pieces of ¼-in. drill rod, sweating in blades of tool steel, and grinding teeth in the blades after they had been sweated in place. We started with four teeth to each broach, spaced about 1 in. apart.

The scheme did not work out well. Notwithstanding the few teeth in contact and the comparatively wide spaces for chip clearance the chips would pile up in



CUTTING A VERY SMALL KEYWAY

a lump under each tooth, and we soon found that at least double the number of broaches we had provided would be necessary. Even with these the job promised to be a long and tedious one with no certainty of satisfactory results.

About this time our foreman toolmaker, whose life was being shortened by worry over the job, came across with an idea that was at once simple and practical, and when worked out was found to give us a production of five or six pieces per hour.

A hacksaw blade was reduced by grinding to a thickness of 3/64 in. and to a width of a trifle less than ¼ in. Steel blocks were then welded to each side of the blade at each end, to act as anchors; these blocks at one end were filed to form a round of less than ¼ in. to pass through the bore.

A hole in each jaw of a 20-in. shaper vise provided for slotted posts, in which the blade could be set and tightened by opening the vise slightly. An angle plate attached to the face of the shaper ram in place of the clapper block held the work.

The operation, then, was to thread the blade through the hole in the hub, fasten the work to the angle plate, set the saw in the slotted posts and stretch it by giving the vise screw a backward turn. The shaper was then started and the work fed down to the saw a few thousandths at each stroke by means of the vertical feed screw.

The resulting slots, though in this case only to provide clearance for a wire that was to pass lengthwise of the shaft held in the hubs, were plenty good enough for any purpose requiring a spline or keyway. The tool cost was but a fraction of the cost of suitable broaches and the rate of production was at least equal to what could have been obtained by broaching.

Wooden Plugs in Loose Pulley Bushings

By Ellsworth Sheldon

On page 1049, Vol. 55, of the American Machinist, there appeared an article under the heading "That Loose Pulley Nuisance Again." It described how a certain New England shop had adopted the expedient of chambering out the hubs of loose pulleys and lining them with bushings that had been prepared by drilling radially through them a large number of small holes and then plugging the holes with red oak wood.

This article evoked a letter from the Carlyle Johnson Machine Co., Manchester, Conn., which adds corroboration to the oft repeated statement that there is "nothing new under the sun." It seems that the above company applied this feature to the hubs of some special clutches as far back as 1902, it being, so far as they know, original with them. Such bushings are still listed in their catalog as part of their special equipment.

I am indebted to Mr. Simon of the Carlyle Johnson company for the information that the early experiments of his firm covered a number of different kinds of wood. Starting with white pine it was soon discovered that the pores of this soft wood were too easily closed by the pressure caused by driving the plugs into the holes and soon became clogged. Other woods, both hard and soft, were tried until mahogany was settled upon as the best medium. Rattan is considered a good material to use with heavy oils, though the open grain is very apt to deliver the lubricant too freely when medium or light oils are used.

When running at high speeds the oil is held by centrifugal force against the outer walls of the chamber and the wooden plugs soon cease to deliver lubricant to the bearing surfaces. To forestall trouble from this cause the company packs with grease the hubs of such high speed clutches as have this form of bearing.

Broaching with a Bearing Ball

By Amos Ferber

Charles E. Frank, on page 225 of American Machinist, advocates the use of a steel ball for sizing holes in small parts, particularly drawing dies, and claims that he secures superior finish and greater accuracy of duplication thereby.

Does Mr. Frank size the holes in drawing dies in this manner *after* the dies are hardened, or does he lap them to size after hardening in the same way that the rest of us do? If the latter is the case what advantage does the ball method possess over the reamer, either in size or in finish?

Built-up Cylinders for Knitting Machines

By Leonard H. Anderson

The "cylinder" of a knitting machine that uses latch needles is an annular ring of steel varying in diameter with the size of the machine, and to some extent in



FIG. 1. MILLING INSERT BLADES FOR A KNITTING MACHINE CYLINDER

length with the nature of its product, but all have the common characteristic of being cut around the periphery with small, closely-spaced, rectangular-shaped slots or grooves in which the needles slide.

In addition to the difficulty of spacing these slots accurately and making them of exact size to allow the needle to move freely without side shake, the rings must be hardened in order to resist the wear caused by the rapid movement of the needles. If even *one* of the divisions between the slots is cracked in hardening, or becomes broken in service, the whole ring is out of business.

To avoid the loss that results from such breakage the Scott & Williams Co., manufacturer of knitting machinery, has designed a cylinder in which the slots, instead of being cut into the metal wall of the ring, are formed



FIG. 2. GAGING THE BLADES FOR THICKNESS AND CONTOUR

by the insertion of steel blades, or dividers, any one of which may be removed from the cylinder if broken and a new one substituted.

The new ring is cut as before, but the surface of the ring, instead of being the outside diameter of the completed cylinder, now forms the bottoms of the needle slots, the blades being inserted in the cuts made in the walls of the ring and held by soldering.

Setting parallel blades into radial slots in the ring would not, of course, produce a rectangular groove; it would be wider at the top than at the bottom. To overcome this, the rings are offset in the cutting machines so that one side only of the slot is radial, and one side of each blade is beveled inward in the making so that when set in adjacent slots the beveled side of one blade becomes parallel to the straight side of its neighbor.

The blades are beveled, two at a time, in the fixture shown in Fig. 1. This is a block of steel with its upper surface beveled inward from both sides to correspond to the angle required on the blades, and provided with gage pins and clamps so that two pieces may be held at once. Thus no bevel is required upon the cutter. A single standard side-milling cutter passes over the work and produces the necessary shape upon both pieces at one pass.

The diameter of the cutter is of no importance except that it must be large enough to allow the milling machine arbor to pass over the clamping bolts of the fixture. Its width must be correct and the corners kept sharp. Thickness of the blade is determined by the vertical setting of the knee of the machine and maintained by constant gaging.

One of the gages used for this purpose is shown in Fig. 2. It embodies the principle of the micrometer but carries a pair of jaws similar to those of a vernier caliper. One of the jaws is beveled to match the bevel of the work so that the tool not only measures thickness but also acts as a check on the contour. Every blade is inspected before it is sent to the assembling operation.

Keeping a Belt Tight

By Hiram Hicks

The problem of keeping a belt tight on a pulley in order to gain driving power, as told by Harold F. Blanchard on page 227 of American Machinist, was "solved" in the same "new and original way" by a millwright in a backwoods Connecticut town fifty years ago.

The belt ran from a wooden drum on the waterwheel shaft in the cellar, to the main shaft of the mill on the floor above; the device was applied to the smaller pulley which was, of course, on the upper shaft. If the "English inventor" could have seen the way it didn't work every time the joint in the belt came around, he never would have had the temerity to invent it again.

Loose belts have a disgusting habit of slipping whenever they want to, and if they can't slip on one pulley they will on the other. The best "solution" for them is a solution of glue or belt-cement, applied with understanding by the belt doctor. If that takes too much time, use a beltlace.

To Blueprint from Typewritten Sheets

By Frank Harazim

To make blueprints of typewritten matter for shop use, place the carbon paper with the coated side against the back of the sheet to be typed. When typing, the impression of the letters will be made on the back of the sheet as well as on the front, making it a good negative for printing.

EDITORIALS

Juggling With the Bonus Problem

THOSE who can hark back to ante-bellum days, when for years the fear of the G. A. R. votes was the nightmare of the politician, tell us that history is repeating itself "in principle," if not in actual occurrence. But we have learned much in the past fifty years. Where can history produce such an amazing juggling act as the last alleged solution of the bonus problem?

The politicians fear the votes of the American Legion, so they propose a bill to pay unknown billions in bonus, in the shape of extra compensation for all who served, whether they ever went into action or not. They also fear the votes of the business men and other taxpayers and so try to frame a bill which will, they think, apparently pay a bonus and yet not cost the taxpayers real money because they postpone final payment for a period of years.

In their frantic endeavor to please both sides they have framed a bill which no sane man can contemplate without wondering whether its framers have developed softening of the brain, or whether they think the taxpayers are all suffering from paresis. Of course, it may be a deep-laid plan to pass some such bill for Mr. Harding to veto, so that the gay and festive "buck" can be passed back to the White House. In either case the man who can retain respect for the lawmakers he has elected, is a peculiar animal.

If we must have a bonus, however, let us be open and frank about it. If the veteran needs and deserves cash let us not give him a certificate which must be pawned in order to raise half of its value. Let us impose a tax and call it by its right name—A Bonus Tax—and from the funds so raised pay a real bonus, not a half-price paper certificate.

The best bonus is a returning prosperity which will give good jobs to the jobless. Any bonus scheme yet proposed will retard the return of business and work to the hardship of all who need employment.

Courtesy Demands An Answer

EVERYONE appreciates a reply to a letter—even if the answer isn't as satisfactory as they might wish. But when a man out of work replies to an advertisement for help and encloses a stamp for reply, the disappointment is rendered more keen by the fact that hope of employment is maintained in vain over a long period.

Answering letters of this kind, after the position is filled, is not a pleasant task. It is one which is put off from day to day until it is often finally abandoned and the whole correspondence consigned to the waste basket. But that is not the right procedure from any point of view. There is a moral obligation which should be heeded. The letters should be answered—and as promptly as possible.

A letter recently received cites numerous instances where applications for employment are not answered even though stamps are enclosed. The writer of this letter has a real grievance and one which can be eliminated by a little more thoughtfulness on the part of those advertising for help.

The insertion of an advertisement of this kind involves numerous replies. Part of the price of securing the right man is the reading of applications from those who do not fill the bill. But the letter from the man who is rejected is entitled to an answer, whether he encloses a stamp or not. It is just as important to know what you do not want, as what you do. And his letter has aided in picking the right man.

To see this most clearly put yourself in the place of the applicant for the job, particularly if you had enclosed a stamp for reply. If you do this, every applicant's letter will be answered. If we put ourselves in the other fellow's place we are pretty apt to do the right thing.

Beware of the Feeling of Complacency

TUCKED away in one of the paragraphs of the leading article is a thought that is likely to be overlooked. It has to do with the feeling which is variously designated as self-satisfaction, cock-sureness or complacency. And a very dangerous feeling this is.

We can all take warning from the experience of the plant manager who was convinced that his shop was developed to a point where further improvement was impossible. Our own particular complacency may not be the result of achievements in shop management; it may be due to social position, financial status, political importance, skill or artistic ability, but it is dangerous nevertheless.

Let us take heed, therefore, before it is too late, and be constantly on the lookout for new tools, new methods, new ideas. Not only that, but let us also make immediate use of what is good in the new things, scrapping if necessary the old idea, method or tool. It will be economy to part with the most cherished of our possessions if by so doing we increase our efficiency and aid the advancement of our civilization.

Insure Aviation Development

IT IS generally admitted that the program of aircraft was largely responsible for the decision to scrap the expensive battleship as a means of national defence thereby saving us large sums in taxation. The remarkable results of the air bombing tests last year gave some idea of its possibilities.

With this in view it is difficult to understand the action of Congress in still further reducing the appropriation for aircraft in both Army and Navy. A reduction from a total of $50,000,000 in 1920-21 to the proposed $32,000,000 for 1922-23 seems hardly credible when we consider that a single battleship represented over $40,000,000.

Aside from the effect on the development of commercial aviation we should not forget that it was the airplane which saved us millions of dollars in taxes. The price of one battleship is surely not too much for planes for both Army and Navy.

Shop Equipment News

Whitcomb-Blaisdell High-Speed Planer

The accompanying illustration shows a 26 x 32 x 18-in. planer intended for high-speed operation, and recently placed on the market by the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. The table operates at a speed of 150 ft. per minute on both the cutting and return strokes. It is stated that smooth running at the high speed is attained largely because of the second-belt type of drive employed on the machine.

The shaft carrying the tight and loose pulleys that can be seen in the illustration, passes entirely through the bed. At its other end it carries a pulley driving a larger pulley by means of a belt kept tight by an idler. The power is then transmitted through a helical pinion and gear, also on the outside of the bed, to the pinion engaging the rack under the table.

The bed of the machine is cast in one piece. The table contains T-slots, but no holes, and the steel rack extends for the full length of the table. Thirty-inch driving pulleys and shipper motion are provided. Two heads are mounted on the crossrail, both running on the lower screw. The minimum distance between the tools is 12 in. The material planed consists of composition



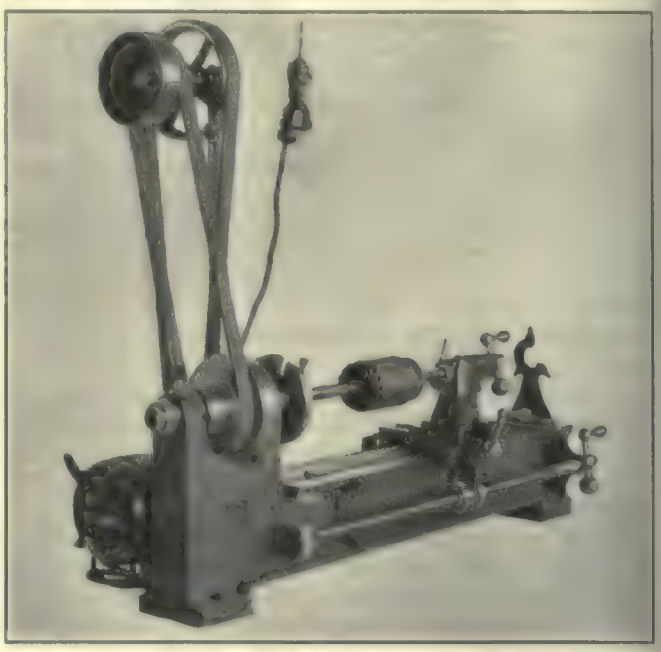
WHITCOMB-BLAISDELL HIGH-SPEED PLANER

brass screen plates about 13 x 30 in. in size. The plates are held in quick-acting fixtures placed two abreast on the table.

Carroll Motor-Driven Bench Lathe

The lathe shown in the accompanying illustration has been recently placed on the market by the A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio.

The countershaft is mounted on a 1¼-in. steel bar fitting in an extension support cast on the bed. The swing over the bed is 10 in. and the distance between centers is 24 in. The spindle has a ⅝-in. hole through it. The carriage is gibbed to the bed and is traversed by



CARROLL MOTOR-DRIVEN BENCH LATHE

means of a long screw at the front of the machine. The feeds are all operated by hand. The motor is attached to the back of the bed and can be operated from an ordinary lamp socket. Voltage and current should be specified when ordering.

The equipment includes motor, cord and plug, faceplate centers, center rest and wrenches, so that the lathe is ready to run without any expenditure for installation.

D.&C. Strip-Metal Filing Machine

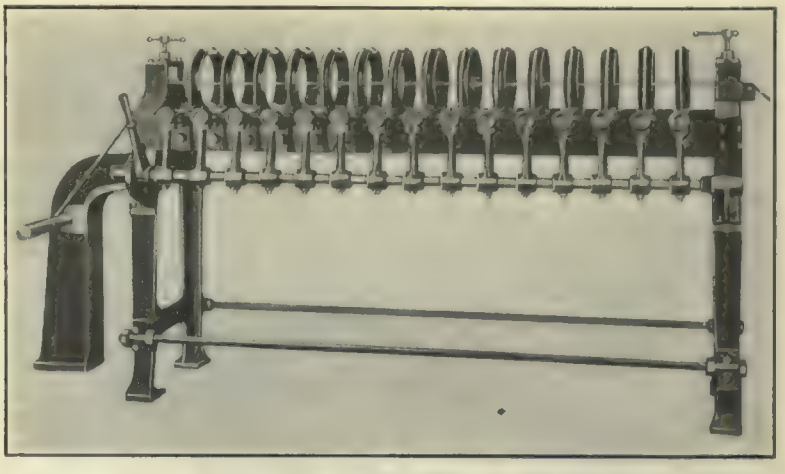
The machine shown in the accompanying illustration is intended for filing the edges of strip metal. It has recently been placed on the market by the Duston & Clark Engineering Co. Inc., 5225 Superior Ave., Cleveland, Ohio, successors to the D. & C. Engineering Co. The machine is of special use in cold rolling mills, where metal is rolled wider than necessary and then cut into narrow strips and wound in coils. Before this metal is made into springs, hacksaw blades, or such parts, it is desirable to remove the sharp edges. Different classes of work require that the edges be either round, oval or of some special shape.

The coil of metal to be filed is placed on a spool on the spindle shown at the left of the machine. The end of the metal is passed between the two clamps at each end of the table, and then gripped and wound on a power-driven spool that draws the metal through the machine. The power must be applied by a unit separate from the filing machine.

The machine is equipped with fifteen pairs of semicircular heads carrying the files. Each head is mounted

on two rods placed one above the other transversely of the machine. The rear head of each pair is secured to the rods by setscrews, while the front head is a sliding fit and is held in place by the tension of a spring. Each of the heads carries a file holder in which is mounted a file 1¼ in. wide by 2¼ in. long by ¼ in. thick. The positions of the files are adjustable by swinging them around the semi-circular heads and locking them in position. Since an adjustment of 180 deg. is obtainable, it is possible to so group the files as to give the desired shape on the edges of the work. It should be noted that the files operate in pairs, so that the pressure of a file on the work is counterbalanced by a pressure on the opposite side.

All the heads at the front of the machine can be operated by a lever, so as to pull them forward and open the filing space. To insert a new coil, the operator pulls on the lever, so as to provide clearance and to allow of putting the strip in place by dropping it down between the two heads. The metal passes in a straight line from one end of the machine to the other. The strip metal may be of any gage and up to 3 in. in width. The machine itself is simple in construction, although heavily built, and it can be quickly adjusted and operated. It weighs 1,000 pounds.



D. & C. STRIP-METAL FILING MACHINE

"Perfection" No. O Armature Press

The accompanying illustration shows the "Perfection" No. O armature press which has been placed on the market recently by the Naperville Machine Co., Inc., Naperville, Ill. The press is intended for the use of electrical repair men, although its construction and capacity enable it to be employed also for assembling operations on piston bushings, spindle bushings, gears and similar work.

The frame is cast steel, designed to withstand a pressure of 3,000 lb. It is 17 in. in height overall, and the opening in the base is 5 in. in diameter. A hardened steel plate having three different sizes of openings is furnished to accommodate small work. This plate is made of two pieces, held together by two bolts, as shown. The two halves can be slipped together underneath the bearings on an armature shaft so that the shaft can be pressed out of the bearing. The working height between the plate and the bottom end of the arbor in the raised position is 9¾ inches.



"PERFECTION" NO. O ARMATURE PRESS

"Hallowell" Steel Lift-Truck Platform

The Standard Pressed Steel Co., Jenkintown, Pa., has recently placed on the market the "Hallowell" lift-truck platform shown in the accompanying illustration. The device is made of steel and wood, and is designed for great strength and durability. The runners at each side consist of steel angles, the ends of which are bent outward. It is thus very easy to slide the truck between the runners, the flare tending to move the truck sidewise to the proper position. There are no bolts or projections that can interfere with the running of the truck under the platform.



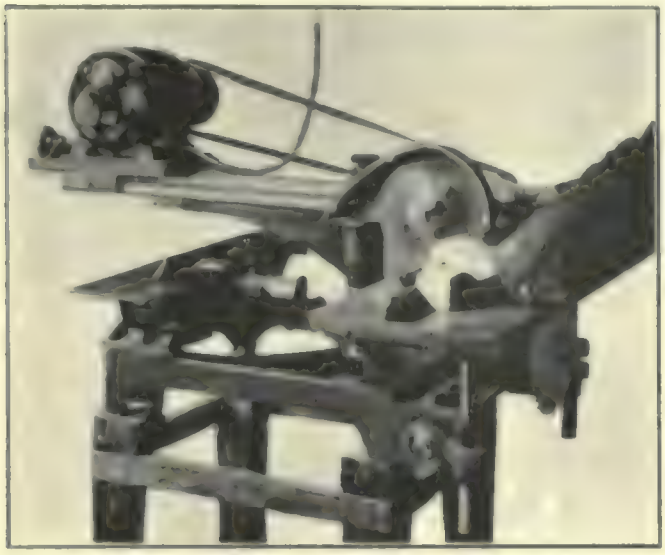
"HALLOWELL" LIFT-TRUCK PLATFORM

The top of the platform is made of wooden planks, which are bolted to the runners with the positions of the bolts staggered. This construction increases the rigidity. All nuts are provided with lock washers. The wooden top is stated to be preferable to a steel one, as the load is not apt to slide off it; it does not dent and deform as steel plate does, and it is easily renewable after it has been marred or weakened by rough usage or wear.

Steel sockets are riveted to the runners for holding the legs. Wooden blocks are inserted in these sockets and bolted in place. The action of these blocks is not detrimental to the floor, as would be sharp edges of metal rested directly on the floor. The chief reason for employing wooden legs is, however, the fact that their use enables speedy changing of the height of the platform. Blocks of different lengths can be furnished, so that the platform can be adapted for use with the type of truck that is employed. The construction provides a serviceable and sturdy platform of simple construction and light weight.

Hutchinson Woodworking Machine

The machine shown in the accompanying illustration is intended for general woodworking use, and has recently been placed on the market by the Hutchinson



HUTCHINSON WOODWORKING MACHINE

Manufacturing Co., Norristown, Pa. The machine is intended for mounting on a bench or stand, and can be easily moved about the shop. It is adapted to a great variety of woodworking operations. It carries an 8-in. cross-cut saw, an 8-in. rip saw, jointer, boring and mortising attachments, a miter board and other devices.

The machine is operated by a ½-hp. electric motor that can be driven from the lighting circuit on either direct or alternating current. The motor is mounted on a slide that can be swiveled so as to bring the pulley into the proper position for driving whatever part of the mechanism it is desired to operate. When connected to the cross-cut saw, it swings and slides simultaneously with it.

The machine can operate on hard wood up to 2 in. in thickness. In a pattern shop, it is especially useful for grooving out core boxes, for cutting accurate joints for segment work, for small planing and ripping, and for making miters accurately at any angle. Its particular advantage lies in the fact that it enables the performing of small jobs with much greater speed than is obtainable by hand, and without the necessity of employing a large machine.

When the cross-cut saw is used, the motion is straight and not in an arc as with a swing saw. The miter box can be set at any angle, and the dadoing machine is in full view of the operator. The saws run at a speed of 4,200 r.p.m., and the jointer at 4,800 r.p.m. Both the rip-saw and the jointer operate at the same time, so that two men can work simultaneously. The table tilts for ripping bevels. The machine requires a bench space of only 18 x 24 in., and weighs 240 pounds.

Manley Portable Hoist

The portable hoist shown in the accompanying illustration is intended primarily for use in garages. It has recently been placed on the market by the Manley Manufacturing Co., York, Pa. The frame of the hoist is made up of steel angles, braced and riveted so as to provide a rigid unit. It is mounted on casters, so that it may be easily moved to any part of the shop. When not in use, the two legs at each end may be folded close together, thus permitting the hoist to be leaned against the wall so that it occupies very little floor space.

The principal feature of the hoist is in the arrangement of the lifting chains. Two chains are provided, each operating independently, so that either one or both may be used at one time. The chains are mounted on drums on the horizontal hexagon shaft at the top of the frame. These drums may easily be slid to any position desired, so that the chains always pull vertically. The shaft at the top of the frame is turned by means of a crank operating through a chain and spur gears.

Due to the fact that one end of each chain can be uncoupled, two speed ratios are provided. When the auxiliary pulley is attached to the load, the speed of lifting is half of that obtained when the load is suspended directly from the chain. The leverage when the auxiliary pulleys are used is 400 to 1, and without them 200 to 1. A pawl engages the teeth of one of the large gears, so that the load may be held in any position desired. The height is adjustable by ½-in. steps. When lowering the load, a friction brake acting on the chain-pinion shaft is employed.

The hoist is adapted to many uses, such as removing motors from chasses, removing bodies, or elevating one end of a car so that work may be done underneath the chassis. The frame is long, so that there is plenty of room for the mechanic to work around the machine. The hoist shown, having a capacity of 4,000 lb., has a width inside the legs of 8 ft. and a height of 7 ft. 9 in. It weighs 450 lb. If necessary, it can be furnished with a height of 9 ft. Two sling chains are furnished for attaching to the motor or chassis to be lifted.

A larger size of hoist having a capacity of 8,000 lb. is made for work on heavy commercial trucks. In this case, the two lifting chains are carried on trolleys which automatically position themselves over the center of the load. The chain is wound on a winch at one end of the frame. Two speeds of lifting are provided, one gear-driven and intended for rapid lifting, and the other worm-driven for handling heavy loads. Either method may be engaged without employing any wrenches. A



MANLEY PORTABLE HOIST FOR GARAGE USE

brake and locking device are also provided. This hoist has a width of 9 ft. inside the legs, a height of 9 ft., and a weight of 1,000 pounds.

Racine Junior High-Speed Metal-Cutting Machine

The Racine Tool and Machine Co., Racine, Wis., recently added to its line the "Junior" high-speed metal-cutting machine shown in the accompanying illustration. The most important points with regard to the machine are the high speed and the use of light-gage blades. The saw runs at a speed of from 60 to 100 strokes per minute, the strokes being 6 in. in length. Twenty-one-gage blades from 10 to 12 in. long are employed.

It is stated that the high speed is made possible by the positive mechanical lift on the non-cutting stroke. Thus, clearance for the teeth is given on the back stroke to prevent dulling them and dragging the blade. The cut is taken on the draw stroke. The pressure is applied to the saw blades by gravity. An automatic knock-out



RACINE JUNIOR METAL-CUTTING MACHINE

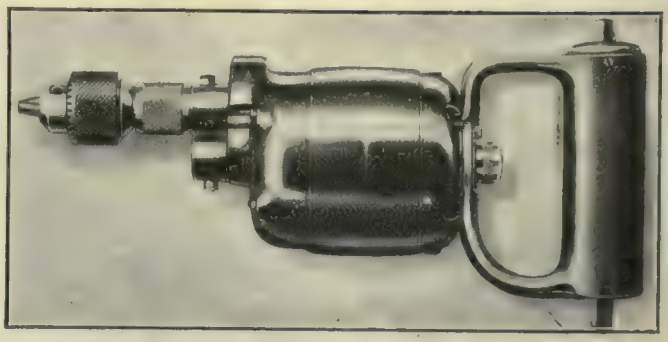
is provided to stop the saw when the cut is finished. The thinness of the blades and the rapid stroke are stated to give unusual economy in blades, time and material.

The saw frame guide holds itself automatically at any height to which it is raised, thus permitting the inserting of stock in the machine. The saw frame slides on V-ways. Means are provided for quickly adjusting the guides for wear. The normal capacity of the machine is 4 x 4 in., but an adjustment is provided by which it can be increased to 6 x 6 in. for occasional large jobs. The height to the top of the table from the floor is 20 in. The floor space is 38 x 12 in. The weight of the machine is 150 lb. net and 180 lb. crated.

Jones Portable Electric Drill

The Consolidated Instrument Co. of America, Inc., 41 East 42nd St., New York, N. Y., has recently placed on the market the portable electric drill shown in the accompanying illustration. The device, which was designed by Joseph W. Jones, is intended for general light work and has capacity for easily driving a ¼-in. twist drill. It is equipped with a universal high-speed motor operating on either direct or alternating current, the latter having from 25 to 60 cycles.

The housing of the motor is made of aluminum and finished in black. The diameter of the motor is 3 in.



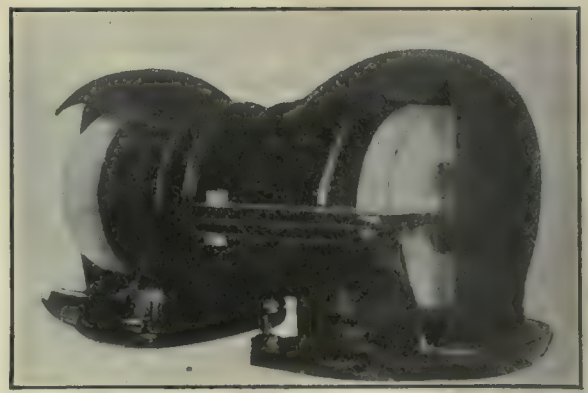
JONES PORTABLE ELECTRIC DRILL

The shafts are ground to size; the gears are made of heat-treated tool steel, and have helical teeth. The spindle carries a No. 1 Jacobs chuck. The end thrust of the drill spindle is taken on ball bearings. The device is furnished with 10 feet of electric cord, plug and switch. The drill is 10 in. in length overall. Its net weight is 4 lb., while the shipping weight is 7½ pounds.

Forbes & Myers Bench Grinder with Self-Contained Exhaust Fan

Forbes & Myers, Worcester, Mass., have recently developed a bench grinder, illustrated herewith, having as a component part provisions for removing the dust caused by the grinding. Outside the bearings are located centrifugal fans which blow the dust directly back through the exhaust pipe connected at the rear of the grinder. No separate motor and fan are required. This method of exhausting the dust is for use with single machines when it is possible to conduct the dust directly outside. However, it is not intended to replace large exhausting systems, as it does not have sufficient power to carry the dust through long pipes with many turns.

The motor is of the induction type and fully inclosed. It is made for single, two or three phase alternating current, and in ½ and ¾ hp. sizes. Inclosed Hess-Bright ball bearings are employed. The fans and the two



FORBES & MYERS GRINDER WITH EXHAUST FAN

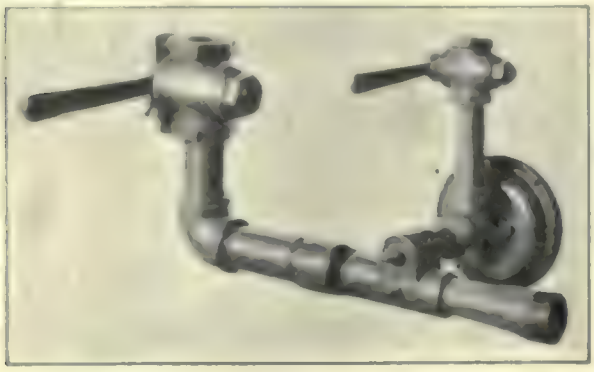
grinding wheels are located outside the bearings. The wheels are well guarded. Adjustable toolrests can be located either at one or at both ends.

Surface-Combustion Low-Pressure Air-Gas Inspirator

The Surface Combustion Co., 366 Gerard Ave., Bronx, New York, N. Y., has recently placed on the market the low-pressure air and gas inspirator shown in the accom-

panying illustration. The device is a redesign of the style of inspirator formerly used on the furnaces made by the company. It is adaptable to any make of industrial gas furnace.

The maker states that the inspirator is essentially a gas-furnace carburetor. The entire operation of the



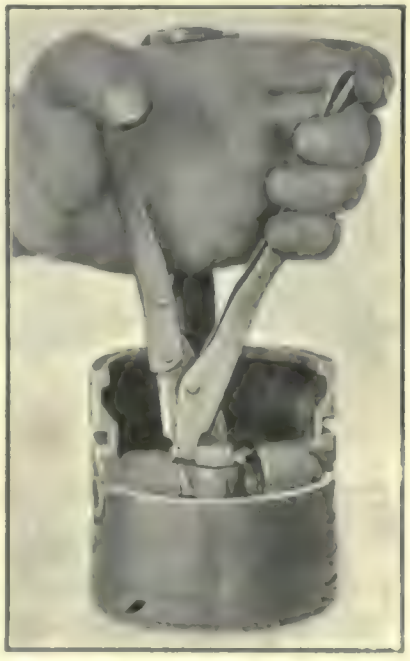
SURFACE-COMBUSTION LOW-PRESSURE INSPIRATOR

furnace equipped with the inspirator is controlled by means of one valve. The gas cock is used only when starting or stopping, and is either entirely closed or entirely open. An increase or decrease of the air supply automatically changes the amount of gas used, so that the proportions of the mixture remain the same.

It is said that no explosive mixture is possible in any part of the distribution mains of the system, as the gas and air are mixed only at the point of supply to the burners. A supply of the mixture is automatically maintained at the furnace under all conditions of operation. The fluids are thoroughly mixed just prior to entering the furnace, so as to provide a homogeneous gas and to give instantaneous combustion.

Tuban Cotter-Pin Puller

The accompanying illustration shows a device recently placed on the market by the Tuban Manufacturing Co., 9137 One Hundred and Eleventh Street, Richmond Hill, New York. The tool is intended for pulling cotter pins, and is shown in use removing a pin from a bolt in a connecting rod. The size shown is for pulling pins up to ½ in. in diameter, although a larger one is made for removing pins up to ¾ in. in diameter. The chief merits of the tool are the speed that is possible in removing pins, and the ability to reach pins in places difficult of access. It is not necessary to straighten the ends or legs of a pin before using the puller. The lifting point is merely hooked in the hole at the head of the pin, and the two handles of the puller squeezed together. The leverage permits of easily pulling the pin out of the hole. It is stated that the average pull required to remove a ½-in. cotter pin, the legs of which have been spread, is between 150 and 200 lb. This pull is sufficient to itself straighten the legs. In order that the tool may have sufficient strength for removing the pins, each one is tested to withstand a pull on the point of 400 pounds. The motion of the movable or lifting point is about 1 inch.

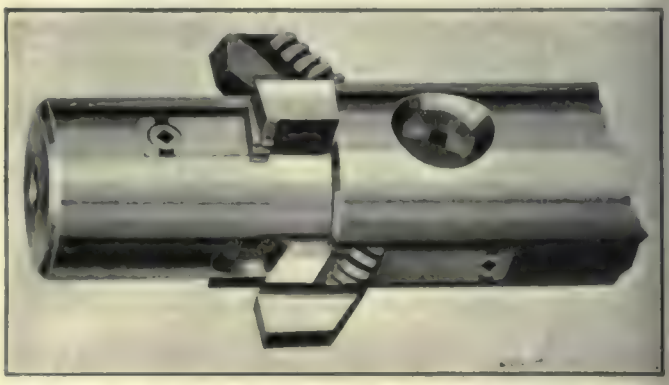


TUBAN COTTER-PIN PULLER

The lifting point is made of tool steel, hardened and drawn. The two handles or lever bars are made of ⅜-in. sheet steel formed to shape and then casehardened. The parts are riveted together. The end of one bar is drawn flat and shaped to a screwdriver point. It is thus of use in spreading the ends or legs of cotter pins after they have been put back in place in the bolts.

Hannifin Adjustable Boring Bar

The accompanying illustration shows one style of the adjustable boring bar that has recently been placed on the market by the Hannifin Manufacturing Co., 621 S. Kolmar Ave., Chicago, Ill. The bar is adaptable to rough-boring, finish-boring, reaming or any other operation where boring bars are used. It has a small number of operating parts.



HANNIFIN COMBINATION ADJUSTABLE BORING BAR

The cutters can be set out or withdrawn by turning the scroll, which is graduated so as to aid in setting them. After the cutters are set, the locking screw at each side is tightened, thus forcing a wedge-shaped locking block forward and holding the cutters firmly in position. There is no strain on the adjusting mechanism during cutting.

Either straight or angle-type cutters can be used, or a combination of both can be made in the same bar. The angle-type cutters are particularly adapted to facing and counterboring operations, because they adjust forward when increasing the diameter. Continual setting out and grinding will leave the forward cutting edge in its original position. Angle-type cutters also allow boring to the bottom of a "blind" hole.

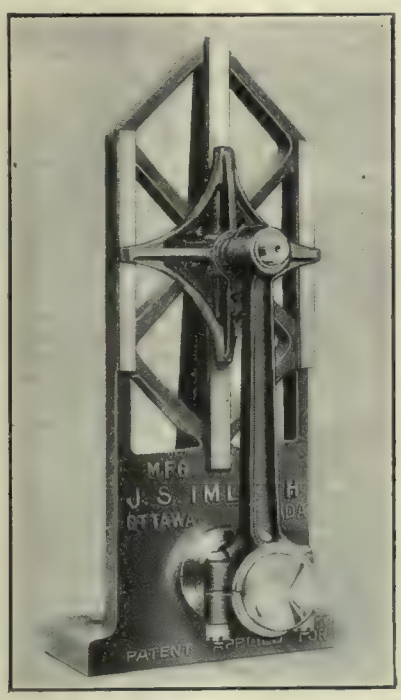
The combination of straight and angle-type cutters enables the boring of different diameters, counterboring or facing simultaneously. If desired, the cutters can be adjusted to cut on a common line, making the bar a four-point cutting tool. A number of combinations of cutters can be incorporated in the same bar. A long tool is obtained by making the cutters overlap at the inner ends. Although the cutters are heavy, the amount

of stock cut from the boring bar is comparatively small. Its strength is thus not reduced.

For rough- and finish-boring cylinders, line-boring and reaming crankcases, and similar work, bars can be furnished with removable block-type cutters. The cutters can be set to size before inserting them in the bar. The rough-boring blocks, finish-boring blocks and reaming blocks can be quickly inserted and removed in succession, using the same bar for all operations. The adjusting and locking mechanisms are included in the block, the only extra mechanism being a lock by which the block is held in the bar. The block can be locked solidly, or it can be secured so as to allow a movement of 0.008 in. for float reaming. A grinding fixture can be furnished for the block-type cutter bars, by which the cutters can be ground so that they will align perfectly when locked in the bar.

Imlach "Twistest" Connecting-Rod Gage

The illustration shows a device recently developed by J. S. Imlach, 324 Catherine St., Ottawa, Canada, for testing automotive connecting rods. The device is known as the "Twistest" gage, and enables the proper aligning of the two bearings on the ends of the rods. The frame of the device is bolted to the bench, as it is not necessary to move it. The ribbed structure above the base has three narrow vertical surfaces accurately ground in a plane at right-angles to the axis of the bore for the mandrel in the base. This bore is provided with a hardened and ground bushing. Separate hardened and ground mandrels are used for each size of crank bearing on the connecting rod. At one end, the mandrels are all of the same diameter, so as to fit the hole in the base of the frame. The indicating device is attached to the wristpin end of the connecting rod. It consists of a hardened and ground arbor fixed in a casting having four arms, the ends of the arms having ground surfaces lying in a plane at right-angles to the axis of the arbor.



IMLACH "TWISTEST" CONNECTING-ROD GAGE

The rod to be tested is clamped to the mandrel and to the indicator. When the mandrel is placed in the frame, the way in which the indicator makes contact with the frame is noted. Since light is admitted through the open frame, it is easily possible to ascertain how many of the points are making contact. The device indicates at one setting the accuracy of alignment of the rod in both directions. Since the length of the arms of the indicator is greater than the length of the wristpin, any error occurring in the alignment is magnified. It is stated to be possible to detect errors in the rod of 0.00025 in. The use of feelers is unnecessary.

The device is of use when scraping bearings, and serves as a jig. In this case, the rod is fastened to the indicator, but is not clamped to the mandrel. It is tested from time to time on the mandrel as the scraping progresses. The final fitting is, of course, done on the crankshaft itself. The device is also of use in testing the alignment of the piston when the piston and the rod are assembled. The standard device is adaptable to rods from 6 to 12½ in. long between centers. Interchangeable mandrels up to 2⅜ in. in diameter and indicator arbors up to 1¼ in. in diameter can be supplied.

Diamond Universal Hob for Cutting Sprocket Teeth

The universal hob for cutting sprocket teeth, that was described on page 350 of AMERICAN MACHINIST, is not manufactured nor sold by the Diamond Chain and Manufacturing Co. of Indianapolis, Ind., although it was developed by that concern. The hob can be supplied by the Brown & Sharpe Manufacturing Co., Providence, R. I., the Illinois Tool Works, Chicago, Ill., and the Union Twist Drill Co., Athol, Mass.

Machinery and Power Our Slaves

A scientist in the Smithsonian Institute at Washington has figured that the use of power and machinery gives to every man, woman, and child in this country the equivalent of 30 slaves. In other words, he says, take away all our machinery and steam and electric power and it would require three billion hard-working slaves to duplicate the work done by Americans of today with the use of these modern inventions.

Why envy the nobleman, back in ancient Egypt or Bagdad, with thirty slaves toiling for him?

He had swift-running slaves bring him fish from the ocean and bird tongues from the mountains. Today, with a few dimes, you can get a tin can of shrimp brought from Japan, a bag of nuts from Brazil, a can of sardines from Norway.

Your slaves—machinery and power—bring them.

Your real wealth is measured, not in money, but in the number of things you obtain to eat and wear, the ease with which you get them, the comforts and conveniences of your home, methods of transportation and amusement.—*Plainville (Col.) Republican.*

Air Service in Mexico

Commercial aviation is rapidly expanding, and thus giving proof of the increasing importance of this branch of the automotive industries. The Secretary of Communications of Mexico, according to *El Campo* of September, 1921, has made arrangements with a foreign company with a view to establishing an aerial transportation service for passengers and cargo between Mexico City and Tampico. The operating company made the first trip with passengers, mail, and cargo on Sept. 1, taking 2½ hours from Mexico City to Vera Cruz and 1 hour from Vera Cruz to Tampico. When the shipment of the fifteen machines arrives, the services will be extended to include San Luis Potosi, Monterey, Laredo, and Matamoros. A special service will be established between Tampico and Laredo.—*Commerce Reports.*



NEWS SECTION

Railroads Show Poor Financial Returns in 1921

The financial results of operation in 1921 by the 201 Class I railroads in the United States are shown in a report just presented to the Interstate Commerce Commission by the Association of Railway Executives.

These railroads had a net operating income of $615,625,619, which was at the annual rate of return of 3.31 per cent on their tenative valuation. This income hardly more than covered the interest charges and rentals alone, these items amounting to $603,000,000 in 1920 and more than that in 1921. Fifty-four railroads, consisting of 26,022 miles of track, had operating deficits in 1921, the deficits for those roads totalling $29,114,000. Operating revenues totaled $5,569,888,000, a decrease of 10.6 per cent compared with the total in 1920. Operating expenses for the past year amounted to $4,602,425,000, which was a decrease of 21.1 per cent compared with the year before.

Australian Railways Not to Standardize Track Gage

Unification of railway gage in Australia has been dropped for the present by the conference of states premiers with the Federal Prime Minister, according to reports from Melbourne, Australia. The report of the Royal Commission on the matter of uniform railway gage compiled under direction of the Commonwealth Parliament, and published October 12, 1921, shows that in Australia there are now 12,686 miles of railways of 3 ft. 6-in. gage, besides many miles built to other gages. The commission has recommended the conversion of all railways to the 4 ft. 8½-in. gage as a standard, and the first installment would involve, it is estimated, an outlay of £21,600,000.

Belgian Iron and Steel

Belgium's iron and steel production figures for January, 1922, have just been received by the Department of Commerce cable from commercial attaché William C. Huntington, of Brussels. The totals for the month are stated to have been: Pig iron, 94,210 metric tons; raw steel, 76,450 tons; rough steel castings, 3,240 tons; finished steel 83,300 tons; finished iron 15,082; Spelter was produced in the amount of 8,250 tons.

A. W. Whitney Elected Chairman of Standards Committee

At the annual meeting of the American Engineering Standards Committee, held in New York on Feb. 9, Albert W. Whitney, a representative of the National Safety Council was elected chairman. George C. Stone, a representative of the American Institute of Mining and Metallurgical Engineers, was re-elected vice-chairman. Mr. Whitney is associate general manager of the National Bureau of Casualty and Surety Underwriters.

The following were elected on the executive committee: Martin Schrieber, Sullivan W. Jones, C. E. Skinner, E. A. Frink, Eugene C. Peck, John A. Capp, A. H. Moore, N. A. Carle, Dana Pierce, A. Cressy Morrison, Coker F. Clarkson, T. H. MacDonald, G. K. Burgess, O. P. Hood, Francis J. Cleary, Beverly C. Dunn.

Rehabilitation Campaign

The Merchants Committee of the Bridgeport, Conn., Chamber of Commerce, is making a survey of all available manufacturing space in the city, with a view of bringing additional industries to Bridgeport. The campaign was started recently by the Chamber of Commerce to get a line on all the wartime factories, now idle, and bring other peace-time concerns to take them over. The business men of the city have pledged several thousand dollars to support the campaign.

Chance for American Machinery in Ireland

An excellent opportunity for American manufacturers of agricultural machinery to introduce their equipment in Ireland will be afforded by the annual agricultural spring show of the Royal Dublin Society, to be held at Ballsbridge, Dublin, on May 16 to 18. This show is attended by practically all those who are interested in agriculture in Ireland, and it is believed that substantial sales of American implements and machinery will follow, if these products are on display. Allocation of sites for exhibits will be made soon. Interested American manufacturers should apply promptly to the secretaries of the Royal Dublin Society, Dame St., Dublin, Ireland, for rates and conditions governing the exhibition.

British Air Service Grows with Government Aid

The British Air Ministry's report for the six months ended Sept. 30, 1921, has just been received by the Department of Commerce from Consul Reed at London. It shows that fewer passengers and less tonnage were carried by air in the summer of 1921 than in the two preceding summers. From the standpoint of the number of passengers carried, the period from the inauguration of commercial flying on May 1, 1919, to Sept. 30, 1919, was the most active, although most of these were local flights.

During the summer of 1921, passenger traffic reached its height during the month of August, when 9,609 persons were carried, of which 2,021 were cross-channel passengers, mainly residents of Great Britain and France.

Sudsidies amounting to £200,000 per year, now paid by the British government, to provide a regular air service between London and Paris, will be continued for some months. A permanent scheme of subsidies is contemplated, however, and it is now proposed that the government shall pay to certain approved British firms operating a cross-channel air service with British machines and engines, a subsidy of 25 per cent of their gross earnings, and that the Air Ministry shall provide a portion of the fleet on a hire-purchase basis at less than cost price.

During the past year certain features of air navigation have been more or less standardized. All British machines operating on cross-channel routes are now fitted with wireless apparatus, and under the new air navigation order this will be made compulsory for all machines capable of carrying ten or more passengers. The stations at Croydon and Pulham have been provided with wireless direction finding stations which work together and enable aircraft to ascertain their positions. Experiments are being made with various pyrotechnic devices and colored searchlights for directing aircraft to aerodromes in fogs or mists.

Machinery in China

Director Klein of the Bureau of Foreign and Domestic Commerce states that the development of factories in China and India has created new markets for American machinery and general equipment. Two million dollars worth of machinery was sold to cotton factories in China through efforts of the bureau.

Technologic Papers in Book Form

Beginning with Technologic Paper No. 203, the Bureau of Standards of the Department of Commerce, will issue volumes of 750 pages each, containing consecutive reprints of these papers. This will enable libraries and schools to keep an accurate and complete copy of each series.

The volume will be uniform in style and size with that of the scientific papers of the Bureau of Standards. Since so few copies are available for free distribution, it is no longer possible to complete all the sets from the beginning. The Superintendent of Documents maintains a sales stock which will help to complete back sets, and he reprints any publication for which there is sufficient demand.

The suggested grouping of technologic papers into volumes need not be followed by libraries which classify the papers on the shelves by subjects, but the suggested grouping will be convenient for those libraries which maintain the series in consecutive order as sent out.

A title page and index (issued separtely) will be transmitted with the last Technologic Paper of each volume to those libraries or subscribers who receive the complete series.

Subscriptions can be placed for the series of technologic papers by sending written orders addressed "Superintendent of Documents, Government Printing Office, Washington, D. C.," and inclosing $1.25 to cover a sufficient number of the papers to make one volume. Separate numbers of the technologic papers may be purchased at nominal cost by sending to the same address.

Circular 24 contains a descriptive list of all Bureau of Standards publications issued since the establishment of the Bureau. An extended abstract shows clearly the nature of the subject matter and gives in many cases a brief summary of the result. This list will be distributed to applicants free of charge.

Mrs. Roebling a Director

Mrs. Blanche Estabrook Roebling, widow of Karl G. Roebling, of Trenton, N. J., has been elected a member of the board of directors of the John A. Roebling's Sons Co., of which her husband was president. Mrs. Roebling is a daughter of Henry D. Estabrook and is an able business woman. She is believed to be the only woman in the United States who occupies a position in the directorate of a business concern of such proportions. Mrs. Roebling and William Gummere, superintendent of the steel mills, succeed as directors Scott Scammell, of Trenton, and Herbert Noble, of New York.

Inspectors' Bulletin

The American Society of Mechanical Inspectors will publish a monthly bulletin containing news of the society and information relative to the furtherance of mechanical inspection. The first issue of the bulletin will appear this month. The paper will be issued from the society's headquarters, 29 West 39th St., New York City. H. M. Spitzenberg, secretary of the society, will be in charge.

Chamber of Commerce Against Certificate Bonus

The following statement was issued last week by Joseph H. Defrees, president of the Chamber of Commerce of the United States, with reference to the proposed certificate plan, at this writing the latest proposal for paying the soldier bonus:

"A general bonus paid through certificates is just as objectionable, from the point of view of the Chamber of Commerce of the United States, as such a bonus paid in cash. The organizations participating in the national chamber's referendum which closed on Feb. 21, were as unmistakable in their opposition to a certificate plan as to a cash plan. They cast 1,221 votes against a general bonus in either form, and only 467 votes in favor.

"The chamber's opposition is to a general bonus, however paid. The chamber has not opposed a bonus merely on account of the amount of money that is involved. Attention has been called to the money requirements because of their importance and the financial problems and consequences they entail. Similar reasons demand public attention to the plan now being considered by a committee of Congress. This plan calls for "certificates" payable in twenty years or at death, in an amount equal to a cash bonus increased 40 per cent, and by compound interest, these additions being on account of postponement. Consequently the face value of certificates payable in twenty years will be about three and one-third times a cash bonus if paid now. Under this plan the Government would have to provide five billion dollars over a period of twenty years, with somewhere around a billion dollars for use in 1925 and the greater part of the rest in 1943. These obligations are in effect proposed in substitution for a cash bonus estimated, if every ex-service man took cash, at a billion and a half paid over the years 1922 and 1923. In the two years before 1925 when the Government would have to find about one billion dollars there are upwards to six billion dollars of debt to be paid or refunded. That a requirement of one billion dollars more will have serious consequences is obvious.

"Some features of the certificate plan now under consideration by the House Committee on Ways and Means are even more objectionable than the original bonus bill. It is proposed that certificates should be used as collatoral for loans at banks and such loans should be rediscounted at the Federal Reserve Banks. Such a purpose means return to war conditions under which the reserve banks held large amounts of loans secured by government war obligations. One of the problems of readjustment has been to get this paper out of the reserve banks and other paper of similar kind out of other banks. Great progress has been made, but this progress will be undone by the new proposal.

"Loans of this character have no place in the commercial banking system. They found their entry only in a war emergency. No loans should go into the federal reserve system except such as are speedily and surely self-liquidating. Violation of this principle means inevitable inflation and other evils which are sure to follow violation of sound banking principles."

Machinists and Toolmakers in Census Reports

Figures being compiled at the Bureau of Census, in Washington, show a consistent shifting in the mechanical forces of the country in the last ten years. A comparison of a few of the cities follows:

Oakland, Cal., had 3,689 machinists and toolmakers in 1920. This is an increase fron 1,174 in 1910. There were 381 mechanical engineers in Oakland in 1920, as compared with eighty-six in 1910.

New Hampshire had 4,592 machinists and toolmakers in 1920. This shows an increase from 3,471 in 1910.

Montana had 2,198 machinists and toolmakers in 1920. This is an increase from 1,251 in 1910.

Idaho had 1,472 machinists and toolmakers in 1920. This compares with 740 in 1910. The 1920 census shows that South Dakota has 1,724 machinists and toolmakers, an increase from 516 in 1910.

Utah had 2,010 machinists and toolmakers in 1920, compared with 1,120 in 1910. When the 1920 census was taken Arizona had 1,675 machinists and toolmakers. This compares with 757 in 1910.

Pittsburgh had 6,523 machinists and toolmakers when the 1920 census was taken, but only 5,429 in 1910. Delaware had 2,955 machinists and toolmakers in 1920 and 1,641 in 1910. Providence, R. I., had 5,066 machinists and toolmakers when the 1920 census was taken. This compares with 4,510 in 1910. Omaha, Nebraska had 1,228 machinists and toolmakers in 1920, compared with 842 in 1910.

Use of Freight Equipment Shows Business Improvement

The number of freight cars idle because of business conditions totaled 437,678 on Feb. 23, compared with 449,819 on Feb, 15, a reduction of 12,141, according to reports just received from the railroads of the country by the car service division of the American Railway Association.

Comparisons show that of the total, 264,814 were surplus freight cars in good repair and ready for immediate service if traffic demands warranted. This was a reduction of 13,667 compared with the number of such cars at the middle of the month. The remaining 172,864 were cars in need of repairs over and above the number normally regarded as being unfit for use until repairs have ben made.

Surplus box cars in good order numbered 105,938, a decrease of 6,616 since Feb, 15, while surplus coal cars in good repair totaled 105,570, a decrease of 6,480 within the same period. Surplus coke cars showed a decrease of 104 within approximately a week, while a decrease of 449 was reported for stock cars with the same time, which brought the total down to 20,732.

Of the 2,282,136 freight cars on line on Feb. 15, reports showed 332,614, or 14.5 per cent, in bad order, compared with 331,050 or 14.5 per cent on Feb. 1. Allowing 7 per cent of the cars on line as being normally in need of repairs would leave 172,864 as the number in excess of that amount which are idle and out of repair.

Business Conditions in Germany

BY OUR BERLIN CORRESPONDENT

The decline of business, which immediately set in at the rise of the mark in December, continued in a more pronounced degree during January. Machinery works are still fully employed with the orders booked last fall, which explains why the unemployment rate, the best indication of business conditions, increased slightly in December. In November this rate had dwindled down to the incredibly low figure of 1.4 per cent. For December an unemployment rate of 1.8 per cent was recorded. The January figure is not yet available, but is believed to be somewhat higher. This rate applies to the total of workmen organized in the trades unions, and differs in the various lines of industry. In the machine building and metal industry, for instance, it was only 0.6 per cent in December. New business is coming in rather sluggishly, which in one way is looked upon with some apprehension, but in another seems to be not quite unwelcome to manufacturers. The caution, not to say reluctance, with which orders requiring several months for delivery are treated, is becoming strongly pronounced. The new tax laws, the transitory state of the prices of coal and raw material, which are in a constant upward movement, combined with the unsettledness of the wages, let appear that all price estimates are built upon quicksands.

Unions Want Sliding Scale

A temporary agreement has been reached in several places between manufacturers and the machinists' unions, providing for an increase of the wages at an average of 1.60 marks per hour, but great divergence still prevails between the minds of the two parties with regard to reaching a definite agreement for the current year. The unions are pressing the demand to place the wages on a sliding scale, moving with the index figures for the living expenses, but this is strongly opposed, not so much by the manufacturers, but by the government. Manufacturers maintain that no reliable index figures exist upon which to base sliding wages, and point to the difficulties which would arise if wages would immediately follow all market fluctuations of commodities. There are, however, actually several departments of the government at work to find a solution of this problem, but from the opinions in authoritative quarters it appears that this is only a demonstration of goodwill, without serious intentions. The government is helping to maintain a comparative steadiness of the rate of exchange which might assist in tiding over the difficulty. In view of the stoppage of the mark depreciation, the trades unions seem more amenable to come to terms, although a considerable element of unsettledness prevails, as was exhibited by the recent strikes. New wage tariffs have been concluded in a number of industrial branches at an increase of from 15 to 30 per cent. This is probably the margin inside of which a compromise will be struck with the machinists' unions. The temporary increase of 1.60 marks already allowed brings the machinist's wages up to 11.30 marks for skilled workmen over 25 years of age, which is nineteen times above the pre-war level; and 9.70 marks for unskilled workmen over 21 years of age, or twenty-four times more than in pre-war time.

As the increase of living expenses above pre-war level, according to index figures available, is only 1,600 per cent, the wages paid have already advanced beyond the standard set by the index figures. The high cost of unskilled labor in comparison to skilled labor is one of the sorest points of the whole wage problem, especially as factories are carrying more unskilled labor than in pre-war times. Fettered as they are by the laws protecting the workmen, all attempts to return to healthier conditions are futile, or at the best very difficult.

Prices Going Up

Under such conditions there is no chance of a stop in the price movement, and prices will move upwards. This is in fact disclosed by the conditions prevailing on the market. The weakening of prices following the decline of incoming orders has ceased, and a steady increase on the whole line can be observed, in spite of the slackening of business. The abandonment of hopes in this direction has lately given the market a better tone, at least as far as the domestic market is concerned.

The export business has sunk back into the state prior to the business boom of last fall, and no revival is expected or looked for at present. With the exception of Russia, which is becoming more and more a factor in the market for railroad material and agricultural machinery, all other export business is getting more and more becalmed. The tendency of expansion and re-organization in the German industry, noticeable in all branches, is undiminished and will doubtless continue to find strong expression on the market as soon as the trend, which the political conditions bearing upon the price movement will take, becomes an absolute certainty. The expectations of a radical change of conditions, built upon the forthcoming conference in Genoa, are more and more diminishing, and are giving place to a more sober survey of the possibilities of the new future. Manufacturers cannot see where a reverse of prices could come from, even if Germany obtained all the success at Genoa which her government appears to expect. The present frame of mind of the business world is characterized by a mixture of increasing optimism in the future and a belief that if a change of the financial conditions is on the way it will not take effect for some time to come.

The returns of the foreign trade in 1921, which are now available, demonstrate that the complaints of the machine building industry with regard to the export business are not without foundation. Official export statistics for the months from January to April, 1921, have never been collected; but by substituting informatory figures of the manufacturing associations it appears that the total exports of the machine building industry in 1921 amounted to 350,000 tons compared with 536,000 tons in 1912, and over 600,000 tons in 1913. During the summer months the exports maintained a level of about 35,000 tons per month, which decreased towards the fall to 27,000 tons. A recovery took place in December, in which month 37,000 tons were exported. The shipments in January and February were probably somewhat higher. Prices maintained an average of 16 000 marks per ton, or approximately fifteen times the pre-war level, up to August. They increased during the subsequent months to 25,000 marks per ton, and in December to over 30,000 marks. The rate of exchange was twenty times under parity in August; in November eighty times; and in December forty times. The depreciation of the money is therefore not expressed in the export prices.

If the total of the machines exported remained behind pre-war level, it can be observed that the drop did not affect all classes of machines equally. In many cases the exports compare very favorably with pre-war results, in others they remained considerably below. The locomotive industry enjoyed a fair amount of export business, while the exports of steam and combustion engines were remarkably small. Machines for the textile industry had about 50 per cent of the pre-war exports, and agricultural machinery 75 per cent. The only decided increase above the pre-war level is exhibited in the case of machine tools. This branch of the machine building industry has now acquired a very important position in Germany's foreign trade, and stands second to the locomotive industry. Whereas in pre-war times the machine tool exports amounted to a tenth part of the total machinery exports, nearly a fourth of the 1921 exports comprised machine tools. The year 1921 was a record year for machine tool exports. The total of 1921 was 78,000 tons, and has never before been reached. It exceeded that of the most prosperous pre-war year, 1913, and is considerably higher than any of the other preceding years. Foreign shipments fluctuated in the year between 4,000 tons in May and 8,000 tons in July. In November 4,900 tons were shipped, and 5,400 tons in December.

Export Prices Low

The prices in the first part of 1921 reached their maximum in May, which shows an average export price of 19,600 marks per ton, constituting approximately nineteen times the pre-war price. They dropped in the subsequent months to from 16,000 to 17,000 marks per ton, which level they maintained up to September. The depreciation of the mark, which it will be remembered started in June, is reflected only slightly by a rise in prices. In October 20,000 marks per ton on the average were paid, which figure rose to 25,500 marks per ton in December. From this it is evident that the prices for foreign shipments were only in the

first half of the year somewhat commensurate with the rate of exchange prevailing, while those of the second half were considerably below. The average export price in November, which was 21,300 marks per ton, equals a gold mark price of 300 marks only, which is a little less than a fourth part of the pre-war average. Considering the fact that, according to reports coming from the machine tool industry, most contracts up to October were made on short delivery, the backwardness of prices can hardly be understood. Complaints are frequently made of the clumsy red-tape fashion in which the export control is handled. Although such complaints no doubt are well founded, they do not fully explain the ridiculously low export prices. The fact is that many manufacturers and dealers were over eager to clear their stock and took advantage of the first signs of reviving business. Besides, the instructions issued by the Association of Machine Tool Builders with regard to export prices do not follow the fluctuations of the exchange with sufficient swiftness, and often lag considerably behind exchange movements.

Manufacturers and dealers are fully aware of the insufficiency of export prices, but although the tendency to get as much as possible is strong, sellers are shy to run up their quotations too close to foreign prices, as the bad experience made with such practice in the past is still too fresh in their minds. The association expects better results from the new practice to quote in foreign currency. This has now been regulated for all the metal-working industries. Quotations are made in marks only for exports to the eastern and southeastern European countries; to all others in their own currency or in English, French or Swiss money. This does not guard against dealers in countries with low exchange taking advantage of the mark quotation by shipping goods, ostensibly bought for their country, to other countries, a practice which is not infrequently met with, and which probably explains the comparatively large exports to such countries. Among the countries sharing in German machine tool exports, Belgium and Holland occupy the first place. Their purchases far exceed those of pre-war times. Holland, for instance, bought during the last three months of 1921 more German machine tools than in any one entire pre-war year. While the exports to Belgium and to France are obviously for home consumption, there can be no doubt that tools bought by Holland are partly re-exported.

The slight revival on the home market, following the slackening of business in December and January, is not general but indications lead to the belief that it will spread further. The opinion prevails that while the export market will possibly fall off further, the demand on the home market will continue at its present size, with slight variations in the various branches of the machine building industry. The tendency to expand and to renew existing equipment is noticeable in the whole industry, even in the mining industry where huge investments for new and existing plants are contemplated or are already being carried out. This tendency is still kept in check by the caution with which the coming political developments are viewed.

The Trend of Business Improvement—Plants Resuming

The Gardner Motor Co., St. Louis, Mo., is increasing production at its automobile plant, with a schedule calling for more than 650 completed cars during March. This is considerably in excess of the combined manufacture of January and February.

The St. Louis & San Francisco Railroad Co., St. Louis, Mo., is arranging to double the working force at its shops at Fort Scott, Kan. The works will be devoted to the manufacture of steel bodies for all coal cars used on the system.

The Trumbull Steel Co., Warren, Ohio, has resumed operations on a 100 per cent basis, with normal working force.

The National Axle Co., Benton Harbor, Mich., manufacturer of automobile and other axles, is operating on a capacity basis at its local plant, and has sufficient orders on hand to insure production on this scale for the entire year.

The Pennsylvania Railroad Co., has increased the working hours in the different departments at its car shops at Olean, N. Y., at the same time adding about fifty men to the working force. It is planned to increase the number of employees at an early date.

The Regina Co., Rahway, N. J., manufacturer of talking machines and parts, is being reorganized, and plans to resume operations at its plant before the close of March.

The Ohio Steel Foundry, Lima, Ohio, has adopted a capacity production schedule at its plant, giving employment to about 500 men. The company has secured a large order for railroad castings for the Argentine Republic, insuring full production for a number of months to come.

The New York Air Brake Co., 165 Broadway, New York, N. Y., is maintaining active production at its plant at Watertown, N. Y., and since the first of the year has closed contracts for about 15,000 brakes for various railroad systems. Recent orders include air brakes for 4,500 cars for the Union Pacific Railroad; for 3,300 cars for the Pacific Fruit Express Co.; and for 1,000 cars for the Great Northern Railroad.

The Meadville Machinery Co. has re-opened the car shops of the Erie Railroad Co. at Stroudsburg, Pa., recently secured under lease, and will give employment to a normal working force on full time. The plant has been closed for more than a year. The company is also arranging for the immediate resumption of operations at the Huntington, Ind., shops of the same railroad, also acquired under lease. The entire plant, including round house and locomotive department, will be operated under contract work for the road. The Meadville company, will also operate the shops of the Erie system at Meadville, Pa., and at Cleveland and Galion, Ohio.

The Jordon Motor Car Co., Cleveland, Ohio, announces an increase in production of 350 per cent during February, as compared with the same month of last year. The plant is running at full capacity, with orders on hand to insure this rate of production well into July.

The Summerill Tubing Co., Bridgeport, Pa., manufacturer of steel pipes and tubing, is maintaining active production at its works and reports that orders received in January and February are in excess of those booked during the last four months of 1921.

The Youngstown Pressed Steel Co., Warren, Ohio, affiliated with the Sharon Steel Hoop Co., of Sharon, Ohio, will increase production in its metal lath manufacturing department, enlarging the works and installing additional machinery

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has secured an order for railroad equipment for the National Railways of Mexico, totaling $100,000.

The Talbot Manufacturing Co., Easton, Md., manufacturer of wheelbarrows and kindred equipment, is working on a capacity schedule with orders on hand to maintain this basis of operation for several months to come.

The Reo Motor Car Co., Lansing, Mich., is maintaining a capacity schedule at its plant, with incoming orders in recent weeks considerably in excess of shipments. During January the company sold 1,000 more cars than the local plant shipped.

The Penn Seaboard Steel Corporation, Franklin Bank Building, Philadelphia, Pa., is operating at four of its five plants, and plans to resume production at the fifth unit at an early date.

During the first week in March., automobile and automobile equipment manufacturing plants at Jackson, Mich., increased their working forces by more than 300 men.

The Lima Locomotive Works, Lima, Ohio, has secured an order for five consolidation type locomotives from the Toledo, St. Louis & Western Railroad Co. A contract has also been secured from the Chicago, Burlington & Quincy Railroad Co., for eight locomotives of heavy mountain type.

The Standard Tank Car Co., Sharon, Pa., is increasing production at its plant, and has recently secured an order for sixty insulated tank cars for gasoline transportation.

The Brier Hill Steel Co., Youngstown, Ohio, has adopted a capacity schedule at its two plate mills.

The Baltimore & Ohio Railroad Co. has resumed operations at its car repair shops at Glenwood, Pa., following a shut down for a number of weeks.

The Baldwin Locomotive Works, Philadelphia, Pa., has secured a contract for forty-seven locomotives of Mikado, Pacific and Santa Fe type, from the Chicago, Burlington & Quincy Railroad Co., approximating $2,000,000.

The Colorado Fuel & Iron Co., Denver, Colo., has taken an order from the Santa Fe Railroad Co., for 10,000 tons of rails, and will handle the production at its Pueblo shops. The company is said to have secured a contract for about the same amount from the Northern Pacific Railroad Co.

The Fedders Manufacturing Co., Military Road, Buffalo, N. Y., manufacturer of automobile radiators and other metal products, is arranging for immediate increase in production, and for this purpose has leased the former plant of the Lautz-Missiquoi Marble Works in Bridgeburg, Ontario, for a branch factory. Machinery will be installed at once.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
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Sailors say that however smooth the course they are sailing, a gale is always blowing or brewing somewhere on the seven seas and in this generalization the merchant will probably agree with the mariner.

The ship of American business is holding steadily on her course. The breeze is moderate, and though her speed is not great it is quickening, but in the offing there are to be descried some political clouds that may soon make it wise to "go about" unless they are meantime dispelled. One of these clouds is the growing opposition to the Four Power Treaty in the Senate.

The divorcement of politics from business is tritely urged in the United States but it is becoming plain that politics, and especially international politics, is the nation's most important business just now; and if through the Senate action or inaction we shall add to our refusal to enter the League of Nations, a rejection of the treaty that Mr. Hughes has negotiated we may become something of an Ishmael among the nations.

In refusing to attend the Genoa Conference because political questions were to be discussed there, we have come very near to excluding ourselves from the world's international fellowship and it is to be hoped that we will not further emphasize our aloofness and egocentricity.

EXPORTS FALLING

These remarks are prompted by the statement of our foreign trade for January. For the seven months ending Jan. 31 the excess of merchandise exports over imports fell from over 4½ billions in 1920 and 1921, to about 2¼ billions in 1922, and it is at present running at the rate of not much over $700,000,000 annually. If the reduction in the so called favorable balance was due to an increase in imports, it might be said that we were collecting the debts due us in goods; but this is not the case, for imports during the seven months period declined in about the same proportion as exports and the fact seems to be that our foreign trade is simply drying up, largely because the spirit of non intercourse that dominates our political policy in international affairs is gradually atrophying our commercial relations.

In time we can of course prosper by trading between ourselves alone, but it is to be feared that in the process of adjusting the nation's business to this limitation we shall experience much discomfort. Meanwhile it is to be noted that the total of our intercontinental foreign trade for January—that is our exports and imports to and from Canada, Mexico and Central America—is nearly $84,000,000, which is about equal to the business we did with England in the same month. From this it is plain that our overseas commerce is rapidly dwindling.

This is about the only unfavorable factor that is to be discerned in the week's development and for the present, at least, it seems likely that its normally chilling effect will be offset by the continued gain in our gold supply and the resulting redundancy of credit. The Federal Reserve statement for the week shows an increase of $14,000,000 in the gold on hand and a rise of 1.1 per cent in the reserve ratio, which now stands at 77.8 per cent.

These figures bespeak an ease of money that facilitates the sale of all interest bearing obligations, and the result has been a demand for bonds that has advanced old issues and made it possible to bring out many new ones. Because they are so readily salable tax exempt securities are being put out with great freedom and some thoughtful bankers are concerned about the municipal extravagance thus induced.

INFLATION IS HERE

But the extravagant expenditure of borrowed money is always a concomitant of inflation; it is in fact inflation, and there is no use mincing words. We are now entering upon a well defined period of inflation. Its advent has for some time been predicted in these letters and its arrival is attested by the reviving activity of nearly every speculative market. In grain and cotton its effect has already been partially felt but is not by any means exhausted.

The reaction of last week was but a resurgence of the rising tide that has lifted coffee about half a cent a pound and advanced sugar to 5.30 for granulated, the highest price touched in some months. Crude rubber, which is selling at 14½ cents a pound for "plantation latex" may be one of the next staples to show the tonic effect of our gold cure. Apparently there is a huge oversupply of rubber, but the price is almost the lowest on record, which is a combination that is almost sure to attract buying under present conditions.

Conditions not dissimilar exist in silk, which has become a highly speculative commodity. In the steel industry things are admittedly better and some quotations have been advanced quite sharply. Trade reports are distinctly optimistic, and a Birmingham correspondent writes us "Well, as you said we have turned the corner. Our furnaces and mines are opening up and by July 1 will be operating at 60 per cent capacity. The feeling is sure exhilarating to business men and laboring people." Copper after some hesitancy has again joined the advancing procession and "a broad demand at 13¼ cents" is reported. And so one might go through the whole list of basic commodities. The jobbing trade in finished products has not yet caught step, but it is sure to do so as spring opens and summer turns the leaves of nature's book.

The threatened strike of the bituminous coal miners and the labor troubles in which some of the New England cotton mills have become involved are not to be ignored, but in the cotton trade it is a maxim to "buy on strikes because they are always called to be settled" and there is, I think, still reason to hope that the coal strike will be averted.

The cheerfulness of the American business world is naturally reflected in the stock market and the reactionists, as the bears now call themselves, have found it difficult to hold prices in check. The advance in the securities of the little Ann Arbor Railroad, which have nearly doubled in value because the Pere Marquette is said to have bought it, is symptomatic of what may be expected as the opportunity for the railroad consolidations, for which the Esch-Cummins bill provides, is appreciated.

I know nothing of the facts in the Ann Arbor-Pere Marquette affair but it should be plain to every student of our railway problem that its easiest solution is to be found through consolidation, and that the railway managers who are not lacking in intelligence, despite their sometimes tactless strategy, will take "the easiest way."

The dispatches from overseas feature the troubles of Great Britain in India and the reported indisposition of Lloyd George, but the London stock market is nevertheless buoyant and there as here the influence of inflation is apparently an effort to exchange money for real property that is being made. There it is paper inflation. Here it is gold inflation. It remains to be seen which is the least objectionable or the most desirable. The way the question is put indicates the economic orthodoxy or heterodoxy of those who ask it. The bonus bill has not been mentioned because it is dead. Although the House will probably pass it, arrangements for its interment are being made in the Senate.

Chicago Metal Trades Association Gives Dinner

The twenty-fourth annual dinner and meeting of the Chicago branch of the National Metal Trades Association was held at the Mid-Day Club, Chicago, on Tuesday evening, March 7. A large number of members and guests were present.

The reports of the officers and the employment department showed all the activities to be in a healthy and satisfactory condition. One fact of particular interest that was brought out was that no strike or labor difficulty occurred in any of the plants during the past year.

Addresses were made by Myrick D. Harding, general superintendent, Chicago Plant, Armour & Company, and by Alvan T. Simonds, president, Simonds Manufacturing Co., Fitchburg, Mass.

The election of officers for the ensuing year resulted as follows: President, Harold C. Smith, Illinois Tool Works; vice-president, C. E. Finkl; treasurer, Wm. Ganschow; secretary, Paul Blatchford.

Chicago Letter

A complete canvass of the Western machine tool field shows that February was a much better month in the amount of business than January, although dealers give conflicting reports. The spotty condition of the market is shown by the fact that while most of the dealers found February better than January others report exactly the reverse.

Inquiries for machinery have increased steadily in number since the first of the year. The business trend since that time seems to be see-sawing (one week it is very good and the next week it is poor) and if the months show similar fluctuations, March will be a rather poor month although up to the present time everything seems to point to a month of good business.

The recent auction of equipment in the plant owned by H. C. Williamson, Chicago, has been declared a failure by many who were present at the sale. Although most of the machines were of late type and little used, only about half were removed.

The Santa Fe system has added the following to its outstanding list: One heavy-duty type crank shaper with 24-in. stroke, one 2-in. double-head bolt cutter, heavy-duty type and one heavy-duty type gap engine lathe to swing 18-in. over bed.

There was an increase of about 100 per cent in the number of building permits, issued during February compared with the same month last year. But even though the number of permits was greater, the total cost of the projects was almost 10 per cent less. There is a reported increase of 39 per cent in the amount of contracts let in the Central West. This is a rather optimistic outlook from the steel man's point of view.

Business Items

The Chandler Motor Car Co., of Cleveland, Ohio, reports net earnings for the year 1921 totaled $41,017, or 14 cents a share on common stock, compared with $4,213,111, or $15.04 a share, in 1920.

Bethlehem Steel Corporation, Lackawanna Steel Co. and the Midvale Steel and Ordnance Co. have announced increase in prices of bars, shapes and plates to meet the $1.50 per 100 pounds quotation by the Jones & Laughlin Steel Co.

Directors of the Pennsylvania Railroad Co. ordered the purchase of 250 new steel cars for passenger service.

The Waterbury Clock Co., Waterbury, Conn., has purchased the property and assets of Robert H. Ingersoll & Brothers for $1,500,000 in cash. The sale is subject to the approval of the court.

The name of the Ball Engine Co., has been changed to the Erie Steam Shovel Co., with the same retinue of officers as before. The offices of the company will be located in Erie and in Pittsburgh.

The Whitman Barnes Co., Akron, Ohio, manufacturers of machine tools and drills, reports a decrease of 20 per cent in sales last year as compared to the year before, and a total operating loss for the year of $280,545. Net sales for the year were $620,052, while general administration expenses were $852,939.

The stockholders of the Garvin Machine Co. met in the plant in New York City on March 8 and the following officers were re-elected: Burr K. Garvin, president; Warren Garvin, vice-president; George Maclagan, treasurer; H. R. Garvin, secretary. Rodger B. Garvin continues as general manager.

Plans for the organization of the Zeder Motor Company, at Cleveland, Ohio, were being made this week under the direction of R. T. Hodgkins, president. The company has been founded by F. M. Zeder, for several years chief engineer of the Studebaker Corporation. The company expects to produce a six-cylinder car, to be made in the plant of the Cleveland Tractor Company.

Reports received in machinery and allied circles this week indicate to Cleveland financial interests that Henry Ford may buy the Tuscora Rubber Co. plant at New Philadelphia, Ohio. It was stated that Ford personally has recently looked over the plant.

The Massachusetts Gear and Tool Co., of Woburn, Mass., has been incorporated under the laws of Massachusetts and has purchased the business and equipment of the Woburn Gear Works of that place. The business of specializing in small and medium size gears and sprockets will be continued.

The Gray Hub Co. has been organized in Detroit, Mich. to manufacture a line of automobile and truck hubs. The company was organized by R. B. Gray who for the past twelve years has been associated with the Timken-Detroit Axle Co., as factory manager. A plant has been secured at 642 Catherine St., Detroit, and production is on the way.

The Monarch Tool Co., of Sidney, Ohio, announces a reduction of 10 per cent on Monarch lathes.

The Sebastian Lathe Co., has been chartered with an authorized capital of $100,000 to manufacture and sell lathes and other special machinery in Cincinnati, Ohio. Among the incorporators are E. E. Stokes and Clare E. Sebastian.

At a recent meeting of stockholders of the Davenport Machine Tool Co., Rochester, N. Y., the following directors were elected: W. S. Davenport, A. T. Hatch and C. W. McKay, of Rochester; G. E. Merryweather, of Cleveland, Ohio, and C. R. Burt, of Syracuse, N. Y.

The American Brass Company, Waterbury and Ansonia, Conn., recently announced a reduction of a quarter of a cent per pound for all finished products, which brings current quotations on sheet stock down to 20¾ cents per pound. This is the second reduction made during the past two weeks. The present price allows a limit of 7½ cents per pound for manufacturing costs and profits in the conversion of copper into brass.

The York (Pa.) plant of the American Foundry Equipment Co., is being moved from the old location on North St., to larger and better adapted quarters on East Market St., adjacent to the Maryland & Pennsylvania Railroad. The company's molding machines, flasks, jackets, and pattern mounting sundries are manufactured at this plant. Sand cutting machines, sand blast equipment, dust arresters and core machines will continue to be manufactured at the main plant, 2935 West 47th St., Chicago.

The Wright & Querie Manufacturing Co., 909 North Colony St., Meriden, Conn., recently incorporated under the laws of Connecticut to manufacture machine and wood screws, hardware, etc., was organized last week by the election of the following officers: President, H. H. Wright; secretary and treasurer, C. W. Wright; vice-president and assistant treasurer, O. J. Querie. The directors are the above mentioned and R. W. Berry and A. H. Smith.

The Steel-Flex Coupling Corporation has been organized and has opened general offices in the First National Bank Bldg., Detroit, Mich. The company will market a line of power transmission equipment. Officers recently elected are: Norman Pearson, Detroit, president; Sidney R. Teasdale, Cincinnati, vice-president; Frederick O. Breed, Buffalo, secretary.

The Allen-Hogan Corporation, Stamford, Conn., has filed a certificate of incorporation under the laws of Connecticut, to engage in the manufacture of metal spool ends and flanges for piano player rolls, and to do other general manufacturing; capital stock is $50,000, and the incorporators are R. E. Gillmor, Van Renssellaer Ave., Stamford; A. E. Moore and J. L. Watson, both of New York City.

The W. F. Concannon Shear Co., 42 Depot St., Milford, Conn., recently incorporated to manufacture steel shears and scissors, have announced through general manager and president William F. Concannon, that the concern will shortly remove to Bridgeport, Conn., where a factory will be established.

The Driscoll Transmission Corporation, which for the past three years has been developing its variable speed transmission in its Astoria plant, is moving to larger and more accessible quarters in New York City, where it will build and install a number of models of the device on various types of machines for which its use has been licensed. The New York laboratory and shop of the corporation is now at 416-22 West 33rd St.

H. B. Smith Co., Westfield, Mass., has begun the erection of an additional building for its foundry work. It will be of steel frame construction.

A 22 per cent reduction of wages at the Savage Arms Corporation's plant in Chicopee Falls, Mass., became effective on March 4.

Page-Lewis Arms Co., Chicopee Falls, Mass., is about to place on the market a new 22-cal. bolt-action, single-shot sporting rifle, and expects to bring production to 150 a day shortly. This weapon is designed to meet the low-price importations from Germany. The 22-cal. lever-action rifle, which sells at a higher price, has been out since Dec. 1, the rate of output being 150 daily. These rifles are being sold chiefly in the Western states, where sufficient orders have been taken to keep the factory busy until May.

Directors of the Archer Automatic Riveting Machine Co., Inc., of Oroville, Cal., have requested the Superior Court in that place to order a dissolution of the corporation. The company was organized in 1912.

A wage reduction averaging 15 per cent for 600 plant employees became effective on March 6 at the motorcycle and bicycle works of the Hendee Manufacturing Co., Springfield, Mass.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drills, Twist, "Mezzo-Steel"

Cleveland Twist Drill Co., Cleveland, Ohio.

"American Machinist," November 3, 1921.

The steel and heat-treatment used are said to make it possible to obtain a performance much better than that of carbon steel; in fact, midway between carbon and high-speed steel. The drills are particularly well adapted for drilling cast iron and soft steel at greater speeds and feeds than can be used for carbon drills. Heating the cutting edge of a Mezzo drill to even a dark blue color does not draw its temper, but the tool works at its best efficiency at this temperature. The drills have a blue-black, rust-resisting finish. They can be furnished between $\frac{1}{8}$ and 2 in. in size.

Sawing Machine, Band, Three-Way-Table

Paddock Tool Co., 320 Ridge Bldg., Kansas City, Mo.

"American Machinist," November 3, 1921.

The principal features of this machine for wood-working use are that the table can be tilted in any one of three directions, and that a three-wheel ball bearing guide is employed for the saw. The 24-in. machine will take a cut under the saw guide 16½ in. deep. The band wheels run on double-row ball bearings. The motor is mounted on the base of the frame. The machine can be furnished with attachments as shown. They include a 15-in. sanding disk having a tilting table. On the back of the frame is an 11-in. wood-turning lathe having cone pulleys. A 35 x 4-in. sanding roll can be placed in the lathe. The machine is made in four sizes, the band-wheels being 20, 25, 30 and 36 in. in diameter, respectively.



Tractor, Caterpillar, T-35

Holt Manufacturing Co., Inc., Stockton, Cal.

"American Machinist," November 3, 1921.

The machine is intended for general use. It consists of three units, the motor, the transmission, and the trucks and tracks, each unit being entirely self-contained. A four-cylinder motor is used, the bore being 4 in. and the stroke 5 ½ in. The transmission provides three speeds forward and one reverse. Side clutches are provided, so that either one of the trucks can be disengaged from the motor, to turn the machine. The tractor is 103 in. in length overall, 48 in. wide, and 52 in. in height to the top of the hood.



Reamer, Cylinder, Expansion, Ransome

H. A. Hopkins & Co., Inc., 247 LaPorte Ave., South Bend, Ind

"American Machinist," November 3, 1921.

The reamer can be used without removing the cylinder blocks from the chassis, and is ordinarily driven by hand. A ratchet wrench can be furnished to fit on the shank. The reamer consists of three units, the body, the nut and the blades. A micrometer dial is provided so that it is possible to set the blades with an accuracy of 0.001 in. Ordinarily, the lower ends of the blades are ground without clearance slightly smaller than the cutting edges, so that they serve as a pilot to assist in the entering of the reamer. The tool is made in five sizes, the total range being from 2¾ to 4 in.

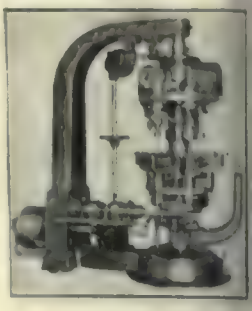


Chucking Machine, Automatic, Vertical, "Jackson"

Vertomatic Manufacturing Co., Third and Buttonwood Sts., Reading, Pa.

"American Machinist," November 3, 1921.

The machine is intended for rapid and automatic machining on small parts such as required for plumbing, electrical and automobile work. Drilling, tapping, facing and similar operations can be performed on the same piece, the operator merely feeding the machine. The type-A machine is intended chiefly for work requiring from three to five operations on the same piece. There are six work-holding chucks and five active spindles. The type-B machine is for work requiring two or three operations. It has four double chucks and three pairs of spindles. The type-C machine is for jobs requiring a single operation only, or two operations combined in one tool.



Bench, Work, Combination, No. 2

Myers Machine Tool Corporation, Columbia, Pa.

"American Machinist," November 3, 1921.

The outfit is intended for use in such places as automobile repair shops and hotels, and for mechanics who have need for a small installation. The machines are mounted on a table 45 in. wide x 84 in. long and 32 in. high. Two drawers are provided for holding small tools. On the shelf of the table is mounted a motor that drives all of the apparatus through a countershaft. The following equipment is furnished: A lathe having a swing of 10 in. and a working length of 45 in.; a 10-in. sensitive bench drill, having a small table and a ½-in. chuck; a 10-in. grinder head carrying an abrasive wheel and a muslin polishing wheel; and a 3½-in. machinists' vise.

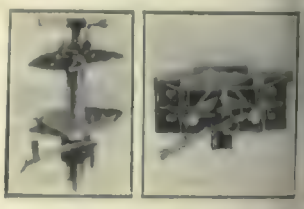


Vise, Woodworkers', Universal No. 1

Oliver Machinery Co., Grand Rapids, Mich.

"American Machinist," November 3, 1921.

The vise is capable of operation in many different positions, and is adaptable to a wide range of work. On the right of the accompanying illustration it is shown in its natural position. The jaws can be set by means of thumb-screws so as to clamp at an angle. They can be turned about the axis of the screw, and used to hold work in any position. When swung through one-half turn, the small steel-faced jaws come in position for the holding of metal parts. The jaws can also be placed in a horizontal plane, as shown on the left. The small detachable angle jaw lying on the lower jaw is for use in holding irregular-shaped pieces. The jaws are 18 in. long by 7 ½ in. wide, and the vise has an opening of 16 in. Net weight, [illegible] lb.



Truck, Hand, "Bluenose"

Sharon Pressed Steel Co., Sharon, Pa.

"American Machinist," November 3, 1921.

The principal feature of this truck is the fact that it is constructed entirely of pressed-steel parts, with the exception of the wheels, axle and handles. The main frame is made in one piece of ¼-in. steel. The crossbars are made straight for general use, but can be depressed for the carrying of barrels. The nose of the truck is a steel stamping made from one piece of ¼-in. steel. The trucks are equipped with malleable-iron wheels, and either plain or roller bearings. They are made in two sizes, the lengths overall being, respectively, 54 and 64½ in.



Personals

CHARLES F. SMITH, president of Landers, Frary & Clark, of New Britain, Conn., has resigned as chairman of the board of directors of the New Britain Machine Co.

EDGAR T. GLASS has resigned as superintendent of the tractor department of the New Britain Machine Co., New Britain, Conn.

HAROLD BLYE, formerly general superintendent of the National Brass Co., Grand Rapids, Mich., and more recently consulting engineer for the Benj. Buckley Co., Paterson, N. J., is now shop manager of the H. E. Boucher Manufacturing Co., experimental devices and marine models, New York City.

E. M. GRIFFITHS, founder of Burton-Griffiths & Co., Ltd., of London, England, has resigned his position as managing director and chairman of that concern and has also retired from the board of the Birmingham Small Arms Co., Ltd., so that he is no longer associated with the control of either company. His city address is now 30 Ludgate Hill, London, E. C.

F. T. SMITH has been elected president of the Republic Motor Truck Co., of Alma, Mich. He succeeds J. N. Willys.

STUART D. LANSING, president of the Bagley & Sewell Co., paper making machinery manufacturers, of Watertown, N. Y., has returned after spending several months in Europe and Asia. Mr. Lansing made a study of market conditions and reports little activity in foreign fields.

ALBERT TURNER, for twenty years engineer with the Norton Company, Worcester, Mass., has joined the engineering staff of the Heald Machine Co.

HORACE S. PECK, formerly comptroller, S-K-F Industries, Inc., New York, is temporarily without an executive business connection on account of changes in the business policy of S-K-F Industries, which caused the resignation of several of the officers and directors of that organization. Mr. Peck is retaining his membership in the Industrial Cost Association, with executive offices at 50 Church St., New York City, and will continue to serve that association as president.

E. R. LYMAN, formerly connected with the management of the Crofoot Gear Works, Boston, Mass., has been elected president and treasurer of the Massachusetts Gear and Tool Co., Woburn, Mass.

JOSEPH CAVICCHI, former works engineer of the Crofoot Gear Works, Boston, since its incorporation, has been appointed superintendent of the Massachusetts Gear and Tool Co., Woburn, Mass.

C. F. TOLLZIEN, factory manager of the Packard Motor Car Co.'s plant in this city, has resigned and will engage in private business. He has been succeeded by Mr. Gill, who has been production manager of the plant for some time.

JAMES BARR, formerly with the Vandyck-Churchill Company, of New York, is now Eastern representative for the American Tool Works, of Cincinnati, Ohio.

C. E. MOORE has been elected vice-president and secretary of the Herbert Machinery and Supply Co., Los Angeles, Cal.

GUY P. MILLER, treasurer of the American Tube and Stamping Co., Bridgeport, Conn., and former treasurer and general manager of the Bridgeport Brass Company, has recently become associated with the firm of Searle, Nicholson, Okey & Lill, auditors, accountants and engineers. The firm has offices in New York City and branches in several of the large cities throughout the country. Mr. Miller, will still remain in Bridgeport, but will be ready for call from the firm on special municipal taxation problems, upon which he is an expert.

H. L. WILSON, formerly vice-president of the Columbia Graphophone Manufacturing Co., New York and Bridgeport, Conn., has been elected president of the company, succeeding Van Horn Ely.

NEIL W. EYER, sales representative in Dayton, Ohio, for the Betz-Pierce Co., Cleveland, jobber of iron and steel, has been appointed district sales manager for the company in southern Ohio. Mr. Eyer is the oldest representative in point of service in the company's sales department. Frank E. Gaines has been made sales representative with headquarters in Indianapolis, Ind.

JOSEPH H. ROBERTS has resigned as superintendent of the bar steel and special products division of the Nicetown works of the Midvale Steel and Ordnance Co., of Johnstown, Pa. He will become assistant to president L. J. Campbell, of the Electric Alloy Steel Co., Youngstown, Ohio.

W. H. SMITH, of Toronto, has been appointed chief engineer and designer for the Wood-Gorrie Motors Co., Ltd., of St. Thomas, Ont. A. J. Gorrie of Montreal, formerly general superintendent of the Canadian Northern Railway for Quebec, is vice-president.

J. P. CARRITTE of the General Aluminum and Brass Co., Detroit, Mich., has been appointed president and general manager of the Canadian Aluminum and Brass Co., Ltd., recently formed at Windsor, Ont., for the manufacture of castings for automobiles.

Obituary

EDGAR H. COTTRELL, president of C. B. Cottrell & Co., printing press manufacturer, of New York, died at his home in that city on March 7. He was 72 years old.

WILLIAM G. SKINNER, chairman of the board of directors of the Colt Patent Fire Arms Co., Hartford, Conn., died on March 8. He was 67 years old.

SENATOR JOHN MILNE, head of the Burrow, Stewart & Milne Foundry, and one of the outstanding figures in the manufacture of various metal products, died on March 4 at his home in Hamilton, Ontario, Canada.

JAMES E. GREENSMITH, president of the Boston Scale and Machine Co., Boston, Mass., died on March 8. Mr. Greensmith was a mechanical engineer and was connected with various machine tool concerns during his career. He was a member of the American Society of Mechanical Engineers and of the Engineers Club of Boston.

JOSEPH H. SHEPHERD, formerly with the Blanchard Machine Co. of Cambridge, Mass., as mechanical engineer, died on March 2 at his home in Needham Highlands, Mass.

COL. JOHN LAMBERT, first president of the American Steel and Wire Co., died on March 6 at Pasadena, Cal., where he made his winter home. He was 75 years old. Col. Lambert was associated with John W. Gates and Elbert H. Gary in the organization of the United States Steel Corporation.

OTIS H. CUTLER, chairman of the board of the American Brake Shoe and Foundry Co., died suddenly while cruising in Southern waters. His home was in Suffern, N. Y. He was an official in several corporations and a director of the Baldwin Locomotive Works.

Forthcoming Meetings

Taylor Society: Mid-winter meeting, Philadelphia City Club, Philadelphia, Pa., March 16, 17 and 18. Secretary's headquarters, 29 West 39th St., New York City.

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drill, Electric, Portable, Light, ¼-inch
Black & Decker Manufacturing Co., Baltimore, Md.
"American Machinist," November 3, 1921.



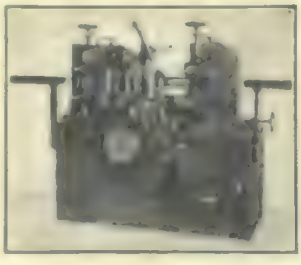
The drill has an aluminum-alloy housing, and weighs only 5 lb. It has double reduction gearing, giving a no-load speed of 1,600 r.p.m. It has six heat-treated chrome-nickel steel, running in a grease-tight box. All bearings are removable and renewable. The drill is equipped with a pistol grip and trigger switch, with the switch mechanism in the handle. The spindle is arranged so that it is possible to drill within about an inch of a corner. The parts are accessible. The tool is supplied complete with a three-jaw chuck, flexible cord and attachment plug.

Grinding Machine, Piston and Valve, Bench
Van Norman Machine Tool Co., Springfield, Mass.
"American Machinist," November 10, 1921.



The machine combines many of the functions of the lathe with those of both the internal and external grinding machine. It is intended for turning, regrooving, and grinding pistons, refinishing valves and wristpins and for similar work on many small automobile parts. The work spindle and the grinding wheel spindle are driven by independent motors of ¼ and ⅓ hp. respectively. The work table slides upon ways and has a traverse of 14 in. The wheelslide is guided to the base. The wheel spindle runs on ball bearings at a speed of 2,800 r.p.m., and is driven by a motor mounted on the same slide. The machine will swing work 8 in. in diameter and take 12 in. between centers. It occupies a bench space of 3 x 4 ft. and weighs 330 lbs.

Welding Machine, Steel-Tube
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



The machine is made in two sizes, the No. 2 machine here illustrated having a capacity from 1½ to 4 in. in diameter on 10-gage steel. In order to vary the speed of the tubing through the machine, a d.c. adjustable-speed-motor giving welding speeds from 24 to 165 in. per minute is provided. The bearings that are subjected to heat are water cooled. An oxy-acetylene torch is carried on an adjustable arm, and the welding is done continuously as the tubing passes through the machine. Acetylene generators can be furnished in order to supply gas for the torches.

Bending Machine, Tubing, Power-driven
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



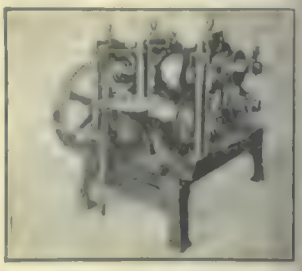
The machine is made in three sizes. It is ordinarily equipped with double clutch pulleys, to provide for operation in either direction. Back benders and power attachments can be furnished, as shown. It is said that the construction of the bending mechanism makes possible the bending of thin-wall tubing without wrinkling or distortion. A special swing frame cut-off saw running at high speed can be furnished for cutting the tubing to length either before or after bending.

Sclereoscope, Model-C, Changes in
Shore Instrument and Manufacturing Co., Jamaica, N. Y.
"American Machinist," November 3, 1921.



In this Model C-1 sclereoscope the maker claims that the refinements made increase the flexibility of the operating mechanism. A fine screen covers the openings in the housing above the scale, to prevent dust from entering the operating mechanism. The leather operating piston has been replaced by one made of tungsten steel. The hammer-hook mechanism has a flexible adjustment. The instrument is adaptable to the use of the labratory man, as well as to the precision manufacturer on quality production.

Forming Machine, Steel-Tube.
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



Strips of steel are run through this machine in order to shape them into tubes. The No. 2 tube-forming machine shown has a capacity from 1⅝ to 3 in. in diameter and handles steel up to 14-gage. The machine is also made in Nos. 0, 1, 1½ and 3 sizes. A hollow conical conductor between the roll stands completes the forming started by the first pair of rolls, and the second pair compresses the tube into a circular shape. Three-roll stands can be furnished for use on large tubing. The machine can operate continously, and requires but one attendant.

Grinding Machine, Steel-Tube, Motor-Driven
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



The machine is intended for grinding off the ridge made on the outside of steel tubing by welding. It consists of a 7½-hp. a.c. motor, provided with a starting device and carrying two grinding wheels. The foot control is so attached to the tube guide as to vary the pressure of the tubing against the wheel, and also to permit of swinging the work to any angle. The tubing is passed through at a slight angle, and the "flash or bead" is removed by the wheel, which becomes concave.

Sand-Blasting Machine, Barrel-type
Pangborn Corporation, Hagerstown, Md.
"American Machinist," November 10, 1921.



The machine is of the barrel type, and is especially intended for use in small industrial plants where the parts to be cleaned are not large and where only comparatively small capacity is required. It consists of a sheet-metal, dust-tight cabinet on a structural-steel frame. The bottom is a hopper to receive the abrasive. The barrel or drum mounted within this cabinet is 24 in. in diameter by 16 in. long and is power driven. The work in the barrel rotates slowly, all pieces and faces passing under the blast action.

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ark., Springtown—C. P. Ogdon—oil filtering plant.

Cal., Santa Cruz—F. McMillan—automatic wood-turning lathes and woodworking tools.

Conn., Greenwich—E. A. Wood. Stanwich Rd.—one No. 4 Burke milling machine.

Fla., Chuluota—D. G. Zeigler—brick machines, concrete block machines, tile machines, concrete mixers and other machinery and equipment for brick and concrete manufacturing. Wants to correspond with parties who can contract to build special machines from drawings.

Fla., Inverness—The Inverness Coca-Cola Bottling Co., W. T. Baxley, Mgr.—shafting and bottling machinery for new factory.

Fla., Pensacola—The Figland Park Canning Co., c/o W. Honsberger, Secy., Route A, Box 219—complete installation of machinery for proposed canning plant.

Fla., Sumica—The Florinda Mill & Planing Mill, W. J. Frank, Mgr.—one 6 x 15 fast feed planer and matcher; blow pipe system complete for planing mill; one covel circular saw grinder for 60 in. saws; Moore dry kiln.

Ill., Chicago—Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Walker, Purch. Agt—one heavy duty type crank shaper 24 in. stroke; one heavy duty type 2 in. double head bolt cutter and one heavy duty type gap engine lathe to swing 18 in. over bed.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—one 3,000 to 4,000 lb. Detroit or standard make electric hoist with 220 single phase, 60 cycle alternating current motor.

Ill., Chicago—The Purch. Dept. of the International Harvester Co., 606 South Michigan Blvd.—one 43 in. to 45 in. round listing magnet.

Ill., Chicago—B. H. Wilson, 409 Transportation Bldg.—
One set sand sieves 20 and 30 mesh standard 8 in. dia., brass rims also other mesh sieves up to and including 80 mesh.
One set cement sieves 100 and 200 mesh, standard 8 in. brass rims with lid and bottom.
One set stone sieves single and gang molds A. S. C. E. Briquette.
One 1,000 lb. and one 2,000 lb. Olsen shot cement testing machine.
One vicat needle.
One Olsen permeability testing apparatus.
One steaming apparatus, 15 x 15 x 30 in.
One Olsen drying oven.
One set Olsen pans plate No. 47.
One Olsen graduate plate No. 48.
One Olsen scale plate No. 51.
One temperature apparatus plate No. 52.
One hand temper plate No. 53.
Six 8 in. mason trowels.
Two Physical testing machines, Olsen or Richle.

Ill., Cicero—The Dearborn Truck Co., 1301 South Cicero Ave.—one air compressor direct motor or belt drive, capacity not less than 140 cu.ft.

Ill., Granite City—H. C. Quin, 2425 C St.—smoke stacks, belts, shafting and motor.

Ill., Quincy—The Illinois Mfg. & Supply Co., 222 Commercial Alley, C. N. Terwische, Pres.—bending roll capacity 1 in. steel plate, 8 ft. wide.
Punch and shear, 36 in. throat, capacity 1¼ in. through 1 in. and suitable for shearing 1 in. steel plate.
One 20 in. drill press.
Steam hammer.
One 30 in. or 36 in. band saw.
One wood lathe.
One 24 in. iron lathe.

Ill., Rock Island—D. Donaldson Co., 1716 25th St.—repair machinery including chain hoist.

Ill., St. Anne—Builders Specialty Mfg. Co.—cupola 2 ton capacity blower with flasks.

Kan., Oswego—H. Romine, garage—drill press, lathe, shafting and belting.

Mass., Worcester—The Wickwire Spencer Steel Corp., 69 Hammond St.—"Medart" straightening machine, for straightening ½ in. steel wire in 18 ft. lengths.

Md., Baltimore—The Aromo Mfg. Co., 308 South Hanover St., A. W. Smith, Mgr.—bottling machinery and chemical apparatus, including mixers, sifters, etc.

Md., Baltimore—The Enterprise Building Co., 2532 Hollins St., J. H. Dewitz, Pres. and Mgr.—mill working machinery including saws, jointers, tenoners, sanders, etc.

Mich., Cadillac—The Cadillac Lumber & Chemical Co., W. L. Saunders, Purch. Agt.—special machinery to manufacture wood alcohol and acetate of lime.

Mich., Detroit—The Cartwright Die & Tool Co., 2962 Hart Ave.—die making equipment.

Mich., Detroit—The Superior Pattern Wks., 1334 Maple St.—one B. & S. mill No. 2; one Van Norman No. 2 and one shaper (used).

Mich., Iron Mountain—The Iron Mountain Publishing Co.—paper cutting machine.

Mich., Port Huron—The Peg Tire Co., 319 Water St.—equipment for automobile and tire repair shop including moulds and vulcanizing equipment.

Mo., Joplin—The Apex Phonograph Co., 1904 South 4th St.—wood turning lathe also a dozen hand screw clamps.

Mo., Joplin—The Barnett Printing Co., 1607 Main St., W. F. Barnett, Purch. Agt.—power printing press for job work.

Mo., Joplin—E. Beasley, 313 West 4th St.—lathe, shafting, belting and small tools for garage.

Mo., Joplin—The Davis Auto Repair Co., 1821 Main St., D. Davis, Purch. Agt.—lathe and drill press.

Mo., Joplin—Helling & Herrod, Division St. and Bway., R. Helling, Purch. Agt.—drill press, drills, lathe, shafting and belts and small hand automobile tools.

Mo., Joplin—The Joplin Typographical Union, c/o J. Murray, Secy.—printing press for news paper and one for job work also metal sawing machine.

Mo., Joplin—A. B. McConnell, 115 East 4th St.—drilling tools and rig.

Mo., Joplin—G. Seward, 918 Bway.—drill press and lathe.

Mo., Joplin—The Western Mfg. Co., 1705 Main St., W. G. Proctor, Purch. Agt.—woodworking machinery, belt, shafting, wood saw and motors.

Mo., St. Louis—Thomsen Planing Mill Co., 1700 South Vandeventer Ave., J. Thomsen, Purch. Agt.—woodworking machinery, 3 drum sander.

N. J., Beverly—J. A. Bidwell & Co., Inc., 413 R.R. Ave., J. A. Bidwell, Purch. Agt.—looms, shafting, pulleys, etc., for new factory.

N. J., Trenton—Peters Auto Co., Commonwealth Bldg., has purchased factory at Bethlehem, Pa.—and plans to install machine tools and machinery for the manufacture of touring cars. W. P. Cubberley, 111 East State St., Trenton, Vice. Pres.

N. J., Trenton—The Star Porcelain Co., Muirheid Ave.—machinery for new addition to plant.

N. Y., Adams Center—S. Dibble Co.—power hack saw, and swing cut off saw for woodworking.

N. Y., Baldwinsville—The Morris Machine Co.—scroll saw, band saw for pattern maker and electric sander.

N. Y., Binghamton—The Pennsylvania Ave. Garage, H. D. Williams, Purch. Agt.—one 18 in. engine lathe and electric hand drill.

N. Y., Brooklyn—The Elgin Knitting Mills, 73 Roebling St.—"Brinton" cylinders 24 or 36 gage, 16 in., 12 to 14 cut.

N. Y., Buffalo—The Aldrich Mfg. Co., 55 Illinois St.—lathe with 20 in. swing or more and full equipment, also plating barrel, complete, with or without plating tank and revolving barrel.

N. Y., Buffalo—The Clifton Connor Corp., 895 Niagara St.—acetylene welding outfit.

N. Y., Buffalo—The Meyer Wagon Wks., 216 Elm St.—woodworking machinery.

N. Y., Canandaigua—The Miller Corset Co., E. H. Miller, Purch. Agt.—special machinery for the manufacture of corsets.

N. Y., Clinton—The Franklin Lithia Springs Inc., O. G. Burns, Purch. Agt.—machinery and equipment for bottling.

N. Y., Dunkirk—G. H. Graf—machinery for the manufacture of furniture.

N. Y., Jamestown—The Lake City Ice Cream Co., F. E. Bufton, Purch. Agt.—ice cream making machinery.

N. Y., Mannsville—J. Muller, J. McKone, Purch. Agt.—milk and ice handling machinery and equipment for milk station.

N. Y., New York—The Otis Elevator Co., 11th Ave. and 26th St.—one 14 in., one 24 in. and two 18 in. geared head engine lathes; two ¾ in. spindle high speed drill presses; two double end dry grinders and one cold cut-off saw for Cleveland and Detroit plants.

N. Y., New York—A. Stroud, 327 Bway.—boring mill, 52 and 60 in., and Gorton universal graver for tire molds, (new or used). Prices boxed for export f.o.b. N. Y.

N. Y., Redwood—The Alexandria Dairymens League Co-Operative Assn., G. Hartman, Purch. Agt.—milk handling-pasteurizing machinery, refrigerating system, steam boiler and transmission equipment.

N. Y., Rochester—G. H. Higgins, 38 South Fitzhugh St.—rip saw with tilting table, about 36 x 44 in.

The Weekly Price Guide

THIS WEEK'S MARKET

NOMINAL quotation of $1.50 for structural shapes, plates and bars by certain independent Pittsburgh mills has made it increasingly difficult to purchase at the recent price of $1.35@$1.40. The minimum on large tonnages is practically confined to $1.40 per 100 lb. Soft steel bars are quoted in Chicago at $2.28 as against $2.53; bands at $2.88 reduced from $3.13 and tank plates at $2.38 as compared with $2.63 per 100 lb. one week ago. Slight advance in pig iron prices.

New York warehouses quote copper sheets at 20½@21c. as against 20½c. per lb. Recent improvement in copper, thought temporary at first, now shown to be permanent. Lead and spelter markets show improvement with no changes in price. Slight drop in cotton waste quotations in Chicago. Increased discounts on rubber and duck belting in New York warehouses. Linseed oil prices firm throughout the country.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.00
Virginia No. 2	27.75
Basic	19.84
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods(base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.25	3.40
Cold finished flats, squares	3.85	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.28
Soft steel bar shapes (base)	2.53	2.36	2.28
Soft steel bands (base)	3.13	....	2.88
Tank plates (base)	2.63	2.46	2.38
Bar iron (2.00@2.10 at mill)	2.53	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅝	8.50		12@13
¼	7.15		11@12
⅛ to ⅜	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	30.25
Lead (up to carlots), St. Louis, 4.60; New York	5.00
Zinc (up to carlots), St. Louis, 4.77½; New York	5.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	20.25@21	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	10.50
Copper, heavy, and wire	9.50	9.50	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.99	.91
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.00
Cone heads, ditto (net)	3.60	3.35	3.35
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	.....
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

N. Y., Rochester—L. Petrie, 241 South Ave.—one 8 ft. tinners brake, one 20 in. former and one crimper.

N. Y., Rome—The Acme Cylinder Grinding Co., M. J. Kernan, Purch. Agt.—grinder and equipment for auto cylinders.

N. Y., Sackets Harbor—The Weaver Machine Co., W. H. Weaver, Purch. Agt.—one portable electric drill, 110 volt, 60 cycle, 3 phase.

N. Y., Warsaw—G. Scott, Clinton St.—complete job printing outfit.

N. Y., Warsaw—The Warsaw Elevator Co.—boring bars, etc. for J 28 in. Gisholt turret lathe.

N. Y., Watertown—F. G. Hall, 219 Arlington St.—bench miller and 14 in. shaper.

N. Y., Watertown—F. F. O'Brien, 267 No. State St.—small portable oxy. acetylene welding cut-fit for light work, (used), also one electric driven air compressor and tank.

N. Y., Watertown—The Watertown Battery & Electric Co., Inc., 1313 State St., G. Tolbert, Purch. Agt.—machinery and equipment for the manufacture of storage batteries and electric equipment for testing and charging.

N. Y., Yorkville—The Railway Silk Corp., R. B. Pflueger, Purch. Agt.—silk weaving machinery and equipment and transmission equipment.

N. C., Bailey—S. Wilson—saw mill and woodworking outfit.

N. C., Elles—C. W. Rothrock—saw mill, No. 1 Lane preferred, (used).

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., A. Jones, Purch. Agt.—one No. 55 or No. 60 Heald cylinder grinder.

O., Cincinnati—The Randle Mchy. Co., Cincinnati, Hamilton & Dayton R.R. and Pogues St., G. Bierbaum, Purch. Agt.—guillotine shear, to shear two 12 in. x 2½ in. bars or four 8 in. x 2 in. bars with motor drive, 60 cycle, 220 volts, 3 phase, ac.

O., Cleveland—The Amer. Steel & Wire Co., Western Reserve Bldg.—one 18 x 8 and one 16 x 8 lathe, both belt driven.

O., Cleveland—The S. H. Vehicle Co., 3291 East 65th St.—one 8 in. jointer (used).

O., Columbus—The Bingham Mfg. Co., 31 East Livingston Ave., H. N. Bingham, Pres. and Genl. Mgr.—two milling machines, one turret lathe, two smaller lathes and two broaching machines.

O., Columbus—The Smith Lumber and Supply Co., 1845 East Long St., A. H. Smith, Pres.—purchased plant of Columbus Woodworking Co. and will install additional machinery including bender and planer.

O., West Park—The city, W. Dahm, Dir. Pub. Serv.—one 3 yd. steel dump body and hydraulic hoist.

Pa., Germantown—W. Whitaker & Sons, (cotton goods)—new Draper looms.

Pa., Penbrook—The Penbrook Knitting Co., J. L. Lenker, Pres.—sixteen machines with auxiliary apparatus for wool yarn manufacturing.

Pa., Phila.—Ayears Mfg. Co., Mascher and Turner Sts.—looms, shafting, hangers, etc.

Pa., Phila.—The Belgrade Textile Mills Inc., 2845 Belgrade St., A. Bartelt, Vice Pres.—machinery for textile manufacturing.

Pa., Phila.—Chair Exchange, 6th and Vine Sts.—several woodworking machines (used).

Pa., Phila.—The city, Dept. of Hy., 216 City Hall, F. C. Dunlap, Engr.—one threading machine, tire bender, tire and axel upsetter and welder, one 20 in. stationary head upright drilling machine and one single end power shear.

Pa., Phila.—The Electric Fdry. & Machine Co., Tacony and Bleigh Sts.—electrical furnaces, cranes and other machinery for new foundry.

Pa., Phila.—The Fowler Bolting & Fiber Mills, 1217 Frankford Ave.—machinery for the manufacture of fiber and jute.

Pa., Phila.—The Grisinger Machine Wks., 904 Quarry St.—additional machinery for new factory.

Pa., Phila.—W. Jahnke & Son, 1825 North 5th St.—manufacturers of truck bodies and wagons—additional wood working machinery for new addition.

Pa., Phila.—J. Kalter Co., 1621 Ridge Ave., manufacturer of lighting fixtures.—additional drilling machines, cutters, lathes, etc.

Pa., Phila.—W. E. Knipe & Sons, Hancock and Berks Sts.—dyeing and finishing machinery for new factories, also equipment for machine shop.

Pa., Phila.—T. E. Millership, 3241 Germantown Ave.—additional metal working machinery for new factory addition.

Pa., Phila.—M. Moister & Co., 3931 North 5th St.—additional woodworking machinery.

Pa., Phila.—Moore & White Co., 15th St. and Lehigh Ave.—additional machinery for new machine shop.

Pa., Phila.—The Morice Twine Co., 84 Tasker St.—twine manufacturing machinery for new factory.

Pa., Phila.—The Newmont Mills, Inc., Amber and Westmoreland Aves.—textile machinery for new mill.

Pa., Phila.—The Quaker City Cold Storage Co., 301 South Water St.—additional machinery for plant on Water St.

Pa., Phila.—C. P. Roberts & Co., 1210 Arch St.—wall paper machines.

Pa., Phila.—The Rogers Hosiery Co., Lena and Collon Sts.—automatic knitters, etc.

Pa., Phila.—J. A. Welsh, 1521 North Bodine St., or 1507 North Lawrence St.—equipment for new foundry.

Pa., Phila.—Wittman-Moriarity Co., 4th and Vine Sts.—conveyors and leather working machinery in new factory.

Pa., Phila.—The Zenith Mills, 2nd St. and Allegheny Ave., S. Dryfoos, Purch. Agt.—additional looms, shafting, pulleys, etc., in new factory on Clearfield and A Sts.

Pa., Sharpsburg—The Sharpsburg Fdry. Co.—one cupola and several flasks.

Pa., Warren—The Broadbent Laundry—machinery suitable for rug cleaning, etc.

S. C., Greenville—J. E. Thackson—canning machinery and equipment for small canning plant.

S. C., St. Matthews—The Calhoun Twine Mill, A. S. Smoke, Mgr.—mill machinery for producing No. 8 yarn for mill which will soon be built; about 1,200 spindles will be operated.

Va., Richmond—The Lombardy St. Auto Repair Shop, 13 South Lombardy St., L. D. Gilbert, Mgr.—lathes, drill presses and full line of hand tools.

Va., Roanoke—The Greenstone Products Co., 1st Natl. Bank Bldg., C. E. Cosby, Purch. Agt.—six 5 or 6 yd. two-way dump cars, 36 in. gage; 12 to 15 ton of 30 lb. rails with splice bars. (Delivery at Deerfield, Md.)

Va., Stuart—J. D. Blackard Stave & Cooperage Co.—pendulum heading saw and heading jointer.

W. Va., Wheeling—The Wheeling Machine Products Co., 1920 Main St., E. W. Krause, Treas. and Genl. Mgr.—one 250 to 300 hp. direct connected steam generator unit including boiler, Ball, Allis Chalmers or Ides preferred.

Wis., Beloit—J. H. Saris, 412 Broad St.—repair tools for garage including lathe and press.

Wis., Chippewa Falls—W. E. Maddux—light power woodworking machinery.

Wis., Mayville—The Peerless Traveling Goods Co.—special machinery for proposed leather goods factory on Main St.

Wis., Merrill—Allen & Zander, H. R. Allen, Purch. Agt.—drill press, air compressor and gasoline storage tank and pump.

Wis., Milwaukee—The Amer. Knitting Co., 464 12th St., W. Schmitz, Purch. Agt.—special knitting machinery, individual motor power.

Wis., Milwaukee—The Argo Tool & Machine Mfg. Co., 345 25th Ave., C. E. Helm, Purch. Agt.—punch press for brouching.

Wis., Milwaukee—B. H. Arnold, 4001 Brown St.—lathe with 30 in. or 36 in. bed, 9 in. swing, motor power.

Wis., Milwaukee—F. Gehrmann, 1020 Grant St.—one arbor press.

Wis., Milwaukee—Jensen & Lindemann, 1105 11th St.—additional sheet metal machinery including beader and shear.

Wis., Milwaukee—P. Kral, 1303 Holton St.—upright boring machine and one sticker.

Wis., Port Washington—Huettman & Peiffer, 117 Park St., F. Peiffer, Purch. Agt.—one chain hoist suitable for small machine shop use, one air compressor, one jack and one electric motor.

Wis., Wausau—The Levenhagen Dairy Co., 612 3rd St.—dairy and refrigerating machinery for proposed plant on Washington St.

Ont., Fergus—Dye Intermediates, Ltd.—electrically operated equipment for making dye intermediates.

Ont., Goderich—The Goderich Salt Co., Maitland St.—special salt handling equipment and additional equipment to double its capacity. Estimated cost, $30,000.

Ont., Lambeth—A. Jones—complete equipment for garage and auto repair shop. Estimated cost, $40,000.

Ont., Parry Sound—Tudhope & Ludgate—equipment for proposed saw mill at Deer Lake.

Ont., Rodney—Faulds & Mulligan—complete equipment for garage and auto repair shop. Estimated cost, $45,000.

Ont., St. Thomas—Wood Gorrie Motors, Ltd., has taken over an old factory and will install equipment for assembling cars. Estimated cost, $36,000.

Ont., Windsor—The Canadian Aluminum & Brass Co., Windsor Ave.—equipment for manufacturing castings for automobiles. Estimated cost, $25,000.

Que., Montreal—The United Auto Supplies, Ltd., 68 Laurier Ave., W.—machine tools and lathe for general auto repairs.

Metal Working Shops

Cal., San Francisco — C. H. Peterson, Sharon Bldg., is receiving bids for the construction of a 1 story motor truck plant on Dore and Folsom Sts. Estimated cost, $27,000. The Italia Motor Truck Co., 556 10th St., lessee. M. Sheldon, 110 Sutter St., Archt.

Conn., New Haven—The Amer. Steel & Wire Co., 238 Fairmount Ave., will build a 1 story, 25 x 90 ft. steel and wire manufacturing plant on Fairmount Ave. Estimated cost, $40,000.

Conn., Wallingford—The Wallingford Steel Co., 60 Academy St., will build a factory for the manufacture of metal goods, including a 1 story, 100 x 130 ft., 1 story, 40 x 100 ft. and 1 story, 25 x 100 ft. buildings. Estimated cost, $60,000. Noted Feb. 23.

Ill., Chicago — B. Boches, 1608 South Central Park Ave., is receiving bids for the construction of a 1 story, 72 x 125 ft. garage at 1731-39 Roosevelt Rd. Estimated cost, $40,000. M. L. Bein, 137 North Clark St., Archt.

Ind., Ft. Wayne—Day & Zimmerman, Engrs., 608 Chestnut St., Phila., Pa., are receiving bids for the construction of an automobile factory for the International Harvester Co., 114 West Wayne St. Estimated cost, $500,000.

Minn., St. Paul—G. J. Kramer, 487 Aurora Ave., will receive bids until March 20 for the construction of a 1 story, 125 x 127 ft. garage on University and Farrington Aves. Estimated cost, $40,000. R. F. Palmer, Commercial State Bank Bldg., Engr.

N. Y., Albany—H. Rogers, Archt., 443 Bway., will receive bids about March 20 for the construction of a 3 story, 74 x 122 ft. garage on Chapel and Orange Sts. for W. W. Farley, 77 Chapel St. Estimated cost, $100,000.

Pa., Phila.—T. E. Millership, 3241 Germantown Ave. (metal worker) will soon award the contract for the construction of a 2 story, 25 x 70 ft. addition to shop. Estimated cost, $20,000. S. B. Vandersliu, Kennelsworth Apts., Archt.

Pa., Phila.—Moore & White, 15th St. and Lehigh Ave., are receiving bids for the construction of a 2 story, 60 x 165 ft. machine shop on Lehigh Ave. Estimated cost, $35,000. Private plans.

Pa., Phila.—The Phila. Steam Heating Co., Juniper and Arch Sts., has awarded the contract for the construction of a 2 story, 51 x 123 ft. office and shop at 3318-22 Lancaster Ave. Estimated cost, $60,000. Noted **Jan. 6.**

Pa., Pittsburgh—J. C. Forster & Son have awarded the contract for the construction of a 2 story, 50 x 100 ft. plant at 2519 Penn Ave. for the manufacture of tinware, steel dies, etc. Estimated cost, $40,000. Noted Mar. 9.

Wash., Puget Sound — The Bureau of Yards and Docks, Navy Dept., Wash., D. C., will receive bids until April 12 for Ordnance plant extension to Bldg. No. 368.

Ont., Fergus—Dye Intermediates, Ltd., will take over factory and equip same for the manufacture of dye intermediates, also install filtration plant. Estimated cost, $40,000. J. E. Windsor, c/o owner, Engr.

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Service in a "White" Station

Eliminating Time Waste—Layout of Stockroom—Exchange of Worn or Damaged Parts—Facilities For Handling Motors and Other Parts

By FRED H. COLVIN
Editor, American Machinist

ONE of the things that impresses a visitor to the average motor repair shop or service station is the great waste of time. Not intentional waste to be sure, but the time required to look up parts, to hunt through books and to "get ready to begin to commence." Anything that eliminates a portion of non-



FIG. 1. RECORDS THAT ARE EASY TO USE

productive time makes for the efficiency of the service station and adds to the joy of the customer, both by speeding up his work and by reducing his bill.

The layout of the Newark, N. J., service station of the White Motor Company shows careful thought as to this question of saving time. And instead of hunting through volumes of heavy books for part numbers and the condition of the stock it uses the visible index system shown in Fig. 1.

The customer for parts comes directly from the street through a door to the small waiting room, shown at *A* in Fig. 2. A clerk located at the desk *B* takes his order over the window counter *C*. Turning to window *D*, the first clerk passes a duplicate of the order to the stock clerk at *E*, who has charge of the visible index shown in Fig. 1.

The stock clerk finds the card for the piece almost instantly and gives the location of the bin containing the part, if necessary. While the first clerk is getting the piece, the stock clerk puts the price on the order, changes his stock list to correspond with the deduction, and notes whether or not this brings him to the point of re-ordering or not. The customer gets his spare part quickly, the bill is ready at the same time, and there is a record of the whole transaction including the effect of the sale on the stock on hand.

One of the cards which forms the visible index is shown in Fig. 3. The cards are fastened on the leaves, as shown in Fig. 1, and keep a complete record of all stock ordered, received and delivered, a card being provided for each separate part. The left-hand portion of the card refers to orders to, and goods received from, the factory. The remainder deals with the local orders and shows the balance on hand at all times. There is also a space for the maximum and minimum amount to carry in stock. These amounts, of course, vary with the parts and can be changed when it seems advisable to do so. The maximum is usually a three months' supply, the minimum one month's.

Whenever the stock of any part reaches its minimum the stock clerk puts a red card in the index. This card bears the legend "Stock has reached a Minimum—Order Today." These cards are removed each day by the stock record clerk, the date and amounts of the orders being entered in their proper places on the regular cards, Fig. 3. When either the whole or part of the order is received, an entry is made in the proper column. If the order is not complete the date when the balance is due is also entered.

The form of order request used is shown in Fig. 4 and is known as Form R-96. The stock record clerk uses it to report to the storekeeper. This form is uniform for all the branches and instructions for using it are given on the back and are quoted herewith to indi-

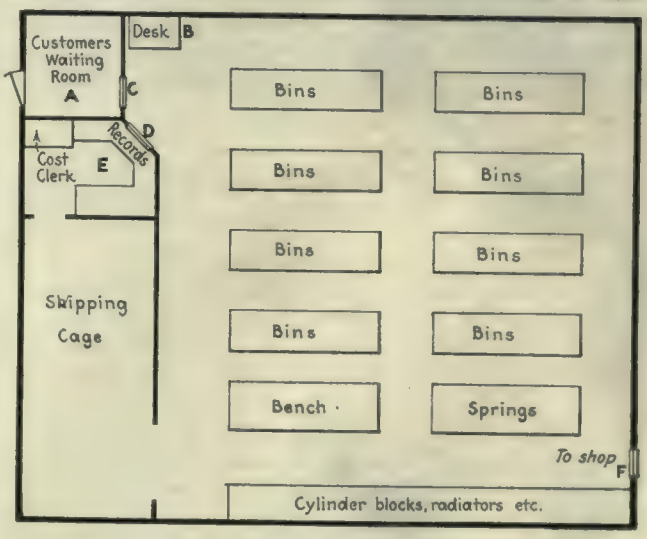


FIG. 2. PLAN OF THE STOCKROOM

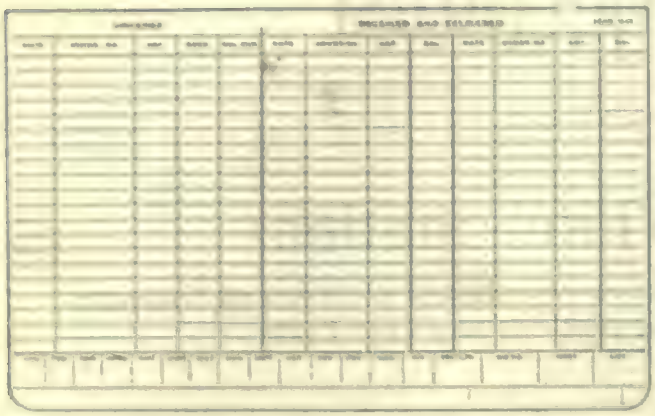


FIG. 3. STOCK RECORD CARD

cate the completeness of the control over the stock on hand. The instructions follow:

(1) The order request, Form R-96, is to be used by the stock record clerks in the branch offices for reporting to the storekeepers, at the close of each day's business, the various items of stock that have reached their minimum and should be ordered.

(2) The stock record clerk will list the items that are to be ordered in the numerical order of the parts numbers—The maximum quality, balance on hand, minimum, quantity used last three months and bin location should be transcribed from the stock record cards and listed on the order request form with each particular item. Particular attention should be directed to seeing that the quantity recorded in the "Balance-on-Hand" column agrees with the quantity actually in the bin.

(3) The order request will then be submitted to the storekeeper, who will assign shipping instructions, approve and refer to the typist for transposition to Form S-89.

(4) When the order has been transcribed to Form S-89 (not shown), the typist will enter on the order request "Date Order Entered," branch office order number, sign and return to the stock record clerk.

(5) The stock record clerk will then enter the order on the stock record cards and hold the order request pending receipt of acknowledgment of the order from the home office. Upon receipt of this acknowledgement the home office order number will be inserted in the proper place on the order request which will then be referred to the receiving clerk.





FIG. 5. STORAGE BINS AND SPRINGS. FIG. 6. SPARE CYLINDERS, RADIATORS AND WHEELS



FIG. 4. FOR ORDERS FROM FACTORY

(6) The receiving clerk will check and place in stock the parts, as received, noting in the column "Quantity Received" the amount of each particular item. The order request will then be returned to the stock record clerk, together with copies of the packing records, that proper entry may be made of the receipt of the material on the stock record cards.

(7) When the order is not received complete the stock record clerk, after making the necessary entries, will return the order request to the receiving clerk, who will hold it pending receipt of the balance of the items. When the order is completed and proper receiving entry has been made on the stock record cards the order request will be filled with the formal order.

(8) Provision is made in the upper right-hand corner of the order request for it to be numbered by the branches, if they so desire, to assist them in keeping

proper record of each order request issued in their offices.

Referring to Fig. 2 once more, the general layout of the stockroom becomes clear. The bins are of metal, numbered so that stock can be easily found. Bin 723, for example, is the twenty-third bin in the seventh row. The shipping cage adjoins the record office so that the proper bills and tags can quickly be made out and go with each shipment.

benches shown in Figs. 7 and 8. Completed motors are tested on the stand shown in Fig. 9 and it is the boast of the shop that when an overhauled motor leaves the shop it is a "White" motor in every way. It can be cranked in the usual way and does not have to be started by towing as is sometimes the case.

Just outside the stockroom and convenient to the rest of the shop is the toolcrib, shown in part in Fig. 10. Every effort is made to keep the tools needed so that

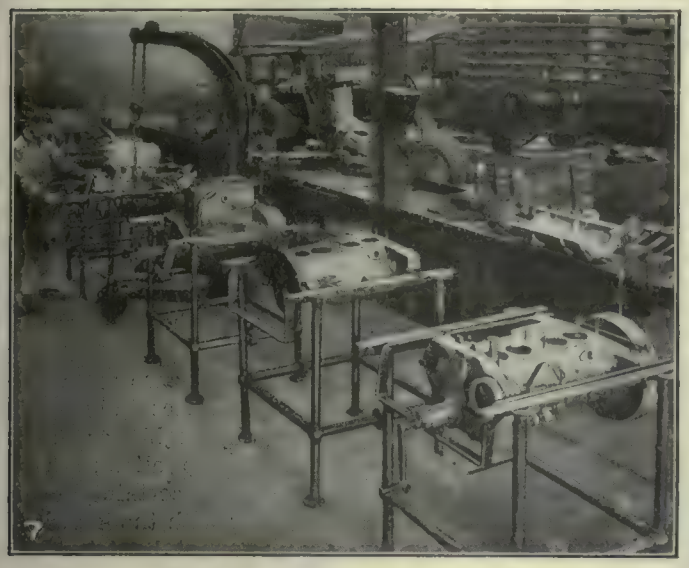


FIG. 7. STANDS FOR MOTOR OVERHAULING.



FIG. 8. OVERHAULING A TRANSMISSION.



FIG. 10. THE TOOLCRIB.



FIG. 11. MOTOR HANDLING FACILITIES

In Figs. 5 and 6 are shown some views in other portions of the storeroom and show how neatly and compactly the stock is kept. Springs, radiators, cylinder blocks, pistons, connecting rods and transmissions are kept in readiness to supply breakdowns and to get the truck into service again at the earliest possible moment. The repair shop draws parts from the corner of the store room as shown at *F* in Fig. 2. This avoids confusion with customers buying parts and keeps the two outlets for storeroom stock entirely separate.

This shop is equipped to handle, not only maintenance and replacement work, but also complete chassis rebuilding jobs. But the dis-assembling, replacing worn parts, fitting new bearings, etc., are handled on the stands and they can be quickly found and to see that they are in good condition. Tools are checked out in the usual way.

Facilities for handling motors in and out of the truck chassis are provided by an overhead monorail with hoists and by a portable crane. Rear axles, frames, etc., can also be handled in a similar manner as well as transmissions and other parts which require lifting by mechanical means.

One of the interesting features of this service station —one that emphasizes the word "service"—is its method of replacing or substituting parts to enable a truck to be kept in use. If for example, a leaf or two has been broken in one of your springs, your truck is not tied up

while the spring is being repaired. Instead, you drive into the station, the old spring is removed and a complete spring put in its place. You pay for the cost of changing the spring and of putting the broken spring into good condition. But in any case you do not have to buy a whole new spring in order to keep your truck in operation. Nor do you wait while it is being repaired.

This same system extends to radiators, magnetos, cylinder blocks, crankshafts, in fact to complete motors. The spring or radiator or motor which you leave is repaired and put in good order for the next man. They are not sold as new but they have miles of good service in them and at a fair price. And, after all, it is miles that you buy when you purchase a truck.

Cylinder blocks, ground and with pistons ready for assembling, are ready if through the freezing of a water



FIG. 9. TEST STAND FOR MOTORS

jacket or other cause, you need one. If faulty ignition can be traced to the magneto, a spare magneto is slipped into place and the truck immediately gets into the earning class once more. Meantime the defective magneto is repaired at your expense and put in stock ready to help out the next man who gets into difficulty from the same cause.

Spare wheels are in stock also, some with solid tires in various stages of wear or service and some without tires. Experience has shown that it is more satisfactory to rent these wheels than to sell them, the tire factor probably being responsible for this decision.

Service, the keeping of trucks in condition to earn dividends on the investment, seems to be the mainspring behind this station. It can well be the impelling motive in all repair stations which hope to build a lasting reputation for the motor vehicles which they handle.

Automobile Headlight Regulations

A great deal of interest is now being shown in regulations governing the headlights used by motor vehicles. The Bureau of Standards has assisted local authorities and the manufacturers through tests of these devices, and already quite a number of the states have framed laws to govern the use of lights on automobiles.

A Simple and Practical Apprenticeship System

By D. M. McLean

During the war many foundries, machine shops and other metal-working establishments were obliged to suspend their apprenticeship systems wholly or in part, due to emergency conditions and the necessity for the largest possible production of munitions. Under the type of organization necessary for this purpose there was little or no place for the apprentice as such, the employment of large numbers of machine operators and the subdivision of machine operations being carried out to an extent never before witnessed.

With the gradual return to normal, nearly all shops have restored their apprenticeship systems and, in some cases have revised them to meet present-day conditions. A well-planned, definite contract between employer and apprentice results in the greatest degree of mutual satisfaction and accord. Such an agreement cannot wisely be dispensed with nor can it be handled in a half-way manner.

It is generally admitted that a well-drawn apprenticeship contract secures to the apprentice: (1) A full opportunity to learn his trade thoroughly as far as equipment and facilities of the shop allow; (2) A definite rate of remuneration with a certainty of increases at proper intervals, together with the knowledge that special exertion on his part will be taken into account and will result in an earlier termination of the apprenticeship period; (3) personal interest in and observation of the apprentice by the employer. The regularly indentured apprentices in most shops today are under the care of a superintendent or supervisor, reporting directly to the general manager or the works manager. Whatever his title, the work of this official is of considerable importance and has a direct bearing on the progress of the apprentices and the future supply of skilled mechanics for the particular industry concerned.

From the standpoint of the employer, a definite and satisfactory apprenticeship contract guarantees to the employer: (1) Persistent service of the apprentice during the stated period; (2) a better type of apprentice. The requirements of the better forms of apprenticeship agreements insure more careful selection of candidates and a higher grade of intelligence in accepted applicants than formerly.

The incentives included in the later apprenticeship contracts usually include a bonus on completion of the apprenticeship period, allowance for attendance at classes of various kinds, and other ways whereby extra application will result in the earlier completion of the period. These all tend to the development of greater diligence on the part of the apprentice and his earlier arrival at a productive state, all of which are features of importance to the employer.

The apprenticeship form given herewith is suitable for use in medium and smaller size plants, and was adopted by an Eastern manufacturer as simple and effective after a careful investigation of the subject.

The increase in hourly rates at the end of the half year instead of yearly, the allowance for overtime, increase in rate when regularly employed on a night shift, allowance for attendance at technical classes and the admission of apprentices to any existing premium or bonus systems are all features which act as strong

incentives to continued application and persistence until completion of the apprenticeship period. They are seldom all employed by any one firm at one time, or embodied in a single contract form as in this case. This system, as here outlined, has been given a thorough trial for some three years, under the care of a supervisor of apprentices, with a marked quickening of interest on the part of the apprentices, and an increase in the number of applicants who wish to apprentice themselves to various trades.

TERMS OF APPRENTICESHIP
TO THE
BLANK MFG. CO.

AGE:	(1)	Apprentices must be not less than 16 years of age. They must be physically sound, of good moral character, and have received an education acceptable to the Company.
APPLICATION:	(2)	Application must be made on forms provided by the Company, and, if accepted, the applicant's name will be registered, and due notice given when he will be required to commence work.
TRIAL:	(3)	Apprentices must serve a six month's trial period. If the apprentice shall, during this term, prove satisfactory, and shall before the expiration thereof execute, together with his father or guardian, this agreement then his apprenticeship shall date from the beginning of the term of trial and shall continue for the full period, unless sooner terminated, as hereinafter stated.
TERM:	(4)	The term of apprenticeship is four years, each year to consist of 2,750 working hours, which, with the usual working week of 55 hours, is equal to 50 weeks —the remaining working days in each year shall be allowed apprentices at such time as the Company directs. If the apprentice works more than 2,750 hours in any one year, the extra time will apply to a reduction of the following year, or to his term of apprenticeship.
LOST TIME:	(5)	Apprentices shall make up lost time at the expiration of each six months period, at the rate of wages paid during said period, and no year of service shall commence until the apprentice shall have fully made up all time lost in the preceding year.
WAGES:	(6)	The regular rates of pay will be: 1st year: 1st 6 months, — cts. per hour, 2d 6 months, — cts. per hour, 2d year: 1st 6 months, — cts. per hour, 2d 6 months, — cts. per hour, 3d year: 1st 6 months, — cts. per hour, 2d 6 months, — cts. per hour, 4th year: 1st 6 months, — cts. per hour, 2d 6 months, — cts. per hour.
OVERTIME:	(7)	All overtime will be paid at —% increase over regular rate of pay.
NIGHT WORK:	(8)	In case an apprentice is required to work on a night shift, his rate of pay will be increased — cts. per hour.
TECHNICAL CLASSES:	(9)	Apprentices will be allowed one day off their time on any period, for each evening they attend a class of the Industrial Drawing Schools, or of any approved technical classes of the Y. M. C. A., or other approved institution.
PREMIUM CONDITIONS:	(10)	Apprentices will be afforded the advantages of our premium or bonus system, whereby their earnings are increased for higher production, in accordance with the provisions of this system.
PRESENT:	(11)	At the expiration of 11,000 hours of apprenticeship, a present of Fifty Dollars ($50.00) will be made to the apprentice signing this agreement. Should an apprentice leave our employ, this agreement is cancelled, and would not apply on another engagement, without another signed agreement.
TOOLS:	(12)	Apprentices are allowed to purchase all necessary tools from the Company at cost, and pay for them in easy weekly payments.
CONDUCT:	(13)	Apprentices will be required to perform their duties with punctuality, diligence and fidelity, and to conform to the rules and regulations which are or which may be adopted for the government of the shops.
TOBACCO:	(14)	Apprentices are not allowed to use tobacco in the shops during working hours.
TERMINATION OF ENGAGEMENT:	(15)	The Company reserves the right, whenever the state of business demands it, to shorten the hours of labor, or whenever, for any reason, it shall stop the works, to suspend apprentices wholly or in in part; and the making up of time so lost shall be at the discretion of the Company. The Company also reserves the right, in its sole discretion, to terminate its agreement with any apprentice, also to discharge him from its employment for non-conformity with its rules and regulations, want of industry or capacity, indifference to his duties or improper conduct within or without the shops.

Romances of Metal Working
The Smith Who Couldn't Be Burned

By H. H. Manchester

According to a story in one of the manuscripts of the Arabian Nights, reports kept coming in to one of the head men of the district that there was a blacksmith who could handle live coals without being burned. In order to look into this, the officer, who was very religious, dressed himself as an ordinary traveler and stopped at the smith's. There he saw the smith handling hot iron unconcernedly. He watched to see if the smith used any black arts to protect himself, but witnessed nothing of the sort. At night and in the morning he saw that the smith attended to his devotions scrupulously, but did nothing that could protect himself from the fire. At last, unable to discover the explanation of the miracle, he disclosed his identity, and demanded of the smith how he did this thing. Whereupon the smith told him the following story:

"Several years ago I was enamoured of a beautiful slave girl, but she would have nought to do with me because it was against the law. At last when the days of the famine came, she came to me and asked for food, but I was wroth at her, and said to her, 'You who have repulsed me, shall not have one bit of bread from me as long as you treat me thus.' But she rose and left me saying: 'Better I should die of starvation than break the law.' Twice more she came to me for food, and each time I repulsed her as before. The fourth time, however, I thought to myself, Who am I, that I should place my wishes in the scale with a human life? And I set food before her, and bade her eat and fear not. Thereupon she said, 'Inasmuch as you bid me to eat unafraid, I pray to Allah that you may hereafter handle red hot iron and live coals without danger.' And ever since then it has been as she prayed."

Leaving out of consideration the smith's explanation, the legend indicates that the secret of handling live coals as practiced by modern exhibitors was already known to certain members of the craft.

Metallic or Carbon Electrodes for Arc Welding

When welding sheets below ⅜ in. in thickness, it is best to use a metallic electrode. However, for metal over ⅜ in. thick it is ordinarily preferable to employ a carbon electrode. These statements were made by A. L. Price, of the Franklin Machine and Steam Boiler Works, when addressing recently the Metropolitan Section of the American Welding Society.

There was no question in the speaker's mind as to the fact that the metallic electrode gives a stronger and more satisfactory joint when arc welding. Welding may be performed much more rapidly with carbon electrodes, although the joint produced is not quite as strong as that obtained with metallic electrodes. Under favorable conditions in both cases, the speed of welding a seam is about 4 ft. per hour when using a metallic electrode, and about 15 ft. per hour when using a carbon electrode.

When the carbon arc process is used, the metallic rod that is fed in to form the weld is ordinarily ⅜ or ½ in. in diameter. It should be noted, however, that in order to properly use the carbon electrode with speed and with satisfactory results, a more skillful operator is required than when using the metallic electrode.

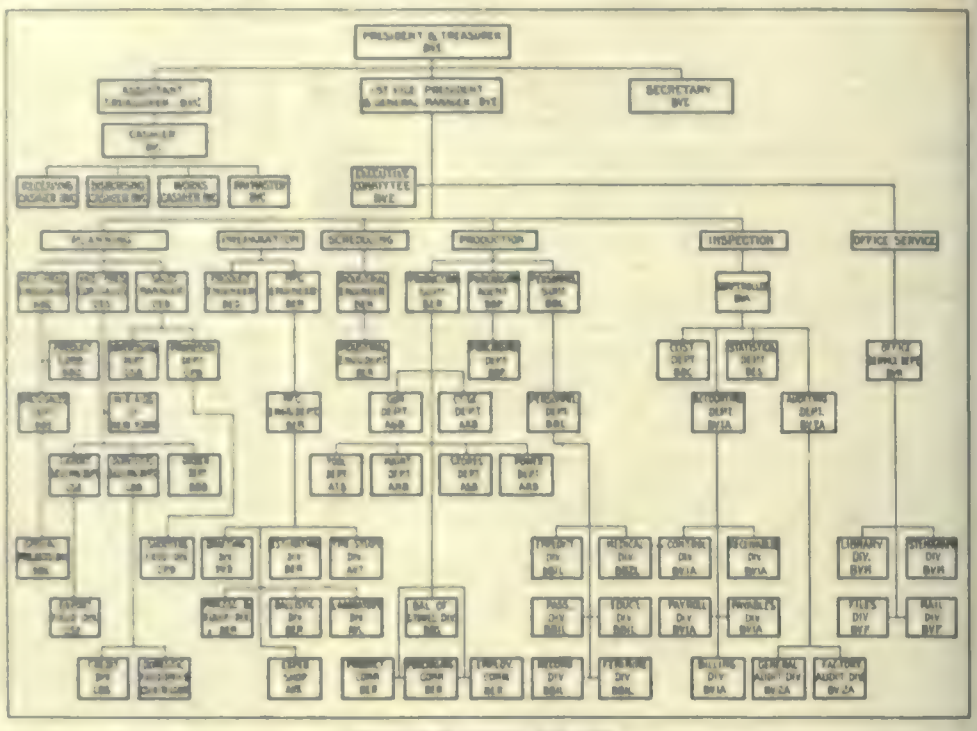
Organization Efficiency

Getting Ready for Production—Starting the Longest Job First—Special Tools Designed in Drafting Room—Work Speeded Up by Departmental Competition

BY CHARLES SORENTRUE

IN THESE times of depression, it is absolutely necessary for all manufacturers to operate at minimum cost and one of the first essentials is an efficient organization.

When any concern decides to develop and manufacture a new product, the experimental and other engineering work is too often allowed to proceed for a lengthy period before any definite procedure and schedule is decided upon. As a rule, the men engaged in the experimental and designing work will claim that work of this nature cannot be planned and scheduled with any degree of accuracy; but nevertheless, with an efficient organization it can be done. This was tried out by one of the largest munition plants in the country when it received instructions from the U. S. Government to complete the development of machine rifles and get into production. This rifle was perfected and manufacture started on a production basis within about three months after the rough model was delivered by the Government.



ORGANIZATION CHART

The work was all done according to a schedule established when the rough model was received and, due to the efficient organization, guns were produced on a manufacturing basis three days prior to the original scheduled date of completion. Shortly before the work was started, a reorganization of the personnel of the plant was effected on a five functional basis, viz: 1, Planning; 2, Preparation; 3, Scheduling; 4, Production; 5, Inspection. These functions are briefly defined as follows:

(1) Planning decides what and how.
(2) Preparation provides the means.
(3) Scheduling determines when.
(4) Production applies the force.
(5) Inspection determines the result.

In smaller organizations these functions can often be combined, but nevertheless they are all necessary to properly accomplish any task. The accompanying chart gives a general idea of this plant's organization as a whole.

I will now briefly outline how this organization accomplished the work of developing and producing the rifles in such a remarkably short time. In doing so it will only be necessary to describe the work as done by the preparation department which department consisted of the manufacturing, engineering and production engineering divisions, as this was the only department involved until the necessary equipment had been provided for the production department to enable it to start producing.

As soon as the rough model of the gun was received the scheduling supervisor of the preparation department, after very careful study of the whole situation, made a master schedule which called for completion of the following items on certain dates:

1st	Completion	of	component drawings.
2nd	"	"	a perfected model gun.
3rd	"	"	operation lists by components.
4th	"	"	steel specifications and delivery of steel.
5th	"	"	equipment drawings.
6th	"	"	manufacture of equipment.
7th	"	"	First 100 guns on a production basis.

The schedule for the engineering work was made so that the longest jobs would be started first, and this is one of the most important points often overlooked by manufacturers. Another point of prime importance watched very closely by the follow-up men, was to make certain that the tool drawings and then the tools were completed in the proper sequence, so that all tools for the first operation would be completed before those for the second operation and so on down the line.

Having only one unfinished model of the gun and no finished component drawings to start with, the first step scheduled was to make a full size assembly drawing from which was developed a perfected model and finished component drawings. While this work was being done the equipment engineers were planning the opera-

tion lists, which included operations, fixtures, gages, special tools and machines required to start production. In conjunction with these engineers the steel experts decided upon steel specifications for the components, so that the purchasing department could order the steel required for the different parts.

As soon as each operation list for a component was completed, a detail drafting schedule was established which called for completion of equipment drawings by parts and operations on certain dates and, as stated above, a systematic follow-up maintained to make certain that these schedules were adhered to.

In addition to the component drawings and experimental work, approximately 300 fixtures, 100 gages and 400 special tools were designed by the drafting room and made by the tool department. Each fixture, tool and gage was completely detailed by the drafting room, as it was found from previous experience that this was the safest, most economical and expedient method to follow. The idea of some organizations that fixtures and other tools should not be completely detailed by the drafting department is a big mistake, because if the draftsmen does not do this the toolmaker will have to do it; and when you consider that the draftsman has drawing tools, handbooks, etc., which the toolmaker does not have in the shop, it is certainly more economical to have this work done in the drafting room.

Designs of Tools and Gages Approved By Equipment Engineer

Another point which is worth while mentioning here is the method which was followed for approval of all designs of tool and gages. Each design was approved by the equipment engineer who planned the operation list, in conjunction with the production shop foreman who was to use the equipment. This was done as soon as the preliminary design was completed, and by following this procedure the shop foreman had no criticism to make of the equipment when he was ready to use it. Previous to establishing this procedure the production shop foreman would, as a rule, criticize most of the tools designed without his approval.

The personnel working on this gun was not very different from that employed on previous guns; but under a new general manager, new organization methods had been introduced which brought about a much closer co-operation between the different departments and by so doing accomplished in three months what had heretofore always taken from twelve to eighteen months to do.

By certain records and charts maintained for the different departments, each department was installed with the spirt to do better than the other departments both in quantity and quality of work produced. With this spirt all through the organization the results accomplished can be imagined.

In perfecting any organization one of the most important essentials is to place men in the executive positions who not only know how to gain the confidence and co-operation of the men whom they supervise, but who also know how to co-operate with their superiors and other executives of equal authority in the same organization. No organization will be efficient unless there is co-operation all along the line.

Italian Engineers To Stage Fair

Modern building machinery and construction materials have been in great demand for reconstruction in Europe since the war. To better meet this demand, the National Association of Italian Engineers, under the auspices of their Turin section, in collaboration with local authorities and principal industrial institutions and technical associations, have arranged a sample fair to take place at Turin, beginning April 1 and extending through May, 1922. Exhibits will include the following articles:

Class 1.—(a) Building materials (lime, cement, bricks, natural and artificial stone, earthenware, metals, asphalt, etc.); (b) machines for trying building materials, having special reference to quick trials.

Class 2.—Machinery for shipbuilding yards of every description, and for the preparation of construction (means of transportation, steam shovels, elevators, mortar mixers, concrete blocks, bricks, paving stones, pipes, and other materials.

Class 3.—Construction systems and their application (reinforced concrete, hollow concrete blocks, special bricks, construction of walls, scaffolding, dismountable materials, waterproof coverings, etc.).

Class 4.—Mural decorations (wooden and iron fittings and their parts, doors of every description, stucco, marbles, panellings, floorings, glass and glassware, paper hangings, etc.).

Class 5.—Samples of construction materials for the "unification of types."

Class 6.—Various installations (heating, electrical apparatus, elevators, hydraulic apparatus, sanitary, etc.).

Class 7.—Drawings and models of buildings, having special reference to economic houses and rural buildings.

Class 8.—Specimens of completed buildings.

Class 9.—Publications and periodicals dealing with building and professional construction.

Further information may be obtained from the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., by referring to file No. 1182.



History of the Patent Office Relief Bill

In 1917, as the Patent Office had lost a great many of its trained examiners and was unable to get suitable men to take the places and become trained as examiners, because of the insufficiency of the salaries (which had only been raised 8 per cent since 1848), the National Research Council was requested by the Patent Office to appoint a committee to investigate the situation and aid the Patent Office. Dr. William F. Durand of the council and of the American Society of Mechanical Engineers, was appointed to select the committee. The committee selected consisted of Dr. L. H. Baekeland, Dr. R. A. Milliken, Dr. S. W. Stratton, Dr. M. I. Pupin, Dr. Reid Hunt, Frederick P. Fish, Hon. Thomas Ewing and C. P. Townsend. Calvin W. Rice having been invited by Dr. Durand to name a representative for the A. S. M. E., designated Edwin J. Prindle who was later elected secretary of the committee.

The result of the efforts of this committee was the drafting of a report strongly favoring relief of the Patent Office and of the Nolan Patent Office Bill, H. R. 11,984. This bill was unanimously approved by the Patents Committee of the House of Representatives, and extensive hearings were held by the Patents Committee of the House, at which the secretary of the Patents Committee of the National Research Council was placed in charge of the production of witnesses and testimony.

Other Patent Committees

The Engineering Council appointed a patent committee to aid in the passage of the bill, as did the National Association of Manufacturers, the American Chemical Society, the American Patent Law Association and other smaller or less interested organizations.

In order that we might ask for a "rule," making the bill special and giving it an early vote a hearing was arranged before the Rules Committee of the House. The hearing was attended by over sixty representatives of all of the organizations interested in the passage of the bill, including substantial representation of every one of the engineering societies which were represented on the patent committee of the Engineering Council. The production of testimony was in charge of the chairman of that committee.

The desired rule was granted and the bill passed the House by a large majority, and went to the Senate.

In the Senate, a bill known as the "Federal Trade Commission Patent Bill," which had passed the House of Representatives, was attached to the Nolan Bill as an amendment, and the salaries specified in the bill were badly cut by amendment. The industrial public had not realized certain possible ultimate reactions of the Federal Trade Commission Bill, and considerable opposition to that portion of the Nolan Bill appeared. The bill was sent to a conference committee, composed of representatives of the House of Representatives and the Senate, and a hearing was obtained before that committee, although such hearings are not customary. Again, a very large delegation of all interested organizations was gathered, and after earnest and vigorous arguments, the conference committee recommended that the figures for salaries be restored to the values as they passed the House.

In spite of the almost unanimous demand that the Federal Trade Commission section be eliminated from the bill, the majority of the conference committee, retained that section. The bill, as recommended by the majority of the conference committee, was repassed by the House of Representatives, but it failed in the Senate solely because of the presence of the Federal Trade Commission section. On March 3, 1921, Mr. Prindle tried to reconcile Senator Reed Smoot, the chief opponent of the bill, and Senator Norris, the chairman of the Patent Committee of the Senate, Senator Smoot offering to give up his objection to the salaries if Senator Norris would give up the Federal Trade Commission section; but neither would yield.

A campaign was then organized for the purpose of creating sufficient sentiment to convince Congress that the Federal Trade Commission Bill should not be enacted, either as an amendment of the Patent Office Bill or in any other form, and thus to eliminate it entirely; and that campaign was successful. The Nolan Patent Office Bill was then reintroduced into the House at the new session of Congress, which began in April, and again unanimously reported by the Patent Committee, taking the name of the new chairman of that committee, Mr. Lampert. Although repeated efforts were made, the bill could not be brought up for a vote, and it finally developed that the floor leader of the House, Congressman Frank W. Mondell, was opposed to it. A delegation of patent lawyers from New York, Massachusetts, New Jersey and other states, called upon him, the chairman of the patent committee of Engineering Council being designated one of the two speakers.

Mr. Mondell stated his opposition strongly, on the ground that the proposed salaries were too high and that it would interfere with the bill for the general reclassification of governmental service in which he was interested. Another campaign was started through all of the organizations interested in the passage of the bill, for the purpose of inducing Mr. Mondell to consent to the bill's being brought up for a vote and to insure that it would be passed. The campaign succeeded and the bill came up for a vote, and, although Mr. Mondell and a number of other leaders of the House strenuously opposed the bill, it passed by an overwhelming majority.

Bill Passes Senate

The bill then went to the Senate and was unanimously reported by its Patent Committee, a similar campaign in favor of the bill being directed at the Senate at this time. On Feb. 14 the bill passed the Senate, without a single negative vote, and became a law on Feb. 18 by the President's endorsing his approval thereon.

The bill adds $451,000 to the payroll of the Patent Office, and increases the salaries of the examiners approximately 45 per cent, and the number of examiners 10 per cent. The bill also contains an amendment to the patent law which will make a money recovery possible in all patent infringement cases where the patent has been held to be valid and there has been any substantial use of the invention. Heretofore the rules governing accountings in patent infringement suits have been so technical and illiberal that a money recovery has been impossible in most cases. Recently a few decisions have been rendered in which a more equitable principle has been applied to a limited class of infringement cases. The amendment makes the said principle statutory and extends its application to all classes of infringement cases. The amendment has been approved in principle by a number of United States Judges, and no judge has disapproved of it. It is believed that it will greatly stimulate the production of inventions.

Press Tools for Aluminum Ware

Press Tools for Blanking, Bending and Perforating—How the Body is Drawn—Spouts Attached by Use of the Welding Torch

BY FRANK A. STANLEY

THE halftone, Fig. 1, illustrates one of many lines of aluminum utensils manufactured by the Aluminum Products Co., of Oakland, Cal. In this view the article at the left is shown before the spout is

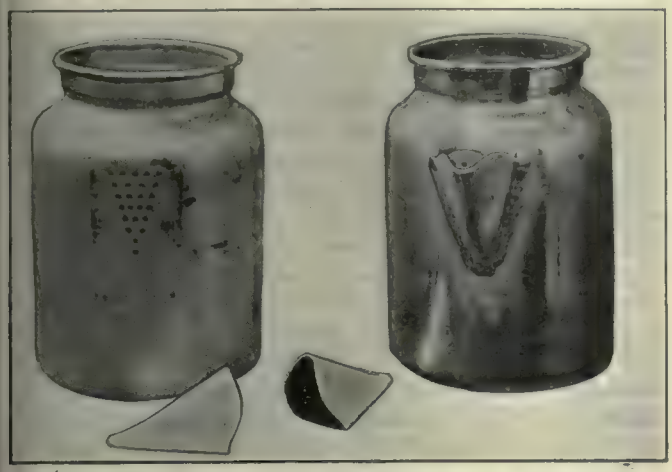


FIG. 1. AN ALUMINUM UTENSIL WITH SPOUT AND STRAINER

secured in place in order to illustrate the arrangement of the perforated holes through the shell.

The spout is blanked out in the form of a segment by means of plain tools as shown by Fig. 2. The die consists of the usual tool steel body secured in a seat in the die base by means of screws and dowel pins. There is a stripper plate over the top of the die carried upon blocks or bushings of the proper height for holding the plate in place. At the side of the plate is a stop for controlling the feeding movement of the strip of aluminum.

The punch consists of a steel block attached by screws to a holder, the latter having a shank to fit the ram of the press. In order to bend the blank to the necessary shape for the spout the work is passed through the second operation tools illustrated in Fig. 3. Here an

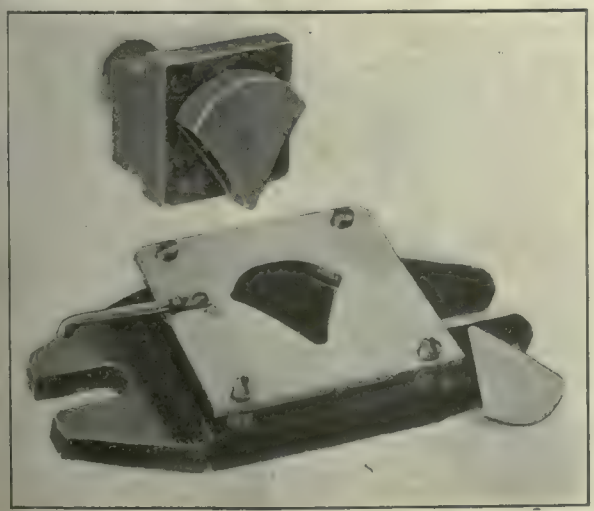


FIG. 2. BLANKING TOOLS FOR THE SPOUT

open bending die is used, being mounted on a base planed across the top to form a seat in which the die proper is fastened securely. The blank to be bent is nested against suitable stops on the die face. The punch is of the solid type and is made in the form illustrated at the right of the photograph.

The perforating operation is accomplished with the tools shown in Fig. 4. The die is of the horn type over which the work is placed for the perforating operation. In the top of the horn is dovetailed a tool steel shoe which forms the die proper. The top of the die is finished to the same radius as the utensil to be perforated, while at the back is a depression to clear the neck of the utensil and allow the work to be seated firmly on the curved face.

The punch is shown at the right in Fig. 4. It consists of a steel holder carrying a set of inserted piercing punches which pass through the spring pressure pad or

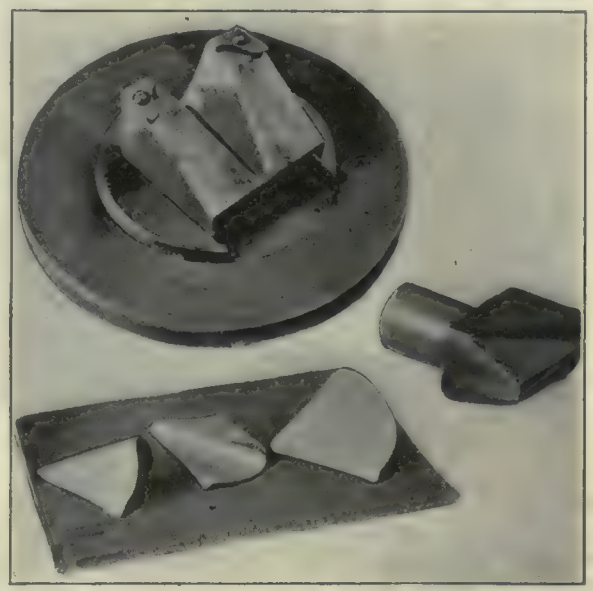


FIG. 3. BENDING TOOLS FOR THE SPOUT

stripper plate shown below the punch face. As the punch descends upon the work this pressure pad serves to clamp the utensil firmly to the die horn and, the downward stroke continuing, the piercing punches are passed through the work.

The blanks from which the work is drawn are about 13½ in. in diameter, the metal being ⅛ in. thick. The drawing is done in three operations without reducing the thickness of the metal. The first drawing operation produces a shell about 3 in. deep and 8$\frac{7}{16}$ in. in diameter. The punch for this first drawing is 8$\frac{5}{16}$ in. in diameter or smaller than the die opening by twice the thickness of the metal. In the second operation the shell is drawn to a diameter of 6½ in. and a depth of 5¼ in. The third operation draws the shell to 5⅜ in. in diameter and a depth of 6 inches.

The drawing face of the die is a tool steel plate about 1 in. thick, hardened and secured to the bolster by

screws and dowels. The drawing edge of this die is given a liberal radius, practically ¼ in. The punch is rounded at the lower end to start the metal freely into

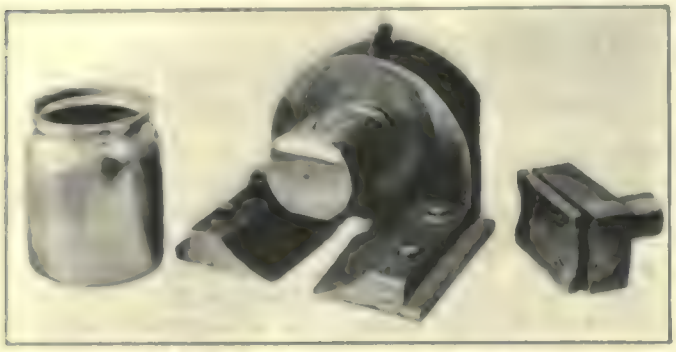


FIG. 4. THE PERFORATING TOOLS

the die. The punches used in the different operations are cast iron.

Following the drawing operation the aluminum shell is placed in a spinning lathe where it is necked and shaped to the outline shown in Fig. 1. It is then ready for the mounting of the spout as in Fig. 5. Here a



FIG. 5. ATTACHING THE SPOUT

bench is shown with a handy work stand which is swung in front of the operator as he applies the oxy-acetylene torch to the job. The work holding fixture consists of three radial arms and hubs over which the aluminum ware is slipped. The spout is held firmly in contact with the body or shell by a spring fork above which presses against the sloping face and is of such form as not to interfere with the free application of the torch.

Labor Cost in Building Machine Tools

By Simeon Williams

The article entitled "The Bugaboo of Production Costs," on page 305 of American Machinist, reports conditions so widely at variance with actual practice that some truthful statements should be made to correct any wrong ideas brought out in that article. I cannot imagine a machine tool in which the labor cost reached only 10 per cent. I know of one case where the actual labor cost was over 33 per cent of the selling cost. That, is, too high of course, but compared with 10 per cent, is far nearer actual practice.

Possibly the statements made about sumptuously furnished offices for several officials, and only ten people in the factory may have been true in one isolated instance and for a short time only, but common sense will teach any one that this could not continue long in any business.

The statement that $69 was the labor cost of a Ford car may be true of the actual Ford shops, but many parts are bought complete, like the tires, carburetors, lamps; further than that, there is a large amount of labor used to produce the steel and other materials for the car before these materials reached the Ford shops. To write an article purporting to show that labor in any article sold is as low as 10 per cent is absurd, and must have been written either by some one of very strong and pernicious, socialistic tendencies, or for the sake of an argument to bring out the correct views.

Labor costs are the controlling cost factor in everything we buy. It is true that selling costs are a considerable item, but in the machine tool business, most machines are sold through dealers on a 10 per cent basis. Some are for less, but a very few may go as high as 15 per cent—and only a very few. Overhead, based on labor costs, runs anywhere from 60 per cent to several hundred per cent, but the latter is for dull times when but few productive men are employed and when the management skeleton of good business times must be maintained. In that case, it is largely "labor" though not the actual time of men working on the machines.

The more labor saving machines and devices we produce and sell, the better for all, for then labor costs will be reduced.

Labor the Controlling Cost in Everything

Everyone should understand and every last person should know that labor is the controlling cost in everything. Take rents for example, as that is the largest expense of any one item in city living. The only reason rents are high is because the building trades have exerted every possible means, fair and unfair to keep up the wages of masons, carpenters, plumbers and all engaged in building or repairs. If they would take a fair wage, and be employed all the time, they would be far better off than at present. Buildings could then be erected to rent at a fair price, while repairs could be made at such low prices that rents would come down. Railroad rates, both passenger and on coal (for coal is one of the highest items in living expenses), are high because of the amounts paid to labor. Taxes are the same, and everything except the air we breath is high because of labor costs. Except at the present time, farm produce is low where it can be obtained direct, and where the transportation costs and dealers' costs do not enter into price of sales.

The present depression is caused more than anything else, by the continued demands of labor for more pay, until the prices of all manufactured articles became so high that people could not buy them. Then production stopped, for factories cannot run without a constant stream of sales, and thus depression spread all over the country. If all labor would go to work for 1914 wages, then production would start again, for more could afford to buy, and no sales would be made. Labor costs caused high prices, and high prices paid to labor caused the depression.

New Tools in Jobbing Shops

By H. L. Wheeler

Concerning the merits of the various classes of machines and methods for doing accurate machine work many different factors must be taken into account.

Though having had considerable experience in manufacturing, particularly of small arms and automobiles, my experience as a foreman has been exclusively in large general jobbing shops doing repair work and building most any kind of special machinery to order in small lots. This class of shop seldom harbors the best of equipment, and in my experience the ones having the old machines seem to make the most money.

Whenever a salesman came around with a new tool the old man always wished him off on me. I recall a salesman once who was selling a new toolholder. It was a fine proposition for a shop with modern lathes but for our shop it would have been but an ornament. I had to tell this man that we could not use it on our machines and that he had better try to sell the boss some new lathes first. He was convinced, when I showed him a lathe built about 1869, that his toolholder was altogether too fancy for our business.

Accurate Work Depends Upon the Man

From my experience I believe the production of accurate work depends almost entirely upon the man rather than the machine. To illustrate this contention let me cite an instance which happened while I was foreman in this shop. Our "toolmaker" was the man who took care of all small work and in addition looked after our large stock of flat drills, cold chisels, crowbars, chains, jacks, etc., and kept them in repair. He had been employed in the shop about twenty years and was a good mechanic. A part of the shop on the second floor was fenced off as a storage place for tools, and here our toolmaker was enshrined with an old lathe about 12 in. by 4 ft. It was the kind of a lathe that is guaranteed to take the heart out of anyone but an old timer—as were all the other tools in the shop.

A customer brought in eight poppet valves one day with the stems badly worn and wanted new stems put on. He was a very fussy person and cautioned me to have the diameter of each and every stem alike and to a micrometer size; no guesswork or caliper measuring would he accept. As I recall it the size was something like 0.481 in. in diameter by 10 in. long.

The old stems were cut off and new oversize stock (chrome nickel steel) welded on, and our toolmaker was assigned to the job of turning them. This man was exceptionally expert with calipers and could make a real fit on anything; but that 0.481 in. sort of got his goat. However we had to get the job done and I knew that a micrometer was absolutely essential so I instructed him in its use; furnishing one from my own kit. I had him practice for a while on some odd pieces of stock and in a short time he was able to get the idea and turn out a piece true to size.

By this time our smith had completed his part of the work and the toolmaker was ready for his first micrometer job, with full confidence in his ability to use the "mike." With the aid of a new file and some fine emery cloth, the finished job would make a modern grinder hand sit up and take notice. Eight valve stems were finished straight and true to size; at any rate our customer was very much pleased and said it was a good job. Thereafter our toolmaker had a little more respect for a micrometer and purchased one for his own work.

Any machine can be made to do good work. It's the man behind—like the man behind the gun—that counts. In 1915, in this same shop I was called upon to produce 75 lead screws for another company that was building some lathes for the British government. Could we do it? Yes we would build a battleship for Uncle Sam, or at least would not refuse a try at it.

The best lathe I had available for the lead screw job had seen something like sixty years of service. An extra screw was kept on hand for special jobs such as this. The stock for the job (ground stock) was furnished to us together with cutting tools and a gage which had to pass over the job when finished. The specifications were rigid, as all government specifications are. The screw was 2 in. in diameter by about 10 ft. in length, ½-in. pitch and 14-deg. thread. This job was finished and every screw was passed.

The next job assigned to that lathe was four large pipe coils, from 2-in. wrought-iron pipe. The coils were approximately 28 in. outside diameter by 5 ft. in length. Needless to say a micrometer was not used on this job; just a few heavy chains, iron straps, a couple of crowbars, some heavy timber, double back gears, slow speed and a little elbow grease.

Some machines in a jobbing shop will necessarily stand idle for days, and even months, at a time. It is evident that where machines have only a junk value there is little or nothing to worry about when a slack time comes. On old machines there are no depreciation charges; or at least it would not pay to bother about them if there were. A fair price is charged for the work, customers of years' standing pay their bills and come back, and the boss generally has cash in the bank and don't need a folderol system to tell him how things are going. If the bank balance is good he greets you with a smile and hands out a good smoke; if it isn't you will not need to be a mind reader or an efficiency engineer to know it.

No man of small means should attempt to start in the jobbing business with the latest and best in machines and equipment and even jobbing shops long established would do well to keep what they have.

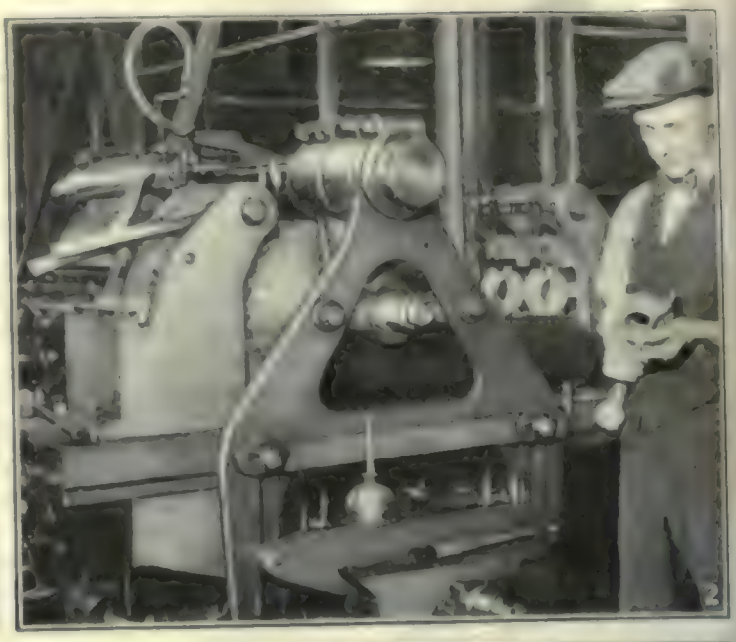
Manufacturers Must Have Best Equipment

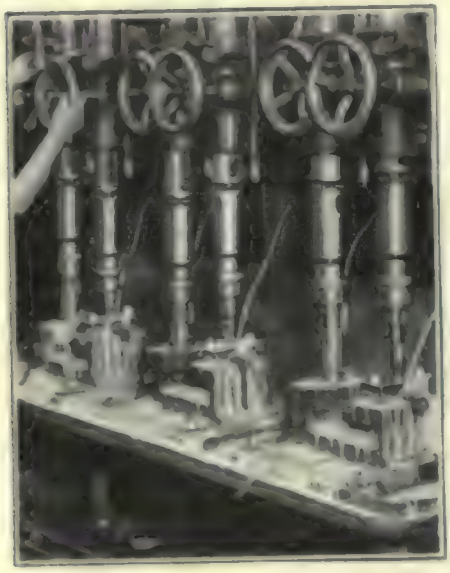
Manufacturing enterprises, on the other hand, cannot afford to be without the very last word in machines and tools. Buy a new machine today and scrap it tomorrow, if necessary, to keep up with competitors. In manufacturing work, full automatic, semi-automatic and hand operated machines are used with equal success. The class of machine to be used depends more upon the quantity than the quality of the work. Automatic machines are known to be very accurate and were it not for the wearing down of the cutting tool they could probably turn out duplicate parts indefinitely.

Special, or single purpose machines are rapidly replacing standard designs in many lines of manufacturing and will no doubt reduce the cost of certain operations where the quantity to be turned out warrants their use. Quantity production and practically continuous operation are necessary to justify special machinery, or in fact any high-priced machine.

A general jobbing business will seldom prosper with high-priced machines, but with the right kind of men and machines having a value of about one-half cent per pound they will make money when the big fellows are idle.







Marmon Connecting-Rod Methods

By Fred H. Colvin
Editor, American Machinist

SOME idea of the care used in the production of Marmon connecting rods can be had from the illustrations on this and the following pages. Each rod is given a Brinell test as shown in Fig. 1, after which the sides are milled by large inserted tooth cutters in the fixture shown in Fig. 2. This view shows the method of clamping. The clamps, to be seen at the right, straddle the bolt bosses.

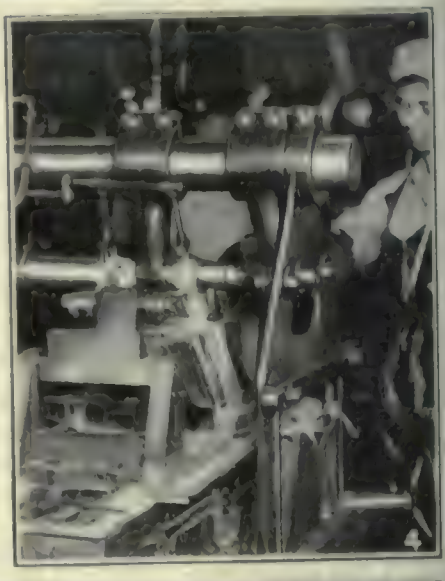
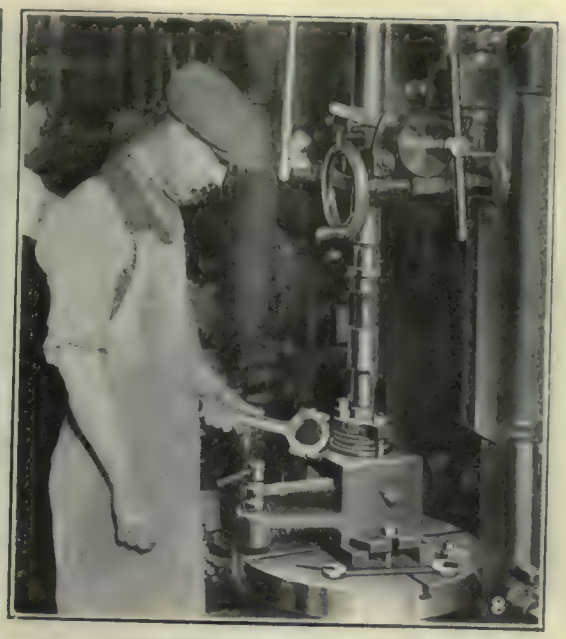


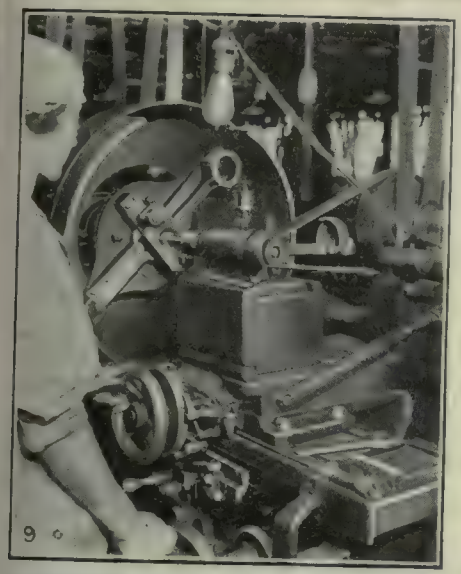




FIG. 1. TESTING CONNECTING ROD FORGINGS FOR HARDNESS ON A BRINELL MACHINE. FIG. 2. MILLING THE SIDES OF THE RODS IN A SPECIAL DOUBLE FIXTURE. FIG. 3. BORING AND REAMING RODS. FIG. 4. MILLING EDGES OF RODS IN DOUBLE FIXTURES. FIG. 5. PROFILING THE SMALL ENDS. FIG. 6. GRINDING ROD FOR CAP BEARING







Then comes the drilling and reaming, Fig. 3, the milling of the edges, Fig. 4, and the profiling of the small end, Fig. 5. The cap is then sawed from the end of the rod and the flat surface finished by grinding, Fig. 6. The rod is located from the small end, and the other end is clamped so that the ground surface will be square in both directions.

The bores at both ends are then protected by suitable covering, and the outside of the rod is sandblasted, as in Fig. 7. The large end is then finish reamed, after which the rod goes to the grinders, where the bores

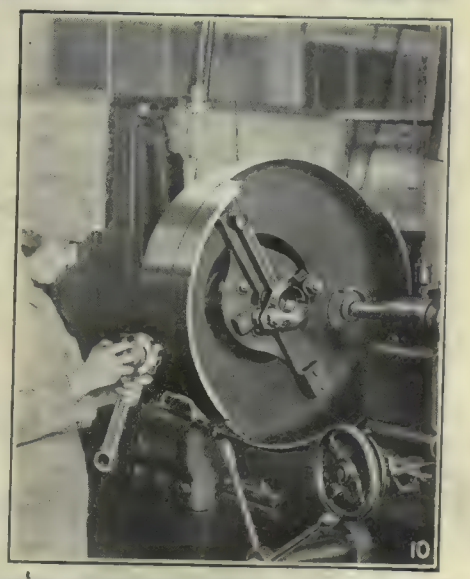
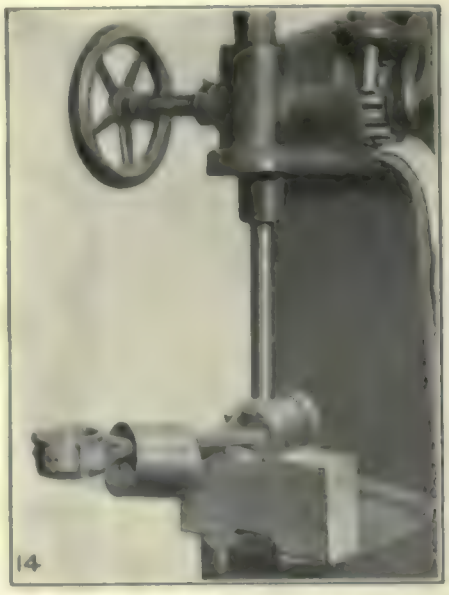






FIG. 7. SANDBLASTING THE RODS FOR FINISHING CHANNELS. FIG. 8. REAMING THE LARGE ENDS. FIG. 9. GRINDING THE SMALL END FOR BUSHING. FIG. 10. FIXTURE FOR GRINDING THE LARGE END. FIG. 11. FINISHING LARGE BEARING WITH PUSH BROACH. FIG. 12. REAMING AND TESTING THE SMALL END BEARING





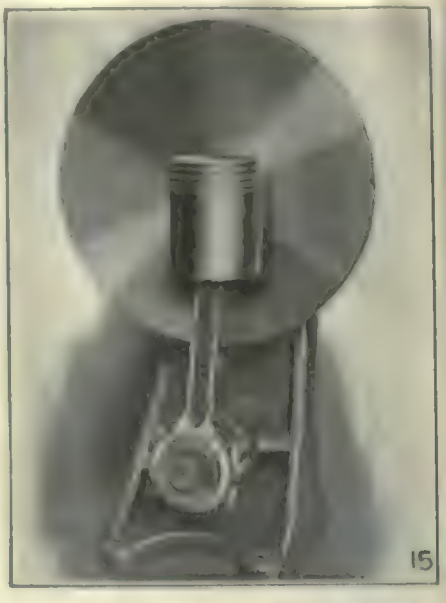


FIG. 13. TESTING ALIGNMENT OF RODS. FIG. 14. ASSEMBLING PISTON ON ROD. FIG. 15. TESTING SQUARENESS OF PISTON AND ROD

of both ends are finished, as in Figs. 9 and 10. These views show the kind of counterbalanced chuck used, and also the wheel guards which protect the workers while testing the hole after grinding. The guard is shown in both positions in both illustrations.

The finishing of the babbitted bearing surface is shown in Fig. 11, where a combined push broach and burnisher is used in a hand machine. Next, comes the final finishing of the bushing which goes in the small end, after which the rod is ready for inspection and assembly.

The fixture shown in Fig. 13 is of the usual type for inspecting the alignment of the piston pin with the crankpin bore. The white paper behind the gage aids in the visual inspection.

Assembling the Piston

The aluminum head and inner portion of the piston are assembled, as shown in Fig. 14. The piston carries a floating pin, which gives a snug fit in the aluminum portion. In order to assist in assembling, the piston is dipped in hot water which expands it sufficiently so that the pin can be easily pushed into place. Then when the aluminum expands from the heat of the motor, the fit of the piston pin will allow lubricant to enter without allowing too much play in the bearing.

The cast-iron skirt is then put in place over the aluminum body and is held by the four studs shown. The rod and piston are then tested for squareness, as shown in Fig. 15, the large circular plate making a very accurate method of showing variations.

An Appreciation of Chordal

By Sir Henry Fowler
Chief Mechanical Engineer, Midland Railway

Two years ago on Jan. 31, 1920, Chordal died, as recorded in the European edition of American Machinist in the issue of May 22, 1920, and in that issue you asked if there were any who would like to say a word or two with regard to him and his work. At the time I was unable to write as I hoped to do, thinking I would leave it until the next anniversary of his death; this too passed by without my doing so, but I do feel as one of your English readers, and one of the world-wide admirers of Chordal and his works, that I should like to write you hereon.

Chordal's Book

I first read Chordal's book considerably over 30 years ago and have ever since, in what I believe to be the best interests of "shopmen," been a "Chordal missionary." No one before had, I think, dealt with such subjects separately, and decidedly no one since has in one book given us so much common sense on shop management as he did. What he wrote then is applicable today, and in that I think is the proof of his greatness. Of the world-wide knowledge and appreciation of his writings I had a very marked example only four days ago, when I gave a lecture on shop management to the undergraduates of Cambridge University in connection with their engineering society; at dinner I met a friend of mine, who is a professor of engineering at a university in Australia, who asked me if he might come along and hear my talk. Early in the talk I mentioned Chordal and could see that I should have to be very sure of my quotations by the appreciative smile which appeared on the face of my Australian friend. As soon as I got off the platform he at once came up to me and said, "You know, like yourself, I am a Chordal enthusiast."

From what I have judged I am sure that in the States, like here, there is not a high enough appreciation of the indebtedness of those connected with engineering shops, to James W. See (Chordal).

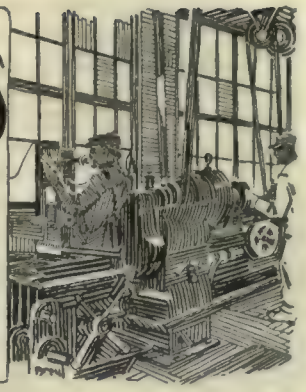
When I first went to America 18 years ago, I made what was really a pilgrimage to Hamilton, Ohio, and I still hold as a treasured memory the conversation I there had with Mr. See. It was a matter of the deepest regret to me that when in the United States on an aeronautical mission in 1918, although I got to Dayton, it was only on the telephone and by correspondence that I was able to again get in touch with one I admired so much.

I do not feel it is necessary for me to apologize for raising this subject, but I should like your readers to know that here, as well as on your side, we appreciate so much the work of a great man.



MODERN PRODUCTION METHODS

By
W P. Basset
of
Miller, Franklin, Basset & Co



XXVII. Administrative Methods

System Aids Management But Does Not Necessarily Insure Profits—Advantages of Functional Organization—Periodical Reports Save Conference Time

BECAUSE the preceding articles in this series were given up to detailed descriptions of systems for finding costs, planning production and setting standards of production, I fear that some over enthusiastic readers may get the idea that that is all there is to managing a machine shop. Forms, systems and routine are a great help to management in any shop. In the small shop of perhaps twenty-five workmen or less, where the owner is in close contact with every man and every machine, the business may, perhaps, be successfully run without system. In the large shop, however, system and routine are essential, but I would be the last one to suggest that the seeker after modern methods should put any of the systems which are described in this book into effect in his factory and expect that the system would assure profits.

System an Aid to Management

Profits come from management, and it is only as system aids management that it is of value. No cut-and-dried method can safely be applied to all shops. In fact, I question whether it is so much the nature of the work in a shop, as it is the peculiarities of temperament of the management, which determines what form a system shall take.

The same considerations apply when we consider the form of organization by means of which the shop shall be managed. When I speak of form, I refer to the methods of organization known as functional or staff, line, and the combination of line and staff.

In the functional or staff form of organization, each activity of the business is under the supervision of a specialist. Thus, we have all purchasing handled by the purchasing agent and his aids; all production planned and routed by an expert production man, the cost finding done by a corps of cost clerks, under the supervision of a chief whose sole responsibility is the gathering of costs; and so on for each activity of the business. Under the complete Taylor system, which is the most minutely worked out staff form of management, there are eight bosses, not of departments of the plant, but of activities of the workmen. There is for instance a speed boss, an inspector, a gang boss, a repair boss and so on.

If we could conceive of say, an automobile shop organized under the line plan, we would find the foremen of the crankshaft department buying forgings for his product, planning the work through his department, gathering his costs, setting the rates of payment for his workmen, hiring and firing his men, and in general being a little czar as regards every activity of his department. Needless to say, in as highly developed an industry as the automotive industry, such an organization is unthinkable, but in many of the smaller shops it exists. This, of course, is because in the small shops the business cannot bear the charges of specialists who, because of the small amount of work handled by the shop, would be busy only a small part of their time.

The line and staff type of organization is perhaps the most common. This is a combination of the best points of the two preceding. As ordinarily found, as much of the specialized work as feasible is handled by staff men, the rest of the duties of management being handled by foremen of departments in the old-fashioned line method. The great majority of machine shops are organized under this type, carrying the functionalization idea as far as the individual shop can afford. It is only in the very small shops nowadays that we find the material line form of organization, and even there it is questionable whether what we find is not more or less a staff organization, where an individual, often the owner of the business, acts in the capacity of several staff men. In other words, in the small shop the owner or his superintendent is forced to be an expert on several phases of the business.

Types of Management

While the type of organization depends primarily upon the size of the business, the staff line-up is undoubtedly the best to be had. So we generally find that as a business develops from small to very large, it starts with the line organization and progresses through the line and staff to the staff type.

It is when more or less of the functions of a business are handled by individuals responsible only for that function, that the owner feels it necessary to call meetings of his executives. I do not believe that in managing a business, two or more heads are better than one. I believe that policies should be laid down and important decisions affecting the good of the entire business should be made by the individual rather than by leaving them to the wordy consideration of conferences. That, however, does not mean that it is

not necessary for the staff men in an organization to get together and discuss problems. For the very reason that each staff man is a highly trained expert in his branch, he is almost sure to be incapable of seeing the problems of the business as a whole. To the cost accountant, costs are an end in themselves, and rightly so. To the production man, the troubles of the sales department mean little or nothing and to the sales manager, problems of manufacture are looked upon as alibis for the factory's failure to make good his promises. None of these functional executives is aware of how his particular problems affect the financing of the business, which is the peculiar trouble of the treasurer.

Therefore, it is necessary that the considerations which affect the executives must be laid before someone, usually the president, who can balance one against the other and make a decision which will be for the best interests of the company as a whole. Much of the information which the president needs can be laid before him in the form of reports. In so far as this is possible, it does away with time wasted in conferences. I know that one purpose of the conference is to build up a human understanding between department heads whose interests sometimes clash. I doubt whether so much good will comes from the average conference as is thought. On the other hand, when these men are allowed to get together and argue their own points of view, they are apt to get more embroiled than they would if they never came in contact. I strongly recommend, therefore, that the chief executive of a business constantly plan to have the pertinent facts from each department laid before him by means of reports and, so far as possible, in this way reduce the time wasted in conference.

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What such reports shall be is largely outlined in the preceding chapters. Certainly, a chief executive who endeavors to keep fairly close to his business should get monthly statements from the cost department, showing the profit and loss by lines. Very likely, he will want a statement of condition of the company each month. He will also want to see a statement showing how closely to normal the operational cost in each productive department is running. If the actual cost is abnormally large, he must know the condition and why it is so. Perhaps he will care to dig into the matter far enough so that he will be warranted in looking over the expense analyses for all departments, both the contributory and the productive. He will probably want a statement showing him the proportion of productive and non-productive payroll, the average earnings per man by departments, and the labor turnover. This and perhaps other reports he will want from the cost department.

From the production department, he should get a concise statement of the activity of the productive departments as scheduled for perhaps two months in advance. This will show him how well the sales department is keeping the factory in balance. It will show on what products the sales department should concentrate in order to load up those departments where inactivity is likely to occur in the future, and it will show him on which products the sales department may lessen the pressure somewhat. Reports of this sort may also indicate the advisability of additions to plant or of adding new lines of product to maintain machine activity.

Against these reports of the cost and production departments, he will wish to compare reports from the sales department. These reports have not been discussed in this series for obvious reasons. In the first place, but few concerns have more than a hazy conception of the conditions in the market. Business is, as a rule, either "rotten" or "booming." The more delicate shadings of marketing and the probable trends are little known. However, most concerns do build up reports showing the orders on hand for the different lines of product. If these were amplified to include also those changes in demand which the sensitive sales department should be able to gage quite closely, it would be possible to effect considerable economies in manufacturing and to be among the first to reap profits from changing conditions. As it is, we usually find that changing conditions are not sensed until they have become the existing conditions.

With all of these reports from the cost department, the planning department and the sales department at hand, the chief executive is in a position to dictate to his executives the policies of the company and to point out how each executive's activities will be affected thereby. Actually, of course, in the individual concerns, the chief executive may feel it is safe to turn over all or part of this work directly to the executives concerned. For instance, where good feeling and a wholehearted regard for the good of the business as a whole exist, it is possible for the treasurer, the sales manager and the production manager to get together and settle upon what shall be made, how much of it shall be made and when it shall be made. This is done in the light of the knowledge of plant capacity brought to the meeting by the production man, the possibility of selling the goods of which the sales manager should have specialized knowledge and the ability to finance production as seen by the treasurer. Perhaps still other groups of executives may well get together, but when they do, it should be because as a group, they are able to consider the problems in the cold, unemotional manner which it is assumed the chief executive bears to his business.

What reports shall go to the lesser executives of the business can hardly be touched upon, for the needs of each business and the duties of the individual executive vary so greatly that it would be difficult to lay down

a rule. However, I believe that in most machine shops it is well to give the foreman of each department, whether contributory or productive, a copy of the expense analysis of his department. This shows him in cold figures whether the efficiency of his department is increasing or decreasing. Not only that, it shows him on just which items he is improving or falling down. If he is a thoughtful man, and if the expense analysis is drawn up in the manner described in earlier chapters of this series, he will often see places where betterments can be made. Actually, this report will give information which in the ordinary factory goes to the foreman in the form of several separate reports. It will show him, for instance, an itemized list of the non-productive labor which he has used. It will show him how much his productive payroll has been and what the percentage of productive and non-productive labor is. It will show him the labor charge per productive hour. In short, it gives the foreman all of the information that he needs about his department. The expense analysis is to the foreman who considers his department as a little business, what the statement of profit and loss by lines is to the chief executive.

Reports, it must be remembered, are, after all, but an unsatisfactory sort of make-shift to take the place in the large organization, of the personal contact and first-hand knowledge that the owner of a small concern has of what goes on in his shop. There is the danger that reports will come to be looked upon as having some mysterious power to make profits. The management of a shop must never get so enthusiastic over modern methods that it forgets that profits can only be made by selling a product for more than it costs to produce it.

Abuse of Free Service

By A. J. Schneider
Cincinnati Planer Co.

In answer to your editorial on page 361, of Vol. 55, I am sending to you two sample forms used by the Cincinnati Planer Co. for service and inspection of planers and boring mills. This policy is in line with your idea that machine tool service should be charged and paid for just as any other service is charged and paid for.

People who abuse the "service" idea and make a big noise about it, should remember that after all the machine that requires the least service is usually the best. If you can buy a machine and then forget about the service you are extremely lucky or wise. There are however, many machines that require service and inspection by experts at regular periods. This, if done right, is real economy and good business for both producer and user.

This company has for about ten years been paying without complaint for service and inspection on office mechanical equipment. Our machines are always in good running order and the operators thoroughly posted up to date on how to get the best results without abusing the machines.

Possibly the greatest benefit of an "inspection and service" system is the training given the operator. Much less service would be required on any kind of machine, if only first class operators were employed.

THE CINCINNATI PLANER CO.
PLANERS & BORING MILLS
CINCINNATI, O. U.S.A.

Gentlemen:-

Have you ever figured the loss of the Shut-Downs on your Planers and Boring Mills?

These are big expensive machines, and when they are out of commission, the whole shop production suffers.

The loss can be greatly reduced by a regular system of Inspection, which we have inaugurated, one of our Experts going over your machines carefully every sixty (60) days, the expense being so small, that not a single user of our machines can afford to be without this Service.

Poor belt conditions, improper gib adjustments, wrong feeds, and speeds, defective oiling facilities, general abuse of the machine, efficiency of the operator, will all be noted in the Inspector's report, copy of which you will receive after each inspection.

The saving in depreciation of your machines alone, will more than pay for this Service, and to have them kept in first-class condition at all times, will make you thousands of dollars.

We know this is just the kind of Service our customers have been looking for, and we will be glad to have you sign the enclosed contract, returning the original to us, keeping the copy for your files.

Hoping you will join us in this proposition, we are,

Yours very truly,

THE CINCINNATI PLANER COMPANY.

R. A. Endebrock

RE:EB
Encls.

CONTRACT

Cincinnati Planer & Boring Mill Inspection Service.

THE CINCINNATI PLANER COMPANY, CINCINNATI, OHIO.

Date,_____

It is agreed that the Cincinnati Planer Co. of Cincinnati, is to send an inspector to the shop of the undersigned every sixty (60) days, for a period of one year, who will inspect thoroughly all Cincinnati Planers and Boring Mills and furnish a written report after each inspection.

This contract does not cover repair parts or work made necessary by either wear or accident, excepting minor adjustments made at the regular time of inspection.

This agreement shall continue in force for one year and shall renew itself automatically until cancelled in writing by either party.

SCHEDULE OF PRICES FOR INSPECTION SERVICE:

To users of (1) Cincinnati Planer or Boring Mill—$ 50.00 per year
" " " (2 to 5) " " " " " — 75.00 " "
" " " (6 or more) " " " " " — 100.00 " "

This contract is contingent upon our securing a sufficient number of clients to make it possible to render the above service at the very low prices scheduled.

_____
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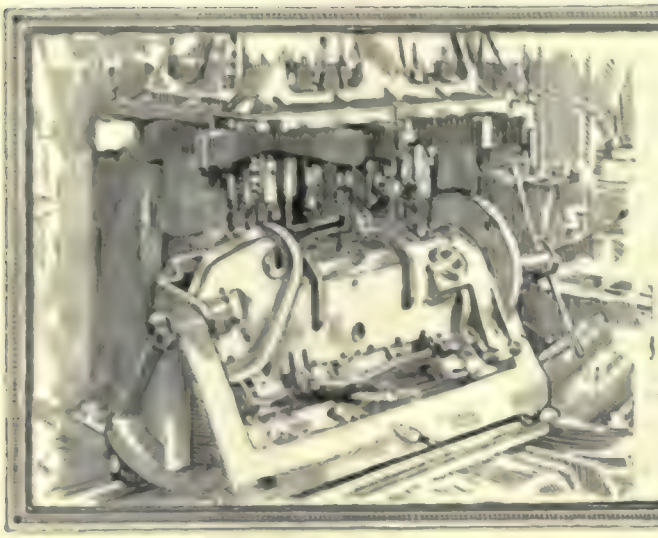
By_____
OFFICIAL CAPACITY

_____
STREET ADDRESS

_____
CITY

THE CINCINNATI PLANER COMPANY,

By_____



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of Cross-Slide Tools for Lathes—Types and Proportions of Toolholders and Blocks—Methods of Clamping and Adjusting Tools

IN CONNECTION with turning and boring operations with tools attached to the turret, work is also performed by cross-slide tools, oftentimes used simultaneously. Forming, facing, grooving and cutting-off operations are usually done by tools on the cross-slide of the machine. There is obviously a great saving in production time when combinations of operations can be made; but in order to obtain maximum efficiency from the tooling, both turret and cross-slide tools must be designed so that there will be no interferences to prevent them from being used at the same time. Cases are occasionally found where the tools must be operated separately, but this method can nearly always be avoided by a careful study of the various cuts to be made and a consistent tool application.

The different movements of both turret and cross-slide must be considered when designing tools. The positions of the tools and their relations, not only to each other but to the work, are of great importance. A turret layout showing all tools in position will be found a great help in avoiding interferences. When machining short work which requires short turret tools, there is not likely to be very much trouble, but when long boring bars or turning tools are used, there are chances for interference. It is not at all difficult to avoid trouble between tools that are working simultaneously; it is the idle tools that project from the turret at various angles that are apt to do the damage.

The diagram shown in Fig. 339 illustrates a common source of trouble caused by tool interferences. In this example the work *A* is quite long and projects some distance from the face of the chuck. It is to be bored and reamed with turret tools and faced with special cross-slide tools as indicated, the roughing tools being at the front of the machine and the finishing tools at the rear. The work is held in special chuck jaws cut away so that the back-facing tools can operate without interference. The boring bars *B* and *G* are long in order to pilot them in a bushing in the chuck and thus give greater rigidity. The reamer bar *F* is arranged so that it will "float," but it is also piloted in the same manner as the boring bars. The front cross-slide toolblock *E* has two tools *C* and *D*, used for rough-facing both sides of the flange. The rear toolblock *H* contains two finishing tools as indicated.

The tool designer can easily design these various tools so that each is apparently all right for the purpose, yet when in use on the machine there would be an interference with the front cross-slide toolblock by the reamer bar *F* at the time when the rear cross-slide tools are finishing the flange. This action is shown in the diagram. There is a very simple way out of the difficulty, either by placing the tools in every alternate turret hole, or by cutting away the toolblock a trifle as shown at *K*. If it were necessary to use several other turret tools in the same set-up, the condition would be more serious, but some way out of the trouble could be found by careful study.

Another situation which is sometimes troublesome on certain types of turret lathes, is the interference of long boring bars with the "spider" or spoke wheel used for the longitudinal movement of the turret slide. To avoid this trouble, an extra long pinion shaft and a special bracket to carry it may be required. Some turret lathes have the turret set at an angle, so that as it is indexed the tools swing clear of the spider. Other machines avoid the possibility of trouble of this sort by doing away with the spider entirely and using a hand-wheel in place of it. The diameter of the wheel is small enough, so that it does not interfere.

The greatest care should be taken by the designer to look into the various points mentioned and see that there is no possibility of one tool striking another or hitting any part of the machine, either during the machining operations or while indexing the turret. The layout of tools showing all turret and cross-slide tools in their operating positions is of great value in preventing any interferences. The matter of turret layouts will be fully discussed later in the series.

The following points of design are of importance and should be considered:

(1) The quantity of pieces to be manufactured is a factor of great importance, as it controls the cost of the tool equipment. Naturally, a small number of parts requires inexpensive tooling, and tools of standard form should be adopted for this kind of work wherever possible. In high production the special tooling expense

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need not be considered very carefully, the great factor being a reduction of time in the process of machining. Hence, special tools designed for high production should be so arranged that they can be readily replaced when worn, easily set and conveniently adjusted.

(2) The material to be machined must be considered when designing cross-slide tools, in order to obtain the easiest cutting action and the removal of the stock in the best manner. For example, cast iron and other materials of short grain can be machined with blunt tools, or those which do not have any "lip." Copper, steel and some aluminum alloys require tools of such a nature that they produce a shearing action on the materials. Occasionally this point affects the design of the toolholder, making it desirable to set it at an angle rather than straight. It is therefore advisable to consider the material to be cut before starting the design.

(3) The cutting action of cross-slide tools makes it necessary to hold them with exceptional rigidity in the tool supports. In forming cuts it is very important,

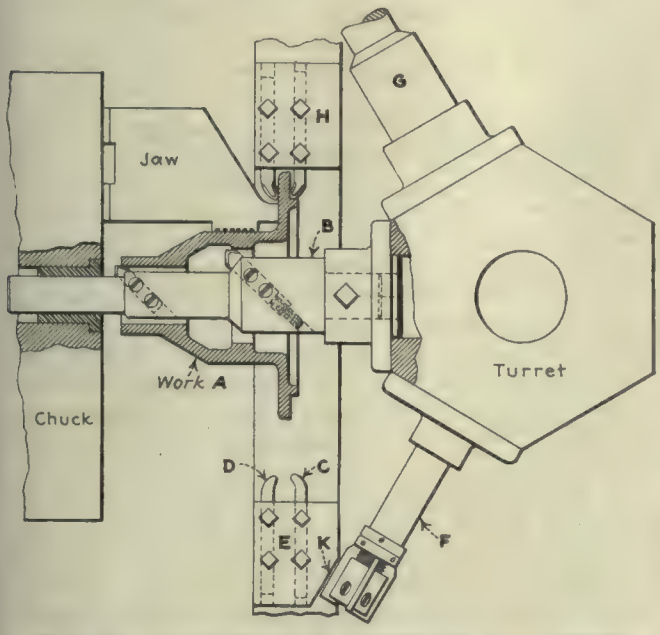


FIG. 339. INTERFERENCE OF TURRET TOOLS WITH CROSS-SLIDE TOOLBLOCK

and also in cutting-off operations. When facing cuts are to be taken, the action is not as severe as when cutting directly down into the body of the metal; nevertheless tools must be held with sufficient firmness, so that no "chatter" will develop. It is advisable to use tool sections as large as possible, in order that the heat generated by the cut will be carried away rapidly.

(4) The method of adjustment of the tools should receive thought. The "sledge-hammer" method of adjustment is crude and out-of-date. Accurate work requires that proper provision be made for easy and accurate setting of tools. When multiple toolblocks are used, as when several shoulders are to be held closely to size, it may be necessary to grind the sides of the tools and fit them accurately to slots in the blocks. Holding-down screws and adjusting screws should both be arranged with regard to the convenience of the operator. They may be operated by a wrench, if desired. Some operators prefer a screwdriver for adjusting screws, while others like a wrench. The designer may be governed by the practice in the shop which is to use the tools.

In order to obtain maximum efficiency from cutting tools, they must be so supported and held that there will be no chance for chatter. The diagrams shown in Fig.

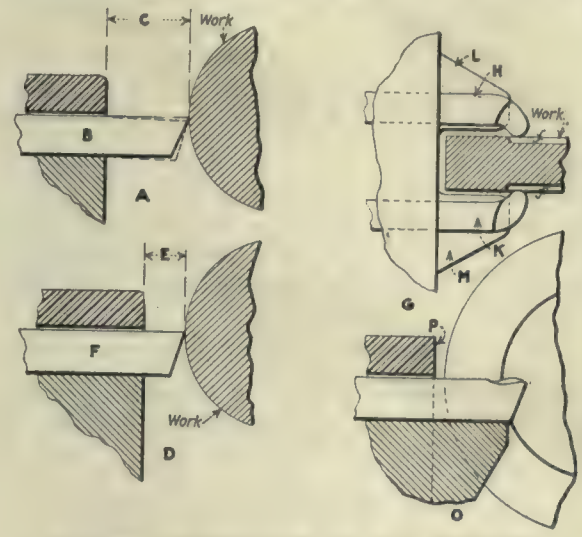


FIG. 340. IMPORTANCE OF TOOL SUPPORT

340 illustrate some important points in connection with tool support. In the example *A* the tool *B* extends beyond its support a distance represented by the letter *C*. If the work which is to be done does not require a heavy cut, this amount of overhang might not cause any difficulty. On the other hand, if the cutting action is severe the tool might be depressed, as shown by the dotted lines, thus causing chatter and injury to both tool and work.

In the example shown at *D*, the tool *F* overhangs beyond the block only the distance *E*. This arrangement would be much better for heavy cutting than the example *A*. The nature of the work and the kind of cut required make a considerable difference in the amount of overhang permissible. A parting tool must necessarily overhang sufficiently so that it will cut off the work without interference by the toolblock against the side of the work. For this reason, a parting tool should be made deep in order that the tool itself will have sufficient rigidity to withstand the pressure of the cut.

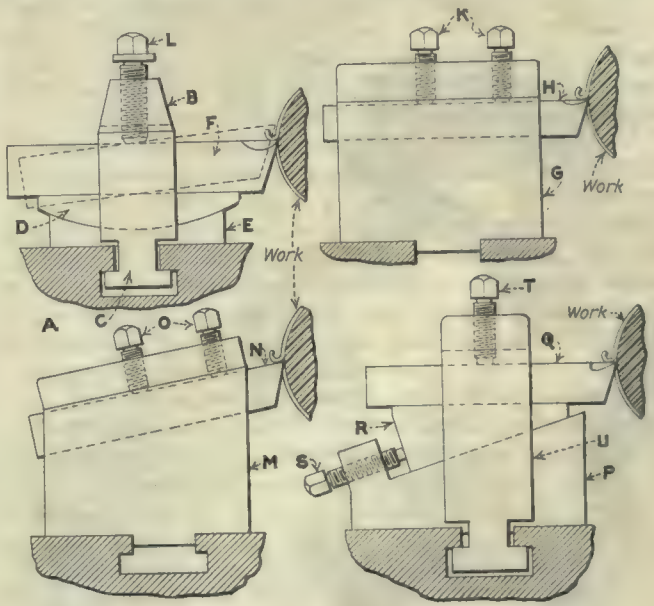


FIG. 341. CROSS-SLIDE TOOLPOSTS AND BLOCKS

In the example shown at *G* the two tools *H* and *K* are used for facing the sides of the work, as indicated. As the tools project beyond the holder some distance, it is advisable to support them in some way so that they will not deflect while cutting. The toolblock is therefore built out in the form of a shelf, as shown at *L* and *M*, thus giving the necessary support. A side view of the toolblock illustrating this point clearly is shown at *O*. An additional refinement for a case of this kind would be a projection of the cap block *P* of such shape that it would extend out over the tool, and permit the use of a holding-down screw as far out on the tool as possible. These points in tool support are all of importance and should be carefully considered when designing cross-slide toolblocks.

Cross-Slide Toolblocks

There are a number of styles of toolblocks in common use on both turret and engine-lathe cross-slides. Several of these types are illustrated in Fig. 341. The



FIG. 342. TOOLBLOCK PROPORTIONS

A—Front toolblock with tools up to ¾ in. wide: $A = 1$ in.
Tools up to 1 in. wide: $A = 1\frac{1}{4}$
Rear toolblock with tools up to ¾ in. wide: $A = 1\frac{1}{4}$.
Tools up to 1 in. wide: $A = 1\frac{1}{2}$
B—Tools up to ½ in. wide: $B = \frac{3}{32}$ in. plus width of tool.
Tools ½ in. and over: $B = \frac{1}{16}$ in. plus width of tool.
C—Tools up to ½ in. height: $C = \frac{1}{16}$ plus height of tool.
Tools ½ in. height and over: $C = \frac{1}{32}$ in. plus height of tool.
D—½ to ¾ in. on all toolblocks when designed with block-adjusting screw as shown.
E—This dimension is always to be shown on assembly drawing, and is the dimension to center line of spindle.
F—Tools up to ¾ in. wide: $F = 1$ in.
Tools over ¾ in. wide: $F = 1\frac{1}{4}$
G—¼ to ½ in. clearance.
H—Four times the diameter of *K*.
K—The diameter of screw.

example *A* shows a form of toolpost in common use on both engine and turret lathes. This form is familiar to all shop men and designers. The post *B* is circular in form and fits the T-slot in the cross-slide at *C*. The tool *F* rests on a rocker *D* supported on the curved surface of the collar *E*. The tool is held in place after adjustment by means of a collar-head setscrew *L*.

One advantage of this type of holder is that it permits the tool to be set either above or below center, as indicated by the dotted line. For this reason it is commonly used on an engine lathe, as tools vary in depth considerably and a vertical adjustment of some sort is essential. For single cuts on turret lathes this type of holder can often be used to advantage, and for very heavy cutting two toolposts can be used in combination with a long tool, thus obtaining exceptional rigidity. For operations requiring two or more tools and in cutting shoulder distances close to size, toolposts of this kind are not generally used in high-production work, as it is much more difficult to preserve the setting.

Another type of toolblock in which the tool is set permanently at an angle is shown at *N*. This type is useful when cutting steel or other materials which require the tool to be set at an angle or "lipped" to make the cutting action easier. The block is usually of cast iron, while the cap is of steel. Two setscrews *O* are used to hold the tool in place. This is a very simple

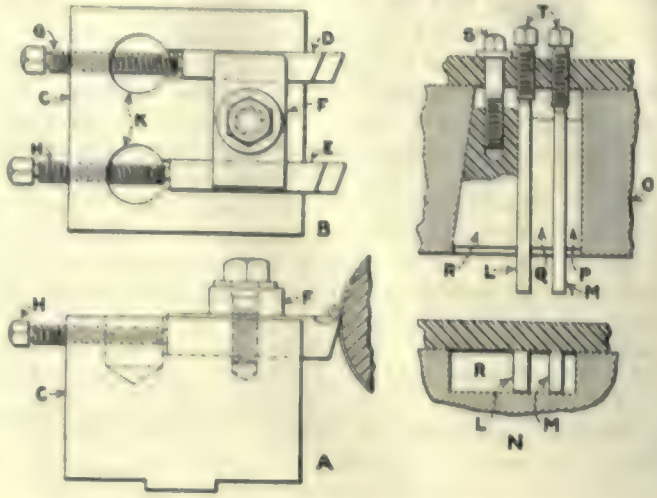


FIG. 343. METHODS OF CLAMPING TOOLS

type of block, and no setscrew is provided for adjusting the tool.

Another example, shown at *G*, is a simple cast-iron block fitted to the T-slot on the cross-slide and held down by means of bolts in the usual manner. The tool *H* in this case is set straight on the center of the work. It is held in place by two setscrews at *K*. The cap in which the setscrews are located is usually made of a steel block. This block should be of sufficient thickness to give a good thread for the setscrews and at the same time resist the pressure of the screw. When a number of tools are used in the same block, care should be taken to make the cap of sufficient depth to withstand the pressure of the numerous setscrews used to hold the tools in place.

An example of an adjustable toolblock is shown at *P*. This block passes through a slot in the post *U*. The latter is fitted to the T-slot in the cross-slide. The tool *Q* rests on a wedge-shaped piece *R*, which may be adjusted by means of a setscrew *S*. The tool is held

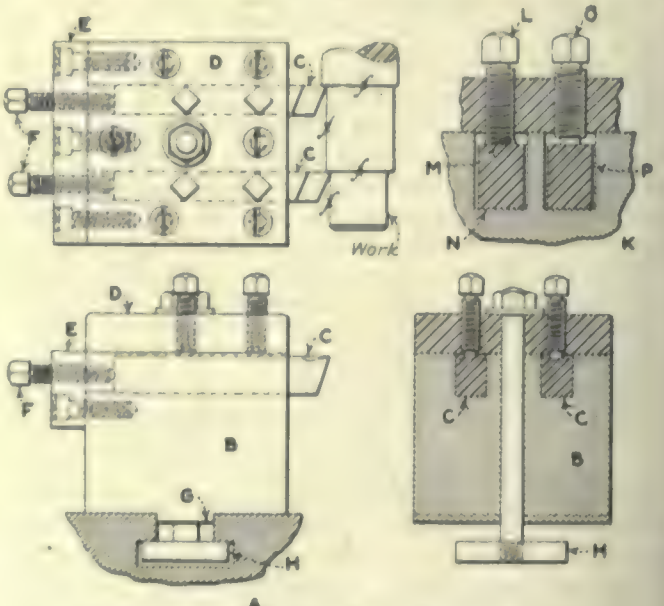


FIG. 344. TOOLBLOCKS WITH PROVISIONS FOR ADJUSTMENT

in place and the entire unit clamped by means of the screw *T*. This toolpost allows the tool to be raised or lowered without difficulty according to the adjustment of the taper block *R*. There is no provision for tipping the tool, as in the example *A*. All of the blocks shown in this illustration are of use for various kinds of work, and they can be adapted to a variety of conditions. In Fig. 342 is shown a diagram of a simple form of toolblock with the proportions of the various parts. This data will be found useful in proportioning toolblocks for ordinary work, and the standard sizes given can be used as a guide when designing. No particular instructions are required for using this information, as the chart is self-explanatory.

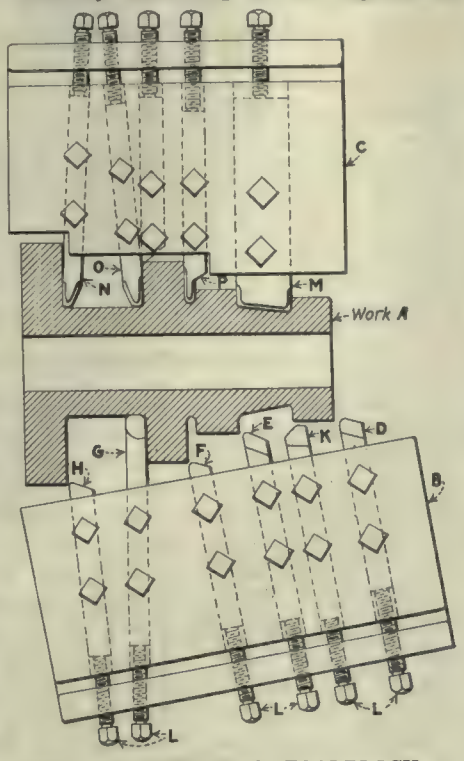


FIG. 345. MULTIPLE TOOLBLOCK FOR CLUSTER GEAR

The importance of an efficient method of holding a tool in position and adjusting it, has already been mentioned. Several examples which illustrate methods useful for this purpose are shown in Fig. 343. The illustrations at *A* and *B* show, respectively, a side and top view of a simple form of toolblock *C*. The tools *D* and *E* are set in slots in the block, and the method of clamping is by means of a single strap *F* having a screw through it midway between the two tools. Adjustment is provided in the setscrews *G* and *H*. Clearance holes are drilled at *K* in order to make it easy to plane out the tool slots.

For light cutting and when only two tools are to be held, this type of block will be found convenient and economical, as it can be made up cheaply and does not require an upper cap or plate. If the cutting action is severe, the same type of block can be used, except that it should be made deeper and the tools longer, so that two straps instead of one can be used for holding and clamping tools. It is advisable to place the forward clamp as close to the front end of the block as possible, when two clamps are used.

In designing toolblocks for grooving tools, a confined situation may require extraordinary methods of holding and clamping. An example which illustrates this point is shown at *N*. The two tools *L* and *M* are used for grooving, and are set in the block *O* with spacers *P* and *Q* of proper size to locate the tools in their correct positions. The adjusting screws at *T* can be set up to regulate the depth of the cut. The peculiar part of this toolholder is in the method of clamping, which is done by means of a wedge *R*. This wedge is operated by means of a special screw *S;* the action of the wedge causing the tools to be firmly gripped between the wedge, the filler blocks *P* and *Q* and the edge of the slot in the toolblock. In adjusting the tools, the wedge may be slightly loosened, if necessary, and adjustment made before tightening. In many cases it is unnecessary to disturb the screw *S*, as sufficient pressure can be brought to bear on the adjusting screws *T* to make the correct setting.

In Fig. 344 is shown a type of toolblock at *A* designed particularly for turning two diameters. The tools *C* are held in slots in a cast-iron block *B* by means of square-head setscrews. A steel plate *D* acts as a cap on the top of the block; and the diameter adjustments are made by means of setscrews *F*, which are held in a strap *E* at the back of the block. This holder represents a simple form which has the advantage of being made up cheaply, as it is a built-up type which does not necessarily require any pattern, yet it is thoroughly substantial and will give good results. There are numerous cases where a design of this sort will be found convenient, not only for turning operations but for grooving or forming. It is only necessary to proportion it to the work for which it is to be used, and provide the slots for the necessary tools, together with the methods of holding and adjusting.

Locating and holding the block down on the cross-slide are accomplished by means of the tongue *G* which enters the T-slot. The shoe *H* is used to draw the block down firmly by means of a bolt which extends entirely through the block. The shoe is a simple strap of proper size to fit the T-slot; it is usually standardized, and often made up in quantity.

The type of setscrew used to hold down a tool is quite important, and the material from which it is composed should also be given consideration. In the section at *K* the tool *N* is held in place by means of a plain square-head setscrew at *L*. The end of this screw *M* is likely to become enlarged by use or abuse until it is very difficult to operate it if made in the manner

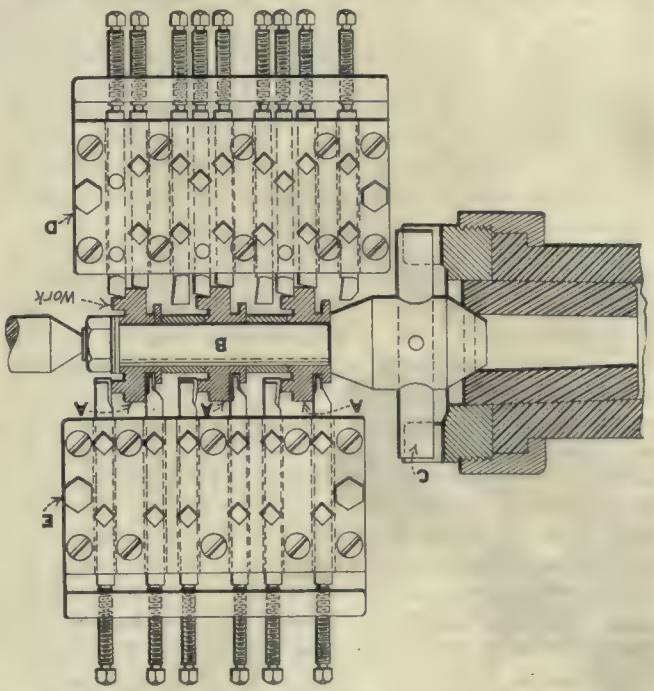


FIG. 346. FRONT AND REAR TOOLBLOCKS WITH MULTIPLE GANG TOOLS

shown. The tool *P* is held by a square-head setscrew *O*, and the end which bears against the tool is relieved, so that under no circumstances can it be distorted so as to cause trouble.

Setscrews should always be hardened, and for severe service the material from which they are composed should be considered. The authors have found Hy-ten steel exceptionally well suited for setscrews subject to hard usage. Tool steel is also used, but considerable care should be taken to draw the temper sufficiently, so that it will not be brittle.

An important point in designing toolblocks in connection with the setscrews used to hold the tools in place, is the amount of thread which the setscrews should have in the cap or block. In general, the diameter multiplied by 2 will be found sufficient, but a little more than this is an advantage in the majority of cases. Some of the points mentioned here may be thought by the tool designer to be more or less unimportant. It must be remembered, however, that care taken in the design will result in much less trouble in the factory, and the tools will stand up and produce the work much better than if some of these small details are overlooked or neglected.

Multiple Toolblocks

In the design of multiple toolblocks for the cross-slide of either a turret or engine lathe, the work which is to be done naturally affects the design strongly. Occasionally, cross-slide tools are used for turning various diameters, and at other times only for facing, grooving or cutting off. There are cases when the front toolblock is used for turning, while the rear toolblock may be utilized for forming or grooving. In general, when roughing and finishing cuts are made by the front and rear toolblocks working one after the other, the front block is used for roughing while the rear is used for finishing. There is a reason for this, as the cutting action on the front block is downward against the body of the cross-slide. Therefore, it is more suited to heavy cutting. The rear block, on the other hand, is subjected to a lifting action which makes it advisable to use it for lighter cutting.

An example which illustrates one use of multiple toolblocks on the front and rear of the cross-slide is shown in Fig. 345. The front block *B* carries the tools *D*, *E*, *F*, *G* and *H*. All these tools are used for turning the various diameters, according to their positions. The tool K is a chamfering tool, and simply breaks the corner of one of the gears after the turning operations have been finished. All of the turning tools are arranged so that they are operating simultaneously, thus saving a great amount of time in production. The toolblock in *B* in which they are held is of a simple type, containing slots properly spaced to hold the tools. All adjustments are made by means of the setscrews shown at L. The block is set at an angle in order to avoid too much overhang for the tools cutting on the small end of the work.

The rear toolblock *C* contains tools *M*, *N*, *O* and *P*, all of which are used for sizing the shoulders, facing or grooving. None of the tools in the rear block are used for turning, but an important point is the fact that the spacing is such that shoulder distances are accurately cut and sized. The construction of the rear block is similar to that used at the front. Setscrews are provided for adjustment, as shown.

These toolblocks are both designed for use on a heavy-duty engine lathe, but it will be possible to use something of the same sort on a turret lathe when the cross-slide is provided with a longitudinal feed. It would doubtless be necessary to provide accurate longitudinal stops if used on a turret lathe, in order to make sure that the shoulder distances are held accurately to size.

Example of Multiple Cutting

Considerable time can often be saved by machining several cylindrical pieces in the same setting by grouping them together on an arbor and providing a gang of tools of suitable size and arrangement. Fig. 346 shows an example of this sort in which three pieces of work *A* are held on an arbor *B* with a special driver *C* in a slot in the faceplate. The other end of the arbor is supported on the center, as indicated. The work is placed on the arbor and driven by means of a key in a keyway in the work. Spacing collars are interposed between the various pieces in order to allow room enough for the various tools to operate.

The front toolblock *D* contains a group of turning tools, the operation of which is somewhat out of the ordinary. The two principal diameters of each piece are turned by a longitudinal feeding movement of the cross-slide in one direction. The small shoulder is turned by other tools by feeding the cross-slide in the reverse direction. The rear toolblock *E* contains a group of tools used only for grooving and facing. As these tools are set accurately, the various shoulder distances and faces are accurately preserved. In both blocks accurate adjustment is provided by means of backing-up screws.

In many cases where work of this kind is to be done it would be necessary to provide the block with accurately sized slots, and the tools would need to be ground on the sides to fit these slots. This can sometimes be avoided by using a special tool-setting gage, which can be arranged as a part of the block or can be a separate unit. The design of a gage of this sort will depend entirely upon the nature of the work. The ingenuity of the designer will be called into play to look into such points as this and provide means for accurate setting.

Very frequently the matter of tool setting is not considered carefully; and as a result when the blocks are placed in the shop the operator is compelled to waste a great deal of time in setting up the tools, and "cutting and trying" until they produce the work according to requirements. The careful designer considers the operator when designing and provides all necessary adjustments, together with means of setting up the tools so that they do not cause trouble when placed in the shop.

Grinding Practice in Great Britain

Increased Use of Grinding Process in Railway Field—Application in Other Fields—Specifications of Wheels Used in Many Kinds of Work—Production Figures

By I. WILLIAM CHUBB
Editor, European Edition, American Machinist

BEFORE giving a few figures as to output obtained in current precision grinding practice in Great Britain, it will perhaps be well to mention that probably the most promising field for its development at the moment is the railway world. During the last two or three years a number of railway engineers have given their minds to this process of manufacture as compared with others, and have placed a few orders. But the railway engineer here is in a number of cases usually conservative and does not move until he is quite convinced. Further than that the shadow of amalgamation of the lines induces hesitancy in expenditure. One of its most recent and most successful applications to railway work has been the grinding of axles especially the journals for passenger coaches and wagons. One line has fitted up an experimental train with all axle journals ground.

IN GREAT BRITAIN the grinding process is now being used extensively on passenger car axles (particularly the journals), crosshead guide bars, links, piston rods, chilled rolls, granite rolls, brass rolls, rubber rolls, paper rolls, crankshafts, camshafts, piston rings, planer knives, ball race rings, aluminum pistons, lenses, plate glass edges, glass tubes.

Experiments are being carried out on the grinding of cylinders for locomotive and other engines.

The Churchill Machine Tool Co., Ltd., now almost the only specialist in precision grinding machines in Great Britain has supplied grinding machines for this purpose with special wheels to produce a semi-burnished finish and to secure a greater accuracy in roundness and parallelism than is possible with the mechanically-burnished journal. Radius link grinding machines for locomotive work have of course long been built in Great Britain, and further interest is being promoted in these machines, of both vertical and horizontal spindle types. The choice seems to rest with the railway company concerned and all parts of link motion work either are ground or are considered for that process. Locomotive piston rod grinding machines are also being employed. As to the grinding of locomotive engine and similar cylinders, this is a matter which is on trial. The writer believes that two companies are testing the ground cylinder against the bored cylinder from the point of view of wear. The railway companies have taken a considerable interest in the heavy face-grinding machine with wheels 30 in. and larger in diameter. Face-grinding machines with wheels up to 52 in. in diameter and with moving wheel or moving table also are being employed.

Grinding Chilled Rolls

A further important development is in connection with the grinding of chilled rolls. The depth of chill usually does not exceed 1 in. Truing the roll by the ordinary turning process in the lathe necessarily means getting well below the skin, so that a considerable proportion of the chilled part is removed and the life of the roll is materially shortened. On the other hand, in grinding the minimum for trueness only need be removed. One of the troubles has been in the production of the necessary camber, but the firm mentioned before is now able—it is perhaps alone in this—to provide machines with motion producing from the maximum camber required down to a parallel roll, without the provision of other camber bars.

Carborundum wheels have been used on this work. Their size is 20 x 2 x 8 in. They are of fairly coarse grit and soft grade and have been used on rolls 4 ft. 6 in. long and 12 and 14 in. in diameter, removing from $\frac{1}{16}$ in. to $\frac{3}{32}$ in. and, after truing, finishing with mirror finish in 1½ hours. The wheel speed employed was 5,000 r.p.m. and the work speed 100 ft. per minute. With the wheels mentioned the machines have to be particularly rigid. It may be mentioned that the Churchill company has recently finished a 36-in. x 18-ft. machine, and is at the moment of writing completing a larger machine, 48 in. x 24 ft. Granite rolls are now in many cases being ground in much the same way as that just described for chilled iron rolls.

The modern machine tool having had its best market of late years in the motor industry, it is not difficult to find here many instances of grinding. Thus the writer has particulars of aloxite wheels, 20 in. in diameter by 3¼ in. thick, roughing out 24 four-throw cranks in eight hours. The stock removed was 0.010 in., the wheel being dressed up twice. Again, in grinding crankshafts a comparatively coarse wheel of this size is employed, a number of crankshafts being roughed-out with a fairly heavy cut and then finished with the same wheel, re-trued with a diamond, taking off fine cuts, say about half a thousandth, until the size is obtained. For roughing work truing is done by passing the diamond rapidly across the face, taking a deeper cut; in the finishing process light traversing cuts are taken with the diamond.

Feeding Directly In

Wheels of the same material on steel differential gear crosses have been used to grind the four taper points to limits of 0.001 in. on the diameter, $\frac{5}{8}$ in. by 1$\frac{5}{8}$ in. long. The wheel is 1¾ in. wide and is fed into the work, without traverse either to wheel or job. With wheels 18 x 2 x 5 in., coarse grit and hard grade, motor axle pins of chrome nickel steel, 3½ x 21 in., are ground, the wheel removing ¼ in. of stock after being re-trued for finishing. The time taken is 1 hr. 20 min. The same wheel is also used on pins 41 in. long, removing ¼ in. of stock.

As an example of wide face and forming cuts on motor axles, similar wheels 18 x 6 x 5 in. of medium grade have been found satisfactory either for taper or parallel work,

the wheel being fed straight in without traverse. As to cam grinding, the case of a wheel 14 x 2 x 7 in. on camshafts of nickel steel for petrol engines used on 3-ton lorries may be mentioned. After turning, the cams are 2 in. in diameter. They are then ground to correct size, 10 min. for each cam, eight cams being on each shaft.

Another wheel 18 x 2 x 5 in. is used for grinding piston rods of 0.4 carbon steel, 3 ft. 6 in. long and 3 in. in diameter. Material is removed by cuts of 0.002 in. until about 0.002 in. is left for finishing, this being taken off in half-thousandths. Some twelve to fifteen thousandths are left on after turning. The tolerance is 0.0005 in., and the production rate five rods an hour. For grinding cast-iron piston rings a carborundum wheel 14 x 1 x 7 in. has been used on rings 8 in. in diameter by ⅜ in. wide by ⅝ in. radial depth, removing 0.006 in., the production being twenty rings per hour with a tolerance of 0.00025 in. For general work a surface speed of about 5,000 ft. per minute has been found suitable, both for rough-grinding wheels and for cylindrical grinding, but in some cases the users prefer to run wheels at 6,000 ft. per minute, and in that case the wheels are, say two grades softer.

For surface grinding the Carborundum Company in Great Britain finds that with Pratt & Whitney grinding machines the speed should be somewhat lower than is usually specified, that is, it should be say 3,500 ft. per minute instead of 4,000 ft., giving on a 14-in. cup wheel 950 r.p.m. instead of something near 1,100 r.p.m. For cutting off steel bars, etc., the Carborundum Company runs wheels at 8,000 to 9,000 ft. per minute. But machines often run at lower speeds, even down to 4,000 ft. For wheels for grinding guillotine and planer knives the surface speed is about 2,300 ft. per minute. One record with a Seybold machine, using a wheel 30 in. in diameter gives the speed for a wheel 1½ in. thick as 425 r.p.m. and for a wheel 1¼ in. thick 350 r.p.m. Spectacle glasses have been edged by hand with wheels running at 1,300 to 1,400 ft. per minute. No general rule can be laid down as regards periphery speed for internal grinding, but for cast-iron cylinders a soft grade wheel gives quick operation and good finish.

As to speed of work, for cylindrical jobs this is usually about 100 ft. per minute, but should depend on the action of the wheel, a point often forgotten by the operator. For surfacing by machines of the Pratt & Whitney type the most useful speed seems to be 8 to 9 ft. per minute.

Speeds of Wheels and Work

A few miscellaneous records of speeds, etc., may be mentioned. A carborundum wheel 12 x 1 x 5 in., medium grade, is used to finish ball race rings about 5 in. in diameter by 1¼-in. face, the rings being fixed on a sleeve and ten or twelve ground at one operation.

For surface grinding an aloxite cup wheel 22 x 4 in., of fairly coarse grit and soft grade in silicate bond, on crosshead locomotive guide bars in a Pratt & Whitney machine, has ground the flat surface in 10 min., the wheel running at 4,000 ft. per minute and the work at 9 ft. per minute. Small iron castings have been surfaced with a carborundum cylinder 24 in. in diameter by 2-in. face on a horizontal spindle. The work is bolted on a slotted table in front of the cylinder, traversed across the wall and back again, a mirror being placed so that the operator can see the work face. The wheel is run dry and the finish is about the same as from a smooth file. The work is done in 7 min. as against 1½ hr. on a planer. Aluminum pistons have been ground with wheels 12 x 1½ x 5 in., fairly coarse grit, soft grade, a solution of one part soluble oil and five parts water insuring cool cutting and a good finish.

Again, for grinding tool steel and mild steel bars to size from the black, the bars being 30 ft. long and the diameter ranging from ¼ to 1½ in., cuts up to 0.003 in. to 0.004 in. are taken when roughing, with an aloxite wheel 24 x 2½ in., leaving a total of about 0.002 in. to be taken off by very fine cuts to get the mirror finish desired. The same wheel is used for both roughing and finishing.

> ARTIFICIAL ABRASIVES have displaced natural quarried grit stones for grinding castings previous to buffing or polishing.
>
> The natural stone is worn away in eight or nine weeks, while the artificial abrasive wheel has in constant use outlasted seven such wheels.
>
> Twelve hours is taken to replace an old grit stone, whereas a new artificial wheel can be mounted in less than one hour.

Artificial abrasives have displaced natural quarried grit stones for grinding castings previous to buffing or polishing. The artificial wheel may be 40 in. in diameter by 14 in. thick, as against 90 in. in diameter by 14 in. thick in the natural stone. The work is of course done more rapidly and has a better finish. In addition the worker has the advantage that dust is eliminated, this applying also to the dust arising from the racing (truing by turning) of the natural stones. The latter, weighing 3 tons or more, is worn away in about eight or nine weeks, while a carborundum wheel has in constant use outlasted seven such wheels. As to time for dismantling, 12 hr. is taken to remove an old grit stone, clear away the mud and mount a new stone, whereas a new artificial wheel can be mounted in less than one hour. The speed employed is about 5,000 ft. per minute. In particular, artificial segments are now being employed in several cases in place of natural stone segments for surfacing cast-iron work for textile machinery.

Other Grinding Operations

An instance may perhaps be given of the grinding displacing the milling machine. Using a Churchill vertical machine a carborundum wheel 14 x 4 x 10⅜ in. with 1¼-in. side walls and ⅜-in. back wall, in coarse grit and soft grade, ground some 2,594 articles, the work being done in about one-fifth of the time previously taken for milling and the average cost working out at ½d. instead of 1s. 6d.

Getting away from engineering, the use of artificial abrasive wheels may be noted in the case of paper mills for rolls of steel, brass, chilled iron, rubber and paper, shellac bond wheels being employed. Much glass work is being done with these wheels; besides being cooler and faster in cutting, they are more uniform than the natural sand stones. A slow speed, namely, 2,000 to 2,600 ft. per minute is employed, and for lens grinding very fine grit, medium grade aloxite wheels are used.

For both roughing and finishing plate glass edging the wheels are grooved on the face to suit the glass thickness, the work being fed over the top of the wheel. For dressing such fine grit wheels carborundum bricks in No. 80 grit with a special soft bond are used. Carborundum wheels of coarse grits and medium grades have been employed on molding work in marble, the wheels speed being 4,500 to 5,000 surface feet per minute, while the work speed varies according to the thickness of the marble and depth of cut. For cutting off glass tubes and ends of electric lamps wheels of very fine grits and hard grades have been claimed to be superior to the diamond. The wheels are about ⅜ in. or ½ in. thick, V-edge, and running at say 6,000 ft. per minute. The wheel cuts much the same as a diamond, the work being revolved on its face, the action producing sufficient heat to crack the glass cleanly.

Experiments with Sherardizing

By Leon McCulloch

When clean iron and metallic zinc dust, protected from the air, are heated below the melting point of zinc, the iron takes on a coating that has excellent protective value. This coating is a brittle alloy of zinc and iron, and the process is called *sherardizing*. Although the zinc particles are covered with oxide and cannot touch the iron, an extremely small amount of the zinc vaporizes and the vapor, reaching the iron, alloys with it. Other zinc then vaporizes to replace that which has been removed from the atmosphere. This process continues indefinitely at a decreasing rate, for the coating already formed permits zinc to diffuse through it to combine with the iron beneath. In this way, the coating grows outward from the surface of the iron, as the bark grows from a tree.

Observing Method of Growth

The method of growth was clearly seen while sherardizing small cubes of cast iron, at about 450 deg. C., in a small glass-stoppered bottle enclosed in a rotating drum. The dust contained about 3 per cent iron, which prevented caking, and coatings ½ in. thick were grown in a few hours. After a heavy layer had been formed, the cubes were again treated, for a shorter time. The layer last formed was seen to lie next to the iron, instead of at the outer surface, showing that the growth was from the surface of the iron outward. The coatings split at the edges and corners, leaving the iron exposed there. Flakes of graphite from the iron were lifted upward and embedded in the coatings.

The composition of sherardized coatings varies from the outer surface inward, as would be expected from the mode of growth. That is, the iron content increases slowly at first, then more rapidly as the iron is approached. At the surface the least amount of iron possible is 6 per cent, as the experiments described below have shown.

A study was made of the effect of iron in zinc dust on the process and on the resulting coatings. Glass bulbs, holding the small pieces to be sherardized, together with enough zinc dust to make them two-thirds full, were heated in a small, rotating electrically heated and controlled furnace. The bulbs had 6-in. necks, of ⅜-in. tubing, plugged with asbestos and zinc dust to absorb oxygen that otherwise would diffuse inwardly and oxidize the contents of the bulbs.

The dusts contained iron in amounts varying from 0 to 26 per cent. They were prepared by mixing 200-mesh zinc in the desired proportions with powdered electrolytic iron of the same fineness. These mixtures, before using, were heated until the iron particles had been thoroughly alloyed. The dusts containing less than 20 per cent iron were no longer magnetic, so that magnetic separation of the iron was impossible. Only oxidized particles or free iron could then be taken out.

The results showed that no part of a sherardized coating can contain less than 6 per cent iron, as heating even for 45 days fails to lower the amount. When the dust contains less than 6 per cent iron, the resulting alloy contains 6 per cent. As the iron is increased from 6 to about 10 per cent the composition of the alloy changes proportionately. When the iron in the dust exceeds 10 per cent the composition of the alloy changes rapidly to about 20 per cent. And when 20 per cent iron in the dust is exceeded, the iron in the alloy rises abruptly to a high value.

These results are in general accord with the well-known equilibrium diagram for the zinc-iron alloys. There is this material difference: These results show iron to be insoluble in zinc at temperatures below the melting point, while the diagram indicates a solid solution containing about 1 per cent iron.

Iron Content Required

The iron content in a dust should be low, but there is some question as to what the limits should be. "Dross" dust containing iron is cheap and the percentage of iron increases with use, as zinc is removed while the iron remains. Iron in dust is useful as it raises the melting point and prevents fusing or caking when a high temperature is used to give rapid deposition. Iron, however, rapidly lowers the rate of deposition, making it necessary to employ higher temperatures, indicating that the iron content should not exceed 7 per cent.

Life tests show that there is a minimum weight of zinc per square inch necessary for good coatings; to test the value of sherardizing, the weight of zinc should therefore be determined. A new method depends on the fact that a boiling 10 per cent solution of ammonium chloride removes zinc from sherardized coatings rapidly, but does not dissolve iron until the zinc is practically gone. This test may be applied in two ways: The coating is completely removed and its amount determined by loss in weight; or the weight of the coating is found approximately by noting the time for iron to appear in the boiling solution. At each 5-minute interval a drop of the solution is removed upon a spot-plate and tested with potassium ferricyanide for the presence of iron. When the blue color appears, the coating is gone, and the time is a measure of the weight of zinc. A good coating should withstand this test for 10 or 15 minutes.

A comparison of short-time rusting tests, such as the salt spray, with tests in actual service, shows that rusting in the short-time tests does not necessarily mean a short life in service. The rapid rusting tests are, however, of value in judging the quality of a coating, when an actual determination of the weight of zinc is made at the same time. These two methods of testing should supplement each other.

Extract from a paper presented at the February meeting of the American Institute of Mining and Metallurgical Engineers, in New York.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

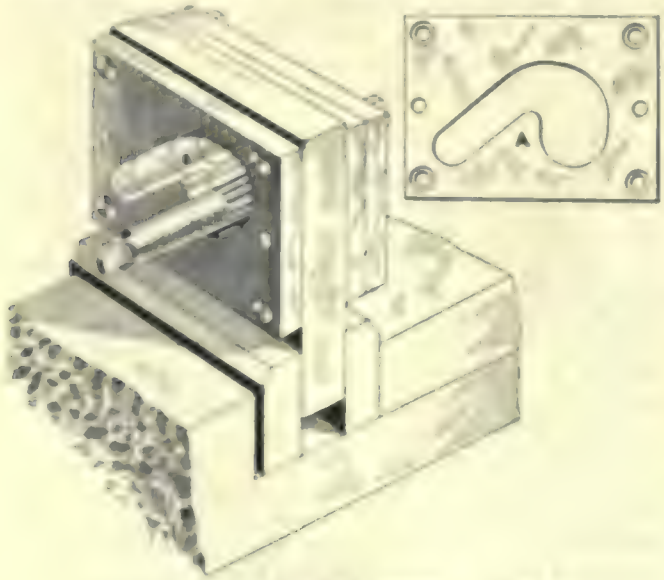
Making Cams from a Sample

BY JOHN T. CLARK

We recently were called upon to make a number of cam plates like the one shown at *A* in the sketch, a sample of which was sent in to be used as a guide, or pattern, to be duplicated. This sample was of machinery steel, pack hardened. First, machinery steel bars of the correct width were planed to the required thickness of ½ in. and cut off in lengths suitable for the new cams. The hardened sample was then clamped to each piece in turn and the screw- and dowel-holes drilled, using the sample as a templet.

With one of the pieces still clamped to the sample, a line was scribed around the contour and the piece laid out to drill out the center; calculating to leave about 0.015 in. of metal all round for finishing. Before actually taking out the center, however, the drilled piece was used as a templet from which to drill all the others.

To mill the cams to the required contour after taking out the centers, we made a cast-iron plate of suitable thickness, as shown in the sketch, with an opening of the same shape as the contour of the sample but a little larger, to provide clearance. This plate was drilled from the sample for the screw- and dowel-holes. Dowels were set in the sample, long



CUTTING CAM PLATES FROM A SAMPLE

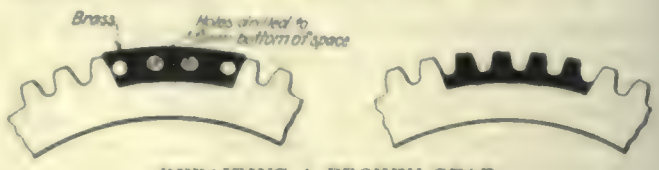
enough to reach through the cast-iron plate and extend about ½ in. on the other side. The sample was then screwed to the plate and the whole set up edgewise in the vise of a hand milling machine.

Two special cutters were made, one with a raised shoulder about 0.020 in. larger in diameter than the cutting portion; the other parallel. Two blanks at a time would be set upon the protruding dowels and clamped to the plate. The cutter with the raised shoulder would then be used to rough out the contour, the operator following around by means of the hand levers, keeping the smooth shoulder in contact with the contour of the sample. This would leave the new piece of the same shape but with 0.010 in. of metal still to remove. It would then be finished to size with the parallel cutter, and the job completed in good time.

Method of Setting Teeth in Broken Gears

BY F. C. SINBACK

I am located in a place where gear cutting machinery is at a premium and having occasion to make repairs upon small cast-iron and steel gears, I have devised the



REPAIRING A BROKEN GEAR

following method of putting teeth in gears of 6-diametral pitch and smaller.

The damaged portion should first be prepared by heating to a dull red for the purpose of burning out all oil and grease that would otherwise tend to prevent the brass, which I use as a filler, from sticking to the seat formed in the gear.

Next, cut out the damaged portion to a point a little below the root of the teeth, as I have shown in my sketch, and clamp a carbon block to each side of the gear to act as sides to the "mold." The acetylene torch is now brought into play and the whole section properly heated so that the brass will flow quickly to all parts of the surface. Sprinkle a little flux over the surface and apply the brass rod, filling the space to a point above the circle of the outside diameter. When cool, the brass can be dressed off with a file to the proper diameter and width.

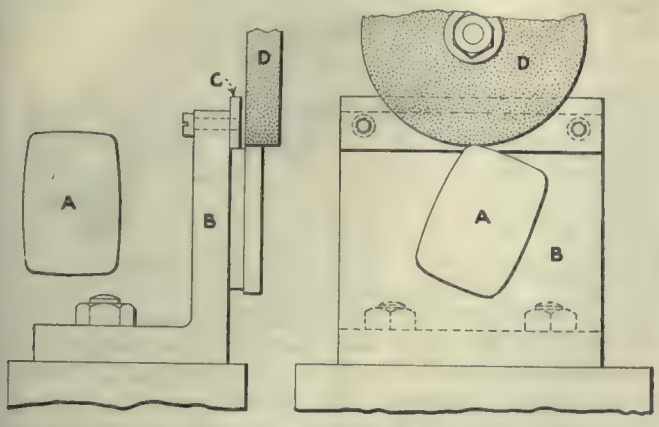
Next, cut a templet from a piece of stiff fiber paper to match the teeth of an undamaged section of the gear a little longer than the repair, and with it lay off the teeth on the finished surface of the brass. A twist drill of suitable size may be used to drill through the brass at the bottom of each space, and two hacksaw cuts from the outer circle to each hole will serve to remove most of the surplus metal, leaving enough to finish each tooth to line with a file.

This method is capable of yielding a very neat and permanent repair, much superior to the commoner method of driving in pegs and filing them to shape, and takes little if any more time. I have applied the same method to cast-iron gears of 4-diametral pitch, using cast iron as a filler, and have secured very gratifying results.

Grinding a Templet

By T. C. Johns

Recently I was called upon to make a die, shaped similar to sketch *A*, a templet being provided. The specifications called for the die to be 0.015 in. larger



HOW THE TEMPLET WAS GROUND

all round than the templet, necessitating the making of a new templet.

To make the templet I took the old one and sweated a piece of 3/32-in. sheet stock to it and roughly filed this stock to shape, leaving approximately 0.025 in. all round the templet. I then ground it to size on the surface-grinding machine in the following manner:

A thin parallel *C* was clamped to angle iron *B*, held on the grinding machine table. The original templet was placed against the angle iron with the edge in contact with the parallel *C* and the grinding wheel *D* brought down until it touched the part to be ground.

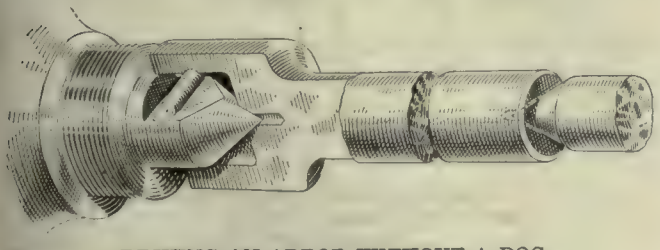
By rotating the templet and adjusting the height of the wheel it was brought to size all round.

Driving a Small Arbor Without a Dog

By W. Burr Bennett

Every mechanic is familiar enough with the delay and trouble caused by the necessity for changing dogs frequently when using small arbors in the lathe, and also knows the danger of getting his clothing caught by the projecting setscrew. The sketch herewith shows an arbor that we have used in our shop to advantage in taking light finishing cuts, trimming stampings, etc. It eliminates all of the trouble occasioned by the dog, and for work not heavy enough to wring the center loose from the spindle it serves the purpose admirably.

Little description is needed to explain the sketch. As many arbors as may be desired are made with one end enlarged and cupped out. A drill-rod pin driven through the recess engages the flat on the live center.



DRIVING AN ARBOR WITHOUT A DOG

Truing Work in a Chuck

By John J. Hill

It seems to be the general practice among the "boys" in our shop when truing up work in the lathe chuck, to just "put 'er in high" and hold a piece of chalk up to the work to mark the high side.

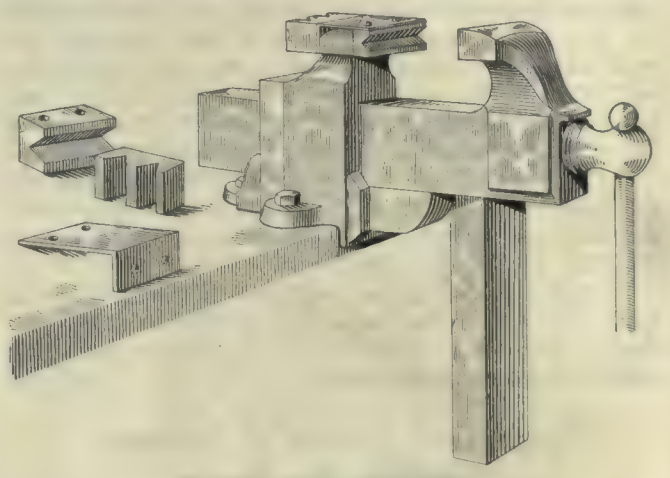
My method is to put a tool or other piece of steel in the toolpost and with each pair of chuck-jaws standing horizontal in turn, I first run the tool against the work and note the reading of the micrometer dial on the crossfeed screw. I then draw the tool back out of the way, turn the lathe spindle a half revolution and again run the tool forward until it touches the work. Noting the difference between this reading and the first, I not only know in which direction the work is "out," but I know just how much to move it to bring it to center. I claim that I can by this means true a piece of work, having a smooth surface, more quickly and accurately than can be done by the chalk method.

[Our correspondent asks us not to laugh because of the simplicity of this method. We won't—but if the piece has a smooth surface why not use an indicator?—Editor.]

Handy False Jaws for a Vise

By Charles H. Willey

When holding round pieces in the bench vise a set of V-blocks secured to a piece of sheet iron, as shown in



FALSE JAWS FOR A VISE

the sketch, will be found very useful and hard to do without.

A Corliss Engine Repair

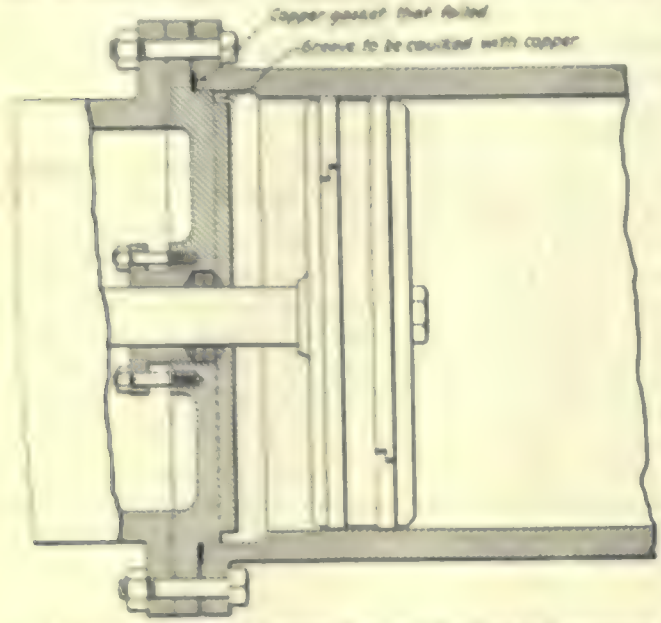
By F. S. Carroll

A large single-cylinder Corliss engine under my charge developed trouble by blowing out a copper gasket between the forward end of the cylinder and the end of the girder frame, which constitutes the cylinder head at that end.

To open this joint would necessitate the almost complete disassembling of the engine, because the foot of the cylinder casting would have to be lifted over the foundation bolts, and would also involve taking down the steam and exhaust connections.

We had been having other trouble with this engine because of rapid and uneven wear of the cylinder wall,

and our schedule of repairs included reboring the cylinder and making a new piston; so I decided to make the attempt to calk the leaky joint at the same time



CALKING FRONT CYLINDER HEAD OF CORLISS ENGINE

that the reboring was done and thus shorten, as much as possible, the time the engine would be out of service.

To provide a place for the calking material, an angle tool with a lip like a parting tool was set in the bar after the boring had been completed. It was adjusted outward until the side of the cutting lip just touched the wall of the counterbore. The bar was then fed forward, cutting a groove as shown in the sketch, straight into the cylinder head for a distance of about ⅜ inch.

A ring of No. 2 annealed copper wire was then set into the groove and calked in as tightly as possible with a suitable tool, followed by a second ring of the same material treated in a similar manner.

Though this engine has been running five or six years since this repair was made, during which time it has again been rebored and the cylinder bushed, there has been no leakage at the joint.

Improvised Method of Grinding a Rectangular Frame

By Ira Roff

Having a rectangular frame, the interior dimensions of which were 4⅛ x 4¼ x 1½ in., to be ground with all sides square, the writer adopted the method here described for doing the work. The corners of the frame were rounded to a radius of 0.150 in. and it was not essential that the inner faces of the frame should be parallel with the outer ones.

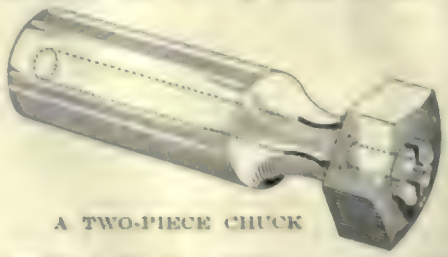
I set up the frame against an angle plate on the table of the milling machine and fastened a "Dumore" tool-post grinder in the spindle of the machine by means of an attachment provided for that purpose. Making sure that the spindle was rigidly fastened and using a wheel of the required diameter I was able to grind all four of the faces at an exact right-angle at one set-up by using the traverse and vertical movements.

There was about 0.003 in. of material to be removed and, because of the high speed of the grinder, the wheel wear was negligible.

A Two-Piece Chuck

By E. A. Thanton

The description of a collet chuck on page 32 of the American Machinist, reminded me of a very simple chuck we used to make for holding drills in screw machine turrets. The chuck, as shown in the accompanying sketch, consisted of only two parts, and if properly made would hold the drills securely and accurately. Ordinary cold-rolled steel was used for the body *A*, and a semi-finished hexagon nut was used at *B*. The body of the chuck was made from over-size stock which was chucked in the lathe and machined as shown in the sketch. The hole *C*, for the drill, was then drilled and bored to size. Pipe threads were cut on the tapered end and a nut, tapped out with a pipe tap, was fitted to it. The body was then cut off from the bar and the drill hole enlarged from the back for clearance, as shown at *D*. The tapered end was slit crosswise with a hacksaw. After casehardening with cyanide the chuck was ready for use. Made in this way, a complete chuck could be produced in far less time than could a split collet for a more elaborate chuck, and it answered all ordinary manufacturing purposes on screw machine work.

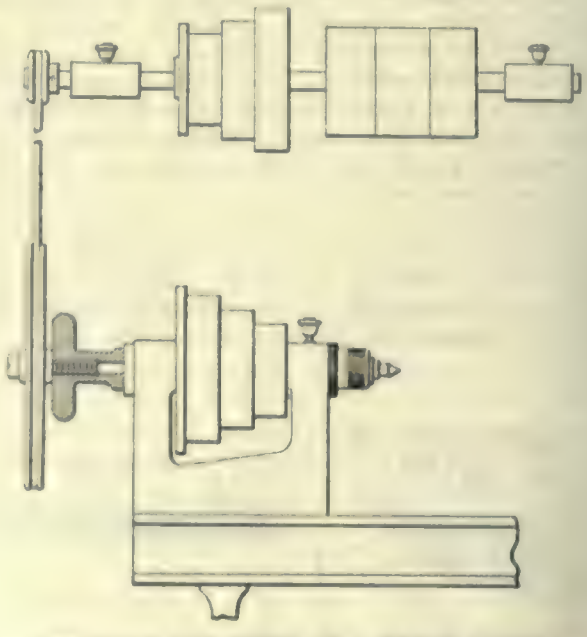


A TWO-PIECE CHUCK

Reducing the Speed of a Bench Lathe

By Dexter W. Allis

Having jobs to do frequently which could not be handled by the bench-lathe on account of its high speed, we devised a speed-reducing rig which greatly increased the range and usefulness of this tool. On the countershaft of the lathe was placed a 2½-in. grooved pulley. This was belted to a 12-in. pulley attached to the lathe by means of a threaded stud screwing into the end of the



REDUCING THE SPEED OF A BENCH LATHE

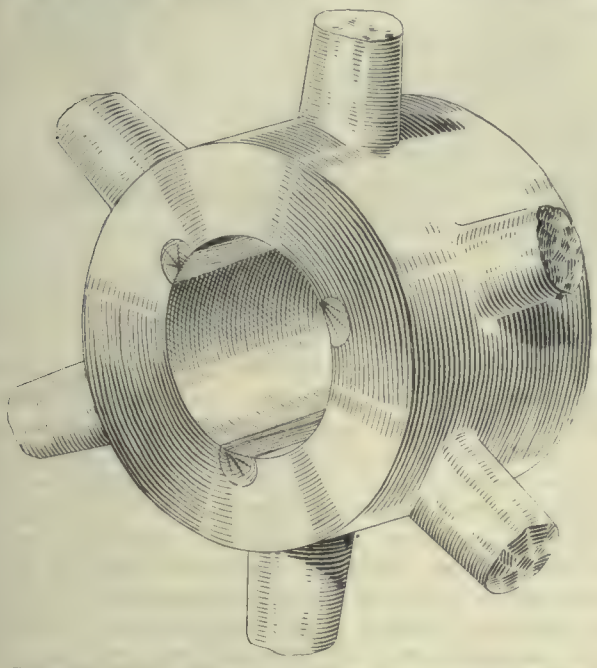
draw-in tube which was tapped to receive it, as shown. The draw-in tube was held from turning in the lathe spindle by its draw upon a center or collet blank in the nose of the spindle. With this attachment plenty of power at low speed could be obtained. The large wheel was removed when not in use.

Lubricating Loose Pulleys

By W. D. Lasall

Having considerable trouble in keeping loose pulleys lubricated, I tried using a loose bushing having a series of holes drilled in it as recommended in an article I read in American Machinist. I filled the holes with a mixture of graphite and cylinder oil. This was two years ago and the pulley has not been oiled since.

The other day I saw a pulley that had three holes drilled lengthwise through the hub, so that they broke through into the bore. See sketch. Soft pine plugs,



PULLEY HUB WITH SOFT PINE PLUGS INSERTED

soaked in oil, were driven into the holes and I was told that the pulley had been running eleven years and had given no trouble.

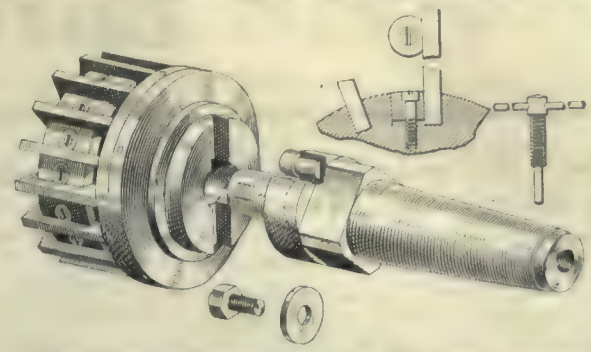
Adjustable Blade Milling Cutter and Shank

By Fred S. Harger

The sketch illustrates the construction of a shank for use in connection with facing or end mills on the Becker vertical milling machine and also one of the inserted blade cutters, both of which were designed by the writer. The shank, as well as the body of the cutter, may be made of machinery steel and pack hardened, or, if preferred, both may be made of tool steel.

The tapered hole in the body of the cutter should be nicely fitted to the lower portion of the shank so that it bears firmly upon the taper at the same time that it seats against the shoulder. Slots in the body of the cutter fit over the tool steel pins that are driven into the shoulder and thus insure a positive drive.

The cutter is further secured against the possibility of working loose by a capscrew tapped into the end of the shank and provided with a washer to fit into the recess at the end of the cutter body. The large end of the shank is drilled and tapped to receive the draw



ADJUSTABLE INSERTED BLADE MILLING CUTTER AND SHANK

bolt by which it is held in the spindle of the machine.

The upper part of the shoulder is squared to fit the yoke of the machine spindle and thus prevent the shank from wringing loose. It also furnishes a place by which to grip the assembled tool in a vise when adjusting or changing the blades.

The construction of the cutter is evident from the sketch. The blades are of high-speed steel and are a tight fit in the slots in the body, being further secured by the flat-sided bushings and fillister head screws.

The holes in the bushings are, of course, made to the body size of the screws, the latter extending through them and entering tapped holes in the body of the cutter. The bushings are also threaded internally to fit the extractor.

In case it becoms necessary to remove the bushings, the screws are withdrawn and the extractor screwed in their places successively. The pilot portion of the extractor reaches the bottom of the threaded hole and further turning lifts the bushing out.

The bottoms of the slots for the blades are inclined so that the diameter of the cutter may be expanded by turning forward the knurled adjusting rings when it is necessary to regrind, thus maintaining the original size.

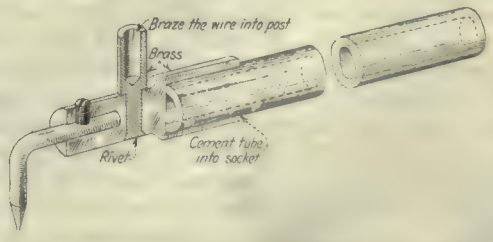
Water Gage Glass Makes Excellent Handle for Etchograph Stylus

By R. Grant

The wood handle to which is attached the copper stylus used for marking with the electric etchograph, has a distressing habit of getting itself burned off quite frequently. This trouble is easily avoided by the use of glass instead of wood for a handle.

A piece of heavy glass tube (an old water gage glass from a steam boiler answers very nicely) cemented into the pocket of the stylus will with ordinary care outlast any number of wood handles.

The sketch requires no explanation.



GLASS HANDLE FOR ETCHOGRAPH STYLUS

EDITORIALS

Lack of Standard Tools in Railway Shops

A RECENT investigation by makers of formed tire turning tools brought to light a sad lack of uniformity in the sizes and shapes of tools used. The sizes and shapes of the tire flanges and of the rest of the contour, are fixed by the American Railway Master Mechanics' Association and are standard on practically every railroad. The lack of uniformity in the sizes of the forming tools themselves makes it difficult to supply commercial tools at a reasonable price.

There has been in the past too little standardization of tools and other things used in railway shops. This has not been altogether the fault of the mechanical officials, but can frequently be charged to the financial policy of denying the railway shop sufficient appropriations for tools and machines. To this policy is due the common practice of "making your own" machines and tools.

Any one who has the slightest knowledge of standardization in tools and the economy which accompanies it, can see the great waste entailed by having each shop make its own tools. It would be as sensible to make drills and reamers of standard sizes in each shop.

This is one of the many opportunities for economy in many railway shops. Some, like the Santa Fe, have standardized shop equipment to a very considerable degree and have profited greatly thereby. Much of this has been offset in many cases by constantly introducing new classes of locomotives, which entails the carrying of many more spare parts at all store depots along the line.

Economic railway operation is vital to every other industry as well as its own. Those responsible for railway management will do well to follow some of the other industries in matters pertaining to shop practice. The use of standard tools as far as possible is a step in the direction of economy.

A Pleasant Record of Legislative Obstruction

ON ANOTHER page is a brief account of the trouble encountered in the efforts to enact the Patent Office Relief Bill into law. We have printed it for two reasons. In the first place it gives some of the provisions of the new law which are of interest to all manufacturers and engineers. In the second place it gives an incidental outline of unreasoning obstruction on the part of some of the honorable members of our national legislature which is illuminating.

The bill as presented was good from every angle. It gave a certain measure of vitally needed relief, and it did not saddle the treasury with a heavy additional burden of expense. But objections came up just the same and from men who should have supported the bill. Fortunately most of the members of both houses were not impressed by the objectors and the bill passed by a big majority, but it is nevertheless instructive to examine its history and judge the obstructionists by their stand.

Beware of the System!

THERE is a warning in the last installment of Modern Production Methods, which appears in this issue, that can hardly be over-emphasized. All through the series it has cropped up at intervals and here in the conclusion it is driven home once more. It tells of the danger of expecting a system to do all your work for you. A slogan something like this might be adopted with good results—get a good system and make it work, but don't let it get you. Another thing, it is not likely that the same system will work equally well in any two plants. Each shop has an individuality and a set of problems all its own and consequently the system has to be modified to fit each particular case. Beware of the universal system; it's loaded!

How We Came to Have Machine Tools

THE buyers of machine tools have never fully appreciated their worth. They rarely seem to realize that without them we should never have attained our present industrial supremacy.

Machine tools came into being because they were needed to produce other machines. The primitive lathe and drilling machine date back many centuries, but machine tools as we know them were developed to make possible the steam engine, the loom and other machines which forced their way into industry at the beginning of the industrial revolution.

As the demand for steam engines, textile and other machinery grew, the need for better machine tools became more apparnet and many ingenious machines were developed. Many good mechanics with inventive genius designed and built new and improved machines and frequently started little shops of their own. In fact nearly all of our well-known machine-tool building plants today are the outgrowth of these small enterprises.

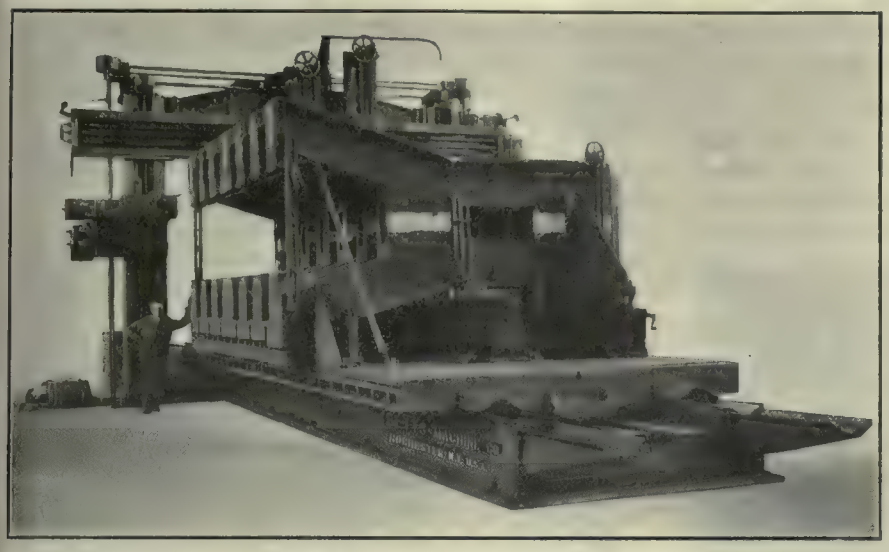
The proprietors however were frequently much better mechanics than business men. They knew little of business economics, of overhead, of selling costs, of depreciation and other important factors. In most cases they seemed to forget all about sinking funds for expansion or for dull times, and frequently priced their product so low as to leave little more than day wages to pay for the development and all that entered into it. There are, unfortunately, too many examples of this still in existence.

With few exceptions it may be said that prices of machine tools have never been set with a proper regard for the part they play in industry or the costs that go into them. Machine tool builders have been content with too small a return for their service to industry. As a result they have suffered in times of business depression from the lack of reserves of capital and have had serious trouble in weathering the inevitable business storms. It would be hard to find beter proof that the main aim of business is not to render service but to make profits while rendering service.

Shop Equipment News

Betts 15 x 10 x 38-Ft. Planer

The accompanying illustration shows a large planer recently built by the Betts Machine Co., Rochester, N. Y. The machine has a distance of 15 ft. 2 in. between the uprights and 10 ft. 2 in. between the table and the crossrail in its highest position. The table is of the box type, and has an overall length of 38 ft. and a width of 12 feet.



BETTS 15 x 10 x 38-FT. PLANER

The machine is driven by a 75-hp. reversing planer motor. A range of cutting and return speeds which can be changed instantly is provided. In addition, the table is equipped with a device providing for "air" or spot planing; that is, for automatically increasing or decreasing the speed during the cutting stroke. This device consists of a switch connected with the main controller, and is operated by sets of dogs carried on the left-hand side of the table in positions corresponding to those where increasing or decreasing of the cutting speed is desired. The return speed remains constant.

Five toolheads are provided; two heads are carried on the crossrail, one extension-slide sidehead on each upright, and one head on a separate column. The independent feed and power rapid traverse in all directions for the two crossrail heads and the two extension-slide sideheads are so arranged that each can be engaged for power rapid traverse in any direction, at the same time that the other head or heads are feeding. A 15-hp. motor located on the top of the girt furnishes power for raising and lowering the crossrail and for the power rapid traverse to the heads.

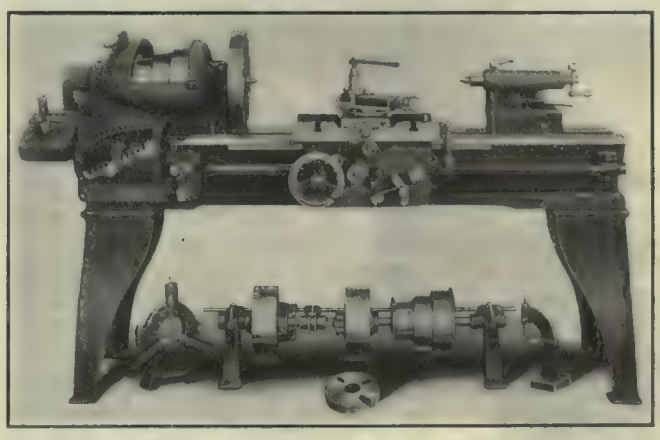
Automatic tool lifters are provided for the crossrail heads. Forced lubrication of the table ways, as well as of the driving gears, rack and shaft bearings, is furnished by means of pumps and an oil-filter system. A separate toolhead or column fastened to the bed some distance ahead of the right-hand upright carries a saddle which is provided with vertical feed and power rapid traverse in both directions. This power is furnished by a separate electric feed motor.

Carroll-Jamieson Engine Lathes

The Carroll & Jamieson Machine Tool Co., Batavia, Ohio, has recently placed on the market a line of lathes intended especially for use in toolrooms and automotive service stations. The accompanying illustration shows the 14-in. quick-change lathe, which can be supplied with either single or double back gears. A lathe of very similar type but of 16-in. size can be supplied, a cabinet leg under the headstock end being regularly furnished. In a 13-in. size, a semi-quick-change lathe with a single back gear can be supplied. The swings over the bed in the 13-, 14- and 16-in. sizes are respectively, 13¼, 15¼ and 16¼ in., while the swings over the carriage are 8, 10⅜, and 11⅜ inches.

A bowl headstock is employed and the gears are fully inclosed. The spindle is made of high-carbon steel, and has a 1¼-in. hole throughout its entire length. The spindle bearings are phosphor bronze. The tailstock is cut away so as to permit the compound rest to be swung parallel to the ways. Furthermore, it can be set over and locked in any position to permit of turning tapers.

The quick-change gear mechanism permits of cutting all standard and odd threads from 3 to 64 per inch, either right or left hand. All changes are made by the use of one handle and a knob placed in front of the headstock. Sliding gears are employed in the gear box. On the semi-quick-change lathe, three changes of feed are provided by shifting a lever. Additional changes are obtained by means of removable change gears. The apron is provided with a reversing lever for the feed, as well as with an interlocking device to prevent two feeds being engaged simultaneously. The carriage is fitted with a device for clamping it securely to the bed when facing work. It is gibbed at both the front and



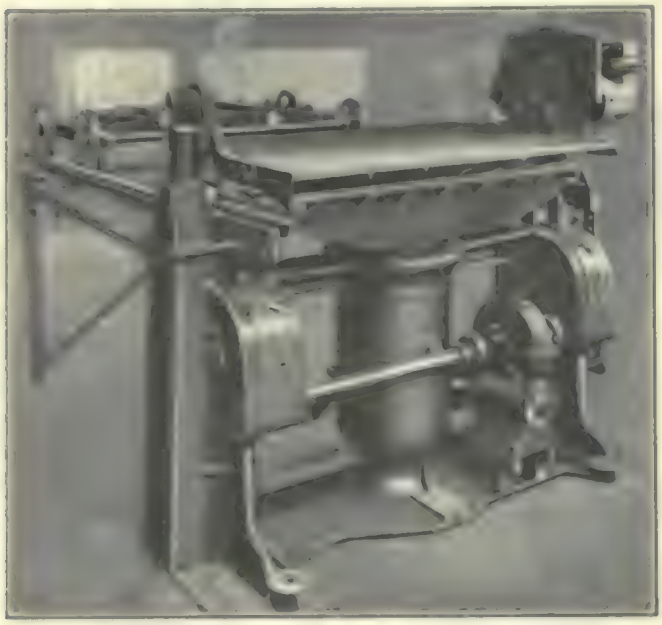
CARROLL-JAMIESON 14-INCH ENGINE LATHE

the back. Taper gibs are used on the cross-slide and the compound rest.

The lathe is ordinarily equipped with both small and large faceplates, chuck plate, steadyrest, follow rest, double-friction countershaft, as well as centers, wrenches and a thread indicator. Other attachments, such as for milling and keyway cutting, taper turning, and increasing the swing, can be furnished. The two larger sizes of machine have a distance between centers of 39 in. when a 6-ft. bed is employed. The 13-in. lathe has a weight of 1,300 lb. when a 5½-ft. bed is employed; the 14-in. lathe a weight of 1,700 lb. with a 6-ft. bed; and the 16-in. lathe 2,100 lb. with an 8-ft. bed.

Osborn Direct-Draw Roll-Over Jolt Molding Machine

The illustration shows a direct-draw, roll-over, jolt type of molding machine recently placed on the market by the Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio. The machine is of the stationary type



OSBORN ELECTRICALLY CONTROLLED MOLDING MACHINE

and has the standard air-operated jolting mechanism. In addition, it is equipped with an electrically operated roll-over, pattern-drawing apparatus and run-out car. The drawing of the pattern is accomplished when the roll-over table and the pattern are in perfect balance. Since the drawing motion is vertical, there is no unbalancing of the parts.

The machine is built in capacities from 5,000 to 20,000 lb., and in the height and flask length required to suit the work. It is completely equipped with all necessary piping, valves and wiring. The jolting operation is performed by compressed air at a pressure of 80 lb. per square inch.

The mold is rolled over by electrically driven mechanism actuated by an automatic push button. The motion is constant and without shock. Although the entire operation is automatic, the motion may be stopped at any position by the operator. The speed at which the pattern is drawn may be easily regulated, so that the start of the draw may be made slowly, and the pattern then removed quickly after it has been loosened. The pattern plates are bolted directly to the roll-over table, and require no blocking or other inserts either on the table or on the leveling car. The leveling car is mounted on four large roller-bearing flanged wheels and provided with a double leveling device. The latter consists of eight depressible members that can be locked by means of a hand lever, after being partly depressed by the mold as it is lowered on them. It is possible to handle two molds side by side.

The valve of the jolting mechanism is of the balanced piston type. By its use, the machine can be adjusted to give a jolting stroke from 1 to 2½ in. in length, as well as to regulate the amount of compression in the cylinder. All the bushings and pins, excepting the phosphor-bronze guide rod, jolt table and guide-pin bushings, are made of alloy steel. The jolt valve and cylinder are equipped with a force-feed oil system.

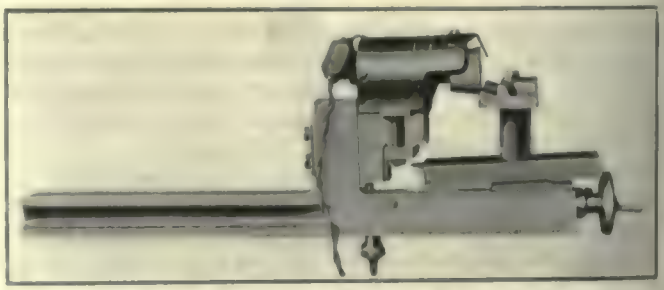
Lifting the load is accomplished by means of heavy cables coiled on drums. The motor driving the mechanism may be either a.c. or d.c., and operates through a worm drive. It is equipped with an automatic electric brake. The controllers used are either of the magnetic type with push-button control, or the manually operated upright type, depending on the character of the work.

Cutter Grinder for Sawyer-Weber Crankpin Re-Turning Tool

The crankpin re-turning tool made by the Sawyer-Weber Tool Manufacturing Co., Los Angeles, Cal., for use on lathes was described on page 840, Vol. 51, of AMERICAN MACHINIST. The tool is shown in the accompanying illustration with an electric-driven cutter-grinding attachment to enable the rapid sharpening of the toolbit. The cutter-grinding attachment can be easily applied without altering the re-turning tool in any way. It permits of sharpening the cutter in from two to five minutes.

The grinding device is driven by a ⅓-hp. Westinghouse electric motor running at 10,000 r.p.m. The end thrust of the motor shaft is adjusted by means of the same collet that holds the wheel. The cutter to be ground is passed in the groove of the guide blade by the fingers of the operator, and micrometer adjustments are made by the handwheel and dial of the re-turning tool. The sharpening equipment can be easily attached and the toolbit quickly ground.

The re-turning tool itself when in operation is fitted directly to one of the pins of the crank to be ground,

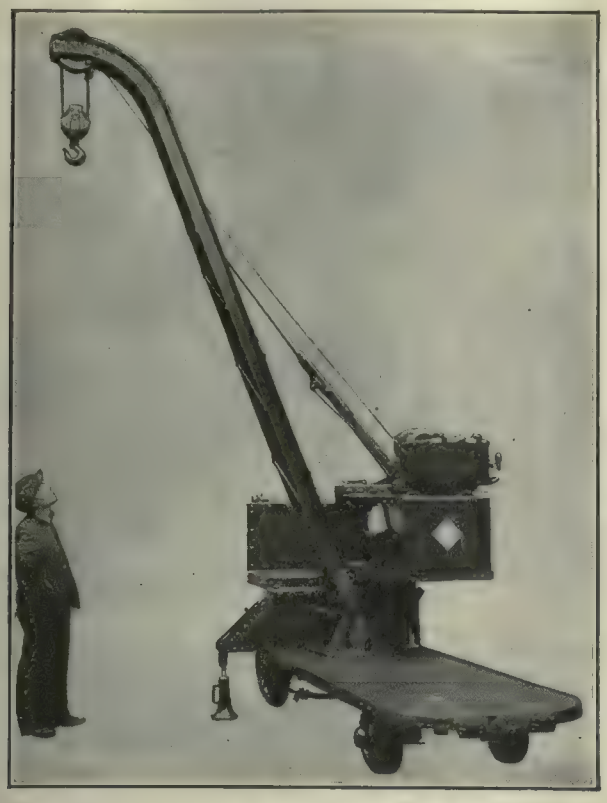


CUTTER GRINDER ON CRANKPIN RE-TURNING TOOL

and the handle or bar of the tool rests on the bed of the lathe. The handwheel serves to provide a feed for the tool, so that the size of the pin can be adjusted, and so that the amount of feed movement can be accurately measured.

Elwell-Parker Electric Crane Truck

The electric crane truck shown in the accompanying illustration is intended for heavy duty in the lifting and stacking of material in a yard or warehouse. Due



ELWELL-PARKER ELECTRIC CRANE TRUCK

to the low bed and long boom, and to the ready portability of the machine, the crane is applicable to many jobs. The truck is very similar to that illustrated on page 839, Vol. 54, of AMERICAN MACHINIST, the principal difference being the fact that a longer boom is employed and out-riggers are provided.

The out-riggers are furnished at each side, one of them being shown in use in the illustration. They are provided with jacks, so that the height may be quickly adjusted. When not in use, the jacks are lifted and turned about the pivot at the top, so that the out-rigger is merely folded and then swung in close to the crane column. The illustration shows one of the out-riggers in place on the ground and the other one folded and out of the way. The boom may be lowered to permit of passage through doorways.

The boom is 12 ft. in length, and may be raised and lowered by the operator without leaving the driving position. The motor and the controlling apparatus for the winch counterbalance the boom. The entire lifting mechanism can be swung about the vertical column. The crane will pick up 1,000 lb. at an 8-ft. radius at either the side or the end of the platform; with the out-riggers in position, it will lift 3,000 lb. at a 6-ft. radius.

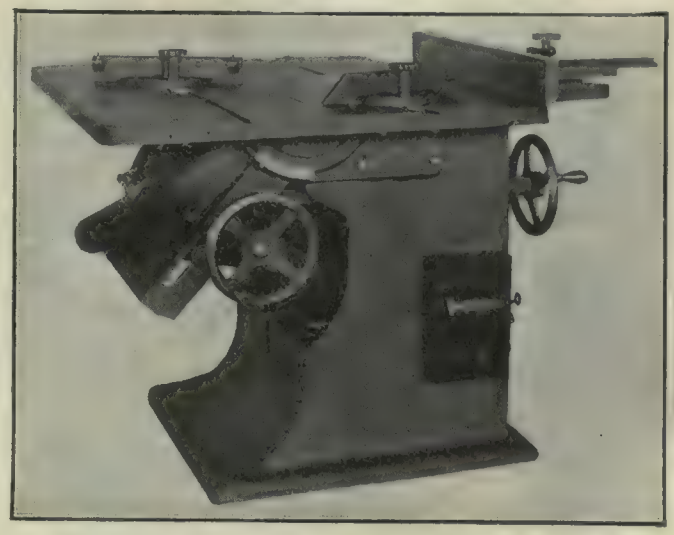
The truck is equipped with a single storage battery for furnishing power for the motors that operate the crane and propel the truck. The motors, differential worms, wheels and crane column are all fitted with ball bearings. The truck is driven by only the two larger wheels, although steering is done on all four wheels. A coupler is provided at the rear.

Tannewitz Tilting-Arbor Saw Bench

The Tannewitz Works, Grand Rapids, Mich., has recently placed on the market the Type-J tilting-arbor saw bench shown in the accompanying illustration. The saw is driven directly by a motor inclosed in the base. The motor can be supplied for either 2- or 3-phase, and for 220-, 440-, or 550-volt current. S.K.F. ball bearings are employed, with provision for oiling and draining the bearing housings.

The motor is mounted on a sliding bracket carried on a yoke hinged on the base. It is thus possible to tilt the saw by turning the handwheel on the right side of the base. Vertical adjustment of the motor is obtained by the handwheel on the front of the machine. Knobs are provided for clamping the movements after they have been adjusted.

The table is 38 x 47 in. in size.. It is mounted on a base cast in one piece, so as to give a rigid construction and to exclude dust from the mechanism. The machine is provided with the necessary gages. The rip fence is non-tilting and can be used on either side of the saw. It can be adjusted by means of a gear and rack. A tilting fence can also be furnished. The saw is protected by a curved steel splitter guard. A dust spout with a



TANNEWITZ TYPE-J TILTING-ARBOR SAW BENCH

door incloses the bottom of the saw. The starting box for controlling the motor is mounted on the side of the base.

Alvord Adjustable Helical Reamer

The Alvord Reamer and Tool Co., Millersburg, Pa., has recently added to its line of "X-Cel" tools an adjustable inserted-blade helical reamer. The tool is distinguished from the concern's regular straight-blade adjustable reamer by the name "Shear-Cut," applied because of the cutting action resulting from the angularity of the blades.

The body of the reamer is made of alloy steel, and the shank is especially heat-treated to withstand rough



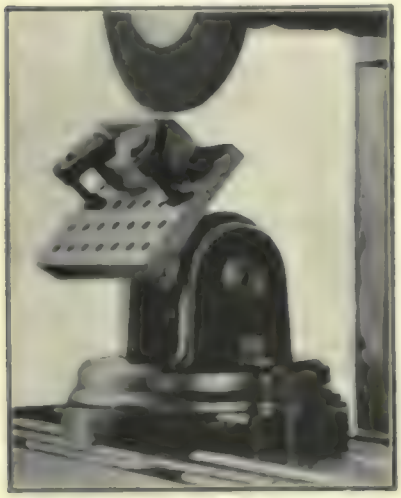
ALVORD ADJUSTABLE HELICAL REAMER

treatment. The blades are made of a special steel and are accurately ground all over. Both ends of a set of blades are ground so as to give proper contact with the nuts, and to insure that the blades are of exactly the same length. They are thus securely locked in their seats when the nuts are tightened. The nuts themselves are of hardened and ground crucible steel.

The reamer is especially recommended for work on bearing metals, particularly bronze. It can be used for split bearings and holes provided with oil grooves or keyways. The tool is made in seventeen sizes to cover diameters from ½ to 4⅛ in. The maker calls attention particularly to the fact that the reamer does not chatter, this effect being accomplished by giving the tool special treatment to suit it to the type of metal on which it is employed. Special equipment has been developed for manufacturing the reamers.

Krag Universal Angle Fixture

The accompanying illustration shows the "Little Bob" universal angle fixture recently placed on the market by E. L. Krag and Co., 50 West Randolph St., Chicago, Ill. The device is intended for use when making angle setups on milling, drilling and grinding machines. The plate can be tilted 90 deg. to either the front or the back. The yoke carrying the plate can be revolved throughout a complete circle. The base, as well as a flange on the horizontal pivot, are graduated so that the position of the plate may be easily adjusted. All surfaces of the plate are ground true and square with each other, so as to facilitate setting. Holes are provided in the plate for the insertion of special clamps, so that work may be easily secured to the fixture. The plate pivots on a ¾-in. stud. To lock it in position, the nut is tightened on the stud, so that friction between the large flanges prevents movement of the plate.



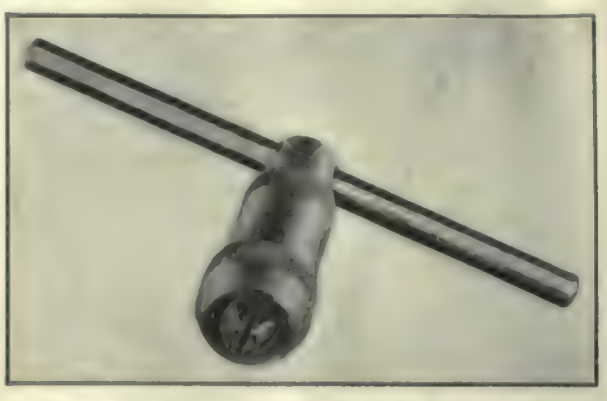
KRAG "LITTLE BOB" UNIVERSAL ANGLE FIXTURE

The yoke casting revolves on a 1½-in. pilot in the center of the base. It can be clamped by two ½-in. bolts fitting in circular T-slots in the base. Since the three clamping nuts are all of the same size, but one wrench is required for making all adjustments. Projecting lugs are provided, so that the fixture may be clamped to the machine table. The device is simple and rigid, and should be adaptable to a large variety of work in the toolroom. The plate is 3¾ x 4¾ in. in size; the base is 8½ x 6½ in. The device has a total height of 6½ in. and weighs 25 pounds.

Consolidated Tool and Tap Holder

In the accompanying illustration is shown a device for holding taps and small tools such as reamers. It is known as the No. 90 tool and tap holder, and has recently been placed on the market by the Consolidated Tool Works, Inc., 296 Broadway, New York, N. Y. The construction gives the chuck a wide range; the maximum capacity is for taps up to ⅝ in. in diameter and other tools in proportion.

The jaws are provided with V-grooves extending parallel to the axis of the holder, and they are serrated throughout practically their whole length, so as to give a secure grip. The opening of the jaws may be easily adjusted by turning the sleeve, which is knurled and has a maximum diameter of 1⅜ in. The length of the handle is 7½ in. and the length of the tool itself 4 inches.

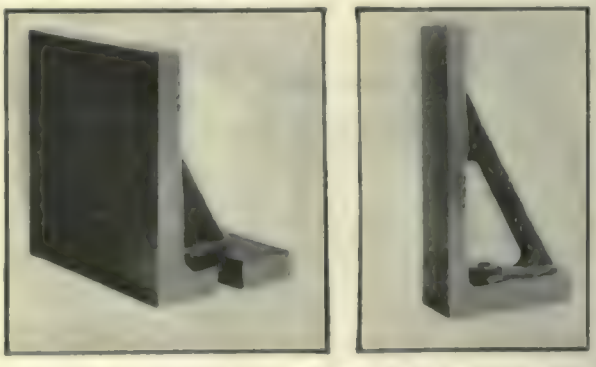


CONSOLIDATED TOOL AND TAP HOLDER

Simplex Precision Angle and Measuring Irons

At the left of the accompaning illustration is shown the precision angle iron recently placed on the market by the Simplex Tool Co., Woonsocket, R. I. The device is made of cast iron and is intended for holding work in place on a machine table. Two slots are provided for clamping one leg to the table, while the slot in the other leg can be utilized to secure work to the angle iron. Two ribs brace the legs to keep the device from distorting. The iron is made in three sizes, 4 x 5 x 5 in., 6 x 6 x 8 in., and 8 x 10 x 12 inches.

At the right of the illustration is shown the precision measuring iron that has also been placed on the market. The device is especially intended for use when setting and aligning work, as for accurate boring operations. It is provided with a bolt hole and a keyway, so that it can easily be secured to the table of the machine. If desired it can be used for clamping work that is to be machined. The tool is made in two sizes, 2½ x 6 x 12 in. and 4 x 8 x 21 inches.



SIMPLEX PRECISION ANGLE AND MEASURING IRONS

Hoffman Drawing Table

The Hoffman Drawing Stand Co., 189 N. Water St., Rochester, N. Y., has recently placed on the market the drawing table illustrated herewith. The board can be



HOFFMAN TUBULAR-FRAME DRAWING TABLE

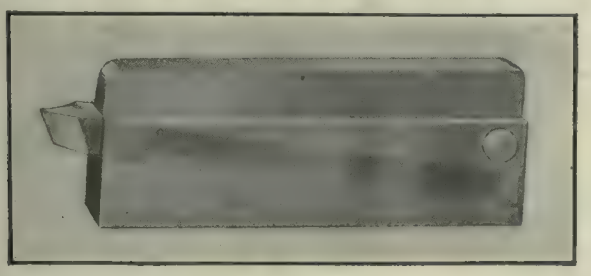
tilted about a horizontal axis to almost a vertical position toward either the back or the front of the stand. Its height above the floor can be adjusted by turning the handwheel on the vertical screw in the center of the frame. The maximum height of the board is 44 inches.

The principal feature of the frame consists in the use of tubular members. The frame is light in weight, although possessing strength and rigidity. The feet of the stand are provided with cork inserts, so as to prevent slipping and marring of the floor. A separate tray fastened to the stand can be placed on either side so as to carry the draftsman's instruments. A drawer is provided in this tray. The height and the position of the drawer tray can be adjusted to suit the convenience of the operator.

Lovejoy "Use-em-up" Toolholder

A toolholder which is intended to effect a saving by making it possible to use up short toolbits, has been placed on the market by the Lovejoy Tool Works, 319-331 West Ohio St., Chicago, Ill. The device, which is shown in the illustration, is known as the "Use-em-up" toolholder.

The holder is made of tool steel and designed to



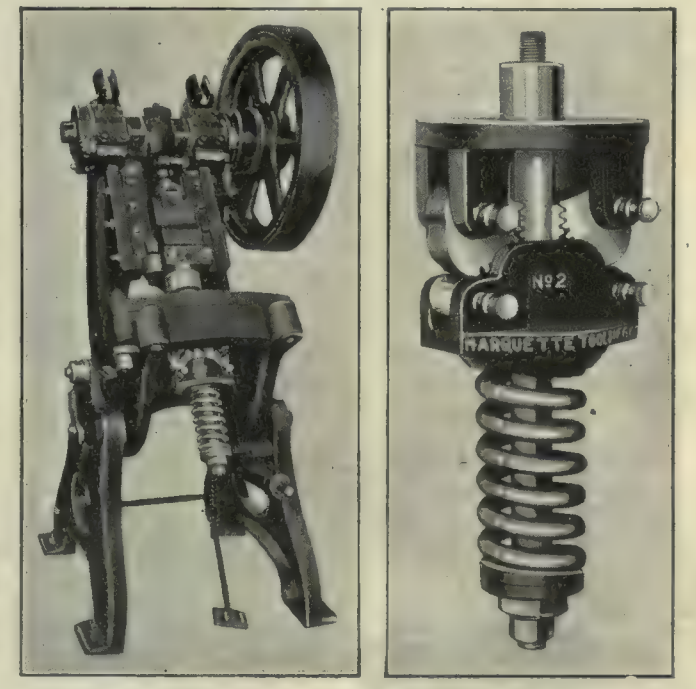
"USE-EM-UP" TOOLHOLDER

withstand heavy service. It will hold full-length toolbits without danger of breaking them, but is particularly useful when the toolbits become short through repeated grinding. Toolbits as short as $\frac{1}{4}$ in. can be rigidly held, and the holder can be used very close to the work. The No. 2 holder carries a bit $\frac{3}{8}$ in. square in section, and is $\frac{5}{8}$ x $1\frac{1}{2}$ x 4 in. in size.

Marquette "Even-Pressure" Spring Cushion for Punch Presses

The Marquette Tool and Manufacturing Co., 321 West Ohio St., Chicago, Ill., has recently developed for use on punch presses the attachment shown both separately and in place on a press in the accompanying illustration. The device is known as the "even-pressure" spring cushion and is similar in principle to the cushion previously described on page 570, Vol. 55, of AMERICAN MACHINIST. It is claimed that, due to the uniform pressure obtained during the entire stroke of the press, deeper shells can be drawn in one operation.

A bolt is screwed under the die or bolster plate, and the cushion is slipped over it and held in place by a nut. An arrangement of compensating cams works in conjunction with the spring so that the pressure does not build up toward the bottom of the stroke. The action reduces the strain on the metal and prevents back lash on the return stroke. It is said that due to the elimination of wrinkles in the blank and excessive pres-



MARQUETTE SPRING CUSHION FOR PUNCH PRESS

sure on the draw-ring, the dies are not worn as quickly and repair costs are reduced.

The cushion can be installed without alteration of the dies, and without drilling holes in the press or bolster plate. It can be easily adjusted for different pressures, and it retains its adjustment when either on or off the press. The attachment is especially adaptable to use on presses of small or medium size for drawing metal shells where the conditions require that the device be attached and detached quickly. Its universal application makes it possible to do a great variety of jobs with the same device, as it can be readily changed from one press to another. The cushion is made in four sizes intended for maximum depths of draw from $1\frac{1}{4}$ to 4 in. and for maximum pressures from 1,800 to 6,000 pounds.



NEWS SECTION

Comparison of January Sales With Other Years

The following table from the monthly statement of the Federal Reserve Bank of New York shows the value of sales in the month of January for the past four years. For purposes of comparison sales in January, 1921, are taken as 100 and January sales in other years are expressed in percentages of this base. A column is also added showing the approximate relative values of the products handled in the different lines. The reports of the United States census of manufactures have been used as the basis for calculating the relative values.

	Relative Values	Monthly Sales Jan., 1919	Jan., 1920	Jan., 1921	Jan., 1922
Dry goods	20	134	274	100	140
[illegible]	3	106	126	100	110
Shoes	7	131	242	100	106
[illegible]	1	274	309	100	100
Jewelry	1	120	255	100	90
Groceries	37	118	158	100	91
Clothing	25	97	176	100	77
Stationery	2	89	98	100	75
Hardware	1	112	140	100	72
Machine tools	1	200	186	100	51
Weighted av		114	181	100	9

Standardization Committee for Turret Lathe Group

A. J. Jones, chairman of the committee of the National Machine Tool Builders' Association which is in charge of standardization of turret lathes, has appointed the following men to assist him in that work: R. E. Flanders, Jones & Lamson Machine Co.; Oskar Kylin, Foster Machine Co.; Charles Meier, Acme Machine Co.

Adding Machine Companies Cleared of Charges

The Federal Trade Commission has dismissed, because of insufficient evidence, complaints charging unfair competition against the following adding machine companies: The Adder Machine Co., Wilkes-Barre, Pa.; Accounting Machine Co., Inc., New York City; Burroughs Adding Machine Co., Detroit, Mich.; The Dalton Adding Machine Co., Cincinnati, O.; Ellis Adding Typewriter Co., Newark, N. J.; International Money Machine Co., Reading, Pa.; Marchant Calculating Machine Co., Oakland, Cal.; Rockford Milling Machine Co., Rockford, Ill.; Teetor Adding Machine Co., Des Moines, Iowa.

N. F. T. C. Scheme to Aid Unemployment Here

The National Foreign Trade Council has sent a letter to trade organizations and Chambers of Commerce throughout the country requesting their co-operation in a plan which it believes will assist in reducing unemployment in the United States, by providing that a part at least of the proceeds of foreign loans floated here shall be spent for the purchase of American products.

The council urges American investors to insist that the underwriters of foreign loans shall require the inclusion in the loan agreement, wherever practicable, of a stipulation covering such use of the loan proceeds. The council points out that it is the settled practice of British and other European bankers, and adds that the effect of such a practice is providing employment for the industries of the country furnishing the money is obvious. This proposal of the National Foreign Trade Council is particularly significant in view of the importance of the firms composing the council.

"The United States today has an industrial establishment capable of providing much more than is needed to meet domestic requirements," states O. K. Davis, secretary of the council. "The slackness of foreign trade is one of the strongly influential factors in our present business depression. The Foreign Trade Council believes that this depression might be substantially relieved by requiring foreign countries which are borrowing here, to follow their loans with orders that would give work to American factories."

The letter calls attention to some recent instance where this policy was not followed, in one of which the borrowers expected to be required to spend part of the loan in the United States; but because they were not so required, they are planning to spend in Germany the money borrowed here.

Auto Industry Ahead of Iron and Steel

The value of automobiles produced in the United States in 1920 was $917,470,000. If the $450,000,000 in tires, the $184,000,000 paid for garage hire and wages, and the many millions spent on motor car accessories, are added, the automobile industry looms up with $1,500,000,000 turnover. This brings it ahead of the steel and iron industry.

President Signs Screw Thread Resolution

The President has signed House Joint Resolution 227, thereby extending the term of the National Screw Thread Commission for a period of five years from March 21. The commission was scheduled to meet on March 17 to formulate plans for the extended work which it now will undertake.

Some opposition has been voiced recently to the effect that too many are dabbling in standardization. It was reported that some opposition would meet the Screw Thread Commission bill in the Senate on that ground, but it failed to materialize. Senator King, of Utah, did ask if Congress is not making appropriations for similar work which could be discharged just as well by this commission, which receives no salary. He apparently was satisfied by the assurances given him by Senator McNary, of the Committee on Manufactures, and he interposed no objection. The bill passed by unanimous consent.

National Metal Trades Association to Convene at New York

The twenty-fourth annual convention of the National Metal Trades Association will be held at the Hotel Astor, New York City, on Wednesday and Thursday, April 19 and 20.

On Monday preceding the convention the executive committee will convene, and the twenty-three branch secretaries will hold their semi-annual meeting. In the evening there will be a joint dinner of the administrative council with the local branch presidents and secretaries. On Tuesday, the administrative council will hold its semi-annual meeting.

On the evening of April 18, the annual dinner of the Alumni Association will be held.

The convention will open on Wednesday morning with a short business meeting. Able speakers have been secured to discuss important business, financial and labor questions of the day.

The association, after a most careful survey of apprenticeship training, covering a period of more than two years, has prepared a very exhaustive plan of apprenticeship training, which will be submitted to the members at the convention.

Ordnance Department Gets Large Share of Army Appropriations

While heavy reductions were made in appropriations asked for the Ordnance Department of the Army, that service has fared better at the hands of the Appropriations Committee of the House than have many other bureaus. In the War Department appropriation bill just reported to the House, the following amounts were allowed on items involving machine shop activities: Ordnance stores and supplies, $150,000; manufacturing and repairing arms at national armories, $400,000; automatic rifles, $250,000; tanks, $300,000; field artillery armament, $750,000; alteration and maintenance of the mobile artillery, including the purchase and manufacture of machinery, tools and materials, necessary for the work and the expenses of the mechanics engaged thereon, $400,000; improvement of arsenals and depots, including machinery for manufacturing purposes in the arsenals, $805,000; testing machines, $26,250; coast defense cannon, $450,000; alteration and maintenance of sea-coast artillery, including the purchase and manufacture of machinery, tools and materials, $350,000; sea-coast cannon for insular possessions, $150,000; sea-coast cannon for Panama Canal, $85,000.

In justifying the appropriations asked, Gen. Peirce, assistant chief of ordnance, appeared before the committee. Among other things he explained that it is necessary to go ahead and complete the work on fourteen 16-in. guns that are so far advanced that it would cost less to complete them, than it would to adapt special mountings to such naval guns as might become surplus. He explained that it would cost $175,000 to make a Barbette carriage for the 16-in. naval gun. The naval gun cannot be used on the Army Barbette carriage because of the difference of dimensions in two ways. The Navy gun is longer from the trunions to the breach than the Army gun, and it requires a modification of the carriage to get the required angle of fire. The Navy slide is also different from the Army slide. It was brought out at the hearing that a completed 16-in. Army coast defense gun represents a cost of $550,000. Other interesting points brought out during the discussion of the ordnance appropriations follow:

There are 2,406 five-ton tractors in storage and 1,073 ten-ton tractors. In addition there were 1,250 ten-ton tractors turned over to the various states for road-building purposes. Care is taken at all ordnance manufacturing plants to keep wages adjusted to the level of wages paid by private industry in the same region. At the small-arms factory at the Springfield (Mass.) arsenal, it is planned during the next fiscal year to employ about 300 men so as to maintain a daily output of thirty rifles per day. This is regarded as a very thin skeleton organization. Before the war the minimum rate of manufacture was seventy-five rifles per day. During the war it was demonstrated that nearly any manufacturer of automobile frames could manufacture bombs.

The Coal Supply—If There's a Strike Next Month

An analysis of the coal situation, the purpose of which is to give business men information regarding possible fuel supplies in the event of a strike of miners on April 1, was issued last week by the coal bureau of the natural resources department of the Chamber of Commerce of the United States.

A general summary states that factors which will control supplies in case of a strike that closes the mines in union fields, will be stocks on hand and output of non-union fields. As the anthracite field is 100 per cent unionized, all supplies in the event of a complete closing of the mines will have to be drawn from stocks on hand. There are no figures available showing stocks in the cellars of consumers, nor in the hands of dealers. The United States Geological Survey has published figures based on statements from 648 typical retail dealers, showing the supply of anthracite usually carried by them on April 1, as follows:

April 1, 1919	31 days
March 1, 1920	21 days
April 1, 1921	36 days

If these figures should hold good for all dealers, there would be in dealers' hands a month's supply on April 1.

The Geological Survey reports that stocks of bituminous coal in the hands of consumers on Jan. 1, 1922, totalled 47,000,000 tons. The Geological Survey further notes that stocks cannot fall much below 20,000,000 tons (as in 1920) without danger of a "coal panic." The quantity of coal, therefore, which can be drawn from stocks on hand before a serious situation develops is about 27,000,000 tons. To this supply there will be continually added the output of non-union fields. The strike of 1919 furnishes some precedent as to what can be expected. At that time non-union districts furnished approximately 4,000,000 tons per week. Assuming this year's consumption to be comparable to that of 1921 (7,600,000 tons per week), the supply from non-union fields would fall short 3,600,000 tons per week of meeting the demand. To cover this deficit we might have the 27,000,000 tons of stored coal, which would last approximately eight weeks. This period might be lengthened by increased production from the non-union fields and there are reasons to believe this production will increase, but how rapidly and to what extent can only be conjectured.

Army Departments Lose on Sales

The Air Service of the Army during February sold surplus property, which cost $310,382.93, for $117,336.57. The recovery was 38 per cent of the original cost. The Motor Transport Corps during that month sold surplus property which cost $417,314.63, for $29,775.10. The recovery in that case was 7 per cent of the original cost. The Ordnance Department sold surplus property during February which cost $2,126,831.39, for $274,258.45. The recovery was 13 per cent of the original cost.

Metric Bill Hearings Completed—Advocates Die Hard

Hearings on the Britton-Ladd metric system bill have been definitely closed with the final appearance of representatives of the American Metric Association to rebut the testimony given in opposition to the legislation.

Senator McNary in the final hearing asked Howard Richards, secretary of the American Metric Association, if he expected the bill to be reported out in its present form. To this Mr. Richards replied: "I certainly believe it should be, in view of all the evidence that has been brought out. We are ready to consider any modifications but unless there is some far more important objection than has been suggested so far, we are sincerely of the opinion that the bill is a good bill."

Mr. Richards submitted a brief in which he attempted to show that the objection had its chief inspiration in Henry D. Sharpe, treasurer of a company which he claims has a peculiar interest in opposing the metric system. Mr. Richards points out that there was only one attempt to submit an actual statement of costs incident to the change from the existing to the metric system of weights and measures. He cites items in this estimate which he regards as unfair. He stated that C. C. Stutz and S. S. Dale, who were the principal witnesses opposing the bill, have been paid to oppose the metric system, and declared it to be "unfair to present their unverified material in the name of others." Continuing, Mr. Richards says in his brief:

"Although Mr. Dale is not an engineer, he does not hesitate to take issue with the leading authorities. Mr. Dale's testimony is remarkable in its misuse and misrepresentation in regard to what the metric system is and how it should be used."

Theodore H. Miller, of the DeLaval Separator Co., testified before the committee in regard to an article in the Feb. 23 issue of AMERICAN MACHINIST This article gave an account of the discussion before the National Council of the Chamber of Commerce of the United States, at which meeting the point was raised that the DeLaval company may be influenced to use metric measurements because certain of its parts are made abroad to metric measurements. In that connection Mr. Miller made the following statement to the committee:

"The separator company's business was established in this country thirty-five years ago. All of the parts were made to English dimensions until ten years ago when they were changed to metric without any reference to parts made abroad. No parts are imported from Sweden except about 100 special machines per year, too small a quantity to be manufactured in this country. There also are brought in a few repair parts for very old machines originally built there. No parts have ever been imported from Germany. The total importations are a very small fraction of one per cent. All parts have been manufactured in this country for machines built in the last twenty years. I have reason to believe that other statements put forth by the opposition have as little foundation."



Some of the Men Who Are Prominently Mentioned in Connection with Big Machine Tool Merger

Proposed Merger of Machine Tool Manufacturers

The rumor has been rife for several weeks of the merger of several leading machine tool manufacturing companies. We are now able to announce that the plans for the merger have finally been completed and that an official announcement will probably be made shortly.

The new corporation, the name of which has not yet been definitely decided upon, will be not only one of the largest machine tool organizations, but one of the largest mergers of machinery manufacturing concerns that has ever been formed.

The companies included in the merger are The Lodge & Shipley Machine Tool Co., The Carlton Machine Tool Co., Newton Machine Tool Works, Inc., Betts Machine Co., The Colburn Machine Tool Co., Hilles & Jones Co., Modern Tool Co. and Dale Machinery Co.

The Companies Included

We have collected brief sketches of the histories of the companies involved to show the background of accomplishment that is behind the new merger. Here they are:

The Lodge & Shipley Machine Tool Company is the direct descendent of Lodge & Barker, which began to build machine tools in Cincinnati, at Fifth Street and the C. H. & D. railway in 1880. "Uncle Billy" Lodge, as his friends affectionately called him, had saved up $1,000 and with this as a start, they grew and prospered, so that in fifteen months they were employing seventy-five men. In 1886 Barker sold out to Charles Davis and the firm became Lodge & Davis. Six years later 1892, Mr. Lodge sold out and joined Murray Shipley in forming the present Lodge & Shipley Machine Tool Company. In 1918 the estate of William Lodge acquired the interest of Murray Shipley and the concern has since been operated under the management of J. Wallace Carrel.

The Carlton Machine Tool Company was organized in 1916 to build radial drilling machinery by William Lodge, Jack Carlton and J. Wallace Carrel. Although it will not reach its sixth birthday until May, it is a well developed, husky youngster that has made its mark in the radial drilling field.

The Newton Machine Tool Works made its bow in Philadelphia in the early 80's, Charles C. Newton being the guiding spirit. It is not generally known however, that previous to this, in 1876 to be more exact, Newton & Cox (the J. D. Cox of the Cleveland Twist Drill Co.) built planers and milling machines in Cleveland, Ohio. His successor, Harry W. Champion, has the advantage of having grown up with the firm under Mr. Newton's guidance and is thoroughly familiar with all the past history of the firm and its product.

Away back in 1861, two brothers, Edward and Alfred Betts, organized what is now the Betts Machine Company under the trade name of E & A Betts, in Wilmington, Del. While in the beginning they built a large variety of machines both large and small, they early began to specialize on larger machines and built up an enviable reputation in this line. This specialization has continued since the business was merged with that of the Bridgeford Machine Tool Company and the Ingle Machine Company, both of Rochester, N. Y. There names have been dropped, however, and the name is still the Betts Machine Company, occupying a new shop with 190,000 sq.ft. of floor space, in the outskirts of Rochester.

The Colburn Machine Tool Co. came into being in Franklin, Pa., in the 90's under the guidance of Mr. Colburn, who was formerly superintendent of the Baker Brothers Co., in Toledo, and Chas. Miller, commonly known as "General" by his many railroad friends. Since 1901 this company has been under the management of Harry W. Breckenridge, moving from Franklin in 1921 and now occupying one of the finest and most modern of machine tool shops, in Cleveland, Ohio. Details of this shop were illustrated during the past year. Beginning with the Colburn keyseater, a line of heavy-duty drilling machinery and vertical boring mills have been developed, that have won an enviable reputation.

Among the pioneers in heavy machinery for punching, bending, shearing and otherwise machining metal plates and sheets for boiler work and in shipbuilding, was the Hilles & Jones Company, of Wilmington, Del. Its machines have been well known in our shops for half a century or more, during which their growth has been steady and interesting.

The Modern Tool Company of Erie, Pa., is comparatively young in the industry, but still a product of the early 1900's. Beginning as a maker of thread cutting tools of various kind, it has expanded and extended its lines to include grinding machines of different styles and capacities. The founders were Calvin N. Payne and Joseph Seip. The sales manager is C. E. McArthur; and Dana Payne, a grandson of Calvin N., is growing up with the business.

The Men Mentioned

Short accounts of the histories and the personalities of the men said to be interested in the plans for the new corporation follow:

C. K. Lassiter is perhaps the best known buyer of machine tools in the country. This is especially true when it comes to the builders of such machine tools as are large enough to find a place in locomotive building. For he has been the presiding genius of machine shop equipment of the various plants of the American Locomotive Company for many years. Nor is that all. When he doesn't find just the kind of machine he thinks ought to be used for a certain job, he goes to work and designs one, has it built and puts it to work. It doesn't matter much whether its a stay bolt machine or a new radial drilling machine, the result is the same. He gets what he wants, even if he has to go into the machine tool building game to get it.

Waldo H. Marshall's first practical experience was in the drafting room of the old Rhode Island Locomotive Works. After considerable editorial experience both in Chicago, on the *Railway Review*, and in New York on the *American Engineer*, he became assistant superintendent of motive power of the Chicago & Northwestern Railway in 1897, going to the Lake Shore Railway in 1899 and advancing successively from superintendent of motive power, to general superintendent, and to general manager in 1903. Leaving this in 1906 he became president of the American Locomotive Company and retained this position until 1917. From here he became identified with well-known banking interests and is still connected with them. He was a member of the Naval Consulting Board and of the Committee of Industrial Preparedness in New York, making a survey of the industrial resources of the state. In 1918 he was appointed chief of the Production Division of the Ordnance Department. His more recent connections have been with the T. A. Gillespie Co. and the Gillespie Manufacturing Co., being chairman of the board of the latter.

J. Wallace Carrel is, without question, one of the best known machine tool men in the United States, not to mention Europe as well. Starting with Lodge, Davis & Co., in 1888, he had a varied career, but always with machine tools. Managing stores in New York, Cleveland and Chicago, traveling in this country and in Europe, and presiding over the destinies of the Draper Machine Tool Co., in Worcester, were all part of his training. Then, when the American Machinist wanted a man to study conditions in Euope—a man in whom the whole industry had the utmost confidence—it picked the logical man, Wallace Carrel. After this he became sales manager of the Lodge & Shipley Machine Tool Company of which he is now vice-president and general manager, as well as being treasurer of the Carlton Machine Tool Company.

J. J. Dale, began his work in civil engineering lines getting into the railroad game at an early age. His entrance into the machine tool field dates back to 1908 when he joined the sales force of the Celfor Tool Company, where he became sales manager before leaving them in 1918 to organize a company of his own. This was the Howe, Dale, Brown Company, which dealt in machine tools and supplies. This later became the Dale-Brewster Company and in 1918 Mr. Dale purchased the Brewster interests, changing the name to the Dale Machinery Company. During 1916 and 1917 Mr. Dale spent much of his time in Europe, a portion of this being devoted to consulting work of the aviation section of the A. E. F.

Harry W. Breckenridge entered the machine tool field in 1901 with the Colburn Machine Tool Company, then located in Franklin, Pa. Those who have watched the growth of this company can see the guiding hand that has finally brought the company out of its old shop in Franklin and into one of the finest machine tool plants in the world. Mr. Breckenridge is now treasurer and general manager of the Colburn Machine Tool Company, as well as having

other interests in somewhat similar lines. Avoiding methods which savor of red tape, he goes directly at the problems which present themselves. And no matter how busy he may be his human sympathy and friendly interest in others, always insures consideration and courtesy.

HARRY W. CHAMPION started with the Newton Machine Tool Works before it was even incorporated. He has worked in every branch from the office to the shop and drafting room and then back to the office as sales manager, secretary, general manager and president. While chief draftsman he pioneered the plan of having a huge blackboard on which the machines could be drawn full size—and they were large machines too.

A. H. INGLE began his business career in a bank but made his way into the machine tool game early in life, starting with the Bridgeford Company, Rochester, in the heavy lathe field. Later he bought out an old machine shop, moved it into a new building and changed its name to the Ingle Machine Company. Later, Bridgeford again claimed his attention. Here he made such a success that he bought the Betts Machine Company several years ago, built a new shop in Brighton, a suburb of Rochester, and installed the combined companies in a thoroughly modern plant under the Betts name.

ROBERT R. LASSITER is the son of C. K., and a graduate of Sheffield Scientific School, Yale. He hasn't years enough to his credit as yet to be in C. K.'s class. But with the combination of such a father and having been connected with J. J. Dale in the machinery selling game, it requires little but imagination to guess that he will be much better known in a very few years.

JACK C. CARLTON'S first name may be John, but if so nobody knows it—he is "Jack" to everyone. What more can be said of a man's personality. Starting with the Bradford Machine Tool Company he has gained his experience in many shops. These include the American Tool Works, Bickford Tool Company and Lodge & Shipley. He has been foreman, demonstrator and European representative for Lodge & Shipley, traveling for three years in fifteen countries. With others he formed the Carlton Machine Tool Co. in May, 1916, and since then Jack has been very much on the map when it comes to getting production out of radial drilling machines.

HENRY J. BAILEY has grown up with the Hilles & Jones Company and has naturally worked his way through the different departments. This includes being sales manager, general manager, and now president. His long connection in this line makes him thoroughly familiar with the types of heavy, plate working machinery for which the Hilles & Jones Company has long been noted.

We regret that lack of time has prevented us from getting accounts of the business activities of C. E. McArthur, sales manager of Modern Tool Company and Mr. Payne.

Director Klein of the Bureau of Foreign and Domestic Commerce states that four machinery associations are in process of co-operating with the bureau in trade promotion.

The Trend of Business Improvement—Plants Resuming

The Chevrolet Motor Co., Bay City, Mich., has adopted a night schedule at its plant, in addition to a full-time, full-crew working day. The extra shift will give employment to about 100 men.

The J. L. Mott Iron Works, Trenton, N. J., is increasing production at its plant. Orders on hand are more than 40 per cent in excess of those booked in the corresponding period a year ago.

The Standard Steel Car Co., Hammond, Ind., is arranging for increased operations at its local plant. Within the next sixty days, work will be placed under way on the construction of 2,600 refrigerator cars for the Pacific Fruit Express Co., a subsidiary of the Southern Pacific Railroad. The order will keep the wood car department running full for at least 150 days. It is expected that the plant will be operating at 100 per cent in all departments by the spring, employing the usual quota of 2,500 men.

The United Shoe Machinery Co. is increasing the working force at its plant at Beverly, Mass.

The Bethlehem Steel Co., Bethlehem, Pa., has resumed operations at its local rail mill after a number of weeks curtailment.

The Bethlehem Shipbuilding Corporation, a subsidiary of the Bethlehem Steel Co., is increasing operations at its Harlan & Hollingsworth plant, Wilmington, Del., devoted to the manufacture of railroad cars, giving employment to about 500 additional men. The plant has orders for 85 steel cars from the Philadelphia & Reading Railroad Co.; 10 steel cars each for the Central Railroad of New Jersey and the Huntingdon & Broadtop Railroad Co., Huntingdon, Pa.

The Ford Motor Car Co., Detroit, Mich., has adopted an increased operating schedule at its Canadian plant, with a five-day week, each day 8½ hours. The output now totals 218 cars a day.

The Hudson Motor Car Co., Detroit, Mich., is increasing manufacture both of Hudson and Essex cars. The month of February was one of largest in output since July, 1920, totaling 3,500 completed automobiles of the two types. Present shipments are said to be from 200 to 250 cars a day.

The Standard Steel and Bearings Co., Plainville, Conn., has resumed production at its local plant, following a shut down of several months. The company has removed all of the machinery from its New Haven plant to the Plainville works, and in the future will concentrate operations at this point.

The White Motor Co., Cleveland, Ohio, manufacturer of motor trucks, is advancing production at its plant. Orders received during February were the largest of any month since June, 1920.

The Santa Fe Railroad Co. has resumed operations at its shops at Cleburne, Tex., giving employment to about 1,000 men.

The Staten Island Shipbuilding Co., Richmond, S. I., is adding to its working force due to increased work on the reconditioning of two liners.

The Alan Wood Iron and Steel Co. has resumed full operations at its Schuylkill Iron Works plant, Conshohocken, Pa. This is the first time that the plant has been on this basis in a year.

The American Bushings Co., Marysville, Mich., manufacturer of bushings for automobile engines, has advanced its output 100 per cent, effective March 1, making a production schedule of 3,000,000 bushings per month.

The Pittsburgh & Lake Erie Railroad Co. has resumed operations at its repair shops at Dickerson Run, near Frostburg, Md., following a shut down of more than a year.

The Bettendorf Car Co., Bettendorf, Ia., has secured an order for cars totaling $1,500,000 from the Union Pacific and Southern Pacific railroads.

The American Locomotive Co., New York, N. Y., has received an order for ten locomotives from the Florida East Coast Railroad Co.

The Mason Motor Truck Co., Flint, Mich., is planning for early operations at the local plant of the Young Spring Co., which it recently acquired. The plant approximates 35,000 sq.ft. of floor area and will be equipped to provide for a maximum daily capacity of thirty complete motor trucks, known as the Mason Road King. The Mason company was organized last year with a capital of $500,000. It is headed by A. C. Mason, formerly connected with the Cadillac Motor Car Co. and the Buick Motor Car Co. of the General Motors Corporation.

The Union Pacific Railroad Co., has placed an order with the Inland Steel Co., Chicago, Ill., for 350 tons of spikes; and with the Kansas City Bolt and Nut Co., Kansas City, Mo., for 200 tons of track bolts.

The Rickenbacker Automobile Co., Detroit, Mich., will increase production at its plant at once. The schedule of 6,500 cars, as recently arranged, has been advanced to 12,000 cars for the present year.

The Greenfield Tap and Die Co., Greenfield, Mass., is operating on an increased production schedule. Orders for February were 26 per cent more than those for the same month of last year, and orders for March up to the present time show still larger increase.

The Fitzgibbon & Crisp Co., Trenton, N. J., manufacturer of automobile bodies, is working at a capacity basis, giving employment to a full shop force. Orders on hand are said to insure at least four months continuous operation on this schedule.

The Lackawanna Steel Co., Buffalo, N. Y., has secured an order for 5,000 tons of rails from the Buffalo, Rochester & Pittsburgh Railroad Co. The company has also contracted with the Hocking Valley Railroad for 3,000 tons of rails.

Goodell-Pratt Co. has increased the output of its Shelburne Falls (Mass.) plant and is operating it five days a week with half the normal force.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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In its bearing upon our domestic affairs the most important news of last week was the announcement that the income tax returns filed March 15 indicate that income taxes for the year will be from 30 to 40 per cent under those of 1921. It is said that the decrease is chiefly due to the shrinkage in corporate incomes and those of very rich individuals. This is as it may be, but it will probably be found that the income tax revenue is drying up because the wealth of the country is finding investment in non-taxable securities as those who own it are unwilling to risk it in new enterprises or development under a law which takes a very large share of their profits and leaves them to bear the whole loss of any venture in which they may engage.

Income Tax All Wrong

But whatever the facts it is plain that the income tax will yield nearly a billion dollars less than last year. The last year for which complete statistics of the income tax returns have been published is 1919. The figures show that five-sixths of our income tax revenue in that year was derived from 217,808 persons and 12,071 corporations. Taken in connection with this year's returns they presage the failure of any scheme which seeks to make a negligible portion of the population pay five-sixths of the taxes. They are therefore highly encouraging because they indicate that we shall shortly be compelled to adopt a more rational system of taxation. When this happens and private enterprise is no longer discriminated against by laws which drive capital into tax exempt securities, we shall enter upon a period of genuine prosperity.

But even more important than the income tax returns as a financial illuminant, is a dispatch from Paris which reports that the Swiss government has announced that it will not mint any more gold, and that the Swiss National Banks will not make further loans on gold ingots, because the country is being swamped and demoralized by the gold that is seeking refuge there and for which there is no outlet in international commerce or loans. I have previously called attention to the fact that money is almost unloanable in Switzerland even at 2½ per cent and this attempt to check the influx of gold is a premonition of what may occur in the United States unless we can find a way to employ the plethoric bank reserves that are piling up here as our own gold supply increases.

Last week the Federal Reserve Banks added $11,000,000 in gold to their holdings, and though the reserve ratio declined 2.2 to 75.8 per cent because deposits were increased in preparation for income tax payments, the money market has been almost weak at 4½ per cent for prime commercial paper, 3⅞ per cent for eligible bankers acceptances, and 3 per cent for call loans against stock exchange collateral. Under these conditions it is not surprising that new bond issues aggregating over $140,000,000 were readily absorbed. Of this total more than $80,000,000 was for account of foreign borrows. These loans and many others privately arranged and not reported run to a total that almost makes one dizzy. It probably exceeds the record of any similar period in London in its palmiest days. But London is also doing its share and there, as here, the security market was booming nearly all the week and was seemingly unaffected by the troubles in India, the revolutionary strikes in the South African gold mines, of the predicted fall of Lloyd George and his Coalition Cabinet.

These developments, which have led some pessimistic Englishmen to say that there is a close analogy between the present condition of the British Empire and that of Rome as described by Gibbon in the first chapters of his "Decline and Fall," are apparently ignored by financiers on both sides of the Atlantic and we are forced to conclude that Sir Reginald McKenna was right in his contention that abundant credit is more essential than political tranquility to business prosperity.

In this article last week I defined inflation as "the extravagant expenditure of easily borrowed money," and there is every reason to believe that the near future will indicate the accuracy of that definition.

Buy Anything

On the New York Stock Exchange there are many evidences of reviving speculation. One group of stocks after another is being taken up and advanced because the professionals have found that the public are in a buying mood. The market is in fact rapidly approaching the condition which inspires wags to advise their friends to buy "A. O. T." meaning thereby, "any old thing." It is upon this theory the many stocks recently selling at less than two or three dollars a share have doubled in price. Some of them are worthless, but those who buy them are willing to risk the small investment involved because they know that when the public imagination is excited it is easy to give a semblance of value to the valueless. But underneath the whole movement there is a confident expectation of an increase in corporate earnings with the return of business activity and prosperity that will follow the expenditure of the enormous sums now being borrowed on both sides of the Atlantic.

This expectation is warranted by the increase in railway traffic reported from week to week, bank clearings and many other statistical indicia that I have not space to include. The speculative commodities are, it is true, relatively quiescent. Some of them, like wheat, have lost a large portion of their recent advance, but every one seems to be waiting an opportunity to buy and where prices are really low, as in the case of sugar, the demand seems almost insatiable. Rubber and coffee, to whose cheapness I alluded last week, are slowly moving upward. Steel and copper are slightly higher. Wool continues to disappoint those who predicted lower prices. Cotton is "between seasons" but shows great resiliency on any decline, though the bitterness with which the New England strike is being fought out and the reiterated predictions of a coal strike that will include both the anthracite and the bituminous miners, naturally induces industrial and commercial caution. Of the striking cotton operatives in New England it may be said that their success is probable, because rightly or wrongly public sentiment seems to be with them, but of the threatening coal miners this is not true and it is still unthinkable that any group of men can tie up the entire fuel production of this country for any length of time. For these reasons neither the cotton strike nor the threatened coal strike should be counted as permanently depressing influences. Like wars, they must end sometime and peace and prosperity are sequential as well as alliterative.

Exports Falling Down

The figures of our foreign trade for February show that the value of our exports exceeded that of our imports by only $34,000,000. This is the smallest "favorable balance" for any month since September 1914.

It is due not to an increase in imports but a decrease in exports which were valued at only $251,000,000 as compared with $489,000,000 in February 1921. It may be that our exports will be increased again in the near future if we continue to lend money to Europe at the rate indicated by the foreign bond issues floated last week, but a reduction in imports will certainly follow the enactment of the new tariff bill which the Senate is expected to take up as soon as the four-power treaty is ratified, as now seems probable, thanks largely to the patriotic and non-partisan candor of John Sharp Williams. The empty and misleading gestures that are being made with the bonus bill in the House mean nothing. The bill is dead.

The Outlook Is Bright

Conspectively viewed the outlook is highly encouraging. Business is improving from the center, radially, and while the improvement has not yet reached the outer circumference represented by the jobbing and retail trades, there is every reason to expect a general and inclusive increase in activity as the year grows older.

Cleveland Letter

Probably the most important development in the Cleveland, Ohio, district since the turn of the year, at least as it affects the machinery manufacturer and distributor, is the actual gain in orders obtained by the automotive industry in that territory. In a survey just completed by the industrial activities division of the Cleveland Chamber of Commerce, it is estimated that at the present rate of progress in the automotive field 25 per cent of Cleveland's industries will feel the effect of this improved business. The lines most likely to be affected for the better would be leather, glass, textiles, brass, copper, foundry, iron and steel, and a wide variety of minor interests.

For example, this reflection already is seen in more than thirty plants which are members of the East End Manufacturers Association. These plants have shown gains of 5 per cent per month for the last four months, bringing the production up to 35 per cent of normal. It is believed by many that by May these plants will be operating 50 per cent, or showing a gain of 66 per cent since last December.

Edward S. Jordan, head of the Jordan Motor Car Co., just back from a trip through the Central West, asserts that the farmer again is in a buying mood, and is probably figuring on buying a new car. The Jordan plant in Cleveland, Mr. Jordan says, is making twenty-five cars a day now, or three times the output of a year ago. The same prospects for this particular plant will be guaranteed for another ninety days at least, plant officials assert.

Figures on production at the plant of the Peerless Motor Car Co. in Cleveland indicate that March will show double the output of the beginning of the year. Here, as elsewhere in the local automotive industry, stabilization of prices is firmly believed.

The far-reaching effect of the improvement in automotive business here is shown by the substantial orders being received by the Gustave Schaefer Wagon Co., which recently closed a large order for truck bodies from the White Company, which requires this production to supply new demands of the American Railway Express. Steady increase in bus bodies from street railways likewise is noted here.

Radio Craze in Detroit

Detroit seems to be in the grip of the radio craze at this writing. Several specialty manufacturing companies are devoting their entire facilities to the production of radio telephone sets. A few new concerns have been started in the past few weeks to manufacture sets of all sizes and price. The Burroughs Specialty Co., has received an order for 10,000 complete radio sets. Other companies report large orders for the same product.

Cadillac School Resumes

The Cadillac Motor Car Co., Detroit, Mich., has reopened its local technical school for automobile mechanics, temporarily discontinued a number of months ago. Conditions have now so nearly returned to normal in the automotive industry that it has been deemed advisable to resume at the school.

Taylor Society Meeting In Philadelphia

The spring meeting of the Taylor Society was held at the City Club, Philadelphia, March 16, 17 and 18 and was well attended. A noticeable feature of the program was the enlarging of the scope of the society to include other phases of management beside production. This was shown by several of the papers, beginning with that of John M. Holcombe, Jr., manager of sales research division, Phoenix Mutual Life Insurance Co., which has been making a study of selling problems such as the selection of salesmen and the best classes of prospects. Taking a somewhat similar course to that used in selecting the risks for insurance, they have been working out a law of averages for selecting salesmen. This includes a history of the applicant, his education, his tendencies and experience. Henry P. Kendall of Boston, gave a splendid talk on the "Problem of the Chief Executive," also pointing out the growth of the society in handling problems other than production. Taking a medium sized industry as an example, an industry small enough to demand a knowledge of the business on the part of the executive and yet large enough to make it necessary for him to be free from details, he analyzed the problems which have presented themselves during the stress of the past few years. He pointed out how industries varied. In the cotton mill industry for example, material was twice labor and salaries; in some lines engineering was simply maintenance while in others it was the most important factor.

Considering advertising as a tool of sales, he cited cases where the advertising manager had developed into the manager of merchandising and dwelt on the need of a much better understanding of what merchandising really is. It is a science which has not been developed as such. Real merchandising must know possible markets, production of various competitors and many facts which are now merely guesses or poor information. Trade associations are tending to remedy this condition.

The balance sheet should be more and more a guide to the executive than in the past. The controller is a more important man than is usually recognized even though he has been characterized as the pessimist of the organization. He is the one who puts the brakes on over expansion, who points out what is to happen next year—and who has saved many a concern during the present crisis.

The other papers were "Super-Standards," by Frank B. and L. M. Gilbreth; "Budget Control," by Geo. E. Frazer; "Mills and Minds," by Arthour Pound; "String Board Graphics," by Percy S. Brown, and "Work of the Balance of Material Clerk," by Thomas W. Mitchell. Extracts of these will appear later.

Owing to the absence of Mr. Gilbreth, who is in Europe, the paper on "Super-Standards" was presented by Mrs. L. M. Gilbreth, so ably as to win the approval of all present. She pointed out that the term "super-standard" was not a desirable term, but was only used to designate the best known practice of today; and that the super-standard of today became the standard of tomorrow.

Chicago Letter

Another week has passed without any definite change in the trend of business in the machine tool industry. Buying remains spotty and consists mostly of small and miscellaneous machinery. However there are a few exceptions, where orders, transfers, or prospects for orders of considerable size were involved.

The Western Clock Co., LaSalle, Ill., recently placed an order with a local dealer for twenty-four automatic screw machines.

Inquiries are as optimistic as ever. The Universal Portland Cement Co., Buffington, Ind. has issued a list calling for eight machines and the Santa Fe R.R. system has added a belt-driven combination saw and dado machine and one belt-driven 42-in. band sawing machine.

About $10,000 worth of machinery was destroyed by fire in the shop of the Passenger Elevator Safety Lock Co., 119 North Washington St., Peoria, Ill., this company will in all probability be in the market for machines to replace those damaged.

The Hurley Machine Co., West Twenty-second Street and South 54th Street, Cicero, Chicago, manufacturer of electrically operated washing and ironing machines, has purchased the plant and business of the Superior Machine Co., Dekalb, Ill., manufacturer of similar equipment.

A recent fire on the outskirts of the machinery district, amounting to a loss of $15,000,000 has added a few new prospects to the machine tool dealers lists. A few of the machinery and manufacturing concerns destroyed by the fire have already started operations in new locations and are purchasing machinery to replace that lost in the fire.

Ayer & Lord Tie Co., 80 East Jackson Boulevard, Chicago, will build a two-cylinder creosote plant at Louisville, Ky. The Leonard Construction Co., of Chicago, will be in charge of material buying which will consist mainly of steel tanks, creosote cylinders which are 130 ft. long and 7 ft. 6 in. in diameter, fabricated for 250 lb. pressure, a quantity of train cars, boilers, hydraulic pumps, air compressors and vacuum pumps, besides the necessary piping.

Maney Brothers, of Oklahoma City, were awarded a contract by the Santa Fe system to build the proposed line of the Osage County & Santa Fe Railway Co., from Owen to Pawhuska, about 35¾ miles. C. F. W. Felt, chief engineer of the Santa Fe, at Chicago, is supervising the work.

The Chicago, Indianapolis & Louisville R.R. is in the market for 2,500 tons of rails and the Illinois Central is still in the market for 40,000 tons.

It is understood that the Chicago, Burlington & Quincy R.R., is preparing an extensive list which is expected to be issued within a short time. There is a rumor that the Rock Island R.R. is negotiating for some of the equipment on its recent inquiry, but apparently has not placed orders for any of it.

The Barrett-Cravens Company, manufacturers of Handling Equipment, at present located at 169-173 North Ann St., purchased the four-story building at 1328 W. Monroe St., containing 43,000 sq.ft. of floor space, for $100,000, and which will be occupied on or about May 1.

Chicago Meeting of Engineering Council

Steady advancement of engineering ideals both here and abroad and a growing sense of the need and importance of professional unity were outstanding features of the meeting in Chicago, on March 10, of the executive board of the American Engineering Council of the Federated American Engineering Societies. Reporting to the board on the results of his recent trip through the South and Southwest, Mortimer E. Cooley, president, stated that in every city visited by him he found engineers zealous to aid in expanding the influence of the Federation, the worth of which was coming to be so widely recognized that its growth and permanence were assured.

A wide range of topics was considered by the board.

The Great Lakes-St. Lawrence Waterway project came before the board, which decided that at present it was undesirable to take any action. This matter has been under consideration by the public affairs committee of the council for a considerable period, and the board's decision was reached after opportunity had been provided for a careful study of the report of the international joint commission.

The proposal to urge the elimination from the Fordney Bill of the tax on foreign books in English met with a divided report from the committee on public affairs.

The general question of international engineering federation was considered in many phases and provoked much discussion. Secretary Wallace reported that the proposal to form an international federation of engineers had been given wide consideration and that federation progress was reported from England, Canada, Australia, Sweden, France and Italy.

The committee on procedure recommended that the next meeting be held in Pittsburgh, the latter part of May, and the following meeting, in September or October, in Boston or New York.

Another Navy Sale

The central sales office of the Washington Navy Yard has issued notice of a sale of surplus navy supplies, bids for which will be opened on April 5 by the officer in charge at the Navy Yard. The material up for sale comprises approximately 748,000 lb. of steel shafting, steel rivets and gear steel. The material is divided into two lots which will be sold as units.

Trade Associations To Confer with Hoover

Secretary of Commerce Hoover will hold a conference in Washington with representatives of trade associations, in the Department of Commerce Building, on April 12. The meeting will be for the purpose of discussing ways and means of collecting and disseminating statistical information of the associations through the Department of Commerce. This follows the recent controversy on this subject between the Department of Commerce and the Department of Justice.

League for Industrial Rights Celebrates Twentieth Anniversary

With a meeting in the afternoon and a dinner in the evening, the League for Industrial Rights celebrated the twentieth anniversary of its existence, at the Waldorf-Astoria Hotel in New York, on March 10. An outline of the achievements of the league in labor litigation and in the promotion of sane labor legislation was given by the various members of the legal staff. The speakers at the dinner were J. D. A. Morrow, Walter Gordon Merritt, Hon. Chas. F. Moore and Hon. Carrol L. Beedy. The toastmaster was Hon. Daniel Davenport, general counsel of the league.

Industrial Engineers Have Interesting Program

A tentative outline of the program for the annual spring convention of the Society of Industrial Engineers, which is to be held in Detroit on April 26, 27 and 28, has just been given out by the secretary, George C. Dent. The general theme of the meeting will be the influence of industrial engineering upon the earnings of capital and labor. The speakers have not all been selected but the list is nearing completion.

Joseph H. Roe, president of the society will address the meeting on the first day. His subject will be "The Measurement of Management." E. W. Hulet, vice-president of the White Company, of Cleveland, will be another speaker. He will tell how the industrial engineer may serve the executive. Chester B. Lord, works manager of the Advance-Rumley Co. plant, Battle Creek, Mich., has been assigned the subject, "How can Industrial Engineering Increase the Profits and Insure the Stability of both Capital and Labor." Frank B. Gilbreth has been selected as chairman of the dinner meeting at which the discussion of waste elimination in the field of fatigue will take place.

All the business meetings, luncheons, dinners and the exhibition will be held at Hotel Statler. The entire third floor has been engaged for the convention.

Joint Committee on Small Tool Standardization

The American Society of Mechanical Engineers has appointed a committee to represent it in the work of standardizing small tools and machine tool elements, which work is being undertaken by the National Machine Tool Builders' Association. The Committee consists of: Fred H. Colvin, editor, AMERICAN MACHINIST; H. E. Harris, president, Hubbard, Harris & Howell, Inc.; H. M. Hill, engineer; T. H. Miller, works manager, De Laval Separator Co.; E. R. Norris, director of manufacture, Westinghouse Electric and Manufacturing Co.

The committee to represent the machine tool builders is made up of A. C. Hoefinghoff, Cincinnati Grinder Co.; R. T. Hazelton, Cincinnati Shaper Co.; George Langen, Cincinnati Planer Co.; E. C. Henn, National Acme Co.; R. E. Flanders, Jones & Lamson Machine Co.

A. A. Stevenson To Aid Standardization Work

At the request of Hon. Herbert C. Hoover, Secretary of Commerce, the American Engineering Standards Committee has designated A. A. Stevenson, the retiring chairman of the committee, as a special representative to work with the department in the co-operation between the department's division of simplified practice and the American Engineering Standards Committee.

The division of simplified practice is a co-ordinating unit of the Department of Commerce, assisting in those reductions of excessive variety and other simplifications which many industries are undertaking in order to decrease the cost of production and distribution of manufactured articles. The work of the division was organized in the latter part of 1921 and is now actively under way.

The American Engineering Standards Committee, which serves as a national clearing house for a broad field of engineering and industrial standardization, has offered Secretary Hoover the use of its machinery in carrying out the detailed work on technical projects initiated in the simplification program of the Department of Commerce. The committee hopes to be of great value to Mr. Hoover in this simplification program of the department. It was as a result of this hope that the designation of Mr. Stevenson as a representative of engineers came about.

The American Engineering Standards Committee is maintained jointly by twenty-nine national organizations, including five departments of the Federal Government, nine national engineering societies, and fifteen national industrial associations. There are now similar national industrial standardizing bodies in thirteen foreign countries, all but one of which were formed during or since the war. Of these the British and the German work is the most extensive, but active and important work is going forward in other countries.

Mr. Stevenson, who is a past president of the American Society for Testing Materials and has had a most extensive experience in standardization work, is vice-president in charge of manufacture, of the Standard Steel Works Co., which is a subsidiary of the Baldwin Locomotive Works.

McGraw-Hill Co. Combines Mining Papers

The McGraw-Hill Co. of New York, has purchased the *Mining and Scientific Press* of San Francisco, and on April 1 will consolidate it with the *Engineering and Mining Journal* under the name of *Engineering and Mining Journal-Press*. These two publications are the leading magazines of the metal mining industry, the *Journal* having been established in 1866 and the *Press* in 1860.

J. E. Spurr, editor of the *Journal* will be editor of the combined weekly, while T. A. Rickard, editor of the *Press* will be contributing editor, keeping his residence in San Francisco and representing, in particular, the Coast and western viewpoints.

The combined publications will be issued in New York.

Standardization of Screw Threads

The sectional committee on the standardization and unification of screw threads held an interesting session at the rooms of the American Society of Mechanical Engineers on March 15. This committee is reviewing the work and the progress report of the National Screw Thread Commission, with a view of harmonizing it with American practice in every particular. It is the intention to clarify any points which may have been obscure and to arrive at definite tolerances which are practical for use in American industry as a whole. To this end the members of the committee have been chosen from various industries, including bolt and nut manufacturers, makers of taps and dies, users of both these products and engineers who design machines and specify the fits required.

At this meeting the sectional committee reviewed the report of a subcommittee of seven men which has been studying in detail the National Screw Thread Commission's report for some months. Before the sectional committee makes its final report it hopes to hold informal conferences with the National Screw Thread Commission, with the expectation of harmonizing any differences which may arise.

Business Items

The Vandyck-Churchill Co., machinery dealers, New York City, will remove its general offices from 149 Broadway to 52-54 Vesey St. The change will take place on April 1.

The Defiance Machine Works, Defiance, Ohio, has gone into the hands of a receiver. E. M. Hummer, formerly manager of the concern, has been named receiver by the court.

The interests of Charles H. Wood in the C. H. Wood Company, of Syracuse, N. Y., machinery dealer, have been sold to W. R. Olds, G. E. Ingraham and A. J. Littlejohn, all of Syracuse.

The Craine & Schrage Steel Co. has been organized in Detroit, Mich., by Clyde P. Craine and Arthur A. Schrage, formerly of the Pittsburgh Shafting Co. The new organization has opened offices at 6180 Hamilton Blvd., Detroit.

The Federal Trade Commission has dismissed its recent charge of unfair competition against the Barr Sales Co., of Chicago, engaged in selling road machinery.

The Universal Wrench Co., Ltd., of Windsor, Ontario, Canada, plans to move its plant to Amherstburg.

The partnership between Edward Woods and A. Ouellette, of the Woods-Ouellette Machinery Co., Amherstburg, Ontario, Canada, has been dissolved and in the future the business will be carried on by Mr. Woods.

The Chicago Pneumatic Tool Co., for 1921, reports net income after depreciation charges and Federal taxes of $158,107, against $1,869,093 in 1920. Total income was $259,854, against $1,957,925. The surplus for the year, after allowing for interest charges, was $118,363, against $1,273,061. The balance sheet showed current assets of $9,678,525 and current liabilities of only $1,405,202. The profit and loss surplus at the close of 1921 was $2,375,185.

William H. Ginder was elected president of the Resistant Alloy Casting Co., of New Cumberland, W. Va., at a recent meeting of the directors. Other officers elected were as follows: S. C. Williams, vice-president; Charles E. Douglas, secretary-treasurer; D. D. McIntosh and Lee Llewellyn, directors.

Increase in the capital stock of the Alliance Machine Co. at Alliance, Ohio, from $500,000 to $2,000,000, was recorded this week in Columbus, Ohio. The increase is made to keep pace with the growth of business.

Gropler Brothers, representatives of manufacturers of metal cutting tools, are now located at 16 Hudson St., New York City.

The Tool Sales Co. has opened sales offices in the Hudson-Reade Building, New York City.

The Acme Die Casting Co. has moved its plant from Brooklyn, N. Y., to more spacious quarters at Garwood, N. J.

The Hornell Repair and Construction Co. has taken over the railroad repair work for the Erie Railroad in the entire Susquehanna division. The shops included are the ones at Elmira, Binghamton, Southport, Corning, Hornell, Salamanca and Bradford.

The United States Machinery Manufacturing Co. has been incorporated at Springfield, Mass., for the production of washing machines. Incorporators are Walter D. and Albert D. Clairmont of 5 Elm St., and Clinton Gowdy, all of Springfield.

Bateman & Co., Inc., has reopened its plant for the production of agricultural tools at Chicopee Falls, Mass., after a shutdown of ten weeks.

Announcement has been made that the Western Maryland Railway has entered into a contract with the Dickson Construction and Repair Co., Youngstown, Ohio, under which the Dickson concern will take over the railroad company's maintenance-of-way work.

The Akron Spark Plug Co., Akron, Ohio, has been sued for $22,000 by William Spence, Sr., of Springfield, Ill., a sum he alleges he has loaned the company. The concern has been in the hands of a receiver.

The plant of the Victor Saw Works, at Springfield, Mass., having been idle for several months, has been offered for sale at a price of $175,000. Manufacturing operations of the concern are now centered at Middletown, N. Y., to which place practically all of its machinery was removed.

The United States Government has certified to a discharge of mortgage held against the Farrell Foundry and Machine Co. of Tonawanda, N. Y., in the amount of $348,000. The discharge was signed by Theodore Roosevelt, Jr., Acting Secretary of the Navy. The plant was built during the war by the Government and used for the manufacture of airplane motors.

The Kendell Engineering Co., of Fort Wayne, Ind., engaged in the manufacture of Kendell piston rings, has been incorporated under the state laws of Indiana and is now known as the Kendell Engineering Corporation. No changes in officials have been made. C. A. Kendell remains president; Robert L. Kendell, vice-president and M. W. Cartwright secretary and treasurer.

Personals

HARRY V. HAYMAN, for the past thirteen years sales manager of the Automatic Machine Co., machinery manufacturer, Bridgeport, Conn., has resigned his position with that company to accept one with the Wellman-Seaver-Morgan Co., of Cleveland, Ohio. Mr. Hayman will be sales manager in this new appointment.

VINCENT S. WHITNEY has recently become local sales manager of the Shea Foundry and Machine Co., Fifth St., Bridgeport, Conn.

HUBERT E. BAKER, who for several years has been chief draftsman of Manning, Maxwell & Moore, Inc., Shaw Crane Works, Muskegon, Mich., has been appointed chief engineer.

J. M. BALLENTINE is now employed by the International Harvester Co., Akron, Ohio, as assistant superintendent of the motor truck division.

GARNET C. BROWN has terminated his connection with the L. H. Gilmer Co., of Philadelphia, and is now chief engineer of the automotive equipment division of the United and Globe Rubber Co., Trenton, N. J. Mr. Brown will be located in Detroit, Mich.

ROBERT H. CAMPBELL has resigned as president of the Campbell Engineering Co., Chicago, to become associated with the Wharton Motors Co., Pittsburgh, Pa., in the capacity of vice-president and chief engineer.

WILLIAM H. GRIFFITHS has opened offices in Hartford, Conn., as a consulting mechanical engineer.

JOHN A. HENSE, formerly connected with the Exeter Machine Works, is now Eastern manager for the Northern Fire Apparatus Co., of Minneapolis, Minn., with offices in New York City.

ROBERT H. MCLAIN, previously sales engineer for the power and mining department of the General Electric Co., Schenectady, N. Y., is now connected in a similar capacity with the Maine Electric Co., Portland, Me.

W. H. SACKMAN, who recently resigned as chief engineer of the Light Manufacturing and Foundry Co., of Pottstown, Pa., has been chosen director and chief engineer of the Pennsylvania Gasoline Drill Co., of Philadelphia, Pa.

JOSEPH S. WEBSTER has organized a sales force to be known as Joseph S. Webster & Co., to represent the Kingsford Foundry and Machine Works, Oswego, N. Y., in the New England states. Offices will be established in New Haven, Providence and Boston.

L. S. JONES, general manager of the Lumen Bearing Co., Buffalo, N. Y., has been elected to the board of directors of that concern. He succeeds H. P. Parrock, who has severed his connections with the company.

GEORGE S. SQUIBB, of the Diamond Machine Co., Providence, R. I., has been appointed on the safety code committee of the National Machine Tool Builders' Association.

FRANK E. HARLEY, machine tool salesman for the Fairbanks Company, of New York, has left that concern and

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Polishing Machine, Western, No. 10

St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

"American Machinist," November 10, 1921.

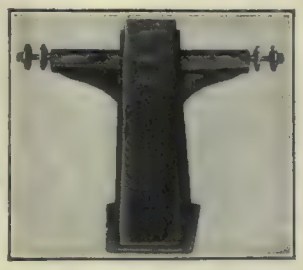


The machine carries an arbor 48 in. long. The wheels are 38 in. apart and the bearings are 1½ by 9 in. in size. Low-friction metal is used in the bearings, which are self-oiling. The arbor is made of 40-point carbon steel, and the threads are of square section and coarse pitch. The height of the center of the arbor above the floor is 34 in. The machine can be furnished either with a plain pulley, as shown, or with tight and loose pulleys. Either a plain or a pull-type countershaft can be provided, its weight being 165 lb. The weight of the machine itself is 260 lb.

Polishing Machine, Ball-Bearing, No. 7

St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

"American Machinist," November 10, 1921.



The arbor, which is 56 in. long and 1¼ in. in diameter in the collars, is supported in four ball bearings, two near the wheels and two near the pulley. The front of the base is vertical, while the rear face is at an angle, so as to increase the floor space of the machine. Also, the rear of the base is 4 in. wider than the front. The total size of the base is 23 x 24 in., and the height to the center of the arbor is 38 inches. The machine can be driven from beneath the floor, the belt being enclosed in the base and a guard being placed over the arbor pulley. The weight of the countershaft is 250 lb. and that of the polishing machine 530 lb.

Grinding Machine, Surface, Swivel-Table, No. 1

Wilmarth & Morman Co., Grand Rapids, Mich.

"American Machinist," November 17, 1921.

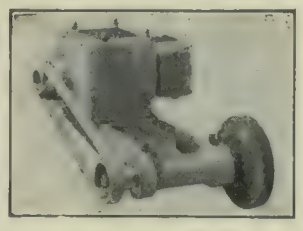


The use of the auxiliary swiveling table adapts the machine to the performing of grinding operations on angular and irregular shapes. It is not necessary to remove the work from the table and reset it for the angle required; but the auxiliary table can be swung on the sliding table. Graduations are provided at one end to facilitate adjustment. The table is provided with T-slots. It is not necessary to disturb the work to dress the wheel, as the built-in wheel-truing device is located on the hood of the wheel.

Grinder, Electric, Portable, R.V.

Arva Stroud, 327 Broadway, New York, N. Y.

"American Machinist," November 17, 1921.

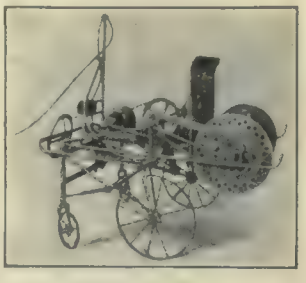


This precision grinder is for general use either on a machine tool or held in a vise. The machine is made in two sizes; the Type A has a ¼-hp. motor, and the Type B a 1-hp. motor. The motor is of the commutator type and operates on either direct or alternating current. It runs at high speed, and is provided with belt drive on two-step pulleys, so as to give spindle speeds of 4,000 and 12,000 r.p.m. under load. The low speed is used for external and the high speed for internal work. Spindle extensions are provided for the latter work. The frame and motor housing are made of an aluminum alloy. The grinding spindle runs on ball bearings. It weighs 22 lb. net and 37 lb. with the accessories.

Sand-Cutting Machine, Hand-Propelled, Type H

American Foundry Equipment Co., 366 Madison Ave., New York, N. Y.

"American Machinist," November 10, 1921.

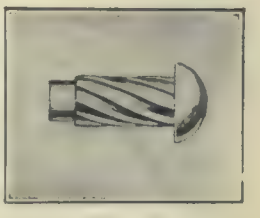


The machine employs power only for the rotating of the cutting cylinder. It is propelled and guided by hand. It weighs less than 700 lb., due to the use of seamless tubing for most of the members. The cutting cylinder, which is 36 in. wide and 26 in. in diameter, is carried in approximate balance upon a frame which can be tilted back by means of a handwheel at the front of the machine, so as to lower the cutting cylinder. The machine is 7 ft. 4 in. over-all in length and 55 in. wide, while its clearance above the floor is 20 in. It is especially intended for use in small foundries, where the sand is ordinarily cut and tempered by means of a hand shovel.

Screw, Drive, Nameplate

Parker Supply Co., Inc., New York, N. Y.

"American Machinist," November 10, 1921.

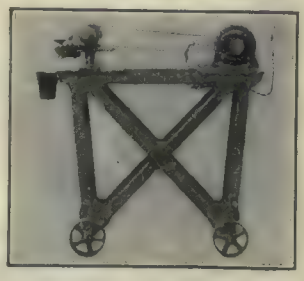


The drivescrew is intended primarily for permanently attaching nameplates and trade marks to machines. It has a thread of very quick pitch and a slotless head. To insert it, holes a trifle larger than the cylindrical point or pilot are drilled, and the screw is driven in with a hammer. Since the screw is hardened, the steep-pitched threads cut their way into gray iron or any soft metal. The screw cannot be removed except by cutting off, thus making it difficult to substitute another name plate for the one originally fastened to the machine.

Grinder, Portable, Motor-Driven

St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo.

"American Machinist," November 17, 1921.

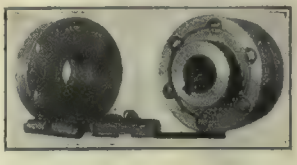


The machine has a large stand mounted on wheels, so that it can be moved over irregular surfaces without danger of tipping, being particularly adapted to outside work or yard use for grinding tools and implements. On one end of the stand is mounted a fully inclosed a.c. motor of the induction type. If desired, a compound d.c. motor can be furnished. The wheelhead is mounted at the other end of the stand, and is belted directly to the motor. The machine can be furnished with either No. 1, 2, 3 or 4 "Saint Louis" grinder heads, or No. 0, 1, 2, or 3 "Western" heads. Wheels from 6 to 12 in. in diameter can be carried. The weights vary from 200 to 260 lb.

Coupling, Flexible, Light-Duty, Francke

Smith & Serrell, Central Ave. at Halsey St., Newark, N. J.

"American Machinist," November 17, 1921.



The coupling is intended for use on motor drives up to 50 or 75 hp. It consists of two cast-iron flanges mounted on the shafts to be connected. Both parallel and angular misalignment are corrected by the spring pins connecting the two flanges. At the left of the illustration can be seen one of the flanges, and also the type of flexible pins employed. Six pins are used in the assembled coupling on the right. Each pin unit consists of a bundle of thin, flat steel springs held in keepers at each end. Movement is allowed both lengthwise in the pin and at an angle to it. The coupling is furnished in eight sizes for bores from ⅝ to 3½ in. in diameter. The weights vary from 5 to 70 lb.

Clip, paste on 3 x 5-in. cards and file as desired

has gone to San Domingo, where he will become highway engineer for the government of that country.

W. C. BUELL, of the Diamond Machine Co., Providence, R. I., was the principal speaker at the recent meeting of the salesmen of the Chas. A. Strelinger Co., in Detroit, Mich.

EDWARD W. BECKMAN, was recently appointed superintendent of the foundry department of the Gilbert & Barker Manufacturing Co., Springfield, Mass. Mr. Beckman was formerly with the Dodge Manufacturing Co., at Mishawaka, Ind., and later with the Walworth Manufacturing Co., at the Kewanee, Ill., works.

Obituary

FRANK E. CABLE, one of the organizers of the Porter-Cable Machine Co., of Syracuse, N. Y., died at his home in Newton Center, Mass., on March 7. He retired from active business about two years ago. Mr. Cable organized the Porter-Cable Co. in 1906 to manufacture metal turning lathes, milling attachments and small tools. He was treasurer of the company until his retirement and then he became a director, a position he held at the time of his death.

WALTER S. WILMOT, treasurer of the Bridgeport Hydraulic Co., Bridgeport, Conn., died in that city on March 7.

WILLIAM H. HEGMANN, for the past six years superintendent of the Atlas Crucible Steel Co., at Dunkirk, N. Y., died in Buffalo of sleeping sickness. He was formerly superintendent of the Braeburn Steel Co., at Pittsburgh, and was generally well-known in steel circles.

JOHN SARGEANT, sixty years old, president of the Domhoff & Joyce Co., Cincinnati, Ohio, pig iron brokers, died in Buffalo, N. Y., on March 4. Mr. Sargeant was a prominent figure in the iron and steel industry and was one of the organizers of the Domhoff & Joyce Company.

Book Reviews

Business Administration. By Leon Carroll Marshall, Professor of Political Economy and Dean of the School of Commerce and Administration, University of Chicago. Nine hundred and five 6 x 9-in. pages, green cloth boards. Published by the University of Chicago Press, Chicago, Ill. Price $4; postpaid $4.24.

The following subjects are dealt with thoroughly and competently: The field of business administration, plant location, the administration of personnel, the administration of market problems, the administration of finance, the administration of production, the administration of risk-bearing, the form of the business unit, basic features of administration, analysis of a business case.

Because it analyzes and clarifies so well the various departments of business, the book is very valuable for use by anyone engaged in or interested in the administration of business, although it was written for use as a text book, to be a part of the series "Materials for the Study of Business."

The author, in his preface, outlines these four parts into which the book may logically be divided: A general view of the field of study and a certain mental attitude toward the field (an attitude called the functional approach to the study of business administration); an examination of a business problem (that of plant location); discussion of the functions of the business administrator, and a "business case" for the student to analyze.

Questions, problems and cases are employed throughout the book as means of instruction and as tests to indicate to the student the extent to which his study has profited him.

The fourth general division of the book, the analysis of a business case, is intended "to get a clearer view of what may be involved in expanding a business" and "to test our ability to form certain kinds of business judgments on the basis of some typical business data." A general, but brief, statement of the case is made and is followed by problems, some of which refer to the engineer's report, the accountant's report, the prospectus and the stock subscription form that follow the problems. The reports referred to afford sufficient data on which to base decisions that are definite solutions of the case as a whole.

On account of the growing realization of a need for collegiate instruction in the fundamentals of business and business administration, Mr. Marshall's book is particularly deserving of recommendation.

Mechanical World Year Book—1922. Published by Emmott & Co., Ltd., Manchester, England. 615 pages, 4¼ x 6¾ in., bound in red clothboards. The book sells for 2s. 6d. in England.

The 1922 edition of a yearly publication of mechanical data. The book this year has been enlarged by the addition of twenty pages to cover new matter. The section on boiler construction has been rewritten and a chapter devoted to pipes and tubes has been added.

The book presents a collection of tables and charts on mechanical subjects. Some of the tables are devoted to weights, measures, thermal properties of solids, liquids and gases, money rates and exchanges, foreign and domestic weights and measures and comparisons with our own systems; post office rates and regulations, both foreign and domestic. Separate chapters are devoted to steam engines, turbines, Deisel engines, shafting, gearing and pulley data, grinding, screw cutting and various other mechanical processes. Several pages are given to tables of squares, cubes and roots, logarithms and trigonometric formulas and equations.

The book is backed up with a diary large enough for the whole year.

Trade Catalogs

Maxim Silencer. The Maxim Silencer Co., Hartford, Conn. Bulletin No. 1, describing the Model 1018 silencer for engine exhausts, suctions, hoists, steam discharges, valves and blow-offs.

Laps. R. & C. Lap Co., Davenport, Iowa. A series of three booklets covering a line of laps for toolroom and production work, with particular reference to automobile cylinder work.

Grinding Machines. The Cincinnati Grinder Co., Cincinnati, Ohio. A sixteen-page catalog describing by word and picture a new automotive parts grinding machine recently put out by this company. The machine is illustrated in various operations and specifications are given.

Safety Setscrews. The Bristol Company, Waterbury, Conn. Bulletin No. 811, describing the Bristo patented safety setscrew.

Twist Drills and Reamers. Whitman-Barnes Manufacturing Co., Akron, Ohio. A four-page circular showing photographs of important engineering projects, in the production of which W-B drills and reamers were used.

Alundum. The Norton Company, Worcester, Mass. A beautifully illustrated and made-up catalog, thirty-six pages, on fancy coated stock, describing the alundum safety tile manufactured by this company. The illustrations show the use of tile on stairs, treads, floors, ramps, elevator landings and places where a slip-proof surface is desired. Data for architects, engineers and contractors are included.

Thor Tools. Independent Pneumatic Tool Co., Chicago, Ill. A large folding circular describing a line of Thor tools, including drills, riveters, hammers and hoists, all of the pneumatic type.

Thermo-electric Pyrometers. Thwing Instrument Co., 2339 Lancaster Ave., Philadelphia, Pa. Bulletin No. 10 describing and illustrating a line of electrical instruments for measuring temperatures from the coldest to the hottest.

Gear Cutting. Follows Gear Shaper Co., Springfield, Vt. First edition of a booklet entitled "A New Development in Gear Cutting," which describes the No. 7 high-speed gear shaper. The machine is illustrated in every detail and some interesting data are furnished.

Catalogs Wanted

H. F. Gray, instructor in mechanical drafting and machine design at Wentworth Institute, Huntington Ave. and Ruggles St., Boston, 17, Mass., would like to receive catalogs on foundry and pattern-making equipment, machine tools and other mechanical apparatus.

TOLNAI VILAGLAPJA, Budapest, Hungary, VII. Dohany-Utca 12, would like to receive catalogs on tools, dies and metal-working machinery.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

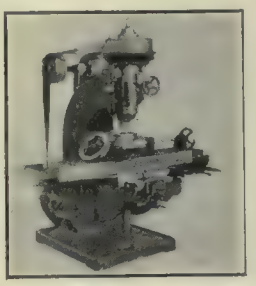
Patented Aug. 20, 1918

Cleaning Machine, Gasoline, Safety
Black & Decker Manufacturing Co., Baltimore, Md.
"American Machinist," November 17, 1921



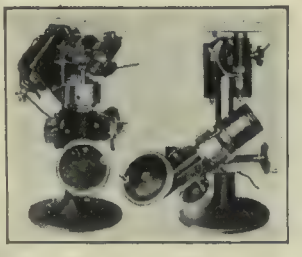
The device is intended for cleaning small parts with gasoline. It consists of a cast-iron pedestal with a bowl at the top. About 5 in. from the bottom of the bowl, a fine-mesh screen is supported. A plunger pump is cast integral with the bowl. The cover is arranged so that it cannot be left open when the device is not in use. The operation of the plunger pump forces a stream of gasoline or cleaning fluid from one side into the center of the bowl. The liquid passes through the screen and returns to the pump, so that it is used over and over. It is merely necessary to hold under the stream the part to be cleaned.

Milling Machine, Vertical, High-Speed, No. 5C
Becker Milling Machine Co., Hyde Park, Mass.
"American Machinist," November 24, 1921



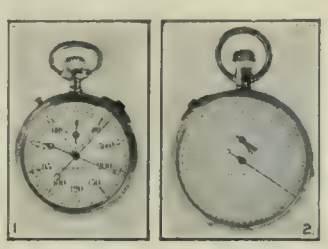
The machine is for special work, so that spindle speeds up to 1,400 r.p.m. may be obtained and cutters as small as 7/32 in. may be used. The normal range of speeds of the standard machine is from 13 to 500 r.p.m., and the high speeds added do not interfere with them. The high speed has been added because it is sometimes necessary to do light milling on large pieces of work. A special three-speed countershaft is furnished. In the work shown, a groove is milled tangent to the circular wall previously milled, and about 1 in. below the top face of the work. A bushing is provided for supporting the cutter close to the surface being milled.

Grinding, Drilling and Turning Machine, Bench, Parker
Ex-Cell-O Tool and Manufacturing Co., Detroit, Mich.
"American Machinist," November 24, 1921



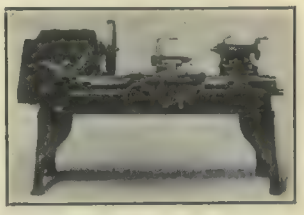
The upper spindle head can be set at any angle about a horizontal axis, being directly connected to the ¼-hp. motor. The upper spindle has 1½-in. travel. The lower spindle has 2½ in. vertical travel, 8¾ in. vertical adjustment and 7 in. horizontal travel. The machine weighs 135 lb., and is 24 in. high. Both external and internal grinding operations can be performed, as well as any class of cutter grinding. By inserting a tool in the lug to the left of the upper spindle, small turning operations can be done. By placing a drill chuck on the upper spindle, small drilling or milling operations can be performed.

Watches, Time-Study
Mortimer J. Silberberg Co., Peoples Gas Bldg., Chicago, Ill.
"American Machinist," November 24, 1921.



A decimal-graduated, two-handed, computing, time-study watch is shown in Fig. 1. The dial is graduated in tenths and hundredths of minutes, to indicate at any point of elapsed time what the output per hour totals on the work in process. A sliding stop is provided by which the watch may be started, stopped and started again without returning the hands to the zero position. The watch shown in Fig. 2 is known as the "decimal duration" type. The small hand records the revolutions of the large hand up to and including 30 minutes.

Lathes, Production, Quick-Change, Type-8
Sebastian Lathe Co., Cincinnati, Ohio.
"American Machinist," November 24, 1921



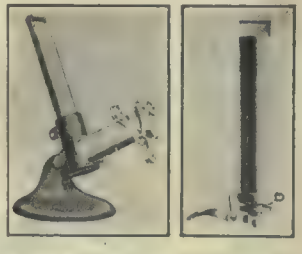
The lathe is made in swings of 13, 15 and 18 in. It can be furnished in either the geared-head or cone type. The bed can be furnished in lengths from 5 to 14 ft. in the two smaller sizes of machine, and from 6 to 14 ft. in the largest size. The geared headstock provides speeds from 19½ to 487 r.p.m. for the 13- and 15-in. sizes, and from 14 to 350 r.p.m. for the 18-in. size. The geared headstock can be used with a double friction countershaft or with a motor drive. A thread-chasing dial is regularly furnished. The quick-change box provides for the cutting of threads from 3 to 48 per inch, and gives feeds from 6 to 96 per inch.

Grinders, Motor-Driven, Belted
St. Louis Machine Tool Co., St. Louis, Mo.
"American Machinist," November 24, 1921



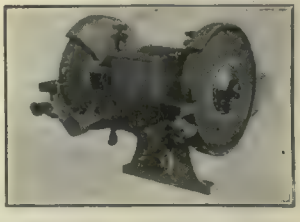
The motor is carried on a heavy arm fastened to the rear of the pedestal. It is thus protected both from the dust and dirt that ordinarily accumulate on a motor mounted on the floor, as well as from the action of grit that is apt to find its way into a motor mounted directly on the grinding spindle. The addition of the motor does not increase the floor space required by the machine, and does not interfere with the operator. Motors can be furnished for the type of current available. The starting switch is mounted beneath the motor. The machine can be furnished with practically any type or size of head used on the regular line of "Saint Louis" and "Western" grinders and polishers.

Minimeter, Hirth
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," November 24, 1921



The concern is marketing a complete line of the original Hirth minimeters. The minimeter proper, an instrument for precision measurement, is shown at the right. It consists essentially of a lever having unequal arms and resting on two knife edges. The ratio of amplification may vary from 1:50 to 1:1,000, depending on the accuracy to which it is desired to gage. The measuring instrument proper can be mounted in different types of holders. One application of the minimeter is the inspection of balls requiring high accuracy. The type shown is intended for measuring holes. Another recent model is intended for gear inspection.

Grinder, Electric, Bench, 8-in.
Black & Decker Manufacturing Co., Baltimore, Md.
"American Machinist," November 24, 1921



The machine has a ¾-hp. motor capable of operation on either alternating or direct current. The motor is air cooled, and arranged so that the cooling-air intake is located 12 in. from the grinding wheels. The wheels are set forward of the motor casing, so that they overhang the bench. It is possible to grind long pieces and odd shapes without interference from the casing. The machine is equipped with two 8 x ¾-in. grinding wheels, wheel guards, adjustable toolrests, and an electric cable fitted with an attachment plug and switch.

The Weekly Price Guide

THIS WEEK'S MARKET

PITTSBURGH mills, with few exceptions, are holding firmly to the asking price of $1.50 per 100 lb. on structural shapes, plates and mild steel bars. Only in exceptional cases, involving large tonnages, is the quotation of $1.40 easily obtainable.

Copper sheets (base), in New York warehouses, are quoted at 19½c.@20½c. as compared with 20½c.@21c. per lb. one week ago. Copper market continues to show improvement; zinc somewhat firmer. Dealers' purchasing prices on old copper and brass quoted at an advance of ¼c.@½c. per lb. in Cleveland.

Raw linseed oil quoted in Chicago at 97c. as against 91c. per gal. New York continues to quote 87c., but cutting under this figure to the extent of 3c. has resulted in quotations ranging from 84c. to 87c. per gal. in 5-bbl. lots.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.17
Northern Basic	19.71
Southern Ohio No. 2	21.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	15.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.26
Virginia No. 2	27.24
Basic	19.84
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	20.46
Basic	19.46
Bessemer	21.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.5
Philadelphia	8.0	5.0	2.63
Atlanta	5.0	4.0	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Inches	Steel Black	Steel Galv.	Inches	Iron Black	Iron Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.25	3.40
Cold finished flats, squares	3.85	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.28
Soft steel bar shapes (base)	2.53	2.36	2.28
Soft steel bands (base)	3.13	....	2.88
Tank plates (base)	2.63	2.46	2.38
Bar iron (2.00@2.10 at mill)	2.53	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
¼	7.15		11@12
⅛ to ½	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			30.25
Lead (up to carlots), St. Louis, 4.65; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.50
Copper, heavy, and wire	9.50	10.00	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.25	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	22.50	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.84@.87	.99	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.00
Cone heads, ditto (net)	3.60	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	.....
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Birmingham — The Birmingham Slag Co., Jefferson County Bank Bldg., G. Ireland, Pres.—three pneumatic drillers for drilling holes for blast charges in slag bed.

Ala., Birmingham — The Ingalls Iron Wks., 802 Ave. D—serpentine shear, for 3-4 in. and lighter sheets.

Ala., Mobile—The Alabama Drydock Co., foot of Eslava St., A. Reddy, Purch. Agt. —two 27 in. LeBlond lathes and one No. 4 LeBlond milling machine.

Ark., Hope—The Eclipse Mfg. Co., H. H. Howel, Pres.—one high speed drilling apparatus for drilling rivet holes in sheets for tanks, similiar to that used for ship plates for bending machine to be used for bending plates 48 in. and under.

Cal. Los Angeles—Globe A No. 1 Ice Cream Co., c/o W. A. Heitman Constr. Co., 900 Market Bldg.—electric elevator and conveyors and refrigeration system and modern ice cream making machinery.

Fla., Cantonment—The Cantonment Merchantile Co., H. I. Root, Secy.—complete line of canning factory machinery for small cannery, also creamery and dairy machinery.

Ga., Eatonton—The Eatonton Cotton Mills, F. W. Gurry, Pres. and Mgr. — twenty-one hundred 3 in. and eight hundred 5 in. spindles for cotton mill.

Ga., Savannah—W. Ross, c/o Hotel Marjorie—complete supplies and machinery for proposed newspaper plant.

Ia., Marshalltown—E. A. Ford, oil drill.

Ill., Chicago—The Cadet Knitting Co., 1734 Belmont Ave.—one Scott & Williams body machine 15 in. diameter with 16 end Crawford stop motion.

Ill., Chicago—The Chicago Roller Skate Co., 4454 West Lake St., R. Ware, Purch. Agt.—one vertical wet surface grinder about 14 x 36 with or without magnetic chuck, and one ¼ in. high speed hammer forger.

Ill., Chicago—The Quadrangle Mfg. Co., 551 West Monroe St.—one 52 to 60 in. power square shear to cut 14 gauge steel, (used).

Ill., St. Anne—The Builders Specialty Co.—machine work and assembling lathe, swing up to 40 in. also a planer and a drill press.

Ind., Huntington (Gary P. O.)—The Universal Portland Cement Co.—one 60 in. x 24 ft. heavy duty type engine lathe.
One 44 in. vertical boring mill.
One 1,000 lb single frame steam hammer.
One No. 1 horizontal spindle milling machine with table 14 in. x 5 ft.
One 4 head quick return planer with bed 42 in. wide and 12 ft. long.
One type "J" Gisholt turret lathe with 24 in. swing and 7½ in spindle bore.
One 24 in. x 15 ft. engine lathe.
One cold cut circular saw to cut material up to 12 in. in diameter, inclusive.

Kan., Wichita — The Central Furniture Co., South Santa Fe St.—woodworking machines, including planer, shaper, rip saw, etc.

Kan., Wichita—The Empire Sand & Material Co., 102 Northern Bldg.—mixer, conveying equipment, steam boiler and miscellaneous equipment.

La., Shreveport—W. E. Hampton, 725 Christian St.—additional machinery for the manufacture of machinery etc.

Mass., Boston—Perkins & Boland, 176 Federal St. (manufacturers of cotton yarn) —late model chinchilla machine Curtis & Marble make preferred.

Mich., Detroit — The Batchelder-Wasmund Co., 2300 West Jefferson Ave., D. W. Davie, Purch. Agt.—lathe for turning stone.

Mich., Detroit—The Grosse Pointe Sheet Metal Wks., 14538 Jefferson Ave., E.—woodworking machine.

Mich., Detroit—The Ka-Wood Gear Co., 2281 Superior St.—miscellaneous machine shop equipment, including heavy press.

Mich., Detroit—Lamb Co., 1938 Franklin St.—small screw machines plain, small screw machines automatic, and small punch presses about No. 2 or No. 3.

Minn., Minneapolis—B. W. and L. Harris Co., 2407 University Ave., S. E., general machine shop operators—machine tools for equipping new plant.

Minn., Minneapolis—The Liberty Garage, 524 10th St., S., F. J. Mason, Purch. Agt. —equipment for auto repair shop.

Minn., New Prague—The Gopher Machine Mfg. Co. has sent out a printed list of machine tool and machinery requirements.

Minn., St. Paul—The Dept. Educ., City Hall, H. W. Austin, Purch. Agt.—
One tenoner, 24 in. capacity slide 3½ tenon, complete with all knives and belts, tilting table for angle tenonizing motor 3 phase, 60 cycle, 220 volt, Oliver No. 125 less cutoff attachment, or similar.
One bench trimmer, Oliver No. "O" or similar.
One hollow chisel mortiser motor drive on spindle, motor 3 phase, 60 cycle, 220 volt, Oliver No. 91D or similar.
One variety saw, complete with motor belt drive, mortising and boring attachment with all chisels, universal ripping fence, plain table, including one rip saw and one cut-off saw, motors 3 phase, 60 cycle, 220 volt, Oliver No. 80 or similar.

Mo., Joplin—The Auto Service Co., 108 North Main St., L. C. Martin, Purch. Agt. —lathe for garage and machine shop.

Mo., Joplin—The city, J. M. Lane, comr. —lathe and other small tools for machine shop.

Mo., Joplin—The Creech Auto Repair Co., 209 East 20th St., T. Creech, Purch. Agt —lathe, drill press, emery wheel and stand.

Mo., Joplin—The Lewis Machine Co., 206 Joplin St.—large lathe and drill press for machine shop.

Mo., Joplin—The Miners Ice & Fuel Co., 318 Main St.—J. E. Campbell, Mgr.—compressor about 450-500 cu.ft. free air, 110 lb. working air pressure, steam driven.

Mo., Joplin—The Second Street Garage, 2nd St.—R. Cassnier, Purch. Agt.—lathe, drill press, shafting and belting.

Mo., Joplin—L. Stites, 1415 Main St.—drill press, lathe and shafting.

Mo., Springfield—The Wilhoit Oil Co., 718-21 Woodruff Bldg., E. M. Wilhoit, Purch. Agt.—oil filtering machinery.

N. Y., Albany—C. L. Cadle, Supt. Pub. Wks., will receive bids until April 11 for two 5 ton electric gantry cranes on Barge Canal Terminals at Rochester and Syracuse, Terminal Contr. 122.

N. Y., Binghamton—The A. & J. Mfg. Co., 340 Water St.—special machinery and equipment for the manufacture of metal egg-beaters.

N. Y., Buffalo—The Amer. Radiator Co., 1807 Elmwood Ave.—two 24 in. and six 16 in. Barnes drill presses; one high speed drill press; one radial drill press 36 in. arm; one shaper, 24 in. stroke; one 20 in. lathe, 7 ft. center; one milling machine; one Brown & Sharpe universal grinder and one power hack saw.

N. Y., Buffalo—The Hess Rubber Wks., 522 Bway.—complete vulcanizing outfit and machinery.

N. Y., Buffalo—J. U. Landsittel, 276 Glenwood St.—small printing press.

N. Y., Carthage—D. J. Renaud & Son, Inc., 672 West End Ave.—small oil burning brass furnace.

N. Y., Manchester—A. J. Butterfield—tinsmithers and roofers tools and machinery.

N. Y., Watertown—The Biche-Gardner Motor Co., Stone St.—1 7/8 in. cold rolled shafting, 14 in. hangers and one 12 in. x 8 in. split steel pulley.

N. Y., Watertown—The Brennan Eng. Co., Mill St., M. Brennan, Purch. Agt.—pipe tapping and threading machine and portable volt-meter with case.

N. Y., Watertown—Gray Bros. Vulcanizing Wks., Inc., 436 State St., A. J. Gray, Purch. Agt.—triple chain hoists, ½ and 1½ ton.

N. C., Chalybeate Springs—W. J. Morris—machine to handle gravel from pit to cars, information on new machine or will consider used track crane.

N. C., Hickory—F. B. Williams, 1503 10th St.—machines to manufacture shoe strings.

N. C., Pembroke—The Honey Sorghum Producers Co-operative Assn.—three roll crusher, evaporator, filter, engine, tank, boiler and various machinery for new canning factory.

O., Cleveland—The Fanner Mfg. Co., Brookside Park, (foundry), J. E. O'Brien, Purch. Agt.—Toledo press, screw machine and several moulding machines.

O., Massillon—The Massillon Aluminum Co.—V. Watt, Purch. Agt.—three 32 in spinning lathes with sliding tailstock.

Pa., Allentown—The Defiance Auto Lock Corp., R. H. Peterson, Purch. Agt.—hydraulic press, milling machine, lathe and gear cutter.

Pa., Bridgeville—The Universal Steel Co.—shear, Crocodile or Alligator for cutting soft steel billets cold.

Pa., Erie—The Erie County Comrs.—scales to weigh trucks.

Pa., Hawley—E. Ludwig, plumber and steamfitter—pipe threading machine to cut threads on pipe up to 4 in.

Pa., Phila.—G. T. Kershner, 313 North 34th St.—one sole leather stripper.

Pa., Phila.—R. Marl, 5843 Morton St.—dough mixers, conveyors and electric furnaces.

Pa., Phila.—M. Moister & Co., 3931 North 5th St., M. Moister, Purch. Agt.—woodworking machines, drill press, metal working machinery, shafting, hangers, etc.

Pa., Phila.—R. Schleter, Kensington and M Sts., (hosiery mill)—spoolers, winders and cones, also automatic hosiery machines, belting, shafting, etc.

Pa., Pittsburgh—Hubbard & Co., 6301 Butler St., H. G. Glaser, Jr., Purch. Agt.—two 1¼ or 1½ in. Acme heading, forging and upsetting machines with 10 in. stroke.

Pa., Pittsburgh—P. Limegrower, 126 Collins Ave.—electric hoist outfit or 25 hp. gas engine.

Pa., Pittsburgh—H. Muser, 314 38th St.—small drill press, 18 in. power saw and small emery wheel (used).

Pa., Willow Grove—J. Stuckert—one 10 ton ice manufacturing machine (used preferred).

S. C., Sumter—The Sumter Pine Co., 604-605 City Natl. Bank Bldg., R. B. Waters, Secy.-Treas. — complete machinery and equipment for the manufacture of boxes and crates.

S. C., Winnsboro—J. F. Watson—complete woodworking machinery outfit including matchers, planers, sanders, etc., for turning out handles, spokes, etc., from hard wood lumber.

Tenn., Chattanooga—The Chattanooga Roofing & Fdry. Co., Msnry Ave., J. E. Annis, Purch. Agt.—20 in. drill press, upright with stationary head, capacity 1 in. hole in cast iron and steel.

Tenn., Chattanooga—M. B. Parker, 1912 Oak St., manufacturer of machinery, etc.—one 48 x 48 in. x 16 ft. belt driven planer, with two rail heads.

Wis., Beloit—J. H. Saris, 412 Broad St.—modern repair shop machinery, including gasoline storage tanks and pumps and an air compressor.

Wis., Green Bay—The Green Bay Cold Storage Co., 113 West Walnut St.—refrigeration machinery.

Wis., Madison — The Autowash Co., 7 South Bedford St. — equipment for auto repair work.

Wis., Milwaukee — C. Bielefeld, 1161 Grant St., carpentry and millwork—24 in. planer.

Wis., Milwaukee—H. Hawker, 271 Bishop Ave., (woodworker)—22-26 in. band saw.

Wis., Milwaukee — M. Schmidt, 2916 Galena St., carpentry and woodwork—band saw, planer and sander.

Wis., Milwaukee—E. Wiener, 301 7th St.—woodworking machinery for the manufacture of special upholstered furniture.

Wis., Milwaukee—M. A. Weinreis, 241 Lake St.—one 300 to 350 ft., two stage belt driven air compressor and one 8 x 8 x 8 and one 10 x 10 belt driven air compressor.

Wis., Oshkosh—The Gibson Tire & Repair Co., 7 Church St.—one tire press.

Wis., Park Falls—The Flambeau Paper Co., G. Waldo, Purch. Agt.—traveling crane.

Wis., Portage—The Portage Underwear Mfg. Co.—one 18 in., 14 cut, knitting machine.

Wis., Waupun—C. A. Shaler—special machinery for vulcanizing plant.

Ont., Burford—The Paris Knitting Co., Ltd., has secured an old factory building and plans to install equipment for the manufacture of soxs and stockings. Estimated cost, $30,000.

Metal Working Shops

Cal., Fresno—Dolson & Anderson, Inc., 902 Bush St., San Francisco, have awarded the contract for the construction of a 3 story garage and store building at 1215 Bway., here. Estimated cost, $50,000.

Cal., Martinez—The California Car Co., Alexander Bldg., San Francisco, will construct a car plant comprising 1 story buildings, here.

Cal., Oakland—D. Crosby, 105 Sheridan Ave., Piedmont, will build a 1 story battery station on Webster St. near 15th St., here. Estimated cost, $15,000.

Cal., Point Loma — Spec. 4599 — The Bureau of Yards and Docks, Navy Dept., Wash., D. C., plans to build a garage here.

Cal., San Francisco—The York Realty Co., c/o W. L. Schmolle, Archt., 40 Montgomery St., is having plans prepared for the construction of a 1 story auto body factory on Harrison and 21st St., for the Martin-Parry Corp., 500 Golden Gate Ave. Estimated cost, $15,000.

Conn., Hartford—The Bush Mfg. Co., 77 Commerce St., has awarded the contract for the construction of a 1 story, 50 x 250 ft. addition to its plant on Wellington Ave., for the manufacture of machinery. Estimated cost, $60,000. Noted March 2.

Conn., Hartford — Herchman & Levine, 223 Main St., is having revised plans prepared for the construction of a 2 story, 85 x 190 ft. garage, repair shop and sales building on Main St. Estimated cost, $125,000. F. C. Walz, 407 Trumbull St., Archt.

Conn., New Britain—A. J. Olson, 334 Stanley St., is having plans prepared for the construction of a 1 story, 112 x 132 ft. garage, etc., on Arch St. L. A. Oldershaw, 259 Main St., Archt.

D. C., Washington—The Salvation Army, 521 13th St. N. W., has awarded the contract for the construction of a garage and industrial home. Estimated cost, $200,000. Noted March 9.

Ill., Charleston—A. E. Craig, c/o C. D. Mitchell, Archt., Mitchell Blk., has awarded the contract for the construction of a 1 story, 51 x 100 ft. garage and salesroom. Estimated cost, $50,000.

Ill., Chicago—The Dental Products Co., 623 South Wabash Ave., has awarded the contract for the construction of a 2 story, 75 x 100 ft. factory at 7512-18 Greenwood St. Estimated cost, $30,000.

Ill., Chicago—The Natl. Stamping & Electric Wks, 424 South Clinton St., has awarded the contract for the construction of a 1 story, 130 x 155 ft. addition to its factory at 3238-50 West Lake St. Estimated cost, $60,000.

Ill., Harvard—The Manley Motor Co. has awarded the contract for the construction of a 1 story, 68 x 113 ft. garage and sales room. Estimated cost, $30,000. E. A. Manley, Secy. Noted Oct. 27.

Ill., Peoria—C. Welti, 518 Hamilton St., is having plans prepared for the construction of a 1 story, 70 x 120 ft. garage and repair shop. Estimated cost, $40,000. B. L. Hulisbus, 1232 Jefferson Bldg., Archt.

Kan., Parsons—W. N. Chapman is having plans prepared for the construction of a 2 story, 75 x 120 ft. garage and sales room. Estimated cost, $70,000. W. S. Orme, Parsons, Archt.

Ky., Louisville—The Kokomo Rubber Co., 822 East Bway., has awarded the contract for the construction of a 2 story, 45 x 95 ft. garage (filling and battery station) on Logan St. and Bway. Estimated cost, $45,000.

Ky., Louisville—D. X. Murphy & Bro., Archts., 714 Louisville Trust Bldg., will soon receive bids for the construction of a 3 story, 40 x 180 ft. addition to machinery plant and office on 10th and Ormsby Sts. for the H. Vogt Mchy. Co. Estimated cost, $75,000.

La., Shreveport — W. E. Hampton, 725 Christian St., manufacturer of machinery, etc., plans to build an addition to shop.

Mass. Dorchester (Boston P. O.)—The Meisel Press, Dorchester Ave., Boston, has awarded the contract for the construction of a 1 and 2 story, 40 x 80 ft. and 161 x 302 ft. machine shop on Locust St., here. Estimated cost, $250,000.

Mass., Roxbury (Boston P. O.) — The Boston Elevated Ry Co., Massachusetts Ave., Boston, has awarded the contract for the construction of a 2 story, 63 x 450 ft. inspection shop at its Forest Hills yard, here. Estimated cost, $250,000.

Mass., Springfield—W. J. Hyland Mfg. Co., 151 Dwight St., will build a 3 story, 47 x 85 ft. plant on Liberty St., for the manufacture of heating goods. Estimated cost, $40,000. Noted Sept. 22.

Mass., Westfield—H. B. Smith Co., 57 Main St., will build a 1 story, 48 x 160 ft. addition to its machine shop on Main St. Estimated cost, $40,000. Private plans. Noted March 9.

Mich., Escanaba—The Wolverine Delta Motor Co. has awarded the contract for the construction of a 1 story, 100 x 138 ft. garage. Estimated cost, $45,000. Noted Jan. 26.

Minn., Minneapolis — F. S. Gold, 2004 James Ave., S., has awarded the contract for the construction of a 1 story, 150 x 200 ft. garage at 911 1st Ave., N. Estimated cost, $40,000.

Minn., Minneapolis—B. Phillips, 520 New York Life Bldg., is having plans prepared for the construction of a 3 story, 108 x 150 ft. garage and store building on Lyndale Ave., S., and 22nd St. Estimated cost, $60,000. Ar-En Co., 1219 McKnight Bldg., Archts.

N. J., Camden—Ballinger Co., Archts., 12th and Chestnut Sts., Phila., Pa., will soon receive bids for the construction of a 2 story plant on Federal St., for the manufacture of heating systems and steam specialties, for the Warren Webster Co., Point and Pearl Sts. Estimated cost, $50,000.

N. J., Newark—The Eastern Steel & Wire Co. has awarded the contract for the construction of a factory on Evergreen Ave. near Frelinghuysen Ave. for the manufacture of agricultural implements, etc. Estimated cost, $300,000.

N. J., Trenton—The Trenton Emblem Co., 120 Hamilton Ave., has awarded the contract for the construction of a 1 story, 56 x 77 ft. foundry on Hamilton Ave. Estimated cost, $10,000.

N. Y., Jamestown—S. B. Robbins, 315 West 5th St., in conjunction with the 3rd and Lafayette St. Garage Co., plans to build a 1 story, 80 x 82 ft. garage and machine shop on West 4th and Lafayette Sts. Estimated cost, to exceed $18,000. Architect not selected.

N. Y., Olean—The Pennsylvania R.R., Broad St. Sta., Phila., plans to rebuild its car shops here, which were recently destroyed by fire. Estimated cost, $150,000.

N. Y., Poughkeepsie—The Advance Boiler Co. has awarded the contract for the construction af a 1 story, 100 x 300 ft. foundry. Estimated cost, $100,000.

N. Y., Rochester—S. B. Cooper, 29 Elm St., is having plans prepared for the construction of a 3 story, 82½ x 181 ft. garage and press room on Elm St. Estimated cost, $150,000. Architect not announced.

N. Y., Watervliet—The Eastern Malleable Iron Co., Naugatuck, Conn., plans to build a 1 stroy, 50 x 250 ft. foundry, here. Architect not selected.

O., Cleveland—W. S. Ferguson, 1900 Euclid Ave., has had preliminary plans prepared for the construction of a 1 story, 60 x 120 ft. garage on East 152nd St. and Collamer Rd. Estimated cost, $40,000. Private plans.

O., Cleveland — The Hearthstone Bldg. Co., 791 The Arcade, is having plans prepared for the construction of a 2 story, 55 x 200 ft. garage and office building at 3514 Carnegie Ave. Estimated cost, $60,000. Best & Hoefler, Vickers Bldg., Archts.

O., Massillon—W. E. Wagner is receiving bids for the construction of a 2 story, 48 x 105 ft. garage. Estimated cost, $60,000. Albrecht, Wilhelm & Kelly, 1836 Euclid Ave., Cleveland, Archts.

Pa., Phila.—The Barrett Co., 36th St. and Grays Ave., (roofing manufacturers) has awarded the contract for the construction of a 1 story, 55 x 113 ft. and a 1 story, 60 x 100 ft. shop on 36th St. and Grays Ave.

Pa., Phila.—Hoffman-Henon Co., Archts., Finance Bldg., is receiving bids for the construction of a 3 story, 70 x 116 ft. garage on 15th and Locust Sts. for the V.M.C. Garage. Estimated cost, $120,000.

Pa., Phila.—M. Moister & Co., 3931 North 5th St., will build a 1 story, 50 x 180 ft. metal and woodworking factory on American and Bristol Sts. Estimated cost, $35,000.

Pa., Phila.—J. Stern & Sons, 428 North 3rd St., have awarded the contract for the construction of a 1 story, 22 x 62 ft. boiler house and garage on Cedar Ave. and Tioga St. Estimated cost, $20,000.

S. D., Mitchell—The Rozum Motor Co., 400 East 4th Ave., plans to build a 2 story, 44 x 165 ft. garage on 5th Ave. and Main St. Estimated cost, $50,000. A. J. Rozum, Pres. Architect not selected.

Vt., Brandon—The State Dept. of Institutions is having plans prepared for the construction of a 1 and 2 story, 55 x 240 ft. repair shop at the State School for Feeble Minded, here. Estimated cost, $75,000. F. L. Austin, 240 College St., Burlington, Archt.

W. Va., Huntington—The Amer. Car & Fdry. Co., 165 Bway., New York City, has awarded the contract for extensions to plant on 3rd Ave., here. Estimated cost, $500,000.

Wis., Beloit—J. H. Saris, 412 Broad St., will build a 2 story, 98 x 130 ft. garage on Broad St. Estimated cost, $30,000.

Wis., Burlington — J. A. Luke has awarded the contract for the construction of a 1 story, 66 x 130 ft. garage on Main St. Estimated cost, $40,000. Noted Dec. 8.

Wis., Madison — The Autowash Co., 1 South Bedford St., is having plans prepared for the construction of a 1 story, 70 x 160 ft. garage. Estimated cost, $40,000. M. P. Schmeiser, 401 West Doty St., Archt.

Wis., Milwaukee—P. Hirt, 1717 Vliet St., has awarded the contract for the construction of a 1 story, 30 x 100 ft. garage on 16th St. Estimated cost, $40,000.

Wis., South Milwaukee—The Bucyrus Co. has awarded the contract for the construction of a 1 story, 100 x 265 ft. foundry. Noted March 2.

Wis., Watertown—The Klinger Buick Co., 211 Second St., has awarded the contract for the construction of a 1 story, 56 x 100 ft. garage on 3rd and Jefferson Sts. Estimated cost, $40,000. Noted March 2.

General Manufacturing

Cal., Eureka—The Bd. Supervisors of Humboldt County has awarded the contract for the construction of an addition to laundry and heating plant at the Tubercular County Hospital. Estimated cost, $9,994. Noted Jan. 26.

Cal., Los Angeles—Globe A No. 1 Ice Cream Co., c/o W. A. Heitman Constr. Co., Archts., 900 Merritt Bldg., has awarded the contract for the construction of a 2 story, 140 x 216 ft. ice cream factory on 31st and Jefferson Sts. Estimated cost, $300,000.

Cal., Petaluma — Belding Bros. have awarded the contract for the construction of an addition to their silk factory. Estimated cost, $20,500.

Cal., Richmond—The Galena Signal Oil Co., South Park and Liberty Sts., Franklin, Pa., has purchased a site here, and plans to build a refinery. Estimated cost, $100,000. C. A. Miller, Supt.

Cal., Sacramento—W. C. Phillips Co., c/o Union Ice Co., 9th and C Sts., has awarded the contract for the construction of a 1 story artificial ice plant near the Western Pacific sheps. Estimated cost, $16,000.

Cal., San Francisco—The Collins-Hencke Candy Co., 25 Beale St., has purchased a 120 x 135 ft. site on Folsom St. near 2nd St., and plans to build a 3 story candy factory. Architect not selected.

Cal., San Francisco—Francis-Valentine Co., 777 Mission St., has awarded the contract for the construction of a 1 story printing plant on Natoma and 5th Sts.

Cal., Tracy—The General Milk Co. of California, c/o A. J. Mazurette, Archt., 1002 H St., Modesto, is having plans prepared for the construction of a milk evaporating plant. Estimated cost, $75,000. F. S. Glass, Berkeley, Vice Pres. and Genl. Mgr.

Conn., Allingtown (r. d. New Haven)—The Velvet Textile Corp., P. O. Box 1963, has awarded the contract for the construction of a 1 story, 156 x 201 ft. textile plant, and a 1 story, 50 x 50 ft. garage and boiler house, here. Estimated cost, $100,000.

Conn., Hamden (New Haven P. O.)—The Natl. Filter Cloth and Weaving Co., 57 Hope St., Brooklyn, N. Y., is having plans prepared for the construction of a 1 story, 70 x 200 ft. textile factory on Dixwell Ave., here. Estimated cost, $60,000. Private plans.

D. C., Langdon (Wash. P. O.) — The Capitol Bedding Co., 441 O St., N. W., Wash., is having plans prepared for the construction of a factory here. Estimated cost, $40,000. Cutler & Moss, 1301 H St., N. W., Wash., Archts.

D. C., Washington — Chapin-Sacks Co., 1st and M Sts., N. E., manufacturers of ice and ice cream, is having plans prepared for the construction of a factory. Estimated cost, $75,000. J. White, 113 2nd St., N. E., Archt.

D. C., Washington—The Takoma Park Ice & Ice Cream Co. has awarded the contract for the construction of an ice plant at 326 Cedar St. Estimated cost, $20,000.

D. C., Washington — The Washington Electrotype Co., Inc., 922 11th St., N. W., plans to build a printing plant. Estimated cost, $25,000. Private plans.

Fla., Pensacola—The Figland Park Canning Co., c/o W. Honsberger, Secy., Route A, Box 219, plans to build and equip a canning plant.

Ill., Boston—Hays & Naumer Ice Co., Tamaroa, is having plans prepared for the construction of a 2 story, 54 x 120 ft. ice plant. Estimated cost, $75,000. Kennerly & Stiegemeyer, Title Guaranty Bldg., St. Louis, Mo., Archts.

Ill., Brisbane—The Western Union Telegraph Co., Joliet, will soon receive bids for the construction of a 2 story creosoting plant. Estimated cost, $65,000. G. M. Yorks, 195 Bway., New York City, Engr.

Ill., Chicago—The Amer. Cabinet Co., 139 North Clark St., has awarded the contract for the construction of a 2 story, 100 x 125 ft. factory on Crawford St. near Barry Ave. Estimated cost, $100,000.

Ill., Chicago—H. E. Frees Co. (chemical laboratory), 2528 West 48th Pl., has awarded the contract for the construction of a 1 and 2 story, 50 x 122 ft. factory on Wellington Ave. Estimated cost, $25,000.

Ill., Chicago—A. V. Tiesen, Archt., 4804 North Kedzie Ave., will soon receive bids for the construction of a 2 story, 25 x 65 ft. addition to tanning factory at 1611 Lincoln St. for Ludwig & Ludwig. Estimated cost, $25,000.

Ill., Decatur—The Builders Lumber Co., 732 North Monroe St., will build a 2 story, 24 x 170 ft. lumber factory. Estimated cost, $25,000. Noted March 9.

Ill., Elgin—The Elgin Coal & Ice Co., 162 Milwaukee St., plans to build a 3 story ice plant. Estimated cost, $75,000. Architect not selected.

Ill., Evanston—The Boyle Ice Co., 847 Larrabee St., Chicago, has awarded the contract for the construction of a 2 story ice manufacturing plant at 542 Linden Ave. Estimated cost, $40,000.

Ill., Hinsdale—The village is having plans prepared for the construction of a 1 story ice plant. Estimated cost, $25,000. G. H. Williams, Clk. Private plans.

Ill., Matteson—K. I. Herman, c/o Mid West Box Co., 111 West Washington St., Chicago, is having plans prepared for the construction of a 3 story, 60 x 140 ft. chemical plant here. Estimated cost, $300,000. H. C. Miller, 111 West Adams St., Chicago, Archt.

Ill., Olney—The Sexton Mfg. Co., Fairfield, will build a 2 story knitting mill, here. Estimated cost, $30,000. Private plans. M. Ferguson, Pres. Noted March 9.

Ill., Rock Island—The Illinois Oil Co., 215 Safe Bldg., is having plans prepared for the construction of a 3 story, 40 x 150 ft. office building. Estimated cost, $160,000. Cervine & Horn, 310 Safety Bldg., Archts.

Ill., Steelville — The International Shoe Co., 15th and Washington Sts., St. Louis, Mo., plans to build a 3 story shoe factory here, to replace the one destroyed by fire. Estimated cost, $30,000. A. Hume, c/o owner, Archt.

Kan., Wichita — The Central Furniture Co., South Santa Fe St., is building a 1 story, 75 x 100 ft. furniture factory on Santa Fe St. Estimated cost $40,000.

Kan., Wichita — The Empire Sand & Material Co., 102 Northern Bldg., will build a 1 story, 60 x 120 ft. cement and brick plant on Athenian Ave. Estimated cost, $10,000.

Mass., Boston—F. A. Norcross, Archt., 46 Cornhill St., is receiving bids for the construction of a 5 story, 22 x 50 ft. factory on Cross St., for the Boston Spaghetti Co., Cross St. Estimated cost, $30,000.

Mass., Lawrence—The Amer. Woolen Co., 245 State St., Boston, is having plans prepared for the construction of a 6 story, 100 x 500 ft. addition to Washington Mills, here. Estimated cost, $800,000. Private plans.

Mass., North Carver—L. S. Baker plans to build a 2 story knitting mill, also a dye house. Private plans.

Mass., Springfield—The Bakery Finance Corp., Dexter Bldg., plans to build a modern bakery. Architect not selected.

Me., Skowhegan—The Maine Spinning Co. plans to build a spinning mill. Estimated cost, $200,000. Architect not announced.

Md., Baltimore — W. S. Lowell, c/o Pocomoke City Roller Mills, Pocomoke City, will receive bids until April 1 for the construction of a 3 story, 40 x 55 ft. flour mill, here. Estimated cost, $30,000.

Mich., St. Joseph—The Gurinian Candy Co., c/o C. A. Exner, Archt., 38 South Dearborn St., Chicago, has awarded the contract for the construction of a 3 story, 80 x 204 ft. factory on Longfellow Ave. and Bway. Estimated cost, $100,000.

Minn., Minneapolis — The Franklin Cooperative Creamery Assn., 2601 Franklin Ave., E., has awarded the contract for the construction of a 2 story, 123 x 154 ft. creamery on 21st and Washington Aves., N. G. Solem, Mgr. Estimated cost, $125,000. Noted Nov. 10.

Mo., Columbia — The Columbia Bottle Wks., c/o R. Cassidy, has awarded the contract for the construction of a 1 story, 70 x 135 ft. bottling plant. Estimated cost, $35,000. Noted March 2.

Mo., Marble Hill—The Parks Milling Co. plans to build a 2 story flour mill. Estimated cost, $25,000. Architect not selected.

Mo., St. Joseph — The Bd. Pub. Wks. plans to build an asphalt plant. Estimated cost, $25,000. C. E. Jackson, Clk., W. K. Seitz, City Hall, Engr.

Mo., St. Louis — Lecoutour Bros. Stair Mfg. Co., 4523 Shaw Ave., is having plans prepared for the construction of a 2 story planing mill on Shaw Ave. to replace the one destroyed by fire. Estimated cost, $50,000. E. Lecoutour, Pres. E. H. Nieman, 3816 Shaw Ave., Archt.

Mo., St. Louis—The Press Sign Co., 202 South 17th St., has awarded the contract for the construction of a 2 story, 50 x 119 ft. factory at 3400 Dodier St. Estimated cost, $35,000. Noted March 16.

N. J., Beverly—The Beverly Textile Mills is having plans prepared and will soon receive bids for the construction of a 2 story, 40 x 100 ft. textile factory. Estimated cost, $38,000. Private plans.

N. J., Trenton—The Star Porcelain Co., Muirheid Ave., has awarded the contract for the construction of a 1 story, 71 x 101 ft. addition to plant. Estimated cost, $9,000. Noted Sept. 15.

N. Y., Brooklyn—The Brooklyn Retail Butchers Corp. plans to build a 4 or 5 story cold storage plant. Estimated cost, $200,000. Henschien & McLaren, 1637 South Prairie St., Chicago, Archts.

N. Y., Furnius (Oswego P. O.)—The Oswego Gardens Inc. plans to build a cold storage plant, 11,000 bbl. capacity. Estimated cost, $30,000. Address P. T. Vercrouse, Oswego.

N. Y., New York—Fleischmann Co., 701 Washington St., has awarded the contract for the construction of a 3 story yeast laboratory on Mott Ave. Estimated cost $200,000. Noted Feb. 16.

N. Y., Olean—The Vacuum Oil Co. has awarded the contract for the construction of a boiler house, transil oil building and loading platforms, drum preparation building, drum storage building, kiln building, clay storage and filter building, color tank building and pump house. Estimated cost, $100,000.

O., Cleveland — The Ward Baking Co., c/o J. B. Arthur, East 143rd St. and Southern Blvd., New York City, will soon award the contract for the construction of a 3 and 5 story, 240 x 315 ft. bakery and office building on East 45th Pl. and Windsor Ave., here. Estimated cost, $500,000. C. B. Comstock, 110 West 40th St., New York City, Archt. Noted Feb. 16.

O., Dayton—The Terminal Ice & Cold Storage Co. has awarded the contract for the construction of an ice and cold storage plant on Baker St. Estimated cost, $85,000.

O., Toledo—The Sandusky Cement Co., c/o F. G. Herman, Engineer Bldg., Cleveland, plans to build a 1 story cement plant, 12 miles west of here. Estimated cost, $1,000,000. W. B. Rawson, Engineers Bldg., Cleveland, Archt.

Pa., Perkasie—S. M. Schwenk is having plans prepared and will soon receive bids for the construction of a 2 story, 50 x 120 ft. knitting factory. Estimated cost, $35,000. J. S. Landis, Soudertown, Archt.

Pa., Phila.—Morice Twine Co., 84 Tasker St., has awarded the contract for the construction of a 2 story, 112 x 156 ft. factory on Delaware Ave. and Dickenson St. Estimated cost, $175,000. Noted Jan. 26.

Pa., Phila.—The Quaker City Cold Storage Co., 301 Delaware Ave., will build a 1 story, 27 x 126 ft. ice plant at 310 South Delaware Ave. Estimated cost, $75,000. Private plans.

Pa., Phila.—The Rogers Hosiery Co., Lena and Collom Sts., is having plans prepared for the construction of a 3 story, 154 x 174 ft. mill on Stenton and Wyoming Aves. Estimated cost, $300,000. Private plans.

Pa., Washington—W. L. Stoddart, Archt. and Engr., 9 East 40th St., New York City, will open bids about April 10 for the construction of a printing plant, for the Observer Publishing Co. Estimated cost, $200,000.

Wis., Mayville—The Peerless Traveling Goods Co. and J. E. Hennen, Archt., 74 South Main St., Fond-du-Lac, are receiving bids for the construction of a 2 story, 64 x 84 ft. factory on Main St. Estimated cost, $30,000. Noted March 16.

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Progress in Engineering Standardization

Why This Is the Time to Simplify Designs and Adopt Uniform Methods—Pipe Fittings Interchangeable—Gears and Tolerances Standardized—International Co-operation

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STANDARDIZATION in the broad sense has for its purpose the quantity production of interchangeable parts for a machine or device. With the old-time methods of producing parts, interchangeability was not an important consideration. The demand for any one class of machines was small and the equipment for manufacture consisted of the ordinary types of machine tools, with only a few of the simplest forms of special tools and fixtures. Parts were assembled into the machine by a slow process involving much fitting, filing, scraping and chipping.

As the demand for machinery of various classes increased, it became imperative to improve production methods. Improvements in the then existing types of machine tools, particularly in milling and grinding practice, advanced at a very rapid rate. New types came into existence, including semi-automatic and full-automatic machines such as the screw machine and turret lathe. Developments in jig, tool and fixture practice followed as a consequence. The question of standardization and interchangeability has been prominent from the begining of the introduction of these modern shop methods.

Standardization in an individual plant depends somewhat on the output. When certain concerns demanded the output of parts in great quantities, they found that, in order to attain and retain manufactory efficiency, it was necessary to standardize their product and install equipment of a highly specialized nature. In the earlier times each manufacturer had his own schedule of sizes, and views as to what should constitute proper standards were widely divergent.

Little progress was made in respect to the interchangeability of products entering into the construction and operation of machinery until movements to that end were undertaken by the great engineering societies. The generally accepted standards now in existence for machine elements are largely due to the efforts of these societies in securing the co-operation of manufacturers in furthering such movements. To give one example of what has been accomplished in this field, it is only in comparatively recent years that engineers and manufacturers have been able to co-operate successfully in establishing standards for pipe and pipe fittings that would be generally acceptable to all concerned. We now have certain generally recognized standards of weights and dimensions for all classes of pipe and pipe fittings, which standards provide an interchangeability that makes it possible to use almost any pipe product on the market that is intended for the same conditions and service, without checking to ascertain if dimensions conform. Investigations of wasteful methods during the war pointed out strikingly the great desirability of further standardizing many kinds of practices and materials. As a result of the close attention that was necessarily given to the problem, considerable progress was made in many industries toward the simplification of designs of manufactured products and the establishment of uniform methods. Efforts to standardize industrial products and practices, however, involve changes which may for a time greatly disturb the operations of a factory system, with a consequent slowing down in production. During the war period most manufacturers were behind in filling orders; competition ceased to be a factor; profits were generous; and the entire country was straining every effort to produce at the greatest possible speed. It is evident, therefore, that that period was not conducive to the launching of any comprehensive scheme of economy. There never was a time, however, when engineers and manufacturers were more forcibly impressed than now with the benefits that would accrue to themselves, as well as their customers, with the adoption of satisfactory standards.

So in the present period of depression in the industrial world, with many plants almost idle, forward-looking executives are finding an unusual opportunity of doing the things that are difficult to accomplish when operating at normal capacity. They are putting their houses in order. Along with the establishment of the latest efficiency methods and systems in the factory, they are giving more attention than ever before to standardization in design. The present situation in the machine tool trade, which may be considered the basic industry, is that the country is stocked up with great quantities of machines, resulting from the intensive

MODERN COMPETITION requires efficient production, which is secured by standardized methods, materials and designs.

Shop operation is simplified, the number of jigs is reduced, stocking of parts in large quantities becomes possible.

The proper use of standards does not curb the designer's initiative, but relieves him of elementary routine work.

The American Engineering Standards Committee is working for national and international standardization.

war-period production. Many concerns will find their only salvation in producing a new and improved line of machines. This affords them an excellent opportunity to start a standardization program, peculiar to their own product at least.

In a manufacturing organization, original designs and changes in design of the product must, of course, originate in the engineering department. In the very nature of things, then, the designer's methods affect the operation of the shop system. If the designers do not have uniform methods and follow certain standard practices, the results are confusion and waste. Without proper standards in design, the best efficiency systems in the shop are futile.

Flexible Standards

Several common misconceptions of standards, although now fast disappearing, have retarded the work in no small degree. The first is that they are final and inflexible, like standards of weights and measures. An engineering standard, whether a particular manufacturer's standard or one universally agreed upon, such as for bolts, nuts and screws, is a thing that is considered, after careful investigation by those best qualified to judge, to be the best for the great bulk of manufacture in the field, in order to facilitate quantity production. Perhaps the argument most frequently advanced against standardization in every field of endeavor is that it impedes individual and engineering progress. Unquestionably it can be overdone.

It is a fundamental policy of responsible organizations, however, not to endeavor to standardize any product that would impede progress in design. Obviously standards should not be promulgated unless there is sufficient evidence to warrant their holding good for a reasonably long period. In the very nature of things they may not be perfect in their original form. Engineering standards should be and are revised when necessary, or discarded altogether. But in an individual plant it is sometimes justifiable to adopt some sort of standard, based on the best experience available, even though it is known at the time that it may have to be changed. It may be a long step toward securing finally satisfactory results.

The proper use of standards does not curb the designer's initiative, as some mistakingly assume. On the contrary, it relieves him of much elementary and routine work, so that his time is given to the larger aspects of his problem. The average designer in a manufacturing plant is necessarily confined to a more or less specialized field. He considers that it is his chief problem to get out a machine that will perform the work required of it. The details are incidental. Hence, widely varying means are used by different designers to perform a common or similar function. Although each may be individually successful, some means are undoubtedly less efficient or more expensive than others. This is not necessarily a fault of the designer. From the very nature of his problem, he may have neither the incentive nor the opportunity to base the design of a detail on all the best available data.

It is the function of the standardizing engineer in the organization to bring together all the best available information on the subject, to get the collective opinion of those in the plant most competent to judge, and after considering it from every angle, adopt for the designer's use that which seems to have the greatest merit. Thus in a sense, the design of such details as permit of standardization is the collective work of the entire engineering staff, rather than of an individual. The finished product is improved in quailty, both in detail and as a whole.

Most manufacturing concerns use such universally recognized standard parts as screws, nuts, rivets, studs, and other small parts; but some have only recently awakened to the fact that by proper study given to the standardization of such details of design as flange thicknesses, they could with little effort diminish the number of sizes used, in many cases, by less than half, and at the same time obtain better design. The majority of machine-tool builders are also standardizing their pulleys, handwheels, arbors, spindles, toolholders, etc. The idea is being extended to cover larger and more important components. Machines in general are composed of several mechanisms or unit assemblies, such as indexing mechanisms, reversing mechanisms and change-gear boxes. In many cases these parts can be standardized to the extent that they can be used on several different machines of a similar nature.

The automobile affords a striking example of what has been accomplished along this line. Here it is well known that such unit assemblies as the differential and transmission have been standardized so that they are to a great extent manufactured as specialties by concerns that supply them to manufacturers of many different makes of cars. An individual concern may thus successfully establish standards peculiar to its own product, but obviously can not get results in formulating standards of general interest without co-operation with manufacturers' associations and engineering societies. All such societies have comprehensive programs outlined. What the American Society of Mechanical Engineers and the Society of Automotive Engineers have accomplished is well known. The American Gear Manufacturers' Association is at present conducting a very active campaign for the standardization of gears. The Bureau of Standards has collected data from manufacturers with the veiw of standardizing tolerances.

American Engineering Standards Committee

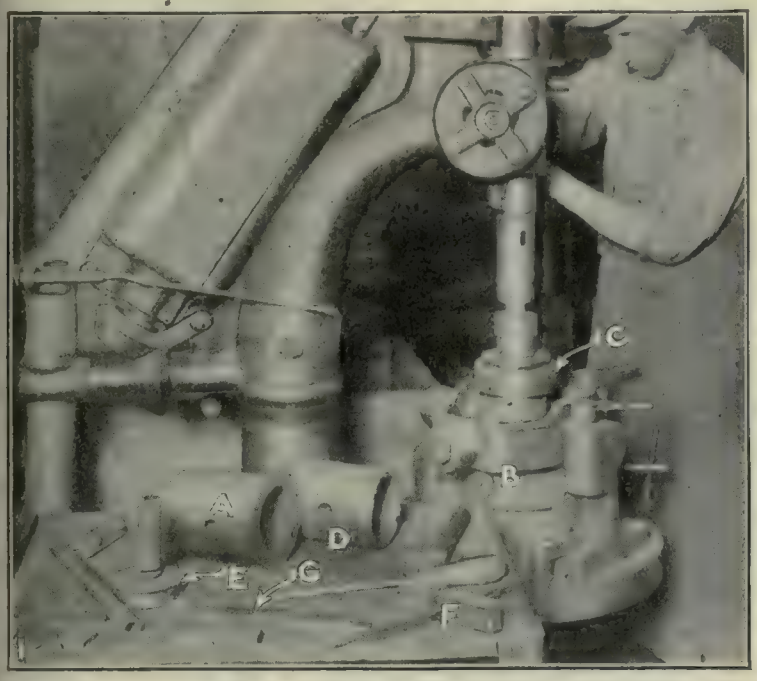
It has long been felt that there is need in this country for something corresponding to the British Engineering Standards Association, to co-operate with similar organizations in other countries and give an international status to approved American engineering standards. After several years of investigation and discussion, the American Engineering Standards Committee has been formed and its constitution adopted by the various engineering societies. Through this new committee, the method of arriving at engineering standards will be unified and simplified. The various engineering societies have direct representation in the committee, and through co-operation, the duplication of standardization will be prevented. Similar organizations are now functioning in several foreign countries, and the American Engineering Standards Committee is in active co-operation with them. Some of its latest activities are co-operation with the Canadians on bridge specifications, with the British on specifications for machine tools, with the Swiss on ball bearings, and with many of our own societies on industrial safety codes. The American Engineering Standards Committee will act as a bureau of information regarding standardization in general. It will collect information regarding existing standards, co-operate in their revision, and give valuable advice and assistance to those who wish to formulate new standards.

Making Pistons for the Mack Motor

Casting a Header to Insure Solid Metal—Fixtures and Tools Used for Machining—Ring Grooves Finished by Hardened Steel Rollers

By FRED. H. COLVIN
Editor, AMERICAN MACHINIST

THE pistons for the Mack Motor are cast with a flange as shown at *A*, Fig. 1, which acts as a riser for clearing the skirt of impurities and also tends to prevent distortion in casting. The bosses are cored as shown. The first operation is to bore and face the open end but instead of doing this in a lathe as is usual, it is done in a Barnes drilling machine, using a special chuck and boring tool. The holder is shown at *B*, the boring and facing tool at *C*, while *D* shows the piston after the operation. The piston is gaged for diameter by the plug *E* and for depth by the gage *F*. securing uniform depth inside the piston it is easy to maintain the desired thickness of the piston head. Details of the centering device and holding fixture are shown in Figs. 2 and 3.



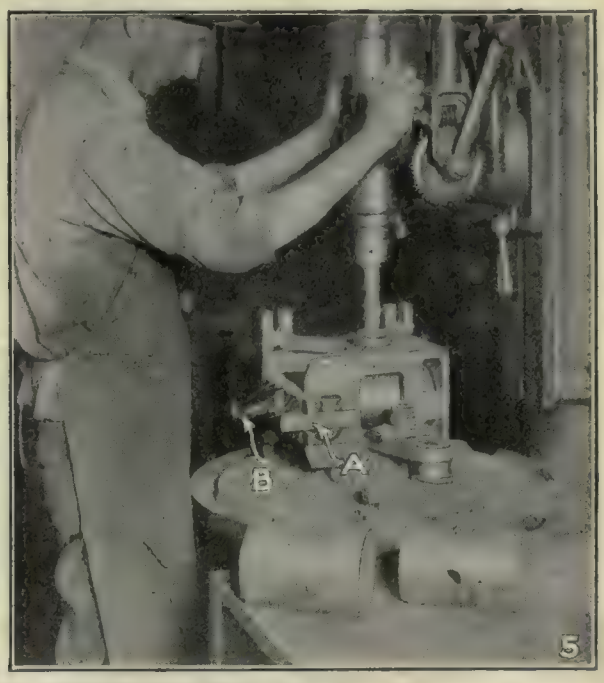


FIG. 1. BORING AND FACING OPEN END. FIG. 5. DRILLING PISTON-PIN HOLE

The details of this holder and of the operation are interesting as the design and the method are both unusual. The piston is first centered from the inside by the expanding mandrel shown in Fig. 2, which consists of a spool with flattened sides to slip past the piston pin bosses, and two sets of centering fingers *A* and *B*. There are 4 fingers in the lower set and 3 in the upper.

With the nut *C* loosened to allow the fingers to recede, the mandrel is slipped into the piston. Then the fingers are expanded by tightening the nut *C* with the wrench *G*, Fig. 1, which draws the cones at the end together and forces the fingers out against the inside of the piston. The piston is then put in the fixture, Fig. 3, which is provided with double trunnions or gimbals to allow the piston to center itself regardless of the outside shape. It can be clamped by tightening both trunnions if desired but the usual plan is to allow it to float at will without fastening. The piston is centered by slipping the guide on the upper end of the mandrel up into the center of the turning and boring tool, then adjusting the fixture to it.

The piston rests on the four studs *A* and is clamped at the bottom by the screw *B*. This, with the serrated jaws *C* and *D*, gives a 3-point hold on the piston.

The boring and facing tool, Fig. 4, consists of a shank *A*, with an inner head *B*, with openings for the cutters as shown in the end view. Inside of this is a spool *C*, which acts as a central support for the boring tools for the end of the skirt. This spool also has a hole for guiding the centering mandrel. The boring tools are seen at *D* and *E*, the first being the roughing and the latter the finishing tool. The facing tool is seen at *F*, while other tools trim off the outside of the flange.

The piston-pin holes are then bored in the fixture shown in Fig. 5. This fixture has a latch *A*, for quick action, the screws *B* tightening the piston into place. Then comes the rough-turning on a Potter & Johnston automatic lathe as in Fig. 6. Here the front cross-slide carriage has been removed and a special tool carriage *A*, put in its place, the carriage support bridging the cross-slide. This carriage is moved by the bar *B*, utilizing the turret-slide feed for the purpose. At the same time the back cross-slide carriage faces the end of the piston as at *C*. Details of this carriage are shown in Fig. 7. A similar attachment can be made for other uses where it is desired to have a longitudinal

feed near the nose of the spindle. The supporting bridge is shown at *A*, while *B* gives the end view and shows the carriage *C* with its tools and their adjustments.



FIG. 2. MANDREL FOR CENTERING PISTON

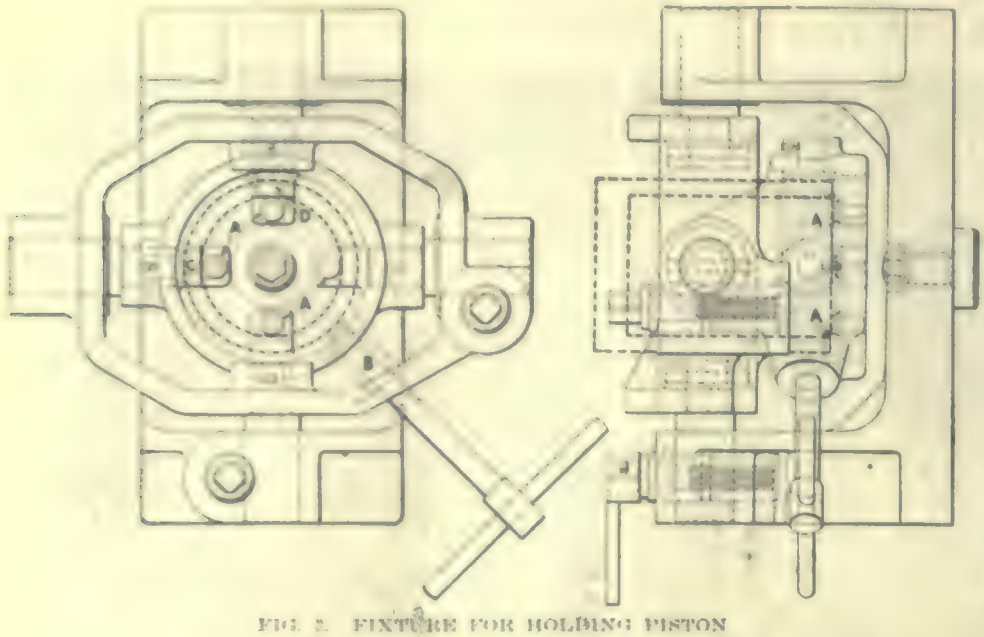


FIG. 3. FIXTURE FOR HOLDING PISTON

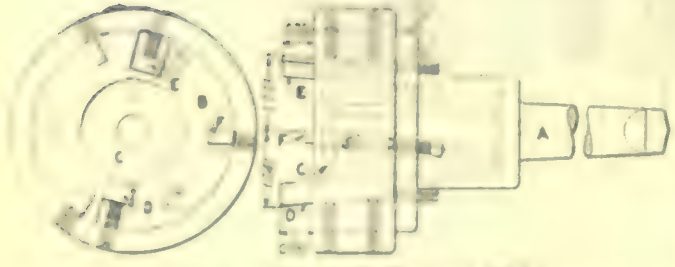


FIG. 4. BORING AND FACING TOOL

The plan view gives all the other information necessary. The pistons are then heat-treated to remove stresses of all kinds.

Another special Potter & Johnston set-up is shown in Fig. 8. This centers the end, finish-turns the outside, and grooves for the piston rings as well as turns the oil relief over the piston-pin holes. The piston is held by a draw-back pin with air chuck control. The springs shown in front at *A*, are to return the relief tools to their cut after being moved out by the cam *B*. The guide roller is at *C*. This cut relieves the sides of the piston over the ends of the pin, in the usual manner.

Details of the relief turning fixture are shown in Fig. 9. The cam *A*, works against the roll *B*, which is kept in contact by the springs *C*. This cam moves the relief tool in the cross-slide, which receives its longitudinal movement from the turret slide by means of a bar at *D*.

The ring grooves are then finished to size and burnished by rolling tools of hardened steel as shown at *A* in Fig. 10. The piston is supported at the outer end by the center during this operation.

The taper is then ground on the head end of the piston, followed by the grinding of the skirt and the finish-facing of the piston head. Then comes the finish-facing of the skirt end and the boring, reaming and facing of the inside of the piston bosses. These operations are done in the fixture shown in Fig. 11. The piston is held by the clamp *A* and the boring bars are piloted by an inner bushing, while the floating bushings *B* and *C* fit into the outer end of the chuck and so the bars are guided at both ends.

The inner ends of the bosses are faced by a special tool which is shown in position at *D*. It has a cross-slide and carries the tool shown in detail in Fig. 12. This tool consists of a bar *A*, turned eccentrically at its outer end except for the portion at *B* to support the cutters *C*. The portion *B* is flattened on the sides



FIG. 6. ROUGH-TURNING AND FACING



FIG. 8. FINISH-TURNING AND GROOVING

as at *D*. As can be seen the cutters can pass through the hole in the piston and, when the bar is in its proper location, it is fed by the slide shown at *D* in Fig. 11, and the inside of the bosses faced to the desired width. The cutters are positioned and held from turning by setscrews at *E*, Fig. 12, while they can be adjusted, after grinding, by the screws *F*. These cutters face the bosses and leave a fillet next to the piston-pin hole.

The oil holes are then drilled in the bosses and oil grooves cut by the fixture shown in Fig. 13. Then the piston is finish-reamed in the machine shown in Fig. 14. Here the piston is clamped very lightly in the V-shaped block at *A*, and located by the end piece *B*, while the clamp *C* holds it for reaming. The dial indi-

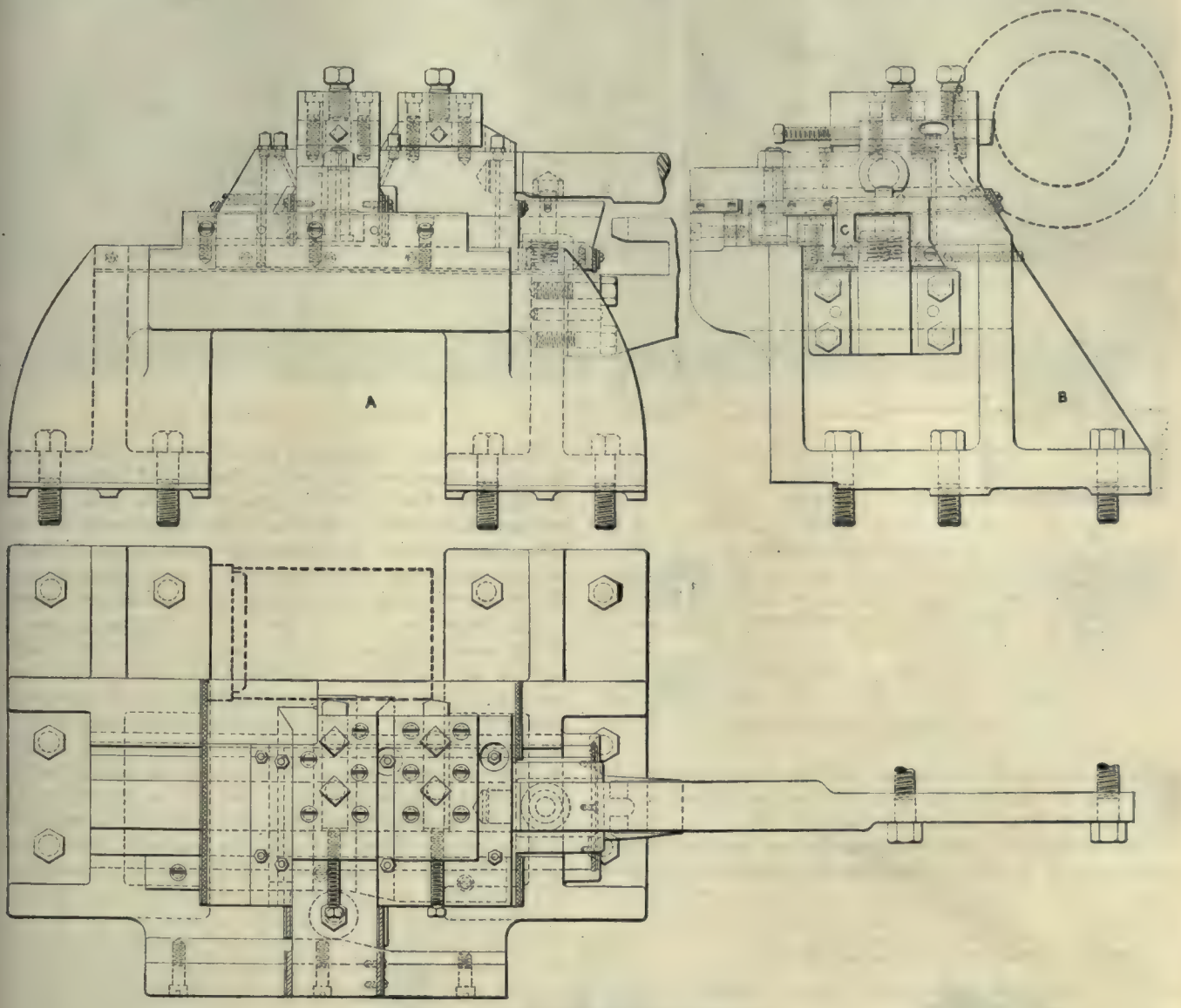


FIG. 7. TOOL FOR ROUGH-TURNING

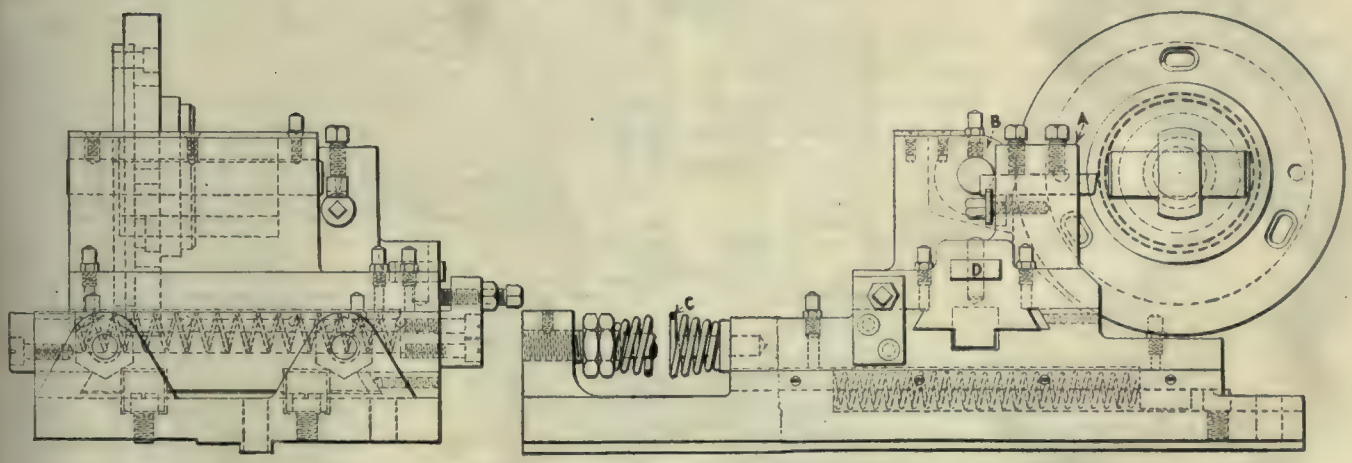


FIG. 9. DETAILS OF RELIEVING TOOL

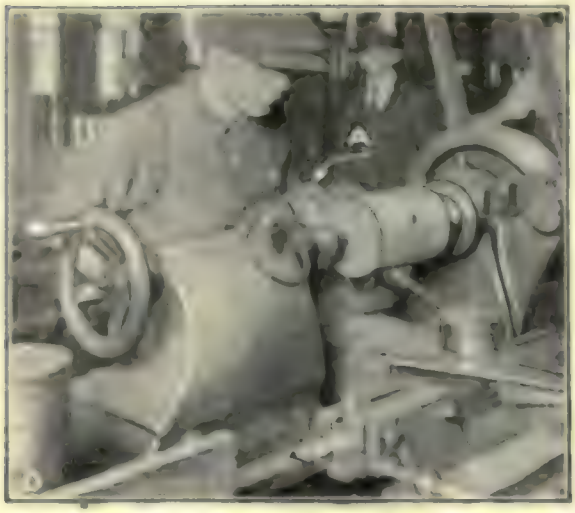


FIG. 10. BURNISHING THE GROOVES.

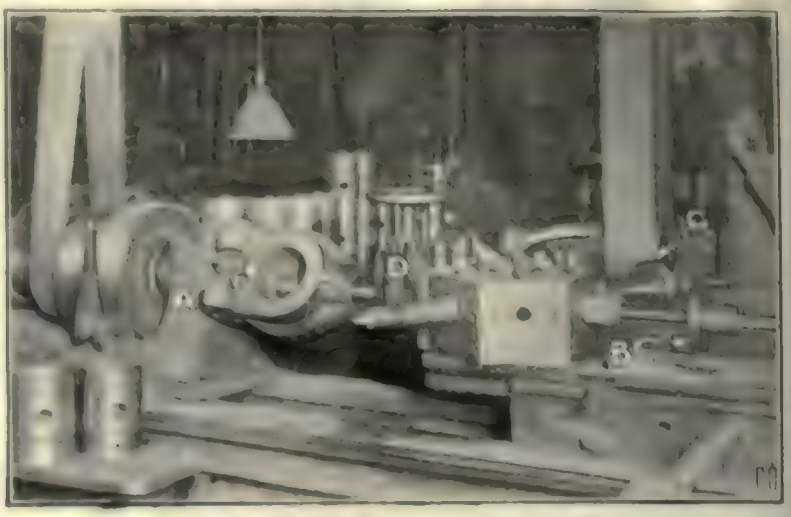


FIG. 11. BORING PISTON-PIN HOLE

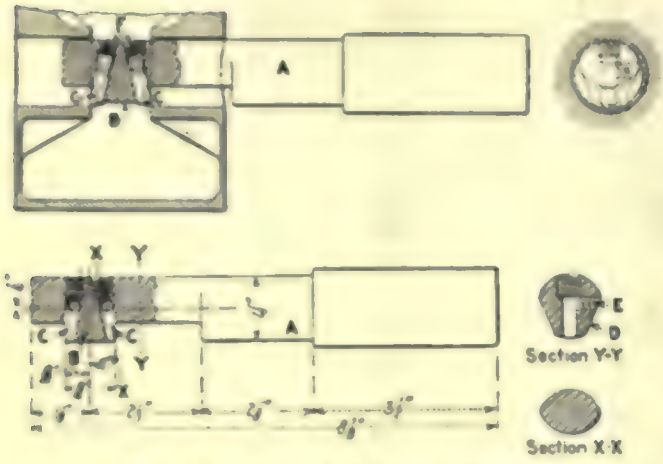


FIG. 12. TOOL FOR FACING BOSSES

cator shown at *D* is used to test the squareness of the piston in the fixture. In this way the trouble of having pistons out of square is avoided.

The inspection is very thorough, the standard diameter gage at *A*, Fig. 15, and the dial gage at *B* with its contact point at *C* show the diameter and the roundness. Pistons are weighed for selection into sets, and the sub-assembly is also weighed.

Grooving the Piston Boss

The piston-pin boss has an oil groove which is cut in a very ingenious manner, in the special fixture shown in Fig. 13. This holds the piston by the head and the bottom of the skirt as shown by the dotted outline. The boring bar carries two grooving tools *A* and *B*, and it will be noted that the boring bar is not concentric with the piston-pin hole, but about ⅛ in. below the center.

The large part of the bar has a guiding groove *C*, which terminates in a cam *D*, at the end, the straight portion of the groove holding the cutters uppermost and out of contact when the bar is pushed in and withdrawn. The pin *E*, with a roller on the end, acts as the guide. This pin has to be withdrawn and inserted at each operation, but in future bars the groove will be extended to the small part of the bar so that it may be entered and withdrawn without removing the pin.

With the cutting tools at the top and clearing the piston-pin bore, a half turn of the handle rotates the

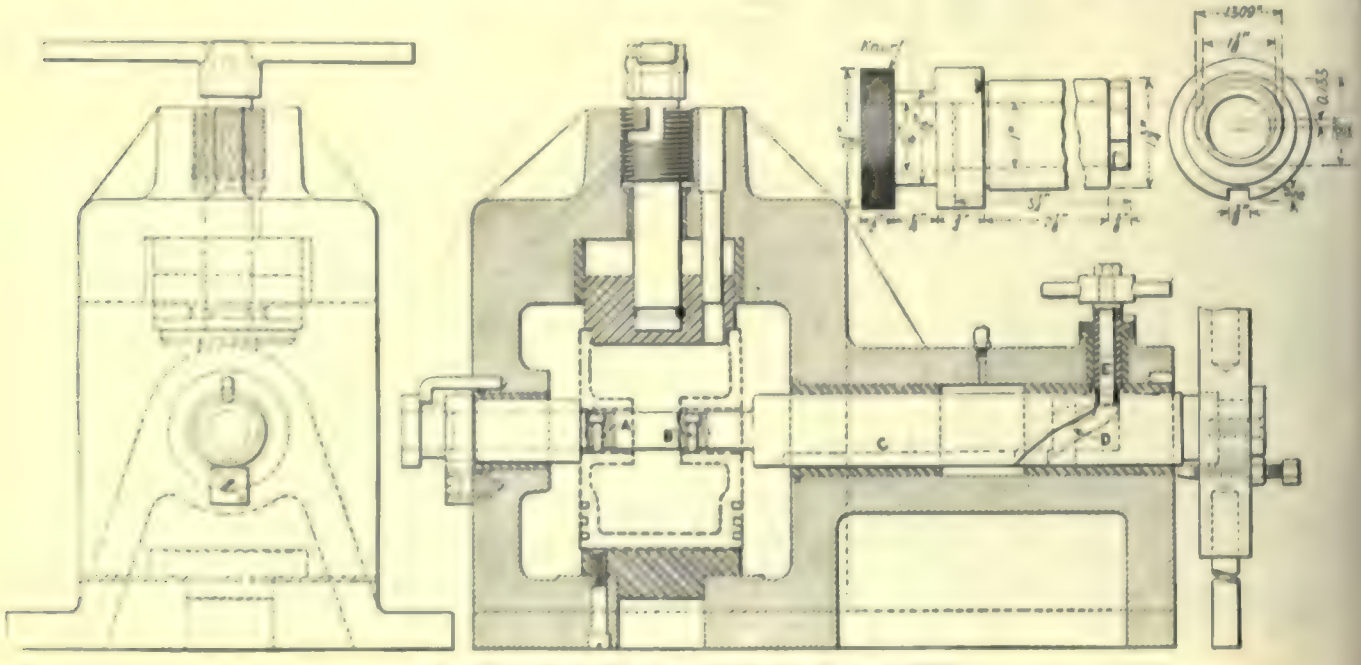
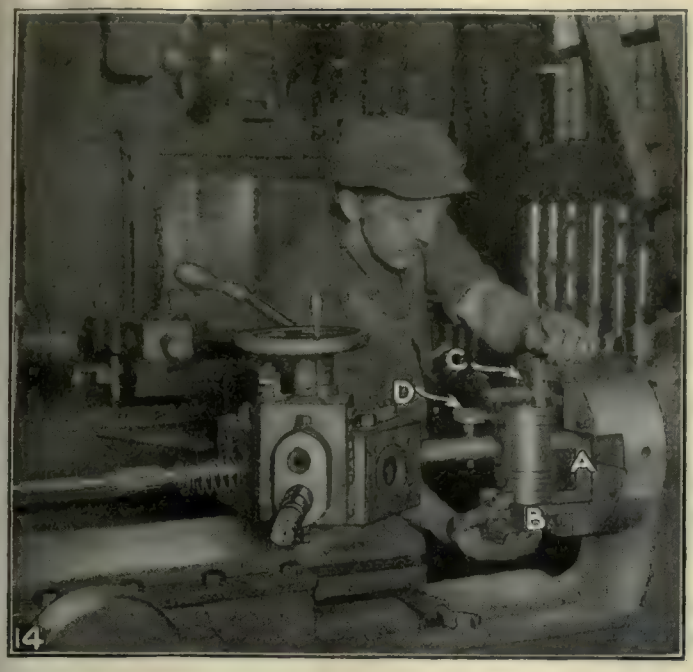


FIG. 13. FIXTURE FOR CUTTING OIL GROOVES



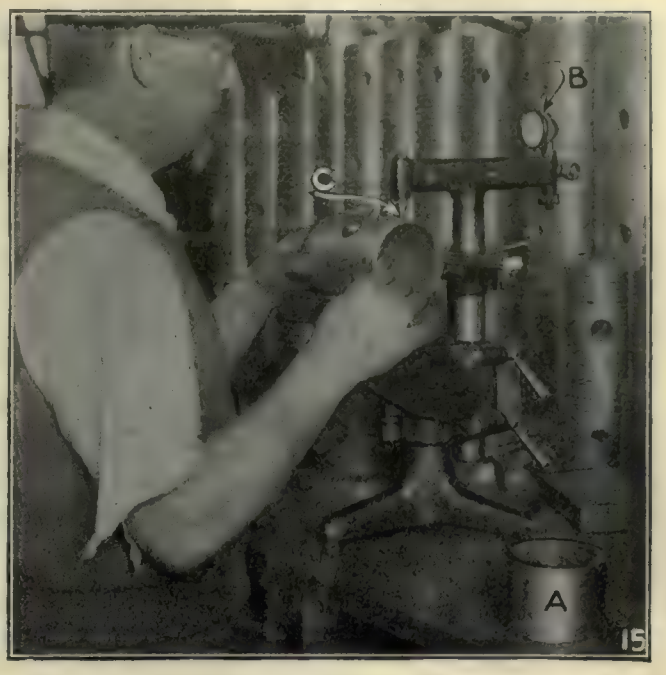


FIG. 14. FINISH-REAMING THE PISTON. FIG. 15. INSPECTING PISTONS

bar in the path of the cam groove *D*. This swings the cutters down into the lower half of the hole and at the same time advances the tool so as to cut an angular groove which runs out at each end. This makes a good oil groove and one which is uniform in all pistons. The production is very satisfactory but a future machine, or fixture, will be arranged for power drive.

Cold-Headed Bolts

By V. E. Hillman
Metallurgist, Crompton & Knowles Loom Works

The term "cold work" implies that energy is expended on the metal when its temperature is below the critical range. The microstructure of the metal prior to the application of cold work consists of an aggregate of crystalline grains or cells, each grain being a structural unit. It may suffer rupture or deformation; it may be enlarged, elongated, stressed, or restored to its normal size and shape. When the metal is subjected to mechanical pressure, the crystals are crushed and intimately mixed. Cold work has an embrittling effect upon the metal and the grains which were originally equiaxed or elongated, assume a ropy appearance resembling fiber. In brief, the grains lose their original identity.

There is a limit to the amount of cold work which a piece of steel will sustain. Therefore, the cold working of the metal must be interrupted from time to time to relieve the internal stresses which have been developed. In other words, if the strained steel be heated to above its critical range, for 15 min. at 1,650 deg. F., and quenched, the elongated grain fibers will be effaced and renewed toughness will be conferred on the metal. A lower annealing temperature, 1,150 deg. F., for one hour will also suffice to remove, partially at least, the embrittling effect of cold work. It should be borne in mind, however, that only the strained ferrite grains are influenced by the lower annealing temperature.

Soft basic steel is well adapted for the cold heading process. The carbon content in the metal, however, should be regulated carefully. It is a well-recognized fact that if an attempt be made to upset a piece of high carbon stock, the steel will simply bend over, whereas material of the proper analysis, 0.10 to 0.20 per cent carbon, will flow readily into a compact mass.

There is a limit to the volume of metal that can be fabricated into the head of a bolt. The maximum length of stock that can be formed into the head is equivalent to seven times the diameter of the rod which is being upset. That is to say, if the diameter of the rod be ¼ in. then it is possible to crush 1¾ linear inches into the head. These tolerances should be followed if "cold shuts" are to be the exception and not the rule.

The reliability of a cold-headed bolt is dependent upon the number of blows it received during the fabrication process. The limit of stock which can be compressed into the head by a single blow is two and one-half times the diameter of the rod. Cold-headed bolts of commerce are generally subjected to two or three blows. However, there are instances where four, five and six blows are required to effect a reliable upset.

Importance of Annealing

Conclusions: Various degrees of distortion may be found in the same bolt. Certain regions undergo slight deformation, whereas other sections undergo extreme distortion.

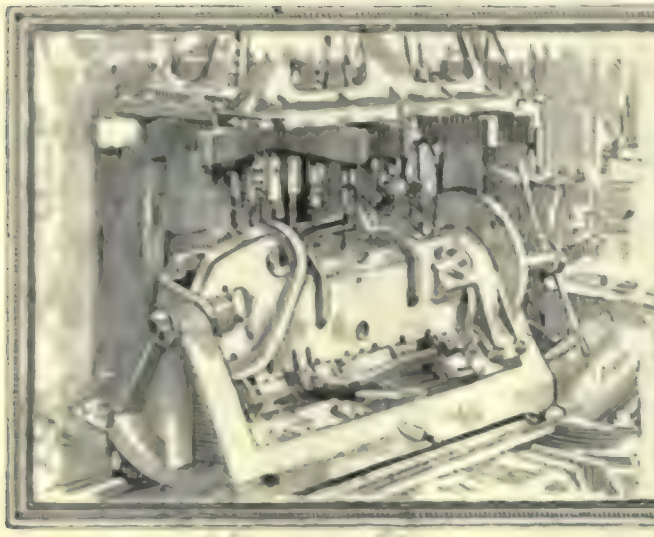
Annealing at 1,150 deg. F. will remove the weakening effects of cold work. Irrespective of the degree of cold work, crystallization will not take place below 1,280 or above 1,380 deg. F. If the temperature of the furnace reaches the hazardous zone, 1,280 to 1,380 deg. F., crystallization will take place only in those areas which have been slightly strained.

Annealing above the critical range 1,650 deg. F. is preferable.

In this range of temperature, 1,625 to 1,675 deg. F., and regardless of the degree of strain, crystallization will not result.

The successful manufacture of cold-headed bolts demands the application of fundamental metallurgical principles. The quality and service of the finished product is therefore dependent upon an adherence to the laws of metallurgy.

Abstract of paper presented before the American Society for Steel Treating.



Tool Engineering

By
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Cross-slide Toolholders for Turret Lathes Continued—Cutting-off and Formed Tools —Circular Forming Tools—Over-shot Tools—Turret Toolposts

IN THE design of parting or cutting-off tools it is particularly important to make the holder in such a way that there will be no opportunity for movement of the tool during the operation. Parting tools

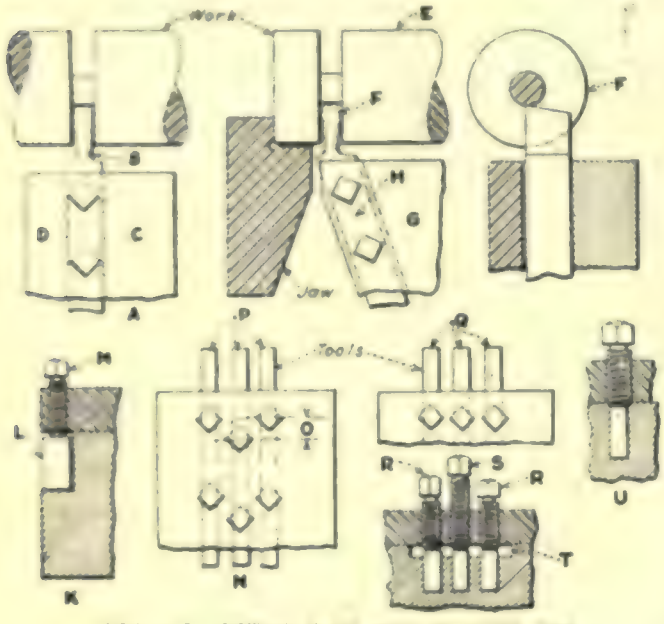


FIG. 347. DETAILS OF TOOLBLOCKS FOR PARTING TOOLS

are usually relieved on the sides, as otherwise they are likely to rub and tear the side of the groove and leave a ragged surface. A grooving or parting cut is one of the most difficult, particularly when the groove is deep and narrow, as shown in the detail *A*, Fig. 347. The type of tool often used for this purpose is shown at *B*. It is held in a slot in a holder *C* by means of two square-head setscrews. A tool of this kind should be made as deep as consistent with the nature of the work which is being cut, as the pressure upon it is excessive, and it is likely to break when the cut is very deep.

When grooving tools are made, if the groove is to be held closely to width and is rather deep, it is generally necessary to use roughing and finishing tools, the finishing tool not being back tapered, but having a slight amount of clearance on the sides. As the finishing tool has very little work to do, the width of the slot can be easily preserved. For very wide and somewhat deep grooves, it is advisable to do the sizing for width with two tools, so made that they can be adjusted to compensate for any errors in grinding on the sides.

In the toolholder shown at *C*, the slot for the tool is cut in the body and there is a projecting portion at *D* which prevents working close to a shoulder or to chuck jaws. In many cases this would not be a good holder to use, for the reason stated. There are two ways of avoiding any such condition; one of them being shown at *H*. The work *E* is held in chuck jaws, so that there is not much space for any projection like that at *D*, beyond the tool. Hence, a bent tool like that at *F* can be held in a holder *G*. The slot which contains the tool is open on the side, thus allowing the cutter to work close up to the chuck jaw without interference.

Another way is to make the toolholder straight, but open on one side; and this method is probably better than that shown, as there is less trouble in setting the tool and less work in making the holder. The illustration at *K* shows the tool *L* held in an open-side holder by means of the setscrew at *M*. This method is used

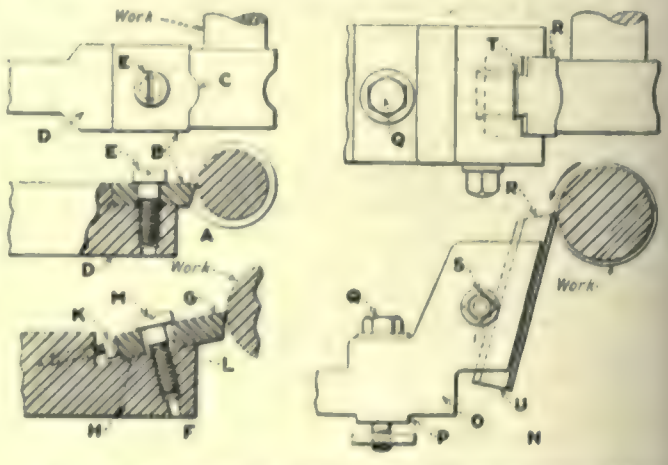


FIG. 348. FLAT-BLADE AND DOVETAIL FORMING TOOLS

For the authors' forthcoming book. All rights reserved.

where tools must be set to operate close to a shoulder.

When several narrow tools are used close together for grooving, as shown at *N*, it may be found difficult to locate the holding-down screws so that they will be easily accessible. The three tools *P* illustrate this point very well, and the method of staggering the setscrews is clearly shown. By making the distance *O* sufficient, so that the operator can place a wrench on the various setscrew heads, no difficulty will be experienced. This method is objectionable because the screws are sometimes placed too far back from the end of the tool, and therefore do not hold it as firmly as is needed. In the example *Q* the three tools are held by three setscrews placed in line with each other, but the screw *S* is higher than those marked *R*. The operator can therefore easily use a wrench on any one of them without interference.

The caution is here given to avoid the use of holding-down screws of too small a diameter. Many designers make errors of this sort due to a lack of thought. In holding narrow tools like that shown at *U*, it would appear that the largest setscrew which could be used would be one which is no larger than the width of the slot. Yet, if the toolblock is relieved, as shown at *T*,

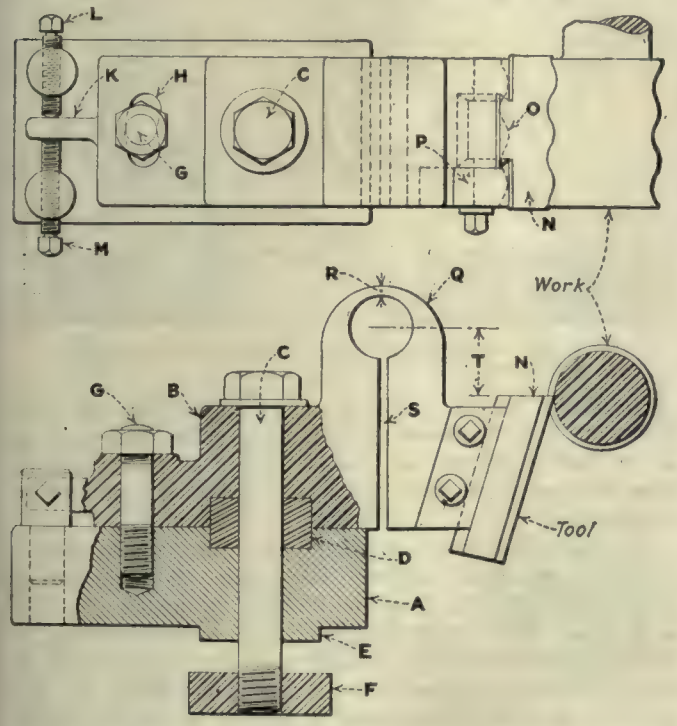


FIG. 349. GOOSE-NECK HOLDER FOR FORMING TOOLS

and the tools project slightly above the relieved surface, the setscrews can be larger than the width of the slot and thus have greater holding power. An advantage in using the setscrews is that they are less likely to be broken or mutilated when in use. This is particularly noticeable when small headless setscrews are used. It is advisable to avoid this type of screw for any holding-down operations, as the slots are likely to become broken so that they are useless.

In making a formed cut, a tool can be made having a contour of the correct shape so that it will reproduce this shape on the work. When the form is simple and does not require to be held very accurately, a flat-blade cutter can be utilized and very good results obtained. If it is necessary to make the form to an accurate size, other methods are to be preferred. Fig. 348 shows at *A* a flat-blade forming cutter *B* designed for the purpose of cutting the form *C*. The cutter blade is ground

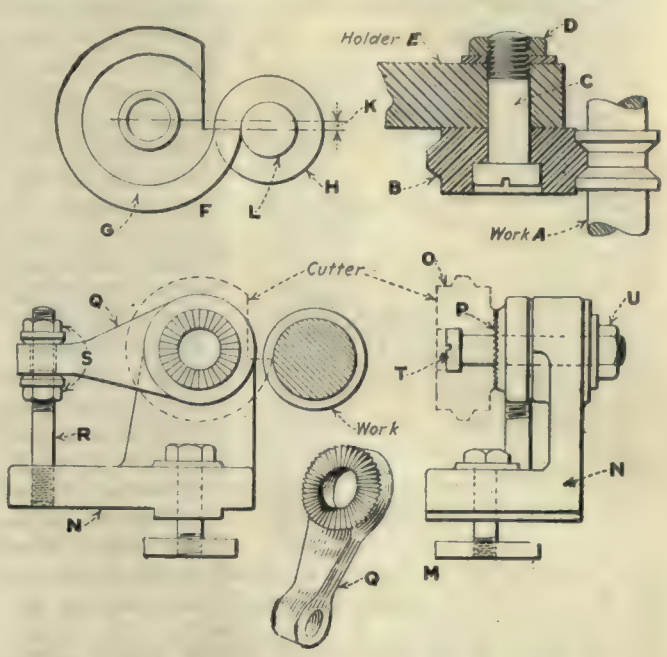


FIG. 350. CIRCULAR FORMING TOOLS

to the required shape, and it is held in a shank *D* by means of a screw *E*. It is backed up against the shoulder on the holder, as indicated. This holder may be used in a standard toolpost or in a toolblock, the shank being proportioned to suit the conditions. For simple work and production which is not very high, this device will give fairly good results.

Another example of a somewhat similar tool is shown at *F*. The blade *G* is set at an angle and is held against an angular surface *H* and backed up by a setscrew *K*. The slot *L* allows the tool to be adjusted slightly, and after this adjustment has been made the special screw *M* is tightened, thus holding it firmly. For steel work when a little shear is required to produce a smooth cutting action, a holder of this general type can be used. It is advisable, however, in the majority of cases to do away with the adjustable feature and bring the back of the plate solidly against the holder. All necessary adjustments can then be made by an adjustment of the cross-slide or the holder in the toolblock.

Another type of tool frequently used for forming is the dovetail forming tool shown at *N*. The toolblock *O* is designed to fit the cross-slide of the machine, and is located on it by means of the tongue at *P*. It is held in place on the slide by one or more bolts *Q*. The tool *R* is somewhat different from others which have been described. It is a long piece of tool steel, dovetailed at *T* to fit the holder. It is clamped in the dovetail by means of one or more bolts *S*, these being arranged so that they bear directly against the dovetailed surface.

Several methods of holding are in vogue, but hook bolts cut out to fit the dovetail will usually give very good results. Sometimes the "pinch-binder" principle is used, the holder being split in the middle and drawn up tightly on the dovetail by means of a couple of bolts. Forming tools of this kind often require support at the point *U* when the cut is very heavy, as otherwise they are likely to slip and change their position with respect to the center of the work. The holder can be

designed so that a backing-up screw may be placed at this point if desired.

In order to avoid chatter under heavy forming cuts, the "gooseneck" principle can be applied to the toolholder. On some kinds of forming cuts it is very difficult to obtain a smooth surface free from chatter marks, but this trouble can be avoided by the use of a holder like that shown in Fig. 349. The block *A* fits the cross-slide T-slot at *E*. Mounted on this block is a swivel member *B* which pivots on the hardened locating ring *D*. The block is held down by the bolt *C*, which draws up on the shoe *F* in the T-slot of the cross-slide, thus holding the entire unit down firmly. The provision for side adjustment is made in the slot *H*, the binder stud *G* being provided with a nut to make the unit secure after it has been adjusted.

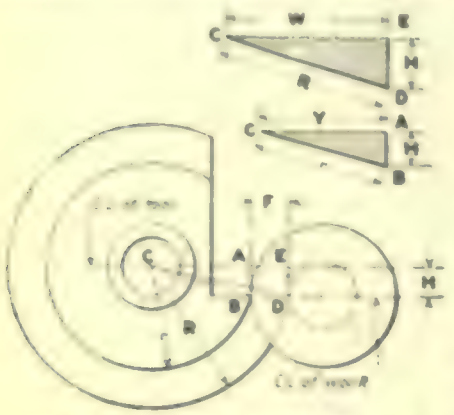


FIG. 351. LAYOUT FOR CIRCULAR FORMING TOOL

The member *B* has a "tail" *K*, which is held between two setscrews *L* and *M*. These two screws can be used to control the position of the swiveling member. The other end of the holder is drilled at *Q* and slotted at *S*, and the portion *R* is left rather thin so as to permit it to spring easily. The tool *N* is fitted to a dovetail at *O*, and is clamped in place by means of a shoe *P*, which fits one side of the dovetail. The distance from the top of the cutter blade to the center of the hole, as indicated at *T*, should be sufficient to allow the movement or deflection of the tool to carry it well away from the work, so that it will not dig in or chatter.

Attention should be paid to the thickness of the wall at *R*, as upon this depends the amount of spring in the tool. It should be thick enough to stand the stresses imposed by the cut, and thin enough so that it will spring readily. The member *B* should be made of tool steel hardened and spring tempered at *R*. It is usually necessary to place a flat spring in the slot *S* in order to prevent too much vibration under the cut. This spring can be adjusted up or down in the slot as may be desired. Tools of this general type are useful not only for forming cuts, but for threading or work of like character. In fact, for any severe cutting which is likely to produce chatter, a tool of this kind is an effective remedy.

Circular Forming Tools

Another type of tool very useful for forming cuts is the circular forming tool. Two examples of this sort of tool are shown in Fig. 350. The work *A* is to be formed by a cutter *B* held in place in the holder *E* by a special screw *C*. This cutter can be adjusted by loosening the nut *D* and turning the cutter around to the position required. In order to illustrate the cutting action of the forming tool, a diagram is shown at *F*. Here the tool *G* represents the circular forming tool and *H* shows the work.

The position of the cutting edge of the formed tool is below the center of the tool but on the center of the work. In other words, the forming tool is sharpened considerably below its own center. The designer will note that the terms above and below depend upon whether the tool is applied to the front or rear of the cross-slide. In the former case the cutting edge would be below center, while in the latter it would be above center, because the tool would be inverted. In either case, however, the cutting edge would be on the center of the work. This vertical distance between the centers

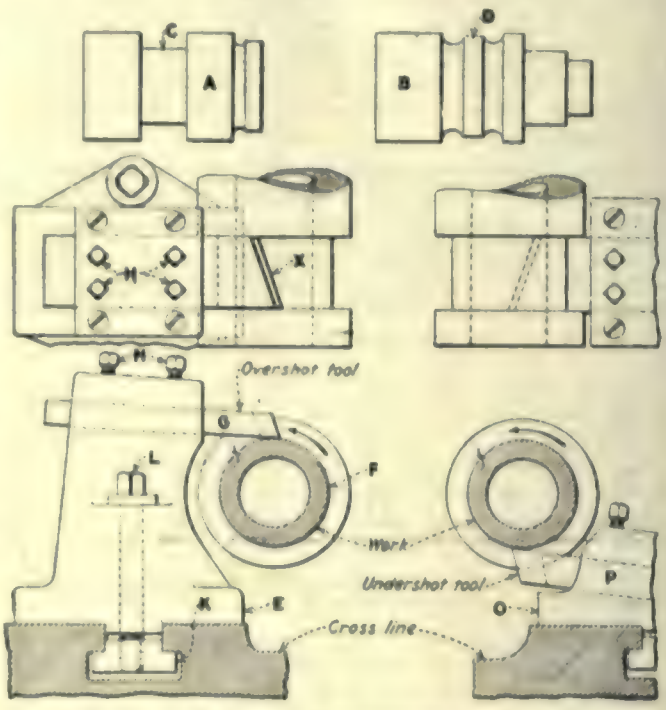


FIG. 352. OVERSHOT AND UNDERSHOT TOOLS

is indicated at *K*. The purpose of cutting the tool below its own center is to provide greater clearance at *L*, so that there will be less likelihood of the tool rubbing and losing its edge due to an insufficient amount of clearance.

An improved form of toolholder for circular forming tools is shown at *M*. The holder *N* is attached to the cross-slide in the usual manner by means of a bolt and shoe. The cutter *O* shown by the dotted line, is drawn back against a serrated member *P*, and held in place by means of the screw *T* drawn up solidly by the nut *U*. In order to provide a means of accurate setting after grinding, the arm *Q* is mounted in such a way that the two nuts at *S* can be adjusted up and down on the stud *R*, which is placed in the body of the fixture. As the side of the forming tool is serrated to correspond with the teeth on the arm, the adjustment of the tool can be very easily made. The arm is shown in detail at *Q* in order to make the matter somewhat clearer. This type of circular forming tool has met with great favor, and it is in common use throughout the country.

Due to the fact that a forming tool has its cutting edge below its own center, it is evident that the radial length of the shoulder or steps on the tool must be less than the actual shoulder to be formed on the work. For tools which have no rake, simple formulas will enable the designer to figure the required diameters without difficulty. When the cutting edge, however, must be

made with more or less rake, other formulas must be used. In order to avoid complications on the matter, we shall concern ourselves only with the simple type of circular forming tool, a diagram to illustrate which is shown in Fig. 351. Referring to the diagram, the various formulas given here will be readily understood.

In order to find the diameter of circular forming tools it is first necessary to find the value of W in the right triangle DEC, or

$$W = \sqrt{R^2 - H^2}$$

In this equation,

R = Radius of largest diameter cutter.

H = The distance above or below center of work that the center of tool is set.

In order to find the value of r in the right triangle ABC,

$$r = \sqrt{Y^2 - H^2}$$

In this equation,

$2r$ = Small diameter of cutter.

$Y = W - F$.

F = Half the difference between the circular diameters of the work.

In connection with forming cuts of various kinds, it is necessary to mention a type of tool which is not in very common use, yet which has a number of advantages. Referring to Fig. 352, two pieces of work are shown at A and B; in one of these a deep groove is

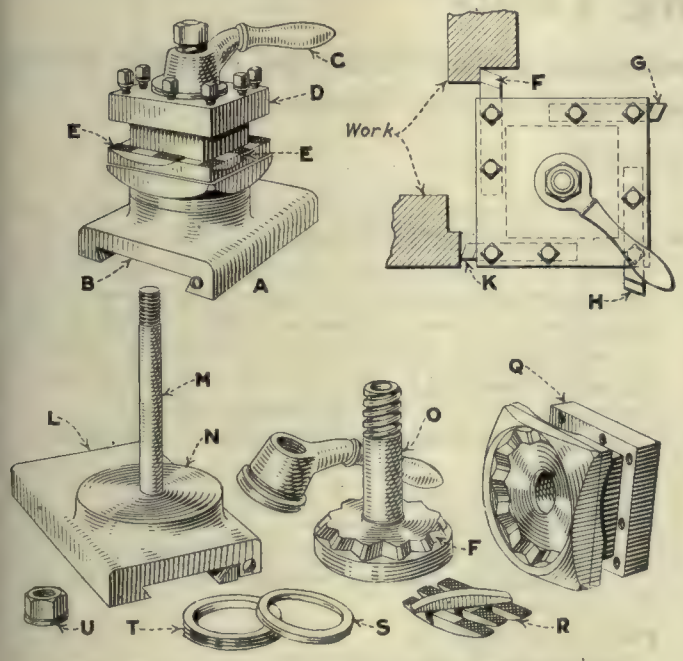


FIG. 353. TURRET TOOLPOST FOR CROSS-SLIDE

cut at C while in the other case a form cut is made at D. Either of these two jobs can be done with a circular or dovetail forming tool. The cutting action, however, in either case is rather severe, especially if the work is of large size.

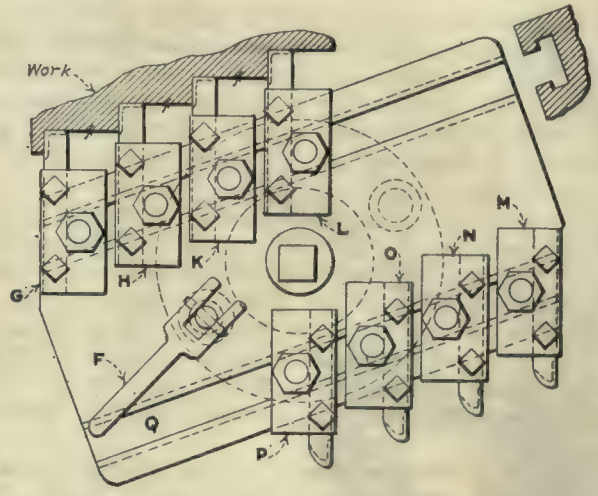
A type of tool which will give good results for work of this character is shown at E and is designated as an overshot tool. The toolblock is fitted to the cross-slide of the machine and is held firmly in place by means of the bolts L which draw up on the shoes K. The tool G is set so that it overhangs the work and so that it is more or less tangent to it when the full depth of the cut has been reached. The tool is held by means of four setscrews at H, and it is set at a slight angle in order to provide clearance. The front of the tool is also cut at an angle, as shown at X.

It is evident that when the cross-slide feed is started, the tool will be fed inward toward the center of the work and that there will be a shearing action caused by the angular surface X, so that the chips will roll up and part from the metal with a minimum amount of friction. An advantage of this type of tool is that the diameter of the work can be held very accurately. A principle similar to this is used in universal turning tools for steel, and it may be here stated that this type of tool is more adapted to steel than it is to cast iron. The tool can be formed to any shape desired, and as it needs to be ground only against the angular surface X, it will hold its shape without difficulty.

Another type of tool employing a similar principle is shown at P. It is called an undershot tool and is placed at the rear of the cross-slide in a holder similar to that shown at O. This type is not as common as the other, and it is ordinarily not considered as good. If the cross-slide gibbing is slightly loose, there is inclined to be a lifting action on the tool which tends to produce chatter. For certain kinds of work, however, it may be found useful.

Turret Toolposts

Work which requires several shoulders to be turned or sized may oftentimes be handled to advantage by means of a turret toolpost such as that shown in Fig. 353. The assembly shown at A gives a very good general idea of the device. It is intended to be fitted by means of a dovetail B to the cross-slide of the lathe. The body of the tool D is arranged so that it can be indexed into a number of positions and clamped in place by means of the binder handle C. The tools are held on



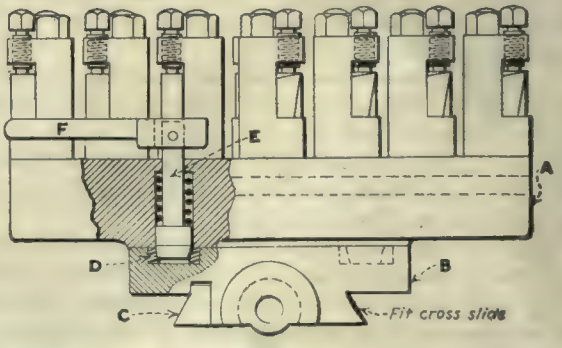


FIG. 354. SHOULDER TOOL SET-UP ON TURRET TOOLPOST

the hardened rockers *E*, and firmly secured by means of the setscrews at the top of the turret. The rockers permit a certain amount of adjustment to the tools, so that slight inaccuracies in grinding can be compensated. The tools *F*, *G*, *H* and *K* are shown in the turret toolpost, and their application to the work can be readily seen by reference to the illustration. Two diameters are turned, roughed and finished without changing the position of the cross-slide after the tools have been set.

The base of the toolpost *L* has a circular pad on it at *N*, in the center of which the stud *M* is fixed. On this stud the quill *O* is located, and at the lower end of the quill indexing teeth are cut as shown at *P*. The turret body *Q* is mounted on the quill, and indexing is accomplished by loosening the binder handle and moving the turret around to engage with the various teeth shown. Other details are clearly shown at *R*, *S*, *T* and *U*. Turrets of this sort are very useful in manufacturing for either high or low production.

Another type of cross-slide turret toolpost is shown in Fig. 354. This example illustrates the possibilities of multiple cutting tools for shoulder work in connection with a turret-indexing device on the cross-slide. The indexing portion *A* is mounted on a base *B* which is fitted to the cross-slide and gibbed by means of the dovetail gib *C*. The indexing of the portion *A* is taken care of by means of a plunger *E*, which engages with various bushings *D* in the base *B*. The handle *F* makes the operation rapid, and it is so arranged that it will pull up the plunger and hold it out of engagement while the turret is being indexed.

The toolblocks *G*, *H*, *K* and *L* each contain a tool which is set to produce a given diameter on the work as shown. These toolblocks are tongued so that they fit the T-slot *R*, in which they can be adjusted longitudinally. The tools mentioned are used for the finishing operation on the work. The roughing is done by those shown at *M*, *N*, *O* and *P*. These blocks are arranged so that they fit a T-slot *Q*, exactly the same as that on the other side of the turret. The advantages of this style of turret toolblock are evident, but when designing anything of this sort it must be remembered that a great deal of work is being done by the tools. As a consequence, the greatest care must be taken to make sure that sufficient strength is given to the various parts, to withstand the heavy cutting action.

Chart for Determining the Pressure Exerted by Boring Tools

Construction and Operation of Chart—Determination of End Thrust and Pressure Due to Cutting—Table for Values of the Feed to 0.7 Power

By J. B. CONWAY

ON PAGE 655, Vol. 54 of the AMERICAN MACHINIST, appeared an article by the author entitled, "Chart for the Determination of Pressure on a Cutting Tool." This article referred to tools such as those used for lathe and planer work, and the chart was based upon formulas deduced by Mr. Taylor as the result of exhaustive experiments.

The chart accompanying this article is for the purpose of determining the end thrust and cutting pressure exerted by one- and two-lipped boring tools. It is based upon formulas evolved by Dempster Smith as the result of experiments, these formulas being given together with a brief treatise on the subject in Mark's "Mechanical Engineers' Handbook," page 1431.

A brief explanation of the chart follows. There are ten scales.

Scale (1) contains values for the constants used in the formulas, these varying from 27,500 to 57,000. They are indicated, however, by the letters (*F*) and (*P*) with descriptive notes.

Scale (2) shows the feed per revolution which is used. It is graduated from 0.005 to ½ in., advancing by 64ths above 0.012 in.

Scale (3) is the support for the product of Scales (1) and (2); but as this result is not required to be known, the scale has not been graduated.

Scale (4) has the values for the width of the cutting lip. The graduations are in inches and tenths, the latter being used on account of their convenience and because the graduations give greater ease of interpolation.

Scale (5) is graduated in values representing pressures in pounds, and is the result of multiplying Scales (3) and (4) together. It gives the result sought from the quantities just mentioned.

Scale (6) contains points representing values of 300,000 and 400,000 together with explanatory notes. These points are to be used as those on Scale (1), but as they are multiplied by different values a separate scale was required. Scales (7), (8), (9) and (10) are similar to Scales (2), (3), (4) and (5), respectively.

The basic formulas, taken from Mark's handbook, are given herewith:

F = Cutting pressure in pounds.
P = End thrust in pounds.
w = Width of each cutting lip in inches.
t = Feed in inches per revolution of either the work or cutter.

For Boring:

Soft Steel: $F = 400{,}000\ wt$
$P = 38{,}000\ wt^{0.7}$

Medium cast iron: $F = 57{,}000\ wt^{0.7}$
$P = 27{,}500\ wt^{0.7}$

For Facing with a Two-Lipped Cutter from the Solid:

Medium cast iron: $F = 300{,}000\ wt.$
$P = 32{,}500\ wt^{0.7}$

For Facing Medium Cast Iron, After Trepanning or Opening the Hole:

$F = 55{,}000\ wt^{0.7}$
$P = 31{,}000\ wt^{0.7}$

The author of the data in the handbook is not definite as to just what is intended by "the width of each cutting lip," but it is presumed that it is to mean twice the width of the single lip. For example, if the width of one lip was 1½ in. on a facing cutter, the value for w

would be 3 in. This scale on the chart is so arranged that either value may be used, but the result obtained of course, would be affected.

To read the chart, several examples will be given. Let it be required to find the end thrust, when facing medium cast iron from solid stock, with a feed of 0.006 in. and width of cutting lip of 3 in. From the proper point on Scale (1) connect with the feed, 0.006 in. on Scale (2). Pivoting on the point of intersection of this line with Scale (3), swing to the width of lip on Scale (4), and on Scale (5) read the value of the pressure, which in this case is approximately 2,200 lb., which for practical purposes is sufficiently close.

In another case the cutting pressure is required, when boring soft steel, using a feed of 0.150 in. and a tool with a 5-in. lip. Connect point on Scale (6) with the feed, 0.150 in. on Scale (7); then pivoting at the intersection of this line with scale (8), swing to the width of lip on Scale (9), and on Scale (10) read the cutting pressure in pounds. It is hardly probable that one would ever find this condition in actual work, and the example is cited merely to show the operation of the chart and the enormous pressure created under such a condition.

The other two examples shown on the chart are self explanatory. It will be noted that the feed on Scale (2) is graduated in thousandths and 64ths, while that on Scale (7) is given in thousandths and hundredths of an

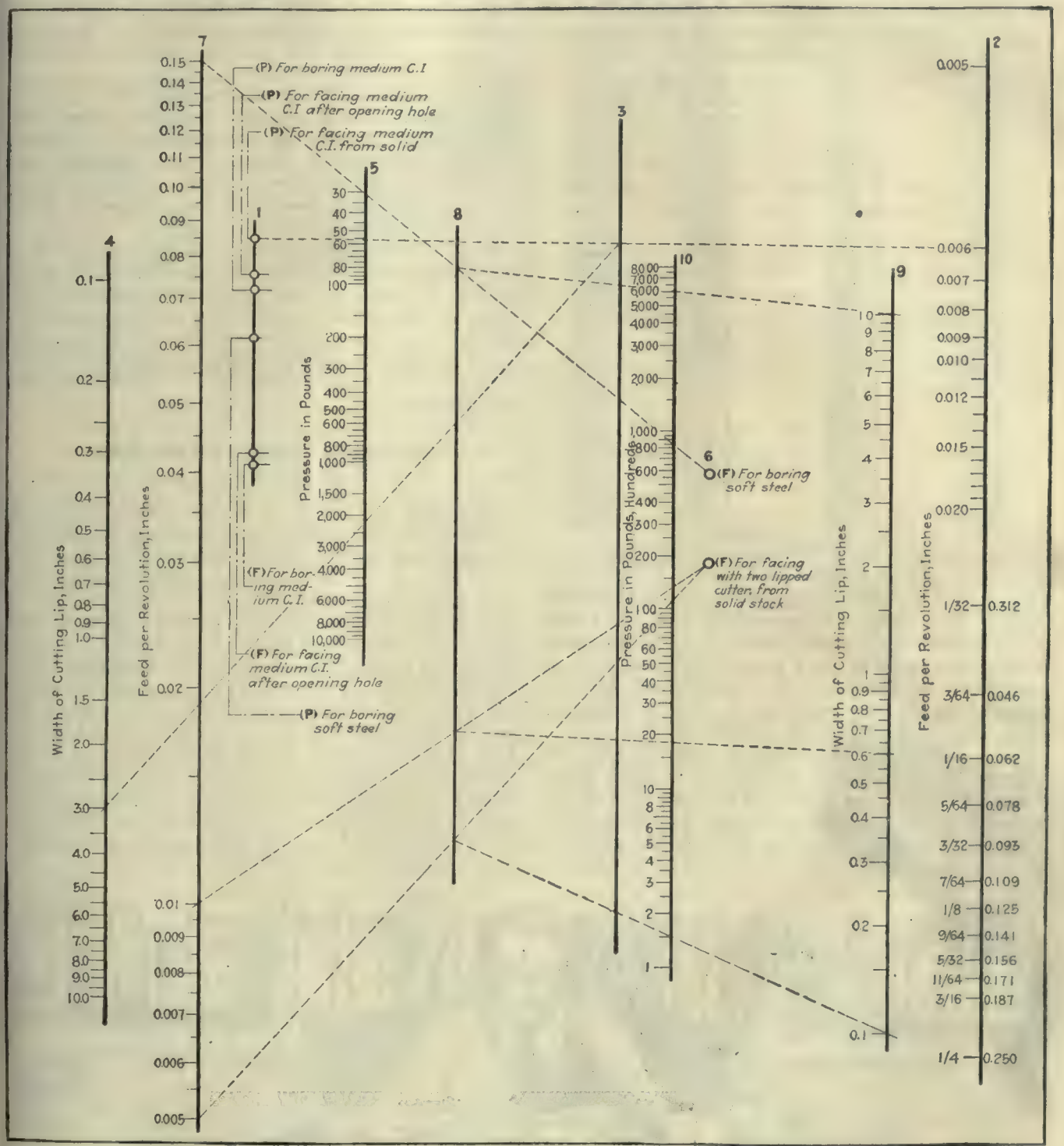


CHART FOR DETERMINING THE PRESSURE EXERTED BY ONE- AND TWO-LIPPED BORING TOOLS

inch. This was done to afford ready recognition of the two scales, as they are not to be used as the same. The values on Scale (2) increase when reading downward, while they increase when reading upward on Scale (7). Also, the values for the pressure increase downward on Scale (5) and upward on Scale (10). This affords a means of distinction between the several scales which are related to each other. Scales (1), (2), (3), (4) and (5) operate together, while Scales (6), (7), (8), (9) and (10) belong to another group.

Feed to 0.7 Power

For the convenience of the reader, the values of the feed raised to the 0.7 power are given in the accompanying table. It is well to call attention here to the fact

TABLE OF NUMBERS REPRESENTING FEED IN INCHES RAISED TO THE 0.7 POWER

n = Number	Log n	Log $n^{0.7}$	$n^{0.7}$
0.005	7.69897	8.18927	0.01546
0.006	7.77815	8.44470	0.02784
0.007	7.84510	8.49157	0.03102
0.008	7.90309	8.53216	0.03406
0.009	7.95424	8.56796	0.03698
0.010	8.00000	8.60000	0.03992
0.011	8.04139	8.62897	0.04255
0.012	8.07918	8.65542	0.04523
0.013	8.11394	8.67975	0.04784
0.014	8.14613	8.70229	0.05039
0.015	8.17609	8.72326	0.05288
0.016	8.20412	8.74288	0.05532
0.017	8.23045	8.76132	0.05772
0.018	8.25527	8.77868	0.06007
0.019	8.27875	8.79512	0.06239
0.020	8.30103	8.81072	0.06467
0.0312	8.49485	8.94639	0.08839
0.0468	8.67094	9.06965	0.11740
0.0625	8.79588	9.15711	0.14360
0.0781	8.89279	9.22495	0.16770
0.0937	8.97197	9.28037	0.19070
0.1093	9.03892	9.32724	0.21240
0.1250	9.09691	9.36783	0.23330
0.1406	9.14807	9.40364	0.25330
0.1562	9.19382	9.43567	0.27270
0.1718	9.23522	9.46465	0.29150
0.1875	9.27300	9.49110	0.31090
0.2500	9.39794	9.57815	0.37860
0.3125	9.49485	9.64639	0.44300
0.3750	9.57403	9.70182	0.50330
0.4375	9.64098	9.74868	0.56060
0.5000	9.69897	9.78927	0.61560
0.5625	9.75012	9.82508	0.66847
0.6250	9.79588	9.85711	0.71970
0.6875	9.83727	9.88608	0.76927
0.7500	9.87506	9.91254	0.81760

that the values on Scale (2) represent the feed raised to the 0.7 power, while those on Scale (7) are the actual values, which is another reason for making a distinction between these scales. In connection with the article previously referred to, the values of feeds advancing by 64ths and raised to the 0.75 and 0.933 power can be found in Mark's handbook. The latter power has been changed from its fractional form, namely, 14/15ths, for convenience in handling the calculations.

The logarithms of the numbers, together with the values to the 0.7 power are correct only to three places, no attempt being made to procure accuracy beyond that figure, inasmuch as accuracy to even two places would no doubt be all that is required for practical purposes. For example, consider the value of $0.010^{0.7}$; which is 0.0399. It would make little difference in the ultimate result if 0.04 were used, for a factor of safety should be allowed in the construction of any parts which are designed to withstand the pressures determined by the chart, or formulas.

As an illustration of the practical use of the chart, it would be a simple task to determine the pressures exerted by the standard two-lipped boring and facing tools that make up any shop equipment, and tabulate these values on the data sheets for the cutters. Counter-bores and spot-facers would also be included. Then, with this information before the designer, his work of designing parts of machinery, tools, jigs and fixtures would be simplified. Whether or not a given job requiring boring or facing could be performed on a certain machine could also be predetermined with a fair degree of accuracy provided that the capacity of the unit was known.

On the other hand, the combined end thrust and cutting pressures have a tendency to distort cutter bars; so knowing in advance the approximate stress to which a bar will be subjected, it can be made sufficiently large to withstand the pressure or stress. This of course, would be governed somewhat by the construction of the part and the tooling conditions.

It is believed that this chart will be found useful in the designing of machine tools and fixtures. It can be used as a companion chart to the one previously published by the author and mentioned at the beginning of the article. These two charts with the one on drill pressures given in Halsey's "Handbook for Machine Designers" make a fairly complete set of data for reference purposes.

Big Shops Versus Little Shops

By Gus Haessler

In reading the late W. D. Forbes' letter, on page 99 of American Machinist, I was especially interested in his suggested method of procedure for getting out the work referred to. If a universal milling machine had been employed to do the drilling, it seems to me that all of two hours would have been consumed. However, that part of the work can be done in less time and with more economy if a bench lathe be used. The equipment should include a milling attachment, index, indexing mechanism and a ½-inch step chuck. The time required for setting up and drilling in a bench lathe is at least one half of that necessary for these operations in a universal milling machine. As the ten ¼-in. holes are located on a ½-in. pitch circle, the drill will clear the chuck body in drilling through; or if desired, the work may be spotted, while it is in the lathe, and the drilling done afterwards on a sensitive drilling machine.



Influence of the Automotive Industry on Thread-Cutting Tools

Development of Interchangeability in the Automobile Industry—Changes in Methods of Manufacturing Threading Tools—Design of Landis Die Head

By C. N. KIRKPATRICK and G. G. VINK,
Sales Manager and Engineer, Landis Machine Co.

THE development of the automotive industry with the concurrent demands in all its various departments for greater production, interchangeability and accuracy, has necessitated radical changes in method, and in the design of many tools and machines. Not the least important are the changes in the requirements of the screw thread, which requirements, in turn, caused a departure in the specifications, as well as in the equipment and method of thread cutting.

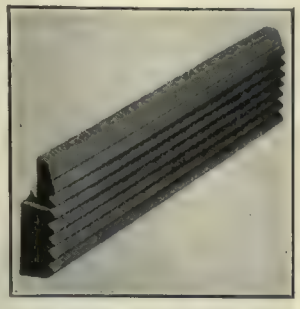


FIG. 1. LANDIS CHASER

The aim of this article is not to discuss in detail the limits of the specifications and standards of screw threads, but to treat of the changes required in the manufacturing of a particular type of thread-cutting tool in order to meet the present standards.

There are many makes of thread-cutting die heads and machines on the market, but only two distinct types of thread-cutting tools; namely, the hobbed chaser and the flat bar chaser milled and hardened for its entire length, as manufactured by the Landis Machine Co. of Waynesboro, Pa. The latter type has been employed very extensively by the manufacturers of motors, automobiles, tractors and accessories, and this article will deal with its development only.

Figs. 1 and 2 show the outstanding features of this type of die. It will be noted that the life is three-quarters of the length of the tool; that the rake angle may be varied from 5 deg. negative to 50 deg. positive without interfering with the efficient operation of the tool; that the same set of chasers can be used for right or left-hand threading by merely grinding both cutting ends and using right- and left-hand chaser holders; and that the die is tangentially disposed to the work, which makes for low friction and a correspondingly high cutting speed. The fact that the chaser is hardened its entire length, makes its sharpness renewable by a slight grinding at the cutting edge, and the necessity of annealing, hobbing and retempering is eliminated.

Increase of Production

Mass production on an intensive scale was introduced in plants manufacturing automotive equipment in about 1910. At that time the requirements for screw threads were not so strictly held. It is recalled that inspection of screw threads at that time consisted in measuring the pitch diameter with a micrometer, and the pitch by means of a scale. The limits for pitch diameter at that time were from 0.003 to 0.004 in., and the pitch could vary about 0.004 in. The taper of the thread was not given much consideration, particularly on threads not longer than 1 in. In other words, the standard for screw threads employed in automotive equipment was very little higher than that maintained in manufacturing commercial bolts.

The inspection of the chaser at that time was correspondingly crude. The milling cutter which formed the threads on the chaser, was inspected by making a test cut on a flat piece of steel. This test cut was examined by means of a magnifying glass to determine if the flats on the tops and bottoms of the threads were alike. The pitch of the thread was measured by the wire method. Two wires 1 in. apart were placed in the grooves of two threads, and the pitch measured by means of a micrometer. A tolerance of minus 0.001 to plus 0.003 in. was permitted. After the hob passed this simple test, the chaser was made, and was inspected for uniform thickness and finish. It was then hardened, and given a final inspection for straightness.

About 1914 it was noted that closer limits were being held on screw threads. This closer inspection was augmented a little later by the development of the aeroplane motor. It was plainly to be seen that the

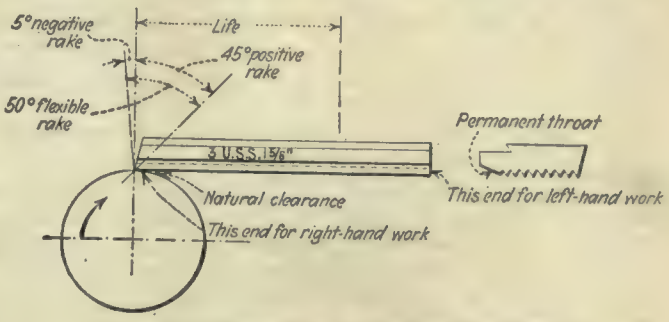


FIG. 2. ACTION OF FLAT BAR CHASER

screw thread employed in the aeroplane played a more important part, due to the great strains and vibrations unknown to land vehicles. As motors of greater power and speed were developed for automobiles and trucks, the inspection of screw threads became stricter, and efforts were made to maintain very close limits, particularly on the pitch, pitch diameter and outside diameter.

This inspection of the thread entailed the use of the latest type of microscopic measuring machines, which brought to light many errors, not only in the form of the thread, but also in the angle, the depth and the width of the flats. The pitch and taper of the thread were usually inspected by means of gages, whereas the pitch diameter was ascertained by micrometer reading, the same as in former years. The tolerances, at the present time, for pitch and pitch diameter are usually 0.001 in. plus or minus, and no taper is permitted, as far as it is possible to cut an absolutely straight thread with a die.

The methods of manufacturing and inspecting the Landis chaser changed with the maintenance of closer

limits on screw threads. The present methods have been in effect for the past several years and will, of course, be improved as the requirements and standards change.

The tool which forms the milling cutter is measured

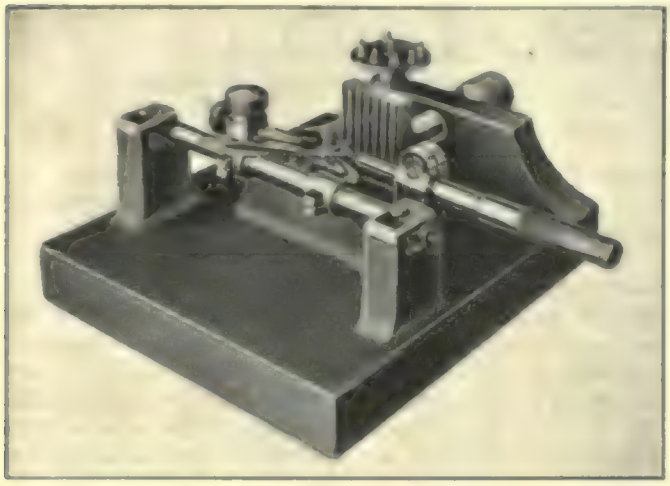


FIG. 3. PITCH AND LEAD MEASURING INSTRUMENT

on a microscopic measuring machine for the flats and angle. The milling cutter is then formed, and with it a test cut on a flat piece of stock is made. The test cut is measured for pitch by means of a precision, pitch and lead measuring instrument, shown in Fig. 3 and described later. In measuring the hob, the limit for depth is nothing minus and 0.002 in. plus. The limits for pitch are plus 0.001 to plus 0.0025 inch.

When the milling cutter passes satsfactory inspection, two sets of chasers are milled. These chasers are measured for pitch, depth, angle and flats by means of the measuring machine manufactured by Alfred Herbert, Ltd., Coventry, England. The chasers are then hardened and inspected for straightness. Test cuts are made with the chasers without the aid of a leadscrew, as this permits a reproduction of the chaser form without any other controlling factors. The cuts are also measured on the Herbert measuring machine for depth, angle, and the flats on the top and bottom of the thread. The pitch of the test cut is measured with the pitch and lead measuring instrument already mentioned.

The precision pitch and lead measuring instrument was designed so as to insure accurate measuring of the pitch and lead of the chasers. This instrument is employed for measuring not only the chasers, but also the test cuts made with them.

Pitch Measuring Instrument

The instrument consists of a main body or casting having a face, or work clamping surface. Parallel to this surface is clamped at the front a hardened and ground bar, which supports the carriage that moves longitudinally. The carriage is equipped with a plunger and an indicator. A ball-pointed end is screwed in the end of the plunger and dropped in the thread to be measured. A micrometer fastened to the main body of the instrument is brought in contact with the indicator, and moved until the indicator points to zero on the dial. The micrometer reading is then taken. The readings of adjacent threads are taken, and the difference between such readings gives the pitch measurement.

Ball-pointed ends of various diameters are inserted in a small disk conveniently located on top of the instrument. The micrometer employed is graduated to read to 0.0001 in., and has a range of 0 to 2 in. The bearing parts and measuring surfaces are hardened to reduce wear, and means are provided to compensate for any wear which may occur. This instrument has been found to be very successful where close limits in pitch and lead must be maintained.

While the chaser does the actual thread cutting and must, therefore, be made as accurately as possible, yet the chaser holder or the block in which the chaser is held plays an equally important part. The threads on the chaser are milled parallel to its finished seating surface, so that the chaser has nothing to do with obtaining the proper helix angle. The chaser holder controls the helix angle and is milled at an angle, so as to incline the chaser to correspond to the helix angle of the particular diameter and pitch.

For commercial threads, one set of chaser holders will cover a very wide range, for instance, from ¼ to 1½ in. inclusive. This is possible because the diameters increase while the pitches decrease, maintaining a close ratio. The chaser holders are, therefore, milled for a mean helix angle between the minimum and maximum diameter. To illustrate, the helix angle for ¼-in. diameter, 13-pitch is 3 deg. 7 min., and the helix angle of 1½-in. diameter, 6-pitch is 2 deg. 11 min. The seats of the chaser holders are milled for a mean angle of 2¾ deg. In this manner the angle of the chaser holder is almost exact for ¾-in. diameter, 10-pitch, and sufficiently close on the other threads mentioned that the variations do not show up on commercial threads. The advantage in milling the chaser holders for the mean diameter is, of course, plainly seen, as it eliminates the necessity of a set of chaser holders for each diameter and pitch.

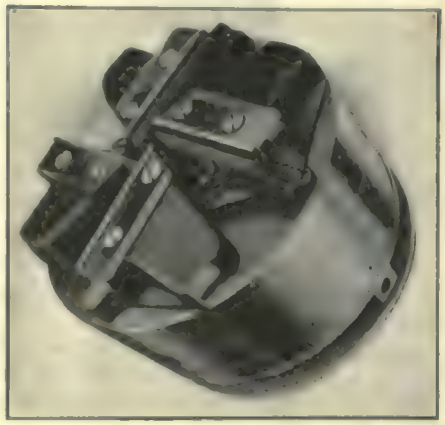


FIG. 4. LANDIS DIEHEAD

When cutting S. A. E. standard threads, which are employed quite extensively on automotive parts, the chaser holders are confined to a much smaller range. This, of course, is due to the greater degree of accuracy required. A set of chaser holders for 1-in. diameter, 20-pitch, and ⅞-in. diameter, 18-pitch, will be milled for an angle very close to the helix angle of those diameters and pitches, and no effort will be made to include a range of diameters. The helix angle of ¼-in. diameter, 20-pitch is 1 deg. 57 min., and the helix angle for ⅞-in. diameter, 18-pitch is 1 deg. 55 minutes. The set of chaser holders, therefore, for these diameters and pitches would be milled for a helix angle of 2 degrees.

In some special cases it has been found advisable to limit a set of chaser holders to one diameter and pitch. This occurs only when extreme accuracy is to be maintained. For instance, a set of chaser holders for 1⅛-in. diameter, twelve threads per inch may be milled for an angle of 1½ deg., which is the exact helix angle for that diameter and pitch.

It, no doubt, has been noted that often on automotive parts, a fine-pitch thread is employed on large diameters. Due to the fine pitch, it would be extravagance to purchase a large and powerful machine merely because of the large diameter to be threaded. Consider, for instance, a thread 2⅛-in. in diameter and of 16-pitch. Basing the recommendations on a suitable machine for the diameter, a machine of the 2½-in. size would be specified, yet on account of the fine pitch, a 1-in. machine would be ample in capacity. The 1-in. machine, of course, should be recommended with the understanding that the length of the thread would not exceed 1½ in. Special built-up and off-set chaser holders must be furnished.

The holder is built up and the chaser seat is off-set, so that a diameter of 2⅛ in., for instance, could be accommodated very nicely. The holder must be built up so that the full length of thread can be cut without necessity for the stock to enter the bore of the head.

Making a Holder

The method of making the chaser holder is of interest. The holder, the shape of which can be seen in the view of the die head shown in Fig. 4, is made from a steel casting. The first operation is to mill the bottom, or that part which rests against the face of the die head. The holder is then drilled, spot-faced, counterbored and shaped on the under side, so that it will fit the sliding block which is supported on the face of the head by a pin. The abutting screw hole is drilled and then the holder is rough milled to a pre-determined helix angle. For the milling operation a jig is employed, which has universal adjustment and which is graduated in minutes. The holder is then scraped for bearing and finish, after which it is finish milled. The clamping screw holes are drilled and tapped, and the chaser holder is then ready for assembling.

After the chaser holder is completed, it is given a careful inspection by means of a special device which supports the chaser holder in the same position as on the die head. A master chaser is then inserted in the seat; and by means of a micrometer measuring device, it

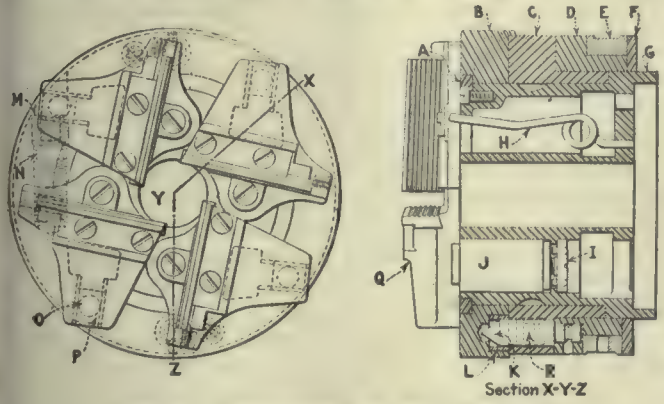


FIG. 5. CONSTRUCTION OF DIEHEAD

is determined if the holder is milled at the proper angle. If it passes that inspection, the chaser clamp which holds the chaser in the holder is fitted; and the completed holder is then tested out in actual cutting.

That the limits which are maintained in making the chaser holders are critical, may be surmised from the fact that when counter-boring the ear of the chaser holder, or that part of which fits over the trunnion, the limits are 0.8745 to 0.8755 in. for the 1-in. head and 1.2495 to 1.2505 in. for the 1½-in. head. The sliding block slot on the under-side of the chaser holders is held to limits of 0.7387 to 0.7403 in. for the 1-in. head and to 0.986 to 0.987 in. for the 1½-in. head.

The Die Head

The results obtained from the chaser and chaser holder are dependent, to a certain extent, upon the die head which supports them. Fig. 4 shows the all-steel rotary die head, and Fig. 5 its principle of operation.

The diametrical or size adjustment is obtained by means of the adjusting worm *N*, located in the adjusting ring *C*. This worm engages the body *G*, and moves as a unit the closing ring *B*, the adjusting ring *C*, the the operating ring *D*, the yoke stop ring *F*, and also the chaser holders *Q*. The body *G*, the closing-ring retaining ring *A*, and the yoke ring *E* determine the proper adjustment of the chaser holders *Q*, which adjustment is maintained by means of the worm locknut *M*.

The die head is locked by the engagement of the two closing pins *K* in the bushing *L*. This prevents any movement of the closing ring *B*, except that obtained by the worm *N*. The head is opened by means of the backward movement of the yoke ring *C*. When the conical surfaces of the pins *K* engage the bevel surfaces of the bushings *L*, the closing ring *B* is released and the force of the chaser-holder springs *H* rotates the ring *B* and the holders *Q*. The chaser holders *Q* are fastened to the trunnions *J* and are supported at their outer ends by the adjusting blocks *P*.

Care in the inspection of the parts of the die head during the course of machining and assembling has increased proportionately with that in the inspection of the chaser holders and chasers. It is unnecessary to state the limits of each and every part of the head, but it will suffice to say that limits vary from 0.0025 in. in grinding the trunnions to 0.003 in. in turning the head body.

After the head is assembled, test cuts are made in cutting minimum, mean and maximum diameters within its range. The test for heads for threading commercial work is the same as for the head which is to be employed on the most accurate work. Thus, it is possible for any head in service, with the proper equipment of chaser holders and chasers, to be used on particular threading jobs.

The cutting of threads on automotive parts requires a machine with a leadscrew attachment. With the non-leadscrew machine, the start of the thread depends almost entirely upon the manner in which the operator feeds the stock in the die head. As human power is variable, it is impossible to obtain the same steady start at all times, and consequently the first thread on the stock is apt to be imperfect. The leadscrew eliminates this trouble and maintains a high degree of accuracy, as it controls the leading feature and relieves the chasers entirely of this duty.

The precision maintained in manufacturing the chasers and parts of the machines insures interchangeability. Any one chaser, or in fact, any one part of a die head or machine may be applied to the die head or machine at any time after the equipment is placed in service. The importance of perfect interchangeability may be appreciated when it is considered that slight error in the head or machine may be multiplied many times at the cutting edge of the chaser. The accuracy of the threads produced really depends, therefore, upon a high standard of interchangeability.

Amortization of Plant Facilities

Regulations 62 of the Treasury Department Give Manufacturers Another Chance to File Claims—Substantial Relief Available Under Little-Understood Provision

By F. H. FIGSBY
Ernst & Ernst, New York

CONGRESS, in drafting the Revenue Act of 1918, recognized that following the entry of the United States in the World War a large number of manufacturers were compelled to pay abnormal prices for new buildings, machinery and equipment and that many of these facilities would become worthless or diminish greatly in value when the abnormal demand for production receded. It was logical that this abnormal cost should be charged against income during the abnormal period of production and Congress accordingly provided for a deduction by "Amortization" of the cost of these facilities.

The original regulations of the Internal Revenue Bureau provided that the date of April 1, 1919, should be tentatively used as the end of the amortization period, but subsequently provision was made for deductions from income in 1918, 1919 and 1920. The Revenue Act of 1921, recently enacted, provides for a similar deduction in 1921 but to obtain the benefit of this deduction it is required that claim therefore be filed not later than the time of filing the tax return for 1921, which, in the case of a taxpayer whose accounting year conforms with the calendar year, would ordinarily be March 15, 1922. *This limitation as to the filing of claims for the year 1921 does not, of course, preclude the filing at a later date of claims or amended returns for prior years.*

Here is the section under which amortization deductions are allowed:

Deductions Allowed

(Sec. 214. (a) That in computing net income there shall be allowed as deductions:)

(9) In the case of buildings, machinery, equipment, or other facilities, constructed, erected, installed, or acquired, on or after April 6, 1917, for the production of articles contributing to the prosecution of the war against the German government, and in the case of vessels constructed or acquired on or after such date for the transportation of aticles or men contributing to the prosecution of such war, there shall be allowed, for any taxable year ending before March 3, 1924 (if claim therefor was made at the time of filing return for the taxable year 1918, 1919, 1920, or 1921) a reasonable deduction for the amortization of such part of the cost of such facilities or vessels as has been borne by the taxpayer, but not again including any amount otherwise allowed under this title or previous Act of Congress as a deduction in computing net income. At any time before March 3, 1924, the Commissioner may, and at the request of the taxpayer shall, re-examine the return, and if he then finds as a result of an appraisal or from other evidence that the deduction originally allowed was incorrect, the income, war-profits, and excess-profits taxes for the year or years affected shall be redetermined; and the amount of tax due upon such redetermination, if any, shall be paid upon notice and demand by the collector, or the amount of tax overpaid if any, shall be credited or refunded to the taxpayer in accordance with the provisions of section 252; * * *

The wording of the law in confining the deduction of amortization to "buildings, machinery, equipment or other facilities constructed, erected, installed or acquired for the production of materials contributing to the prosecution of the present war," has been misconstrued by many taxpayers to apply only to corporations who were manufacturers of munitions under government contracts or who purchased machinery or equipment of special design such as would not be readily adaptable to commercial business. On the contrary, this privilege of reducing income during the high tax years applies, with but few exceptions, to every corporation which between the dates of April 6, 1917, and November 11, 1918, increased its plant facilities to maintain or increase the production of any article which directly or indirectly contributed to the prosecution of the war. It applies to a coal mine or a flour mill as readily as to a munition factory.

Value of a Special Machine

It is not necessary that the facilities be of a special design; undoubtedly, a special machine would be of less value under post-war conditions, but this is only a matter of the degree in which amortization may be claimed.

In the regulations of the Internal Revenue Bureau, deductions for amortization fall within two general classes:

Class 1 includes all property which has been sold or discarded or will be discarded prior to March 3, 1924.

Class 2 includes all property which the taxpayer retains in use.

The amortization allowance in the case of Class 1 property is usually equal to the cost of the property or the difference between such cost and its scrap or salvage value.

The allowance in the case of Class 2 property is the difference between cost and its value under post-war conditions.

The Value-in-Use Problem

The problem of determining the "value-in-use" under post-war conditions is not without its difficulties. The regulations of the Internal Revenue Bureau do not permit of the application of an arbitrary percentage to cost nor do they recognize pre-war costs as indicating probable post-war values. They do, however, recognize the replacement values as of today, compared with the inflated prices of 1918.

It is necessary to determine from an analysis of the operating history of each taxpayer what value the facilities have in his business under stable post-war conditions—whether his operations will permit him to use these facilities to a certain extent of their capacity and to know whether such value-in-use is more or less than the post-war market price for used facilities of the same general character.

There is nothing mysterious about the computation of amortization. Like most important subjects, special training is essential to obtain the best results. It is an accounting problem involving certain engineering principles—in fact, the Internal Revenue Bureau employs engineers especially for the verification of amortization claims. These engineers, however, are only assigned to

the examination of claims that have been prepared in conformity with the requirements of the bureau.

In order that the principles of this important subject may be understood, let us assume a simple case, excluding all complexities:

A Case in Point

The A. B. C. Manufacturing Co. was organized in 1914 and the following is a summary of its investment in plant facilities, exclusive of land, and its production from 1914 to 1921, inclusive:

Year	Cumulative Plant Investment	Production in Units
1914	$120,000	600,000
1915	160,000	700,000
1916	175,000	800,000
1917	250,000	1,100,000
1918	650,000	1,700,000
1919	650,000	1,200,000
1920	650,000	900,000
1921	650,000	800,000

It is quite apparent that this corporation has little, if any, present benefit from the expenditures made in enlarging its plant. With an investment of $120,000 in 1914, 600,000 units were produced. Nothwithstanding an increase in investment of approximately 540 per cent, the production of 1921 is but 33⅓ per cent in excess of that of 1914. It is, of course, a matter of opinion whether the production of 1921 may be considered normal, but it would appear from the pre-war demand for this product that a further decline in production will ensue.

An analysis of the additions made since April 6, 1917, indicates that while a considerable portion of the new facilities are being used, the same production could be obtained from the facilities which had been installed prior to April 6, 1917.

A Deduction Justified

After a careful analysis of the operating history of the corporation to determine the residual value of its war facilities, it is found that the following conservative amortization deduction is justified:

Class 1	Amortizable Cost	Residual Value	Amortization
Machinery	$80,000	$27,000	$53,000
Class 2			
Buildings and Machinery	320,000	154,000	166,000
Total	$400,000	$181,000	$219,000

Assuming that 75 per cent of this amortization is applicable to the year 1918 and 25 per cent to the year 1919, the saving in Income and Profits Taxes would be as follows:

1918	$135,342
1919	24,385
Total	$159,727

Many taxpayers claimed the benefit of an allowance for amortization in preparing their Income and Profits Tax Returns for 1918 and 1919, the computation of the allowance being based upon estimated replacement value under post-war conditions or upon the estimated abnormal cost of the facilities as compared with pre-war costs. Such claims are not acceptable to the Internal Revenue Bureau and unless the taxpayer revise his claim in conformity with present regulations he will in due time be notified that his deductions have been disallowed and additional tax will be assessed accordingly.

On the other hand, many claims which were prepared in the approved manner up to Jan. 1, 1921, do not now reflect the fair allowance to which the taxpayer is entitled. This is due to the changed prices and conditions which in many cases have materially increased the amount of amortization which could properly be claimed. Notwithstanding that amortization engineers of the Internal Revenue Bureau may have inspected the taxpayer's property and made an amortization allowance, the law provides that at any time prior to March 3, 1924, the Commissioner of Internal Revenue may, and upon request of the taxpayer shall, reopen the claim and redetermine the amortization allowance.

String Board Graphics

Percy S. Brown
Works Manager, Corona Typewriter Co., Inc.

The use of string board graphics must not be confused with those of a permanent nature, though used in the same manner and for obtaining the same kind of information. Through their very nature they are for periodical control rather than for permanent data, inasmuch as the strings are moved back and forth either daily, weekly or for such other periods as one may desire to cover. All information of an historical nature is lost, except where it may be desirable to photograph the boards previous to each posting; in such instances records of a permanent nature might be secured, limited only by the inability to reproduce colors in cases where strings of various colors are used on the same board.

The string boards may be of whatever size and shape the designer desires, depending on the number of parts, operations or other data he may wish to show. No matter what the size or shape, the same plan is followed: First, notches or grooves are cut along the top of the board, spaced as desired, and parallel notches or grooves are cut along the bottom of the board. It may be desirable in some instances to substitute grooved rollers for the notches, particularly in the cases of very high boards where freedom of string motion may be impaired unless assisted mechanically. Along the left sides of the board, graduations are drawn, either on the board itself or on the heavy paper affixed to the board, and correspondingly along the right side of the board similar graduations may be drawn. These graduations may be continued across the entire board or only part of them may be continued, as they are merely to facilitate posting. At the lower edge of the board a heavy paper runner is placed, on which is printed the information as to the parts, operations, or names of whatever other items are to be controlled. A piece of colored string and piece of white string of equal length are then tied together around the board, being drawn as tight as possible. When posting, the colored string, which is always at the bottom, is moved up to the proper point by taking hold of the knot and the knot then becomes the controlling point.

We are preparing to extend the use of the boards for securing information in connection with employment, sales, etc. The boards are quite inexpensive and can be made by any carpenter while the charts or strips can be easily made by anyone.

Outline of address before the Taylor Society, Philadelphia, March 18, 1922.

Novel Applications of the Hartness Screw Threading Attachment

By H. A. Loudon

The Hartness screw threading attachment was devised to render the Jones & Lamson turret lathe available for cutting threads of any desired pitch. The

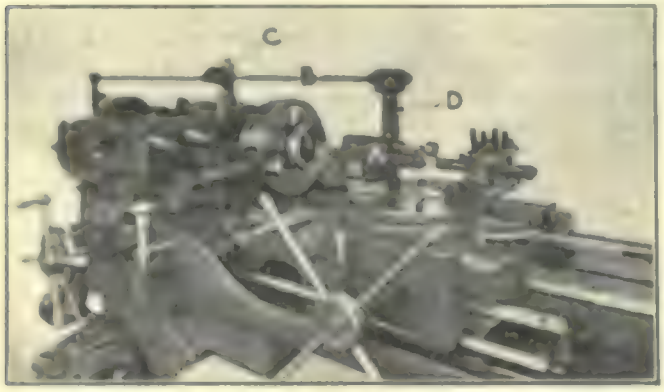


FIG. 1 THE DEVICE IN PLACE ON THE J & L

accompanying illustrations show two applications of the tool that were not contemplated in its design, but which it accomplishes well without change except in the manner of attaching it.

The device is shown in Fig. 1 in place on the turret of a J. & L. machine, with a bronze bushing, one shoulder of which is to be tapered, in the chuck. The piece is bored and faced in the ordinary way by the use of the proper turret tools, and there the use of the J. & L. machine would ordinarily end; necessitating a separate handling of the piece in order to turn the taper.

What the Attachment Is

For the benefit of readers to whom the threading attachment is not known, a cut of the mechanism is shown in Fig. 2 with a brief description of its movements. The base of the housing *A*, Fig. 1, attaches to the turntable of the machine by suitable bolts and clamps, and can be set in any desired position relative to the work. It derives its movement from the headstock through the horizontal shaft *B* and vertical shafts contained in the sleeves *C* and *D*, both of which are arranged to swivel.

Rotary movement is transmitted through helical gearing and the swiveling feature, in conjunction with the sliding movement of the shaft *B* which is splined to the

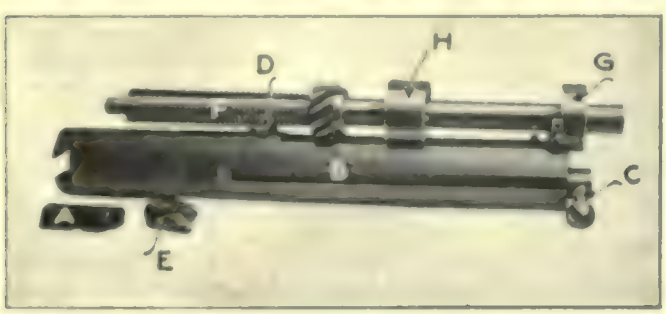


FIG. 2. WORKING PARTS OF THE ATTACHMENT

gear at the headstock end, allows the movement of turret or cross-slide without interfering with the action of the device.

The tool *A*, Fig. 2, slides in the dovetail slot across the end of the bar *B*, and is actuated to and from the cut by an eccentric pin in the end of a shaft passing longitudinally through the bar and terminating at the other end in the handle *C*. On this shaft is a cam which moves the half nut *D* (shown separately at *E*) into or out of engagement with the master screw F.

A pin in the collar *G* throws the nut into engagement with the screw by imparting a partial rotation to the central shaft and the tool is thus moved forward in proper relation to the rotative movement of the work spindle, until the pin in collar *H* moves this shaft back again, withdrawing the cutting tool and the nut at the same time.

A friction-driven pinion on the lower end of the vertical shaft which drives the master screw is always in mesh with a rack on the back of the bar *B*, and, as soon as the nut *D* is withdrawn, returns the bar to the starting point, where it is again reversed by the pin in collar *G*.

Taper Turning

To turn the taper on the piece under consideration the device was located on the turntable at the desired angle, and a turning tool substituted for the threading tool. Bringing the cutting point in proper relation to the work by the combined movement of turret slide and cross movement of the head, the turret slide is clamped in place and the device thrown into action, when the cutting tool passes rapidly back and forth over the

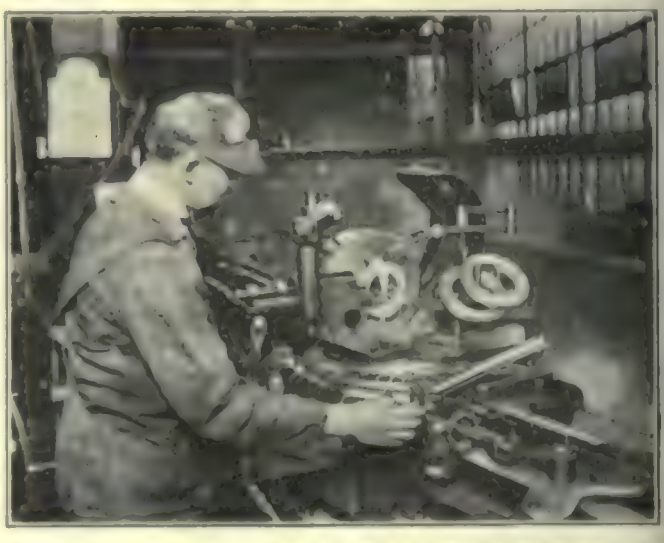


FIG. 3. CUTTING SCROLLS BY MEANS OF THE DEVICE

work, while the feed is applied by turning the handwheel which operates the cross movement.

If the casting to be turned is rough or at all out of round it is advisable to break the scale with one of the turret tools, which can easily be done by manipulating the traverse and cross movements in conjunction by hand.

Another application is shown in Fig. 3, where the tool is in use for cutting scrolls, which may thus be bored and faced on the J. & L. machine in one set up. For this work the attachment is placed with the bar at right-angles to the center line of the work spindle and the cutting tool turned around to face the work. The feed in this case is provided by the longitudinal movement of the turret slide; the withdrawal of the tool at each traverse being automatically taken care of by the device itself.

Forged or Rolled Steel for Gears

The Committee on Metallurgical Standardization of the A. G. M. A. submits the following explanation for Chart No. 1 on "Specifications for Forged or Rolled Gear Steels," which was adopted as recommended practice of the American Gear Manufacturers Association. Suggestions and constructive criticism will be appreciated.

CHART NO. 1. SPECIFICATIONS FOR FORGED OR ROLLED GEAR STEELS

A.G.M.A. Spec.	S.A.E. Spec.	Carbon	Silicon	Manganese	Sulphur	Phos.	Nickel	Chrome	Van	Process
	1,020	.15-.25	.10-.25	.30-.60	Max. .05	Max. .045				Open hearth
1,030	....	.25-.35	.10-.25	.50-.80	Max. .05	Max. .05	....	....	....	O.H.
1,045	....	.40-.50	.10-.25	.30-.50	Max. .05	Max. .05	....	....	....	O.H.
....	2,315	.10-.20	.10-.25	.50-.80	Max. .045	Max. .04	3.25-3.75	....	....	O.H.
....	2,345	.40-.50	.10-.25	.50-.80	Max. .045	Max. .04	3.25-3.75	....	....	O.H.
2,350	....	.45-.55	.10-.25	.40-.70	Max. .045	Max. .04	3.25-3.75	....	....	O.H.
....	3,115	.10-.20	.10-.25	.50-.80	Max. .045	Max. .04	1.00-1.50	.45-.75	....	O.H.
....	3,215	.10-.20	.10-.25	.30-.60	Max. .04	Max. .04	1.50-2.00	.90-1.25	....	O.H.
....	3,245	.40-.50	.10-.25	.30-.60	Max. .04	Max. .04	1.50-2.00	.90-1.25	....	O.H.
	3,315	.10-.20	.10-.25	.30-.60	Max. .04	Max. .04	3.25-3.75	1.25-1.75	....	Electric
	3,340	.35-.45	.10-.25	.30-.60	Max. .04	Max. .04	3.25-3.75	1.25-1.75	....	Electric
	6,120	.15-.25	.10-.25	.50-.80	Max. .04	Max. .04	....	.80-1.10	.12-.25	O.H.
	6,145	.40-.50	.10-.25	.50-.80	Max. .04	Max. .04	....	.80-1.10	.12-.25	O.H.
	6,150	.45-.55	.10-.25	.50-.80	Max. .04	Max. .04	....	.80-1.10	.12-.25	O.H.

Note:—This chart conforms to the S.A.E. specifications with the addition of 1,030, 1,045 and 2,350, and the above additions are now being considered by the S.A.E.

It is understood that where the open hearth process is specified, the electric is an acceptable alternative, but *the reverse of this will not be true.*

No. 1020 is a low carbon machinery steel of good quality, and low enough to case harden well. This is a standard S. A. E. specification.

No. 1030 is medium carbon machinery steel, too high to case, and intended primarily for use in its untreated state, so far as gear work is concerned. For pinions it is suitable to mate with cast-iron gears. This differs only in the phos. from S. A. E. 1030, which has 0.045 per cent phos.

No. 1045 is a machinery steel of high enough carbon to be satisfactorily hardened, yet not so high in carbon and manganese as to cause risk when water-quenching. This differs in manganese specification from the corresponding S. A. E. steel which has 0.30 to 0.60 per cent manganese.

No. 2315 is a low carbon 3½ per cent nickel steel for case hardening.

No. 2345 is a 3½ per cent nickel steel of high enough carbon to be hardened directly. This is a standard S. A. E. specification.

No. 2350 is a similar steel with higher carbon and lower manganese giving better hardening qualities on gears of heavy section. This differs in manganese from the corresponding S. A. E. specification, which has 0.40 to 0.70 manganese.

No. 3115 is a low carbon chrome nickel steel suitable for case hardening. It is cheaper and easier to machine than those which follow.

No. 3215 is a medium chrome nickel steel suitable for case hardening. This is a standard S. A. E. specification.

No. 3245 is a similar steel but with high enough carbon to harden directly. While there is no S. A. E. No. 3245, this conforms to S. A. E. type of specification.

No. 3315 is a high chrome nickel steel suitable for case hardening. This is a variation of S. A. E. No. 3315 and it may be desirable to drop it in favor of the latter.

No. 3340 is a high chrome nickel similar but with carbon enough to harden directly. This is a standard S. A. E. specification.

No. 6120 is a low carbon chrome vanadium suitable for case hardening. This and the two following steels are variations of the S. A. E. steels of similar numbers, which call for a minimum vanadium of 15 per cent. It may be desirable to adopt the latter.

No. 6145 is a similar steel with carbon enough to harden directly.

No. 6150 is a similar steel with 0.05 more carbon which enables it to be hardened to give somewhat higher physical properties, especially needed on gears of heavy section.

It is believed that this chart contains steels which cover the full range of requirements of gear work, and with suitable modifications of heat-treatment it should not be necessary to go outside this list to get any physical properties that may be reasonably required in a gear.

Romances of Metal Working—The Metal Worker and the Painter

By H. H. Manchester

Tales of metal working are not as common in the East as might be expected, until Arabian conquests lent importance to the sword and the Crusades developed armor.

One mediaeval Buddhist story is that of a metal worker and a painter, in which the metal worker gets decidedly the worst of the joke. The smith had constructed a beautiful automatic maiden, which, when the painter stopped at his house, he sent in to wash the painter's feet. The painter was so taken with the maiden that he grasped her in his arms and broke the mechanism to pieces.

"Well," exclaimed the painter to himself, "the smith has made a fool of me in private, but I will make one of him in public."

Thereupon he painted a picture of himself upon the door as if he had committed suicide by hanging. The smith, when he saw it, was frightened, thinking the painter had committed suicide through chagrin. As there was a law that such cases should be reported to the authorities before the body was touched, the smith hurried to the governor of the city, who came with his officers to look into the matter. When they started to take down the body, however, they discovered it was only a painting, whereupon the painter stepped forth and told why he had played the trick. Thus the laugh was on the smith.

The idea back of the story seems to be a comparison of the two arts of metal working and painting, in respect to which creates the most life-like representation of the subject.



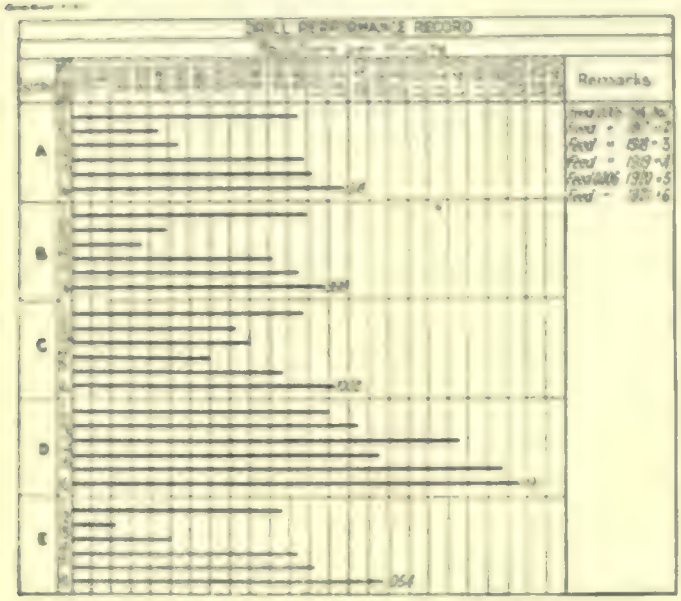
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Perpetual Drill Performance Record

BY H. M. FITZ

The record here described has been in use since February, 1916, and has been the means of saving thousands of dollars. A speed and feed chart for different



SAMPLE RECORD OF 19 64-IN. DRILLS

size drills and varying materials was made from this record and copies placed in frames convenient to the various drilling machines. Contract prices are figured according to these speed and feed standards.

By numbering the years (1916—No. 1, 1917—No. 2, etc.) graphic records for any number of drill sizes can be kept by the year—one card for each drill size, as illustrated. It is a visual record and tells any one instantly the most efficient drill by symbol, *A*, *B*, *C*, *D* or *E*, each representing a different make of drill. The price per drill varies somewhat but amounts to little as more holes per usable inch of drill take care of a slightly increased cost. The card is good for at least twelve years by using the reverse side.

A sample drill may do exceptionally good work. It is not a case of one or two drills doing the business, but when you have a record of drill performances it means that they must all make good or that brand is not purchased for production. This drill record shows actual performance under production conditions—on the same drilling machine, same material and with drills always machine ground and fed automatically, never by hand. The speeds and feeds are changed in accordance with the performance. In 1918 a ½-in. drill failed at 1,130 r.p.m., 0.005 in. feed. For regular production the speed was set at 996 r.p.m., 0.005 in. feed. In 1919 the drill quality dropped. Symbol *D* failed at 1,051 r.p.m. but in 1920 the quality of nearly all the drills improved; *D* failing at 1,178 r.p.m. so that the standard was set at 1,020 r.p.m. and 0.006 in. feed. This increase made a very substantial reduction in drilling costs.

So far this year all the drills show better tha any time since 1916 when the record was started. The r.m.p. linse are followed during the year in lead pencil and at the end of the year are inked in. The following figures show the improvement in ½-in. drills in six years, the figures under the years being the number of r.m.p. at which drills of various makes failed:

	1916	1921
A	970	1,018
B	991	998
C	978	1,002
D	999	1,191
E	956	1,054

The record card shows how the quality dropped in *A*, *B*, *C and E* in 1917 and 1918; in 1916 all five makes of drills were in the 900 r.p.m. class, but in 1921 only one drill was in that class, three—*A*, *C* and *E*—were in the 1,000 r.p.m. class, and one *D* in the 1,100 r.p.m. class.

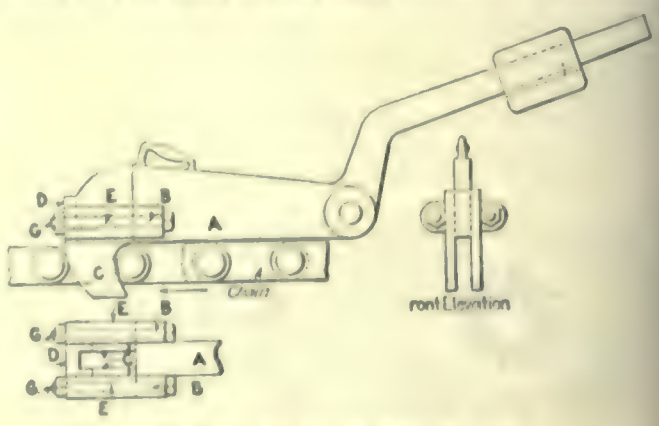
A drill manufacturer told me that drill perfection has not yet been reached and coming years will see further increases in efficiency. When the drill performance record becomes more in use by manufacturers it will help push all drill makers to producing better drills; and the drill buyers will have a practical guide to follow other than the purchase price.

Improvement in Draw-Bench Hooks

BY M. E. DUGGAN

A draw-bench hook is generally a steel casting in which the body and the hook are in one piece. The heavy body is pivoted at the rear end and counterweighted. The hook is designed to stand up under a pull-load at, or a little above, the normal. If it breaks, an entire new casting is required.

In the hook shown in the accompanying sketch, the body *A* and lugs *B* are in one piece. The hook proper, shown at *C* is made of slab sides connected at the ends



AN IMPROVED DRAW-BENCH HOOK

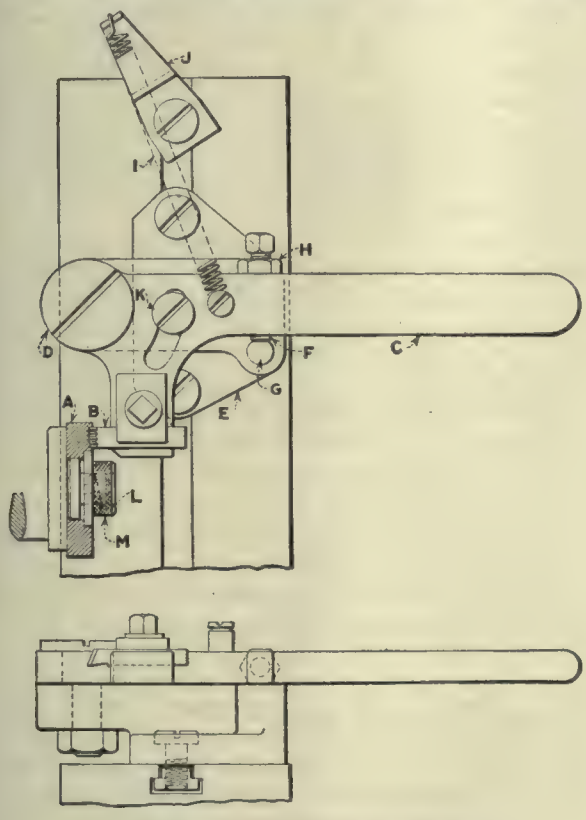
by the part *D*, of which the lugs *E* are an integral part. The bolts *G* answer the double purpose of clamping the hook to the body and acting as a safety factor. They should be the weakest members in the combination so they will be the first to break if the hook is overloaded. In case of breakage, a pair of new bolts will repair the damage.

Cross-slide Finishing Tool

By S. N. Bacon

The illustration herewith shows a tool that largely increased the output of the screw machine to which it was attached and at the same time made the work easier for the operator.

The work was a drop-forged aluminum washer shown at *A* in Fig. 1, and the operation was the turning of a



A CROSS-SLIDE FINISHING TOOL

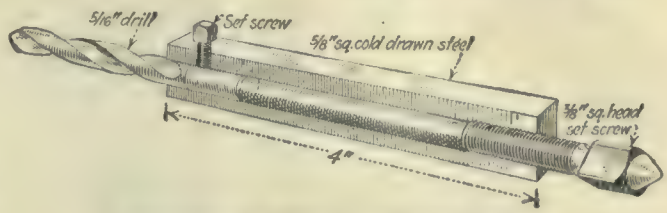
series of grooves in one face. The formed cutter *B* is clamped in the machine-steel holder *C* which pivots on the large shoulder screw *D*, fastened by a nut to the cast-iron base *E*. The slight inaccuracy resulting from the circular feed caused by variation in feeding against the stop in *G*, is negligible on such a shallow cut. The adjusting screw *F* is locked by the check nut *H*. The tension spring *I* for returning the cutter from the work is fastened to the clip *J*, bolted to the cross-slide. The shouldered screw *K* through the slot in the handle, acts as a stop for the return of the cutter and holder.

The end of the work arbor carries the hardened pin *L* which fits in the spiral groove in knurled nut *M*, providing a quick-acting clamp. A fixture of this kind is valuable in any production shop and may be used for various jobs, cutters being made to suit the different varieties of work performed. Unless the fixture is to remain on the machine the spring clip *J* should be fastened to the base of the fixture.

Home-Made Semi-Ratchet Drill

By W. D. Lasall

I had to drill out a broken stud in a place that was too narrow to allow the use of my ratchet drill. To overcome the difficulty I took a piece of ⅝-in. square



HOME-MADE SEMI-RATCHET DRILL

cold-drawn steel, 4 in. long, and drilled a ⅜-in. hole through it lengthwise. I then tapped one end for a ⅝-in. screw. The drill was inserted and held in place by a set screw while a screw at the end with a pointed head, acted as both a center and a feed screw. By using a wrench, with offset opening on the holder, I was able to get one eighth of a turn of the drill before reversing the wrench. The sketch herewith shows the device.

Design and Construction of Dies for Stamping Sheet-Metal Products

By James Richard Ewing

The dies illustrated herewith are both what are known as combination dies, that is, dies in which blanking, forming, piercing and embossing operations are performed at one stroke of the press.

The die shown in Fig. 1 is for stamping a washer used in great numbers by automobile builders. This washer is used for retaining and packing felt or leather around shafting or ends of bearings to keep out foreign substances and to help keep in the oil which would otherwise have a tendency to leak out.

This die, although complicated as to construction especially for the production of the part made, is very serviceable and should last for twenty thousand pieces.

Part *A* is the punch holder proper and is made of

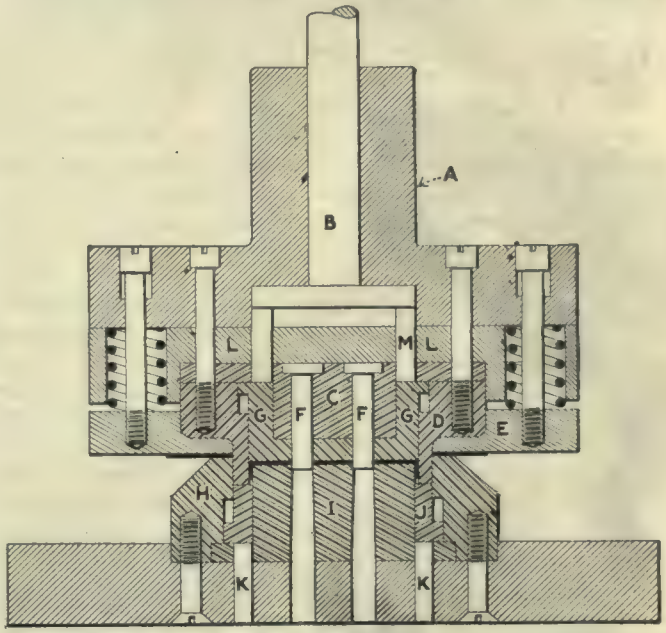


FIG. 1. COMBINATION DIE FOR RETAINING WASHERS

machine steel. The hole in the center is for the knockout rod and must be a few thousandths over size to allow for a sliding fit for the rod. The knockout rod is enlarged at the lower end and this part acts as a bearing for the ends of the four small knockout pins *N*.

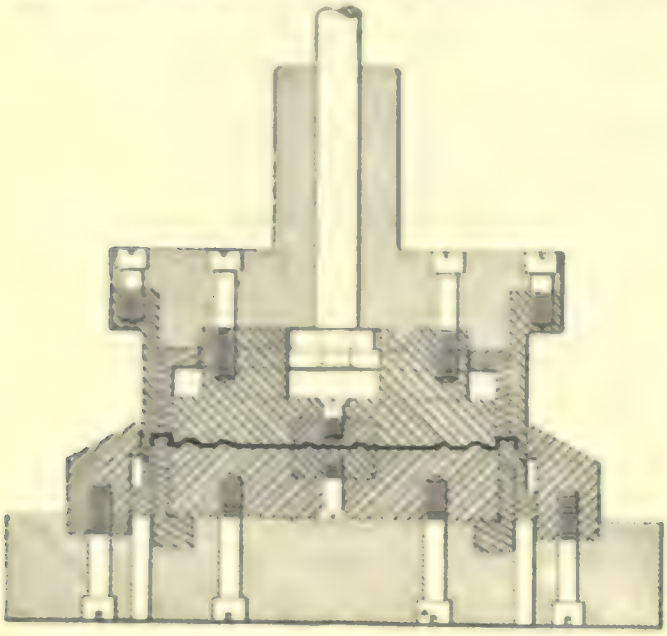


FIG. 2. COMBINATION DIE FOR CAN BOTTOMS

Part *C* is the punch holder for the four piercing punches *F* and is made of tool steel. The piercing punches are made of high-speed steel ground flat on the punching end. High-speed steel punches seem to stand up better for this class of work than carbon steel. Part *D* is the punch ring and is drilled and tapped for four fillister head screws which pass through the punch holder, the spring plate, the piercing punch holder and are screwed into the punch ring to hold the various parts together.

Part *F* is a machine steel pressure plate and has an up and down motion of about ⅛ in. This plate comes in contact with the metal to be stamped and holds it firmly in place during the complete operation. As the punch continues to descend it bends the edge of the blank down and thus forms it to the required shape. While the punch yet lacks ¼ in. of being down, the four piercing punches get in their work. At the bottom of the stroke, part *G* is forced down on the blank with enough pressure to flatten out all irregularities. On the up stroke, part *G* acts as the knockout to remove the washer from the punch.

The cutting end of the punch ring is drawn to a dark straw color.

Part *H*, the cut ring, is hardened and drawn so that it tests out on the scleroscope to about 90. It should not vary from that more than two points either way.

Part *I* is the die center and must be made to the diameter of the washer. The four holes in this part are 0.003 in. larger than the diameter of the punches and are tapered 4 deg. to allow for the clearance of the slugs as they drop down. Part *J* acts as both a draw ring and knockout. As the metal is placed over the die preparatory to being blanked, part *J* is forced up to within ⅛ in. of the edge of the cut ring. As the blanking punch descends, the metal is held firmly between the bottom of the blanking punch and the top of the draw ring. On the up stroke the draw ring follows the punch and acting as a knockout throws the finished washer from the die. This ring is forced up by a pressure plate beneath the bolster.

The die shown in Fig. 2 is used in stamping ends for sanitary tin cans. Its construction and operation is so near like that of the first mentioned die that no additional comment is needed.

Repairing a Broach with Solder

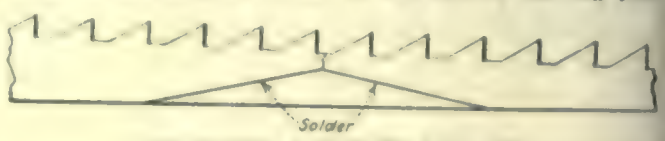
BY GEORGE WILSON

Many mechanics do not realize the possibilities of ordinary soft solder, our old friend "half and half," when it comes to putting metal parts together. Most of us think of soft solder in connection with leaky tinware and similar work. But under the right conditions it can be substituted for brazing or welding.

The sketch shows a broach repair. Through carelessness and accident we have had three of these broken on the return stroke of a machine, when the broach would stick in the work which had not been removed, or in some other unexplained manner known only to the operator. The broach usually snapped in three pieces, and as we always needed it badly just then and the maker charged $27 each for them, we decided to try repairing them.

The broach is 24 in. long by ¼-in. wide on the back. The cut is ⅛ in. Welding with the torch was first tried, but this mutilated the teeth and drew the temper. Brazing was also tried, and while this did not mutilate the teeth so badly, it drew the temper and a tempering warped the broach. As a last resort soft soldering was tried with results that were all that could be desired.

The ends of the pieces were scarfed off for a distance of about an inch, as shown in the sketch, leaving just



SOLDERING A BROKEN BROACH

enough stock below the teeth to prevent the tooth from breaking off under the cutting strain. A piece of soft steel was then fitted into the scarfed ends, the splice being large enough to allow for finishing down to the size of the broach after soldering. The ends of the broach and insert were tinned with a soldering iron and pressed together while being heated with a gasoline torch. A piece of keystock clamped over the teeth and along one side served to hold the hub in alignment. The heat required to melt solder does not affect the temper.

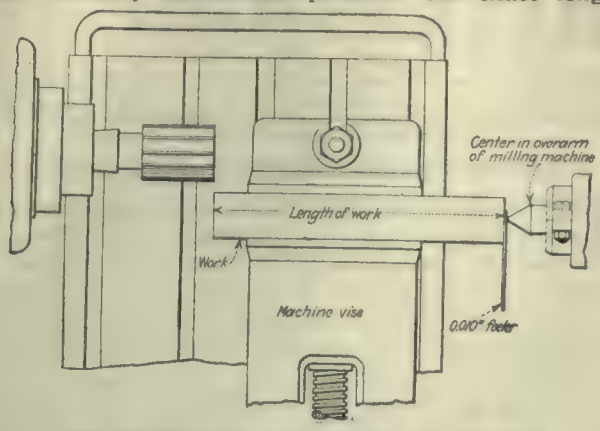
Another use of soft solder is in putting extension shanks on drills or taps where a chuck would strike some projection on the work or jig. A piece of cold rolled makes a nice shank. Drill one end to receive the shank of the tap or drill, tin both parts and slip them together when hot. When the tool is worn out or broken, a new one can quickly be put in place.

Milling Work to Exact Length

BY R. F. MOORE

Having a number of pieces of machine steel about 10 in. long, which had to be milled to exactly the right length, I started looking for a way to rig up a stop which would do away with measuring every piece

separately. I accidentally hit on the idea shown in the sketch. I first squared off all the pieces on one end then carefully milled one piece to the exact length,



SET-UP FOR MILLING WORK TO LENGTH

using a vernier caliper to measure it. Leaving the cross-slide locked, I pulled out the over-arm and brought its center up against a feeler held against the end of the work. I then locked the over-arm, but noticed that locking it shifted its position; so I took a babbitt block and rapped it until the feeler just fitted between the work and the center.

I then took the finished piece out and replaced it with another, locating it against the feeler and center as before.

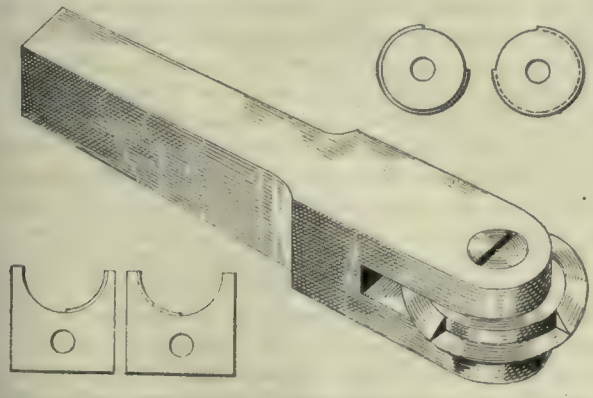
Tools for Finishing Hemispherical Surfaces

By Wilfred H. Brown

The sketch shows a set of tools designed by the writer, originally for the purpose of finishing the valves and seats of a pneumatic hammer made by the Pneumatic Tool and Machine Co., Petrograd, Russia, and later in this country applied to the making of molds for tennis balls. Accuracy of contour and smooth finish were essential in each case; less than 0.001 in. tolerance in size and sphericity being allowed.

The cutting blades were ground to size and shape after hardening and, so perfectly did they do their work, no finishing operations were necessary except to polish the hardened parts with various grades of emery cloth.

Two cutters were placed face to face in the holder as shown. The bulk of the metal was, of course, removed from the stock by means of a tool held in the slide rest in the ordinary way.



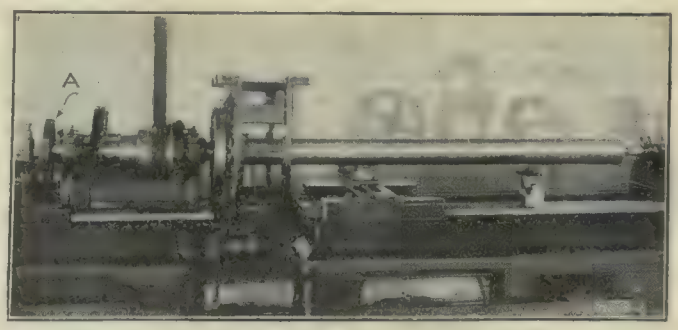
TOOLS FOR FINISHING HEMISPHERICAL SURFACES

Resourcefulness Versus Equipment

By Carl H. Briggs

At the New London, Conn., Vocational High School, each graduating class is required to build, as the culmination of its training, some particular machine or device needed in the school's shop. Included in the products of the graduating classes are a 5-hp. electric motor, a hand milling machine, a gasoline marine engine, four bench drilling machines, a number of machinists' vises and a twin-wheel tool grinding machine.

In building the electric motor it was found that no lathe of sufficient swing was available for boring out the frame. The piece was finally machined in the manner shown in the illustration. Two lathes were placed close together, end for end, and carefully lined up. The headstock of one lathe (shown at the left in the illustration) was turned around and the motor frame mounted on the faceplate and arranged to swing between the ends of the two machines. The headstock of the lathe at the right was removed and the boring tool mounted in the toolpost. The long steel bar shown in the illustration was swung between the headstock of the first lathe and the tailstock of the second lathe, in order to minimize the vibration. With the two machines arranged in this manner the motor frame was bored out, thirty minutes being required for the operation. Another interesting operation was performed at the same set-up. This particular size motor has eight slots in the frame for retaining the field. In machining



HOW THE MOTOR FRAME WAS BORED BY USING TWO LATHES SET IN TANDEM

these slots a sort of hand broaching process was employed. At the time this motor was built the school was in an early stage of development and did not possess a shaper or a slotter, so that further improvision was necessary to complete the piece. A grooving tool was clamped in the toolpost of the machine at the right, and the carriage actuated back and forth by means of a long lever operated by hand with one end secured to the floor. Feeding the tool for the proper depth of slot was accomplished by means of the cross-slide movement, the slide being adjusted to allow the tool to cut several thousandths deeper at each pass. Indexing was accomplished by means of a gear mounted on the rear end of the headstock spindle of the lathe at the left. This gear is shown at *A* in the illustration. The teeth of the gear were filled with wax. Each tooth space coinciding with an eighth of the circumference was cleared of wax, and the indexing positions maintained by means of a piece clamped in the toolpost and meshing successively with each clean tooth space.

EDITORIALS

More Relief for the Taxpayer

DON'T fail to read the short article on amortization which appears on another page. It tells of the possibility of filing amended returns for the years from 1918 to 1921, in which claims for amortization of equipment to a present replacement cost basis may be entered.

We do not pretend to know much about income and profits tax matters, but we do know enough to consult expert advice when the occasion for it arises. Hence the three amortization articles which appeared some weeks ago, all written by experts on the subject, and the present article telling what the recently issued Treasury Department Regulations 62 mean, and bringing the information on income tax procedure up to date.

From the manufacturer's point of view, our internal revenue laws leave much to be desired, and particularly, the act of 1921 from which too much was expected. Of course, the ultimate consumer is the real sufferer in the end, but the blow reaches him in such a way that the blame for it falls more upon the producer than upon the law and the men who passed it, where it really belongs.

On the other hand the 1921 law does leave a loophole through which some light reaches the harrassed manufacturer. Claims for amortization deductions may be made through amended returns for 1918, 1919, 1920 and 1921 under certain restrictions. If you are not familiar with the contents of Regulations 62 take the matter up at once with your tax adviser. You may be entitled to no additional relief, but if you are justified in claiming some it will probably be well worth the effort. Many a plant has made entirely inadequate amortization claims and will benefit greatly by taking advantage of the new rulings.

Call Money Becomes Plentiful

DO YOU believe in signs? We do, in certain ones. Take a ladder, for instance. We admit to a superstitious dislike of walking under one, particularly if there is a painter on it. Seriously, however, there is a sign in Wall Street that we thoroughly believe in. Call money closed at three per cent one day last week and there was a report that ten millions had been loaned outside at two and a half.

If you are looking for signs of returning business here is a fairly reliable indicator. When men have so much money that they will lend it at three per cent or less it is reasonably certain that they are in buying mood and that business is better and will soon be good.

The low money rate also indicates that a definite point in the business cycle has been reached where liquidation is practically complete and recovery has commenced. Our friends, the economic prognosticators, point with pride to this sign, not only as a good omen for the future, but as proof that the prophecies made for better business this spring are on the point of realization. As for us, we are more than willing to listen with patience to their "I told you so" song.

Personnel of the Machine Tool Industry

THE men who established the machine-tool industry were for the most part earnest young mechanics who saw the need of better machines and methods for doing work. Conditions in the early days of the industry were very different as to the capital required, and the fluctuations in demand were far less marked than at present.

Without the work of these pioneers the industrial supremacy of the United States would never have been accomplished. Interchangeable manufacture is directly due to the design and quality of the machine tools which they developed. It could not have been accomplished in any other way.

If our industrial supremacy is to continue we must have a real incentive for the younger engineers to devote their lives to this side of manufacturing problems. The condition of the machine-tool industry has not, however, offered much material encouragement to young men, no matter how much they may have been interested in that line of work.

This has been partly because the industry has never been able to pay the salaries which the same young men readily secure in other lines. As evidence we have only to note how the bicycle and the automobile industries have attracted the best men by salaries which few machine-tool concerns could or would pay. The other reason is that it is difficult for the proprietor who has struggled up from day wages to appreciate the changes which have come over all industry. He cannot see why the young man of today is not content to work as long hours and for as little money as he did.

The machine-tool industry must be brought up to a higher standard. It must be made attractive to the best mechanical minds of the country. Engineering ability and genius applied to machine tools affects and improves all manufacturing, whereas if applied only in one of the manufacturing lines its usefulness is more limited.

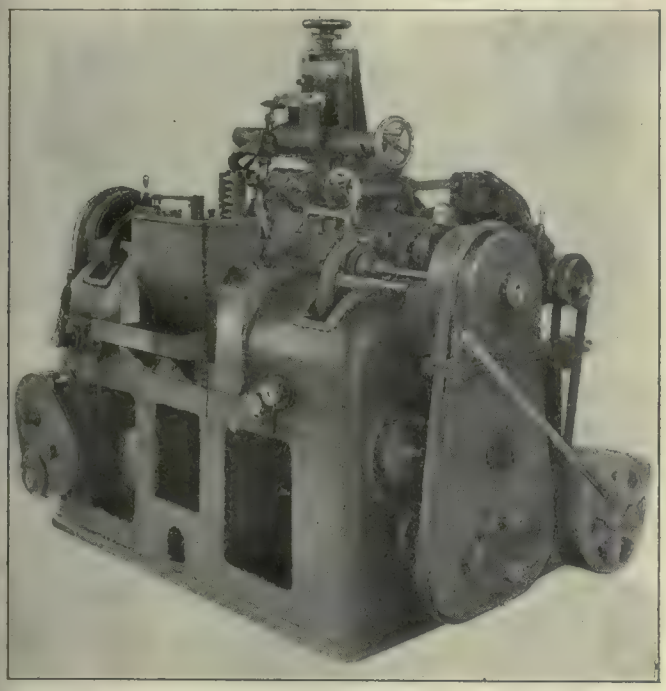
The machine-tool shop which is not so organized as to attract bright young mechanics and to retain them, cannot hope to become or remain an important factor in the industry. And when, as at present, there is very little in the whole industry to attract the best brains and skill, not only is the industry itself in a bad way but the manufacturing supremacy of the country is in danger. It must also be recognized that the machine tool industry is one of great fluctuations in the volume of business. Slack periods must be bridged over if the industry is to continue, as of course it must.

The danger is even more vital to the users of machine tools than to the builders. The buyer who makes it difficult for the maker to get a price that will maintain the industry as it should be, is killing the goose that lays the golden eggs of the profits which come from low manufacturing costs. The future of the industry depends largely on maintaining a superior personnel. Designers with fertile but practical brains must be encouraged in every way, for without them we cannot retain our leadership in this field.

Shop Equipment News

Fraser Automatic Cylindrical Grinding Machine

The machine shown in the accompanying illustration is intended for grinding cylindrical parts held on centers and having diameters larger than ½ in. It is a fully



FRASER AUTOMATIC CYLINDRICAL GRINDING MACHINE

automatic, plain grinding machine recently placed on the market by the Warren F. Fraser Co., of Westboro, Mass. The principal features of the machine are the simplicity of construction and the speed of operation. It is adapted particularly to grinding shafts, bolts, valve tappets, piston pins and similar work. The maximum length of the grind is 6 in., while work up to 10 in. in length may be held between the centers. If desired, the work may be held in draw-in chucks.

The weight, which is approximately 7,000 lb., is stated to aid the performing of operations with smoothness and accuracy. The grinding wheel is 18 in. in diameter and can be used in face widths up to 6 in. Lubricant is forced to all bearings.

The machine is entirely self-contained and run by a 15-hp. motor through a 4½-in. belt. If desired, it may be driven by means of either an overhead countershaft or a constant-speed pulley. The machine controls are easily accessible to the operator. One operator can handle as many as four machines on certain work.

The automatic operation enables production at high speed. It is stated that on piston pins ⅞ in. in diameter, and 3¼ in. long, a production rate of five per minute was obtained. The machine requires no more time to set up for an operation than ordinarily required for an automatic screw machine, and usually less time is taken.

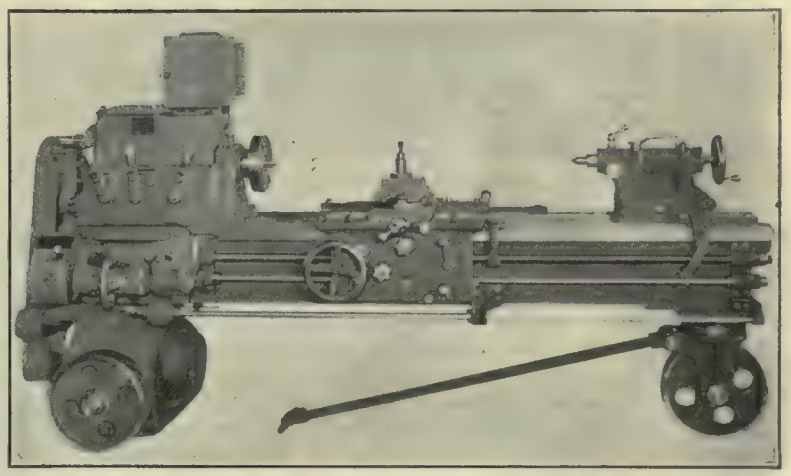
Lehmann Portable Motor-Driven Geared-Head Lathe

The Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo., has just brought out a geared-head engine lathe of the portable type, especially adapted for use in railroad shops and in plants doing large work where it is desirable to bring the tool to the job. The lathe, shown in the accompanying illustration, is built in two sizes, having 18¼ and 20¼-in. swings respectively. It is driven directly by a 1,800 r.p.m. motor through a belt tightened by an idler pulley. The motor is mounted in the cabinet leg under the headstock. The pulleys and belt and all working parts are fully covered by metal guards.

The headstock provides sixteen spindle speeds in almost geometrical progression with the use of only ten gears, all of which are heat-treated. The headstock housing forms an oil-tight case for all running parts. The spindle is hardened and runs in phosphor-bronze bearings. All the other shafts in the headstock run on ball bearings.

The spindle nose has two diameters, one in front and one behind the threads, so as to give firm bearing surfaces for the face and chuck plates. The forward and reverse motion is obtained through friction clutches running in oil. The control handles for the reversing mechanism are located both at the apron and at the head end of the lathe, so as to be always in convenient reach. The clutches require no adjustment, and are capable of transmitting a slightly heavier load than the work requires.

The arrangement of the three wheels and the handle for moving the lathe can be seen in the illustration. The starting box of the motor is mounted on top of the headstock. The lathe has all the features incorporated



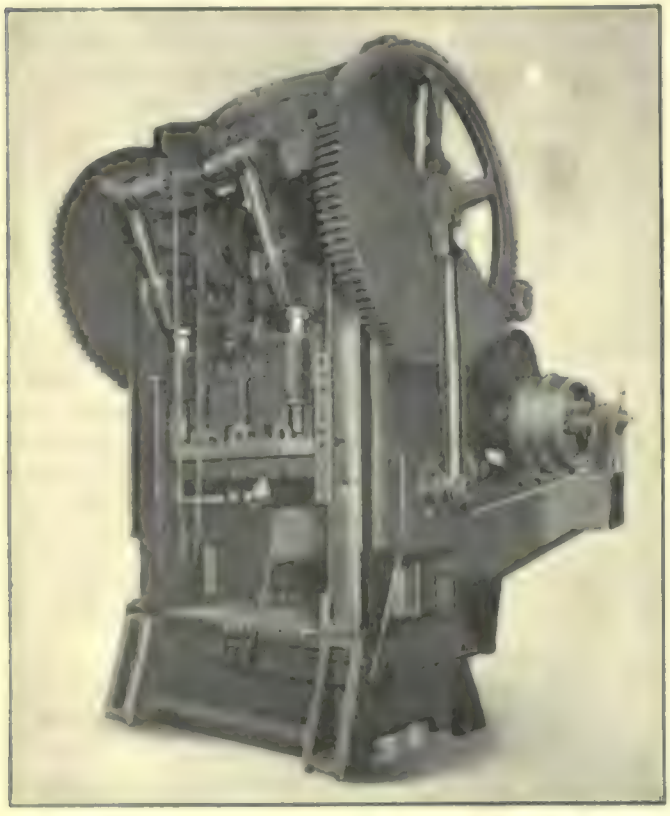
LEHMANN PORTABLE MOTOR-DRIVEN GEARED-HEAD LATHE

in the regular line of Lehmann machines, being equipped among other features with a quick-change mechanism, locking device for the tailstock spindle and a rod and screw shift. Mounting the motor under the bed does not increase the width, so that the machine can be moved through narrow aisles.

Bliss Double-Crank Toggle Press

The accompanying illustration shows a large double-crank toggle drawing press recently built by the E. W. Bliss Co., Brooklyn, N. Y. The press is intended for drawing pressed-steel axle housings for automobile trucks, the material worked on being ⅜ in. thick. The machine is also applicable to the making of heavy stamping of all types. It is of the tie-rod construction, is twin driven and triple geared. The ratio of the gearing is 65 to 1, and all gearing in the driving train is of steel with machine-cut teeth.

Power is transmitted from the main driving gears to the outside slide or blank holder through a series of toggles on which a dwell of 120 deg. is obtained. The drive to this slide is at both ends of the press, the same arrangement being employed for the inner slide. The small number of connections or links used in transmitting the power to the outer slide requires the consumption of only a small amount of power in the mechanism itself, and gives a simple and sturdy construction.



BLISS DOUBLE-CRANK TOGGLE PRESS

To reduce wear at the joints, the connecting pins are hardened and ground. The adjustment of the inner slide or plunger is made by a 15-hp. motor mounted on the front of the crown. The machine itself is driven by a 100-hp. motor. By means of a hand-actuated friction clutch of the double-grip type, the operator has the moving parts under control at all times.

Some of the principal dimensions of the machine are as follows: The stroke of the inner slide is 28 in., while that of the outer slide is 20 in. With the stroke movement down and the adjustment up, the distance from the bed to the inner slide is 59 in., and from the bed to the outer slide 56 in. The bed has an area of 60 x 116 in., the face of the blank holder of 60 x 102 in., and the face of the plunger of 36 x 86 in. The machine weighs about 600,000 pounds.

Davis-Bournonville Tube-Bending Machine

The Davis-Bournonville Co., Jersey City, N. J., has recently developed the machine shown in Fig. 1 for bending light tubing to special shapes. The bending is

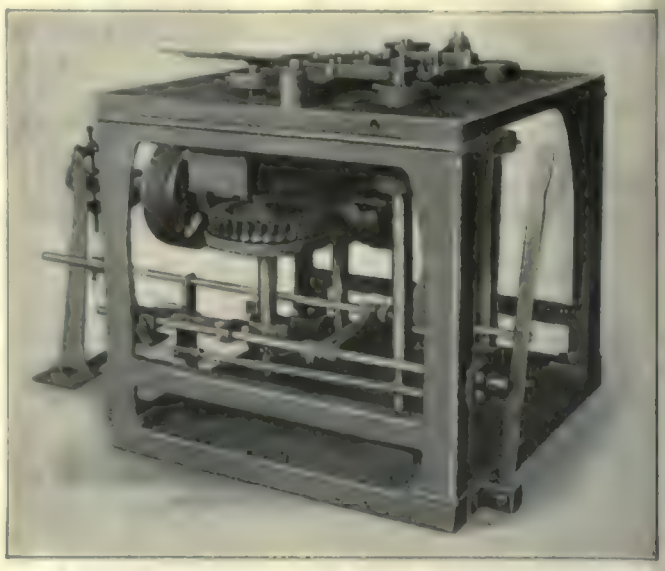


FIG. 1. DAVIS-BOURNONVILLE TUBE-BENDING MACHINE

accomplished by means of two arms or cranks on the top of the table actuated by vertical oscillating shafts. Various arrangements of links and rollers can be applied to the arms, so as to give the form necessary. The vertical shafts are driven by means of worm gearing and a crank motion underneath the table. A clutch is provided for starting and stopping. The machine is driven by belt on a pulley that normally runs at 300 r.p.m.

Although the machine can be applied to the bending of small tubing into any desired shape, it is here adapted to bending a ⅝-in. 22-gage steel tube to the shape required for the frame of a tennis racket. Two operations are required. In the first operation the tube is bent around a form so as to form the bends at the throat of the racket. The straight tube is inserted at the right of the form, while the arms are drawn back to provide clearance. By means of pins and rollers mounted on the levers, the tube is bent into a smooth curve.

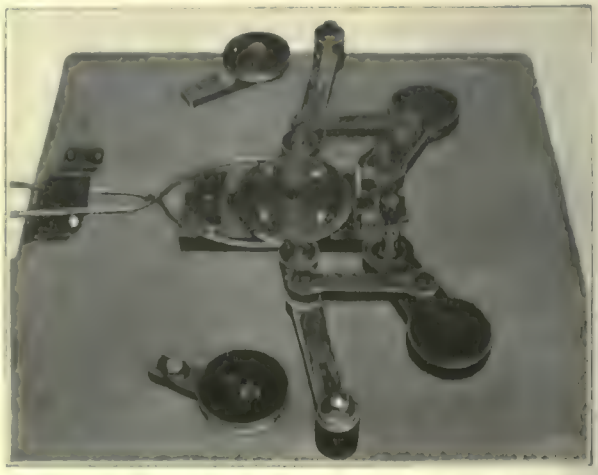


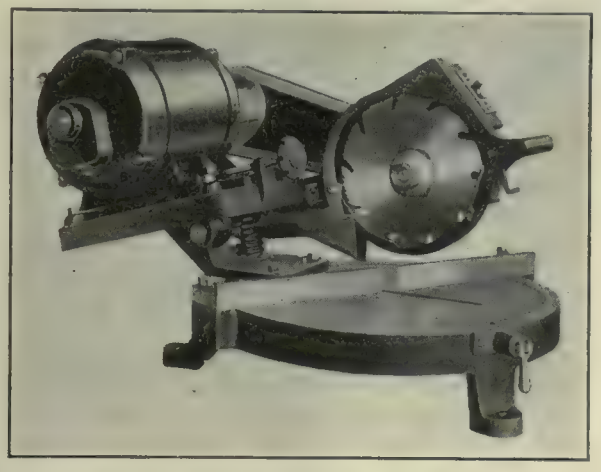
FIG. 2. FINAL OPERATION IN BENDING RACKET FRAME

After a lot of the frames has been given the first operation, the bending tools are changed to those shown in Fig. 2. The rollers on the ends of the cranks are removed and links are connected to the studs on the arms.

so that two small swinging arms can be actuated. The large rollers serve as locating stops. The tube is put in place with the linkage moved to the right, and then the machine bends the tube around the form so that the top of the racket is shaped One leg of the frame passes under the clip at the left, while the other goes over the top of it. It is necessary that the frame be bent to a greater angle of curvature than desired, in order to overcome the spring and to set the metal to shape. It is stated that 600 to 1,000 bends per hour can be made.

Tannewitz Portable Bench Saw

The accompanying illustration shows a small portable bench saw recently placed on the market by the Tannewitz Works, Grand Rapids, Mich. The machine is motor-driven and self-contained, and is adapted particularly to light work in cutting and fitting wood parts. The base of the machine carries a one-piece table, upon which the motor and saw are mounted. It is possible to swing the table and saw to any angle up to 45 deg. in either direction. This feature is of use particularly in cutting molding for miter joints. The motor and the saw are mounted on a frame that swings about a horizontal axis. A coil spring serves to keep the saw normally in an elevated position. The motor is belted to the saw arbor, and a screw adjustment is provided for varying the tension of



TANNEWITZ PORTABLE BENCH SAW

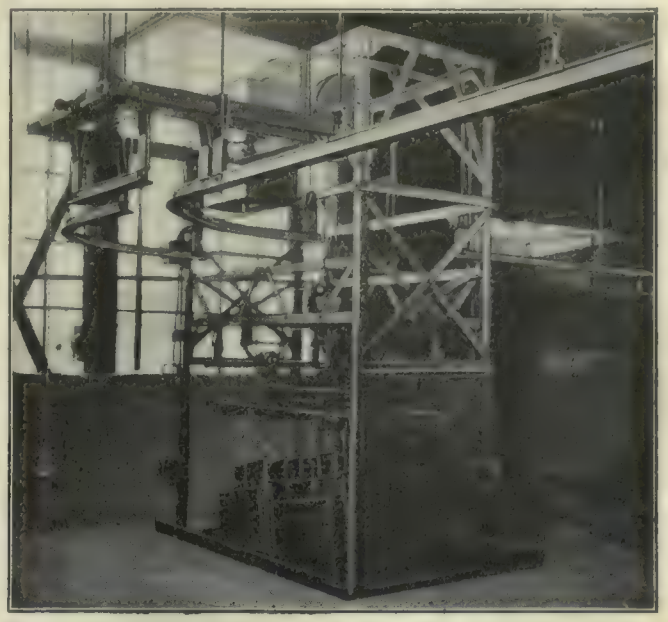
the belt. Both the belt and the pulleys are covered by a metal guard. The saw itself has combination teeth, that is, both large and small.

The saw is covered by a metal housing, at the front of which is the handle for depressing it. But one hand is required for manipulating the saw, so that the other hand of the operator is free to control the work. A switch near the control handle serves for starting and stopping the motor. The bottom of the saw is protected by a metal guard on each side of it. When the saw is raised, this guard is locked in position, so that the work cannot be put in contact with the saw teeth accidentally. Before making the cut, the operator unlatches this guard with his right forefinger, so that the saw can be fed downward while the guard merely rests on top of the work.

A spout placed at the rear of the saw carries off the dust, so that it is not thrown in the operator's face. A permanent gage for positioning the work is secured on the stationary bed. The swiveling table can be locked in any position desired, and it is also possible to lock the saw at any height.

Cleveland Hand or Electric Tramrail Elevator

The elevator shown in the illustration has just been developed by the tramrail division of the Cleveland Crane and Engineering Co., Wickliffe, Ohio, to facilitate



CLEVELAND TRAMRAIL DIPPING ELEVATOR

the dipping of materials in tanks or vats in conjunction with painting, japaning, pickling or boiling operations, where hand or electric tramrail systems are used. The elevator forms a section of the tramrail system itself, in that the carriers loaded with the materials to be dipped are run onto sections of track attached to the elevator platform, which is then lowered into the solution.

The size of the elevator depends on the size of the tanks or vats employed, while the height is regulated by the height of the tramrail from the floor and by other existing conditions. The structural steel angles for the elevator shaft are riveted and braced with gusset plates, angles and cross braces, to provide a structure rigid enough to handle all weights in the capacity of the tramrail itself.

A one- or two-ton electric hoist, fastened to cross members at the top of the elevator frame, furnishes the motive power for raising and lowering the platform. Air hoists can be used instead, if electric power is not available or if greater speed is required. The electric hoist can be arranged with a push-button switch located on the elevator frame. The control is automatic in operation, since it requires only pushing the button to start lowering the carrier into the tank. The control stops the load at its lowest position, holds the materials in the solution for any predetermined length of time to which the control is adjusted, and then returns the load to the original position with the movable section of the rail in line with the stationary tramrail.

The carrier can be pushed off the elevator platform on to the tramrail proper, allowing the dipped materials to be placed in position over the dripping pans.

A riveted structural steel framework composes the movable section of the elevator. The corner angles fit loosely inside the corner angles of the shaft, which form a guide for lowering and raising the platform. Any

number of sections of tramrail corresponding with the stationary system, are located on the bottom of the platform and suspended by suitable hangers. Fingers are dropped over the movable rail sections to stop the carrier wheels at the proper position for lowering the materials into the tank. When the elevator rail is lowered, similar stop fingers fall into place on the ends of the open rails leading to the elevator. This automatically prevents other carriers from over-running the open ends of the rails.

The elevator platform is suspended from the hoist sheave block by a compression spring to reduce shock that may be caused when the materials are being raised. The load is steadily lifted without agitating the solution or causing any undue shaking of the dipped parts.

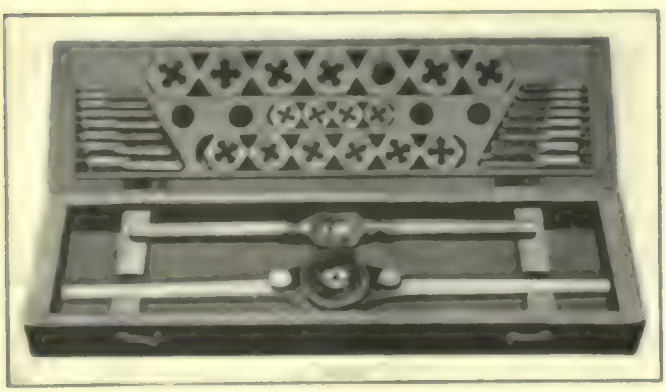
Wells Screw-Plate Set

The Frank O. Wells Co. Inc., Springfield, Mass., has recently placed on the market the screw-plate set shown in the accompanying illustration. The stock for holding the dies is made of an aluminum alloy, so as to have both lightness and strength. The tap wrench is made of steel with hollow handles and is 15-in. long. The dies are all of hexagon shape, and are adjustable as to size. This adjustment is accomplished by turning a fillister-head screw fitted in the side of the die that has a saw-cut through it. Since the tendency when cutting is to force the die outward, the screw merely serves to draw it together to the size desired.

It is not necessary that the die always be used in the stock, as it can be turned by an ordinary socket or open-end wrench, so that it can be employed in close quarters. It can be applied on a screw machine, as it aligns itself readily. The cutting edges of the die are of standard form and have large chip clearances, so that they are suited to cutting thread from the solid and not merely to re-threading. The cutting faces are formed by broaching. The dies are reversible, so that they cut with either side up.

The die stock is provided with an adjustable guide held in place by two knurled-head screws. When the screws are loosened slightly, the guide can be swung to one side so that the dies can be changed. When the screws are tightened, the guide is held in position over the center of the die, and the jaws of the guide are locked in place. An adapter or collet of hexagon form is furnished, so that dies of small outside diameter may be held in the same stock.

This No. 300 set includes eight dies from ¼ to ⅞ in. in size, in both U. S. S. and S. A. E. forms of thread. There are eight U.S.S. taper taps and eight S.A.E. plug taps. The complete set is packed in a wooden case.

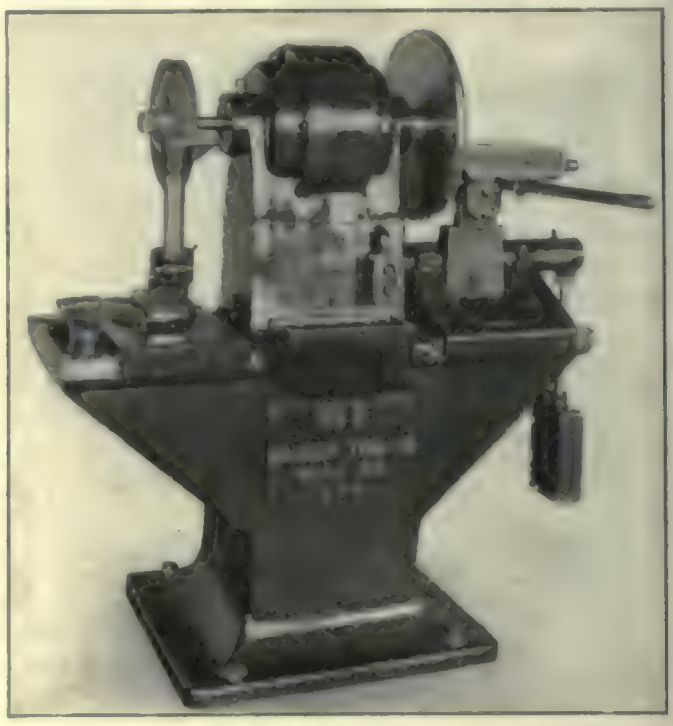


WELLS NO. 300 SCREW-PLATE SET

Badger No. 2 Grinding Machine

The illustration shows the No. 2 grinding machine recently placed on the market by the Badger Tool Co., Beloit, Wis. While various forms of equipment are applicable to this machine, it is here shown with the right end equipped with a 16-in. disk wheel faced with a "Diacarbo" abrasive disk ¾ in. thick. This disk is served by a universal lever-feed table. The left end of the spindle is extended to receive a 12-in. solid grinding wheel served by an adjustable work rest.

The 3-hp. G.E. motor is fitted with special end frames and S.K.F. ball bearings for both radial and thrust loads. The motor is fully enclosed and has forced ventilation, with the current passing down through the



BADGER NO. 2 GRINDING MACHINE

machine pedestal. A push-button station and automatic starter are furnished. The weight complete is 1,300 pounds.

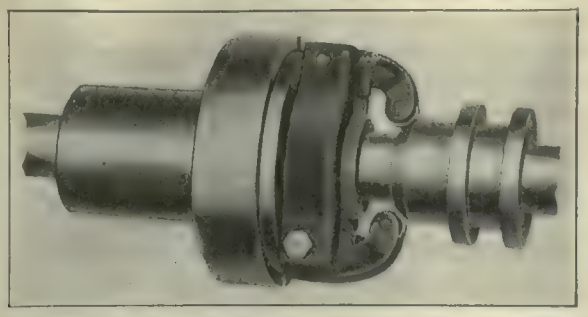
Carroll Extended-Sleeve Clutch

The accompanying illustration shows an extended-sleeve friction clutch that has recently been placed on the market by the L. W. Carroll Manufacturing Co., Batavia, Ohio. The clutch is intended especially for the driving of wood, steel or cast-iron pulleys, gears, sprocket wheels or such parts placed on the sleeve. It consists of but few parts, and is compact in construction.

The friction disk is of large diameter, which permits of a strong, uniform grip capable of fine adjustment. The spider is keyed to the shaft, or held by a hollow set-screw. The clutch can be erected by merely sliding it on the shaft and tightening one screw. No extra collars are required to hold it together, and it is not necessary to compensate for end thrust.

In order to adjust the friction, it is necesary to turn only one nut, which automatically adjusts the tension for both of the fingers. The clutch is intended to run under hard usage with practically no wear and without noise. It may be placed on the line shaft, so that it

drives directly to tne machine without using a countershaft. In this way, considerable space and belting are saved. When used as a cut-off coupling, it enables the



CARROLL EXTENDED-SLEEVE FRICTION CLUTCH

stopping of one group of machinery without interfering with the others, and it eliminates the shifting of belts on tight and loose pulleys to engage or disengage a section of shafting. The bearing end of the shaft runs in a bronze bushing that is supplied with oil from the chamber around the bearing.

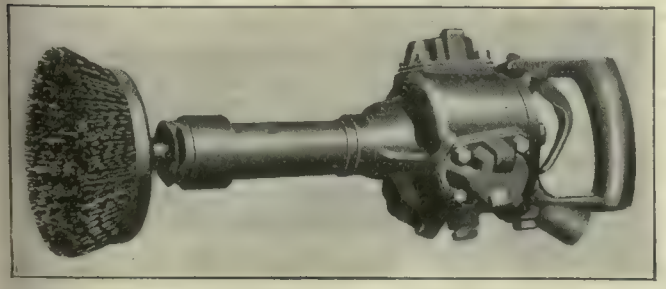
The clutch may be furnished in six sizes, from 5 to 12 in. in diameter. At 100 r.p.m., the horsepower transmitted is 2 to 13, depending on the size. The sleeves are 5 to 6 in. in length.

Ingersoll-Rand "Little David" Wire Brush

The Ingersoll-Rand Co., 11 Broadway, New York, N. Y., has just brought out the No. 601 "Litle David" air-driven wire brush illustrated herewith. The tool is especially intended for removing paint, rust, dirt and scale from tanks, cars and structural steel forms where the area to be cleaned is large and fast work is required. Its chief feature is the speed at which the brush rotates, a point which is stated to enable faster working and to give long life of the brush under severe service. The device differs from the "Little David" brush described on page 1,021, Vol. 54, of AMERICAN MACHINIST, in speed primarily, although it carries a larger brush.

The air motor is of the three-cylinder type, so that all parts are balanced and the machine operates without vibration. Light weight is obtained by using an aluminum casing reinforced with cast-in steel bushings. The complete machine weighs only 14 lb. The average free speed of the brush when operating on 90 lb. per sq.-in. air pressure, is 4,200 r.p.m. The diameter of the brush itself is 6 in., and the length of the tool overall is 17½ inches.

It is stated that on a prolonged test of the brush, steel gondola cars averaging 540 sq.ft. of surface were cleaned in 3½ hr. each. All-steel box cars having 1,400 sq.ft. of surface each were cleaned in 7½ hr. Not only rust, but old paint as well, was removed.



"LITTLE DAVID" No. 601 WIRE BRUSH

Blount Speed Lathe with A.C. Motor Headstock

In the accompanying illustration is shown a 12-in. swing speed lathe for bench mounting that has recently been placed on the market by the J. G. Blount Co., Everett, Mass. The lathe is intended especially for wood turning in manual training schools and in pattern shops.

The principal feature of the machine is the fact that a ½-hp. alternating-current motor is mounted directly on the spindle of the headstock. The spindle is made of 45-point carbon steel, has a hole ⅝-in. in diameter throughout its entire length, and a No. 2 Morse taper hole for the center point. The spindle nose is 1⅛-in. in diameter and has ten V-threads per inch. An outside faceplate and pulley combined, 8 in. in diameter, may be employed



BLOUNT A.C. MOTOR HEADSTOCK SPEED LATHE

for belting the motor to auxiliary equipment. The spindle is mounted on S.K.F. radial and thrust ball bearings carried in dust-proof housings. The motor is fully enclosed, so as to exclude dust.

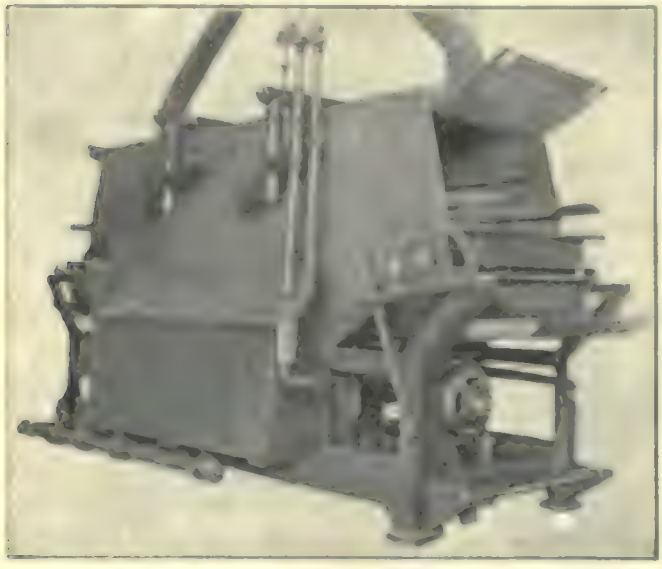
The bed has a flat top and may be supplied in lengths of 4, 5 or 6 ft., the maximum distances between centers for the different lengths being respectively, 25, 37 and 49 in. Short legs for bench use are ordinarily fastened to the bed, although long legs for supporting the bed from the floor can be supplied.

The bed is widened out under the headstock, so as to allow room for the controller. A casting bolted to the leg and to the lower part of the bed serves to fully enclose and protect the starting device. A hand lever on the front of the bed permits of changing the speed of the motor. Four speeds are provided, namely 575, 1,160, 1,750 and 3,450 r.p.m. The wiring between the motor and the controller is, of course, completely enclosed.

A tailstock fitted with an adjustable spindle and a device for clamping it to the bed are provided. The rest holder is clamped by means of a single handle, so that its position may be quickly adjusted. Each lathe is equipped with one spur and one cup center, three T-rests, a 5½-in. faceplate, a 3-in. screw chuck, a knockout rod for the head center and one right-angled rest. Other equipment can be furnished.

Colt "Autosan" Metal-Parts Washing Machine

A machine intended to cleanse screw-machine products and other parts in process of manufacture from the grease, oil, or compound with which they are flooded



COLT "AUTOSAN" METAL-PARTS WASHING MACHINE

during the cutting operations, has been placed on the market by the Colt's Patent Fire Arms Manufacturing Co., of Hartford, Conn., under the trade name of "Autosan." Pieces of work not exceeding 20 in. in width and 14 in. in height can be cleaned in the machine.

The machine is a development of the needs of its manufacturers, whose principal products necessitate the continuous washing of small parts, involving much labor and loss of time when performed by dipping the parts in tanks. The machine illustrated herewith is complete, except for suitable tables to facilitate handling the work. It is entirely self-contained, and requires no auxiliary connections in the way of shafting and belts. Wiring to the motor, and pipe connections to the steam and water supplies and to the overflow, complete the installation.

A linked conveyor belt passes through the cleansing chamber and over drums at the ends, being driven at a constant slow rate of travel by the motor. In the cleansing chamber, the work passes through two separate series of sprays forcibly ejected through small nozzles by a powerful rotary pump that is a part of the machine. Each set of sprays is so arranged as to deliver the jets upon the work from the top, bottom and both sides. The speed of travel can be varied from 10 to 17 ft. per minute, so as to adjust it to conform to the time required for cleansing the work, and to the speed with which the operator can handle and feed the trays to the machine.

The circulating units, consisting of tanks, piping and pump-chambers, are complete and separate from each other, so that a first and second soda solution, or a soda solution followed by a hot-water rinse, may be used. Though the machine shown has but two sections, it can be supplied with three or more.

The work may be handled upon wire-bottomed trays or may be left upon the wooden racks upon which work of this nature is often handled in its progress through the factory. The operator has only to push a tray or rack of work into the receiving end of the machine past the swinging flap that confines the steam and spray within the chamber and he need pay no further attention to it or to the machine until it is delivered to the work tables at the other end. Roller tables or conveying tables can be employed for carrying the work both to and from the machine.

For handling large quantities of very small parts, a small tumbling barrel is provided. The ends of the barrel are perforated disks of metal notched on the periphery to match the links of the conveyor. The weight of the barrel and contained work is borne upon trunnions at each end that run upon fixed tracks extending through the chamber. A pinion upon one of the trunnions meshes with a rack attached to the inner wall of the chamber, so that when the barrel is rolled into the receiving end of the machine, though the action of the conveyor links tends to roll it in a reverse direction, the pinion carries it along in the same direction that the conveyor is moving. Thus a differential movement is established. The barrel is slowly rotated and also carried slowly forward. The time of its passage is about five times the normal time of the conveyor.

The machine equipped with two sets of sprays requires a floor space of 116 x 44 in., exclusive of the work handling tables, and it is 61 in. high. It is driven by a 2-hp. motor that can be furnished to suit any current. The net weight is 2,700 pounds.

Elwell-Parker Drop-Frame Factory Truck

The Elwell-Parker Electric Co., Cleveland, Ohio, has recently placed on the market the low-platform electric truck illustrated herewith. The truck is intended for



ELWELL-PARKER DROP-FRAME TRUCK

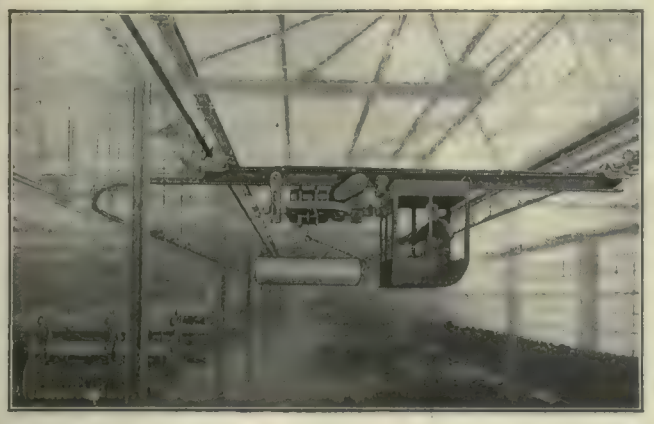
handling barrels, bales and heavy material where an especially low platform is desired. It is very similar to that described on page 347, Vol. 48, of AMERICAN MACHINIST, except with regard to the height of the platform for the load.

The very low platform is obtained by dropping it below the tops of the wheels. Housings are placed over the rear or trailing wheels, which carry rubber tires 10½ in. in diameter and 5 in. wide. The driving wheels have tires 21½ x 3½ in. in size. Steering is accomplished on all four wheels.

The storage battery is carried on the upper deck at the front of the truck. The motor and the worm drive axle are placed below it. The truck is intended to travel from 15 to 20 miles on a single charge of the battery.

Cleveland Hand or Electric Tramrail Crane

A light-weight hoisting and conveying traveling crane with a maximum capacity of two tons, has been added to the hand and electric tramrail equipment manufactured by the tramrail division of the Cleveland Crane and Engineering Co., Wickliffe, Ohio. It is intended



TRANSFER CRANE ON CLEVELAND TRAMRAIL SYSTEM

to act primarily as a feeder or supply crane to the regular tramrail system in the stockroom or other depots, where materials are piled in such a way that an overhead traveling crane can best handle them and convey them over machines, bins and obstructions on the floor.

The light weight of the crane, which runs on the same size rail runways as the tramrail, permits its use in buildings of such structure that a larger traveling crane could not be installed. The runway hangers can be suspended from either the roof trusses or the floor above. The hangers are standardized as to length and method of attachment, a variety of types being furnished to suit the building construction.

The crane consists of an I-beam suspended at each end, as shown in the illustration, from the bottom of two cast-steel carriers, which in turn are suspended in the wheel yoke hangers. The minimum span is 3½ ft., and the maximum 24 feet.

The carrier wheels are fitted with double-row ball bearings. The outer ball bearing races are ground in the chilled wheels, and the inner races on the periphery of the hardened steel hubs. The wheels are arranged in pairs, one on each side of the rail, permitting an easy motion of the crane on the runways. This motion can be operated electrically by cab or floor control, or the beam simply run along the runway by pushing the load that is being conveyed.

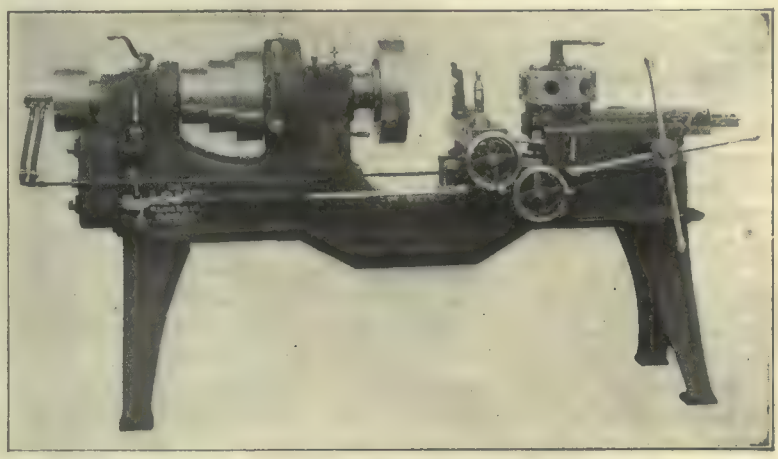
When operated as a simple lightweight crane, there are stop blocks at both ends of the I-beam; when arranged to connect direct with the tramrail system, at one or both ends, the crane becomes a transfer bridge, with stop blocks arranged accordingly. When operating as a transfer bridge, the lower flange of the I-beam matches with the tramrail track at various points along the crane runway, so that the crane may travel over the tramrail system and back again onto the beam. This method of transferring makes it possible to reach all parts of the floor space in the factory. The hoist may climb inclines up to 12½ deg., or run on an elevator to be raised to any floor.

The type of carrier depends on the materials to be handled, the size or length of the system, and the total floor area served. For large installations the most suitable carrier is the electrically operated travel and hoist with an enclosed operator's cab. This equipment permits operating out of doors, and also indoors in foundries and places where fumes or smoke may be encountered. Large indoor installations may be served with an electric carrier having an operator's platform. This arrangement gives speed in travel and permits the operator to hook and unhook the load.

Smaller indoor systems are served from the floor. An electrically operated carrier and hoist may be controlled by a push-button switch on an arm suspended from the carrier to a place within easy reach of the operator. The simplest carrier employed for either the crane or transfer bridge is a hand-operated chain hoist hung on the simple four-wheel carrier, and moved by pushing on the load carried.

Cincinnati Acme Gap Turret Lathe

The accompanying illustration shows a turret lathe provided with a gap bed, a machine that has recently been placed on the market by the Acme Machine Tool Co., Cincinnati, Ohio. It has all the regular dimensions of the 20-in. Cincinnati Acme turret lathe, excepting that the gap provides for a maximum swing over the bed of 28 in. The length of the gap from the end of the spindle is 9⅜ inches.



CINCINNATI ACME GAP TURRET LATHE

The machine is equipped with an air chuck, power feed for the cross travel of the cut-off rest, and power feed for the longitudinal travel of the turret. However, the arrangement of the feeds can be furnished as desired for the work.

Lawson Drill and Tap Crib and Gage

The Victor R. Lawson Co., 35 Hartford St., Boston, Mass., has recently placed on the market the "One-Glance" drill and tap crib and gage shown in the accompanying illustration. The device consists chiefly of a drill crib with a drill gage built into it. The entire crib is 41 in. long by 9⅜ in. wide, and contains sixty semi-circular pockets 1¼ in. wide.

The pockets in the lower row are 4⅛ in. long, and are intended to hold drills from Nos. 1 to 30. The upper pockets are 2⅛ in. long and hold drills from Nos. 31 to 60. The holes for the drill gages are located just at the ends of the pockets in hardened steel strips.

These strips are inserted in the wood of the frame, on which heavy type numerals give the number of the drill required to fit each hole, as well as the drill diameter in decimals. Since the figures are ½ in. in height, they should be readable at a distance of 8 feet.



LAWSON "ONE-GLANCE" DRILL AND TAP GAGE

The taps are placed perpendicularly in holes in the member dividing the upper and lower pockets. Holes are provided to hold three taps of each size from 14-20 to 4-36. Each set of taps is adjacent to the correct drill to use in drilling the hole for it in order to tap a full thread. A red line extending along the board indicates the largest size of drill that could be used. It is thus possible to select a drill for either ½, ¾ or full thread. It is unnecessary to refer to tables in order to find the proper drill for each case, as the relation between the sizes of the drills and the taps can be observed by noting the relative positions of the tools in the crib.

The holes for containing the taps are drilled to the proper size, so that a tap larger than the required size cannot be placed in it, while a smaller one will fall through the board. It is thus possible for the workman to pick out the correct size of tap merely by knowing its proper position on the board. Besides serving as a container for the taps and drills, the board may be used as a ready reference table of drill sizes.

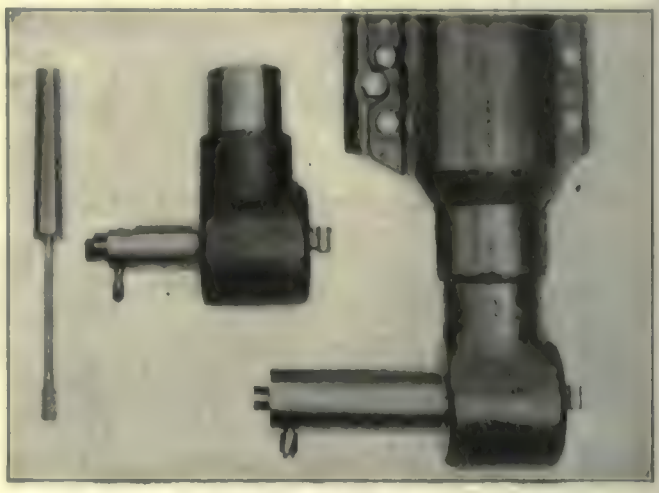
The board holding the pockets is carried on trunnions by two posts mounted on a base, so that the whole unit is easily portable. Due to the fact that the trunnions are tightly pinched in the brackets of the posts, the tray may be titled to any angular position, and will remain so fixed. The base can be attached to the wall, so that it is not even necessary to employ bench space for the crib.

Harris Offset Drilling Attachment

The H. G. Harris Engineering Co., Bridgeport, Conn., has recently developed the offset drilling attachment, shown in the accompanying illustration, for work where a very small clearance space is available. The tool is intended especially for drilling, milling, counter-sinking and counter-boring port holes and grooves in the cylinders of air-driven tools such as drills, hammers and riveters. It is made to reach into the main bore and drill or mill the vents or ports from the inside. It may be used to drill to a specified depth, to counterbore, or to mill circular, transverse or longitudinal slots. It may, of course, be applied to other jobs of drilling in bores, such as when machining oil grooves, keyways or splines.

Owing to the small space and comparatively long overhang with which these tools must work, practically no clearance space is allowed; and the offset or horizontal arm is made as large as the bore of the air chamber and the depth of drilling or milling will permit. Both the power-transmission parts and the offset arm are made of tool steel, heat-treated by the Bellis process, and then ground and lapped. The clearance space inside the arm is very small, so as to add to the strength of the arm. Drills, mills and counterbores having special shanks ground and lapped to fit the spindle in the outer end of the arm are used. They may be easily changed, and have a limited adjustment for depth to allow for grinding and setting.

At the right of the illustration is shown one of the arms mounted in a special bracket on the slide of a Becker vertical milling machine. At the center is shown another offset attachment having a smaller arm and being interchangeable in the bracket with the long arm. The driving spindle is shown at the left of the illustration. It has a taper shank fitted to the machine spindle, and at the lower end is squared to drive the attachment.



HARRIS OFFSET DRILLING ATTACHMENT

It should be noted that the spindle is necked down between the squared end and the taper shank. This construction increases the elasticity, and also provides a point at which failure will occur in case of jamming of the tools. Since the lower half of the spindle is made of cold-rolled steel sweated into the taper shank, it can be easily replaced.

American Truck Wins

A report to the Department of Commerce states that on Jan. 15 the Argentine army made an official test of trucks for speed and economy when loaded to capacity and operated over dirt roads. The conditions of the test were considered so severe that only four trucks—one American and three German—were entered, although invitations were sent to all truck representatives in Buenos Aires. The course of the run was from Buenos Aires to San Fernando, from there over a dirt road to the national encampment at the Campo de Mayo, and after various tests at the camp, to return to Buenos Aires via Moron. The three German trucks (Krupp, Mercedes and Opel) were forced to abandon the test before reaching Campo de Mayo, but the American truck finished the entire course and completed the trials in a satisfactory manner.



NEWS SECTION

Commerce Department Plans Great Expansion

Many new activities in the Department of Commerce will be made possible after July 1, the beginning of the new fiscal year, as the result of the increase of approximately $370,000 over the amount which was available during the current year.

The greatest expansion will take place in connection with the commodity divisions, fourteen of which have been established since Secretary of Commerce Hoover took office.

Congress granted an increase of $200,000 in this particular fund, the total available for the promotion of export industries during the coming fiscal year being $450,000 as against $250,000 for the current year.

Four new divisions will be established covering the following industries: paints, chemicals, dyes and drugs; foreign investments and finance; advertising, packing and credit methods of exporters; and a specialty division to care for miscellaneous work.

New trade offices will be established in South and Central America and in Hong Kong, Bombay, Delhi and Batavia.

Superintendents' Club

Superintendents of thirty-six plants at Evansville, Ind., in different lines of industry, including machinery, metal-working, etc., have organized a local Factory Superintendent's Club, to meet once a month for a discussion of technical matters and problems, as well as to promote social relations between the men and affiliated interests. The organization proposes to co-operate with the Engineers' Club, recently formed in that city.

Cuba Leads in Purchase of Sugar Machinery

A recent report of the Bureau of Foreign and Domestic Commerce of the Department of Commerce states that $145,099 worth of sugar mill machinery was exported from the United States during January of this year. The figures show that Cuba was the largest customer, taking nearly one-third of the entire amount. Peru was also a healthy buyer, taking about $28,000 worth, while Mexico, Argentina and a few other South American countries also bought heavily.

Government Aid for Standardization of Implements

Senator France, of Maryland, believes there is need for standardization of farm machinery, and has introduced an amendment to the Agricultural Appropriation Bill, appropriating $10,000 for studies to that end by the Department of Agriculture. The amendment calls on that department to study the problem of the standardization and simplification of farm implements and machinery, and of repair parts for the same, with a view to more economical manufacture and use of the same.

Senator McNary to Report Against Metric Bill

A short, vigorous report condemning any compulsory adoption of the metric system will be made in the near future by Senator McNary, chairman of the sub-committee which has just completed an extended hearing on the Britton-Ladd metric system bill. This report will be made to the full committee, which is expected to adopt it as its own. Advocates of the metric system have asked Senator McNary if he would be willing to recommend the exclusive use, after five years, of the metric system by the Government.

Exports of Agricultural Implements Increase

Exports of agricultural implements and tractors for the first month of 1922 show an increase of $314,208 over the month of December, 1921, according to a report by the agricultural implement division of the Department of Commerce. Compared with January, 1921, however, there is a very decided drop—from $7,320,277 in that month to $1,011,435 in January of this year. There is reason for encouragement in the fact that statistics for January indicate an upward trend of exports. The exports for January, 1921, were not equaled during any other month of that year and steadily declined in succeeding months, reaching their lowest mark in the last month of the year, when the exports of implements were valued at $697,227.

The chief decrease in January, 1922, as compared with January, 1921, was in plows, cultivators, mowers and reapers.

Belgians Beat Germans for Rail Contract

That German costs are rising is indicated by the bid on 650 freight cars recently opened by the Argentine government railways. Germany has specialized in rolling stock construction and is recognized as being particularly strong in that field, yet she submitted a price more than double that of the lowest bidder.

This particular order, according to advices to the Department of Commerce, went to Belgium. The Belgian manufacturers agreed to furnish the 650 freight cars for 1,080,000 gold pesos. The American bid was 1,160,000 pesos. The British bid was 2,000,000 pesos, and that of the Germans 2,480,000 pesos.

Perpetual Inventory Study by Chamber of Commerce

The perpetual inventory, or stores control system, is strongly urged by the fabricated production department of the Chamber of Commerce of the United States as a better method in manufacturing establishments than the annual physical inventory, with its general disorganization and shutting down of the plant.

A practical treatise on the subject, which has just been issued by the Department under the title of "Perpetual Inventory or Stores Control," goes at length into the advantages of perpetual inventory and carries a series of illustrative forms. Doing away with the annual inventory of materials is only one of a number of benefits derived from the system as set forth by the department. Copies of the pamphlet may be had in limited quantities, free of charge, from the Chamber of Commerce of the United States, Mills Bldg., Washington, D. C.

Army Acquires More Ordnance Property

President Harding has approved an act of Congress authorizing the acquisition by the Army of a number of ordnance depots, including tracts of real estate for army purposes and including the following for ordnance depots: Ordnance depot, Savanna, Ill.; ordnance depot Pedricktown, N. J.; ordnance storage depot Middletown, Pa.; Aberdeen Proving Ground, Md.

The Trend of Business Improvement—Plants Resuming

The Chicago Bridge and Iron Works has increased the operating schedule at its Greenville, Pa., plant to 50 hours a week.

The Oakland Motor Car Co., Pontiac, Mich., is increasing operations at its plant and is now running on a basis of 100 complete automobiles a day.

The Ingalls Iron Works, Birmingham, Ala., has inaugurated a full-time working schedule with increased force of men.

The Missouri-Pacific Railroad Co. has resumed operations at its shops at Kansas City, Mo., following a shut down since last November. Other car and locomotive shops of the company at St. Louis, Sedalia, Mo., Littlerock, Mo., and Desoto, Mo., are now in operation, giving employment to a total of over 1,100 men.

The American Steel and Wire Co. has adopted a capacity schedule at its plant at Salem, Ohio.

The Stewart Manufacturing Co., 4535 Fullerton Ave., Chicago, Ill., manufacturer of die castings, is increasing production at its plant. The company is a subsidiary of the Stewart-Warner Speedometer Corporation, which organization is also operating at greater capacity at its plant on Diversey Parkway, Chicago. The company has booked business during the last three months of close to 100 per cent in excess of the corresponding period of a year ago.

The St. Louis Car Co., North Broadway, St. Louis, Mo., has received an order from the Southern Pacific Railroad Co., for 50 steel electric passenger cars for use on the lines of the Pacific Electric Railway, Los Angeles, Cal.

The American Locomotive Co., New York, N. Y., has taken orders for seventeen locomotives, including seven 102-ton Pacific type and three 76-ton switching engines for the Florida-East Coast Railway Co.; one 138-ton Mikado-type locomotive for the Kentucky & Tennessee Railroad Co.; four switching engines for industrial companies; and two switching engines for export account.

The Wood Newspaper Machinery Corporation, Plainfield, N. J., has adopted a full week operating schedule of 48 hours at its plant, replacing a 5-day week running basis.

The Wilson Foundry and Machine Co., Pontiac, Mich., is operating at full capacity its tire mold department, and has secured an order from the Fisk Rubber Co., Chicopee Falls, Mass., that will insure a continuance of production on this basis throughout the spring and summer. The company is operating its Knight motor department on a basis of fifty automobile engines per day. The Wilson company is a subsidiary of the Willys-Overland Co., Toledo, Ohio.

The St. Louis-San Francisco Railroad Co. will increase the working force at its locomotive shops in Springfield, Mo., and will soon commence the installation of new machine tools and operating equipment to cost about $200,000.

The Columbia Motors Co., Detroit, Mich., manufacturer of popular priced automobiles, is arranging for an immediate increase in production. The 1922 schedule calls for an output of from 10,000 to 12,000 cars, as compared with a capacity of 2,000 in 1921, and 4,500 automobiles in 1920.

The Birmingham Machine and Foundry Co., Birmingham, Ala., is increasing production at its plant. The company has secured a number of orders for sugar mill machinery.

The Tennessee Coal, Iron and Railroad Co., Birmingham, Ala., has adopted a full operating capacity at its structural car works at Fairfield, near Birmingham. The tie plate department of the company is also running full.

The Bridgeport Rolling Mills, Inc., has increased production to 90 per cent of full capacity. The plant is working on a basis of 55 hours a week.

The Slatington Iron and Steel Co., Slatington, Pa., has resumed operations at its rolling mill.

The Packard Motor Car Co., Detroit, Mich., has advanced production to sixty-five automobiles per day, including passenger cars and motor trucks. Employment is being given to 4,000 men, as compared with a force of 2,670 operatives at this same time last year.

The Bethlehem Shipbuilding Co., Ltd., a subsidiary of the Bethlehem Steel Co., has taken a contract for the construction of three railroad car floats for the Lehigh Valley Railroad Co., and will handle the work at its Sparrows Point, Md., plant. The floats will cost $256,000.

The Moon Motor Car Co., St. Louis, Mo., is increasing operations at its plant and has adopted a manufacturing schedule 25 per cent in excess of the corresponding period last year. Sufficient orders have been secured to insure capacity output until well into July.

The New York Central Railroad Co. has resumed operations at its shops at Ashtabula, Ohio, following a shut down for several months.

The Pere Marquette Railroad Co. has leased its shops at Saginaw, Mich., to the Kellogg-Crego Co., Chicago, Ill., which has resumed operations at the plant for contract work for the road.

The Romer Axe Co., Dunkirk, N. Y., has opened its plant with a full working force, following a curtailment for several months past. It is said that sufficient orders are on hand to insure regular production for the remainder of the year.

The Georgia Central Railroad Co., Atlanta, Ga., will soon place orders for 500 steel underframe ventilator box cars to cost about $825,000.

The American Locomotive Co. has taken a contract for repair work for the Lehigh Valley Railroad, and will handle the order at its Brooks plant, Dunkirk, N. Y., giving employment to about 1,500 men in this department.

The Atlas Tack Co., Fairhaven, Mass., has increased production at its plant. During this same period last year the company was running at about 65 per cent.

The Remington Typewriter Co., New York, N. Y., has adopted a night shift, in addition to regular day operations, at its plant at Syracuse, N. Y., devoted to the production of portable typewriters.

The Westinghouse Air Brake Co., East Pittsburgh, Pa., has secured a contract for air brake equipment for 7,300 cars for the Chicago, Burlington & Quincy Railroad Co.

The Chandler Motor Car Co., Cleveland, Ohio, has recently increased production about 50 per cent at its plant, and several hundred additional men are being added to the working force. With manufacture during March, the plant ouput for the first three months of this year will exceed the production for the last eight months of 1921.

William McLaughlin, Newark, N. J., operating a machine shop and metal stamping works, is arranging for increase in production and will remove his plant to the ground floor of the building at 2 Johnson Ave.

The H. & G. Die Head Works, subsidiary of the Eastern Machine Screw Corporation, New Haven, Conn., is working ten hours a day, five days a week. The company reports increased business in January and February.

The blast furnace of the Carnegie Steel Co., located at Isabella, Pa., and employing about 200 men, will be blown in this week. It has been closed down since last May.

The Berwick, Pa., plant of the American Car and Foundry Co. has received an order for thirty steel railway coaches.

The Barney & Berry skate works in Springfield, Mass., owned by the Winchester Repeating Arms Co., is to double its plant force within the next few weeks, bringing its production of ice skates for next season's trade to 2,000 pairs daily. For the past three months the concern has been making roller skates chiefly, for which it reports a good market demand.

The Graton & Knight Co., Worcester, Mass., is operating on a 50-hour week schedule with 900 employees. The company makes leather belting and leather specialties.

The American Car and Foundry Co. has taken a contract from the Central Railroad of New Jersey for thirty all-steel passenger cars. The work will be done at the Berwick, Pa., shops.

The Cleveland, Cincinnati, Chicago & St. Louis Railroad Co. has resumed operations in the freight car department at its shops at Beach Grove, near Indianapolis, Ind. The locomotive department will be reopened at an early date, either on a piece work basis, or under a contract plan.

The Hupp Motor Corporation, Detroit, Mich., is operating under an increased production schedule, with shipments during the past month totaling more than four times those of the corresponding period for last year. The company has adopted a production basis of 30,000 cars during the present year.

The Bridgeport Castings Co., 200 North Ave., Bridgeport, Conn., has recently received orders which will keep the plant in operation for some time to come. Additional men have recently been put on, and the shops are working to full capacity.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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Not long ago I asked the head of one of the largest merchandising houses in New York City what he thought of the outlook, and he answered that if the lawmakers at Washington would only let business alone to work out its own salvation, the future appeared as bright as he could wish. The particular legislative monstrosities which he assailed were the soldiers' bonus and the tariff. His remark has often recurred to me, as in analyzing the phenomena which stimulate or depress business because they inspire or impair confidence, I have seen how frequently of late the favorable items in a week's news come from the business columns and the unfavorable items from the political dispatches. The passage of the bonus bill by the House is a case in point, though it is a mere political gesture and is not likely to be enacted into law.

I gave first place this week to the figures of our foreign trade for February, read in light of the knowledge that the Senate Finance Committee is working out the details of a tariff which will make permanent, and in some cases increase, the high duties already in force, although the steady shrinkage in our export trade is sufficient evidence that we cannot sell abroad if we make it impossible for our foreign customers to sell to us. Last month the excess of exports over imports left a balance in our favor of only $34,000,000. This campares with a balance of $235,000,000 in February 1921, and although February is a short month it is construed by many to indicate a very serious reduction in the export demand for our products and a favorable trade balance of not more than $600,000,000 for the present calendar year.

Second place is given to the falling off in income taxes. It is evident that the extent of the decrease from last year is greater than had been supposed. The best guesses now put it at a minimum of 40 per cent, and Perley Morse, the well-known accountant, suggests that it may reach 61 per cent, basing his estimate on a large number of returns showing an average decrease of 36 per cent in individual incomes and 88 per cent in those of corporations.

Income Tax Shortage

Government reports show that March 15 payments, totaling $400,000,000, were $328,000,000 less than the collections of March 15, 1921, and $60,000,000 below the official estimates. The result will be a shortage of over $100,000,000 in revenues estimated in the budget for the year ending June 30, 1922, and an equal shortage in the next fiscal year, when an expenditure of $3,505,000,000 is contemplated. It is plain, therefore, that the Government will soon be face to face with a deficit that can only be met by additional taxation unless Congress has the courage to cut appropriations below any figure yet considered.

It is well for those who are disposed to be overconfident to remember that a prospect which includes increased taxation and a decreased export trade cannot be especially encouraging. Considering also the unsettled textile strike and the threatened coal strike it is not surprising that a slight reactionary tendency was generally noticeable last week. That the tendency was no more marked is itself striking evidence of the stolid confidence with which the future is now generally regarded in the United States. The neurasthenia that was so common a while back has entirely disappeared and pessimism has given way to a hopeful expectancy of good times this summer.

Money Market Easier

There is plenty of credit, at least in the larger cities. The demand for new bond issues is larger than the supply. The money market is easy at the rates quoted last week. Liberty Bonds have advanced to a new high record. Corporate bonds are firm and higher and the stock market has been strong enough to absorb heavy realizing sales without more than a nominal decline. The Federal Reserve ratio recovered promptly from the decline incident to withdrawals for tax payments, and is back at 78.4 per cent, a new high record since we entered the war in April, 1917.

Industrial improvement is probably most noticeable in the steel trade, which reports a substantial increase in both orders and production at higher prices. Concurrently there is a remarkable gain in building activity, important not only because it means increased employment but because each residence constructed means a greater demand for furnishings and other goods in which people will no longer be disposed to economize when they live in their own homes.

Railroad traffic is larger, though the increase is chiefly in coal that is being accumulated against the threatened strike. The decision of the Interstate Commerce Commission on freight rates will be rendered within a few days, and the Bureau of Railway Economics points out that reductions already voluntarily put into effect have saved consumers $300,000,000, though not long ago railroad presidents were assuring us that rate reductions, if forced upon them, would save the public practically nothing. The rumor of negotiations for a consolidation of the Delaware, Lackawanna & Western, Nickel Plate, Clover Leaf and Pere Marquette lines is a shadow of coming combinations which will in time strengthen the weaker roads and change the railway map of the country beyond recognition.

In the cotton goods trade the demand is still below normal as buyers expect heavier offerings when the New England strike is ended, and raw cotton has also yielded appreciably although an increased demand is to be expected when the mills resume operations.

According to the final ginning returns, which put this year's crop at 7,962,530 five-hundred-pound bales, the Agricultural Department has succeeded in substantially underestimating and overestimating the crop in the same season. This is an unusual achievement that will somewhat impair confidence in the future estimates of that high authority, and next year's crop will be as large or as small as public opinion makes it until the facts are known late in the season, when they will have lost their influence as a market factor.

Among the industries increased activity in machinery and tools is notable. The Department of Commerce reports that business is gradually working its way back to normal, the Bureau of Labor Statistics reports that unemployment is decreasing, and the treasury Department that higher prices are to be expected, a prediction made in these articles when the influx of gold first reached a volume which made it an important economic influence.

Strike Will Come

Factories are well fortified with supplies for the coal strike. It is hard to believe it will occur, but the present indications are that the peace makers will fail. The Geological Survey reports show that the industry provides its workers with an average of only three days work a week and if the strike takes place the result will probably be a dispersion of the surplus labor.

In Europe conditions are much the same as here. It is easy money against the partial paralysis of commerce caused by political uncertainty and high taxes. The result is a booming market for investment securities and a slow improvement of trade as the optimism engendered on the Stock Exchange gradually extends itself among manufacturers and merchants. The Genoa conference, the German reparations and the almost forgotten war in which Greece and Turkey are engaged are all duly discussed in the newspapers, but the commercial mind seems to have been indurated by its experience prior to the armistice and is apparently willing to believe that men must go on buying and selling, whether they are fighting or not.

This is a philosophy of fatalism which is highly dangerous and is certain to lead to trouble because it creates a lethargic sense of the security that can only be secured by constant vigilance. There is every reason why America should be prosperous and will be prosperous, if the burden of taxation is equitably distributed and the commercial enterprise of the nation is unhampered by a tariff so high that it excludes us from the world's markets as sellers as well as buyers. Upon the determination of business men in impressing these truths upon those who make our laws the economic future is dependent.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

The mark is, after a short interval of comparative stability, again on the downslide. This happened while the economic factors which should determine the value of the money are pointing in the opposite direction. With some great effort, the budget of the current year has been made to balance, at least on paper. The state railroads show better results, due to the increased rates which do not seem to have materially affected the passenger traffic, while the goods traffic has become even larger. The foreign trade of the country is again showing a balance on the export side due to reduced imports and increased exports. In January the exports exceeded imports by nearly 1,800 million paper marks. Reports from the seaports, especially Hamburg, indicate that the overseas traffic of the country is running close up to the pre-war level, having reached nearly 85 per cent of that of the years immediately preceding the war. Progress and enterprise are visible in all lines of business, new markets are being opened, especially in the East.

Government Deceit

All these items would indicate strong progress towards recovery, and should in all reasonable expectation react upon the valuation of the mark, especially as nothing untoward has happened to the foreign situation of the country, which from all signs has even been somewhat eased. There can be no doubt that the recent downslide of the mark is of Germany's own making and comes from inside. It marks the abandonment of all hope of an early adjustment of the reparations problem. This hope, which found its strongest support in the rumored promises coming from England of an impending reduction of the indemnity, has been deliberately and skilfully fostered by the government through the press, for purposes of its own.

The optimism thus created has exceeded all bounds, and led the population to the belief that a fair readjustment was on the way. Germany's financial stress is now recognized as being responsible for the business slump of the whole world. So deep rooted was this belief that all faces were turned to the forthcoming conference of Genoa, with hopes that could not have been brighter. The disappointment felt now, when it becomes clearer that the conference of Genoa will probably be an affair which, since the historical Tower of Babel, has not had its equal, is keen and strong reaction is bound to follow. Most manufacturers have held back with procuring cover for their foreign purchases until the futility of all hopes of an improvement of the exchange became apparent to all eyes.

In what state the mark will appear before the conference at Genoa is an open question, but nobody seems to care. In the mentality of the circles akin to manufacturing interests it cannot be low enough. Appearances are kept up, no doubt in good faith, but secretly the sails are set for steering full speed into a crisis. Nothing short of a severe crisis, showing Germany on the verge of bankruptcy, is estimated in these circles as the only means for creating in the world a frame of mind conducive to a radical improvement.

Under such circumstances it is not surprising that the collapse of the hopes centering in the Genoa conference is immediately followed by a wave of rising prices. Judging from the initial indications, this upward movement will take record dimensions. There is much talk at present of prices running up to gold standards, but such talk is no doubt strongly exaggerated and misleading. The economic forces, which probably are not strong enough to control the movement of prices but surely to retard it, will do all in their power to maintain the margin between the purchasing power of the mark inside and outside of the country. There can be no doubt that the present move will take a halt only after all previous levels have been passed.

The prime mover is the price of coal, which is quickly approaching 1,000 marks per ton under the combined influence of the basic prices and the increased coal tax. From the coal prices a parallel movement is imparted to prices of all other commodities and to wages. In fact, it is being seriously considered to adopt the movement of the coal prices as a factor governing wages, not only for the miners but in general. Under the first impact of the price wave the question of sliding wages is again most vigorously put forward by the trade unions. It will be remembered that up to now agreements have been formed between the workmens' unions and the employers' associations settling wages for a specific period. These agreements were a great help to manufacturers, providing a truce between workmen and employers during a certain time and furnishing a basis for the calculation of manufacturing costs. They are now attacked for constituting a hardship to the workmen during times of strong price fluctuations. By way of a compromise it is being proposed that while the term for which the agreements are concluded will not be reduced, an arbitration will be instituted, which during certain intervals is to adjust the wages according to the index figures for the cost of living. There is no manifest unrest among the workmen, but it is admitted that some concessions will have to be made to the workmen to keep discontent down at its normal size.

Preparing for Worst

It can be seen that the business world of the country is putting its house in order, preparing for an aggravation of the present financial conditions. Every part of the economic machinery is striving for an improvement of its own particular interests, and there can be no doubt that lively times are ahead. Manufacturers and the trade are gradually inaugurating a small battle between themselves. The chief bone of contention is the export control. While this is, of course, instituted by the government, the executors are the manufacturing associations, which have been able to arrange matters in such a way that in foreign business transacted through the medium of the trade, manufacturers get the profits and dealers get none.

The total exports in January was 2,027,000 tons (compared with 1,929,519 tons in December, 1921), valued at 14,527 million paper marks. It is interesting to note that while the volume of exports has increased by over 100,000 tons since December, the value remained stationary. The export prices have therefore decreased, evidently due to the rise of the mark in December. The gross average per ton was something over 7,000 paper marks or 35 gold marks, whereas the pre-war average was 154 gold marks per ton, or more than four times higher. The composition of the exports differs largely from that of pre-war times, a strong shifting between goods of high and low value having taken place. This explains the low average of export prices to some extent, but not entirely, as in no class of goods are the export prices up to pre-war standards. An increase of the exports since December has taken place in steel and iron products, and chemical and mineral produce, while against all expectations the exports of the machine building and electrical industries have dropped. The prices of the latter have slightly improved, but the advance is immaterial.

The Russian Market

Russia as a future market is becoming more and more prominent, at least in public and private discussion. Emissaries of the German government, as well as private manufacturing combines are traveling over Russia, taking up pre-war relations or establishing new ones. The number of Russians coming to Germany is swelling day by day. There are over 100,000 living in Berlin alone. There can be no doubt that this influx of the Russian element is secretly favored by the authorities. The Soviet government has now established a business-like organization for trade with Germany. A novel form has been chosen for making this organization workable and effective, consisting of a combination between private and governmental interests. A company has been formed in which a private firm and the Russian government are partners, for the trading of metals from Russia to Germany and metal products into Russia. The basic principle of all this business is the "swapping" of goods. The actual business transacted is still of modest dimensions. The Russians offer payment in kind, and business of this kind needs much preparation before it comes into full swing. The expectations, however, that the German business world would find it very easy to deal with Russia, were doomed to disappointment. The trade emissaries that Russia sent are very shrewd business men, not the ignorant, easy-going sort that was expected. They have discovered flaws in several large contracts concluded some time ago, and are now trying hard to get out of them. The methods so far employed toward Russia have greatly impaired the progress of business relations, and before business will grow to any considerable dimensions, it will be necessary for the Germans to revise their estimate of the Russians' commercial abilities.

The much talked about contracts for railroad material for Russia, reduced

to actual size, are approximately 100 million dollars, of which nearly one-half fell to Germany, while a little less went to Sweden. Small orders were placed in England, Austria, Denmark, Canada and Czecho Slovakia. The orders to Germany comprise 700 locomotives at 84 million gold roubles; 1,000 tank cars, 77,500 tons of rails, 18,569 tons of steel tires; machine tools, steel, wiring and metal. The orders contracted with Sweden consisted of 1,000 locomotives, 200 locomotive boilers and 500 tank cars.

Rumors have lately again been afloat of foreign investments in German business enterprises, coming especially from Upper Silesia. While it seems a fact that French and English capitalists are fighting for the control of several of the most important upper Silesian works, no actual transactions have so far been completed. Such rumors, therefore, have to be treated with great reserve, as they originate mostly from vivid phantasy, and if they are based on facts are mostly premature and exaggerated. It has been freely stated that the Guggenheim concern has again bought up large blocks of shares of the A. E. G. (General Electric Co.), and that the stock of this company will shortly be traded on Wall Street. If this really happened, it would not cause anger in the country, but rather envy. On the other hand, it is being whispered that American firms are about to start manufacturing in Germany. Reports have been heard about the Yale & Towne Co., and about Ford, who is said to be negotiating at present for a manufacturing site in Hamburg.

Unemployment has risen from 1.6 to 3.3 per cent. The number of unemployed was 190,000 at the end of January, of which 165,000 received government subsidies. Unemployment in the machine building industry has risen from 0.5 per cent in December, to 0.7 per cent now. Compared with 163 in December, there were 329 applications of machinists for every 100 jobs.

Machine Tools Show Profits

The machine tool companies are now issuing their reports for the past year. At least the first half of that year was filled with complaints of bad and insufficient business, but this finds no expression in the final results. These results are without exception excellent, and constitute for many firms a record of prosperity. The dividends paid are in most cases keeping only the level of the best preceding business years, but this is due rather to the policy of the management not to create undue attention by sensational figures, than to the size of profits. In most cases it can be noticed that large parts of the profits have been set aside for writing off before drawing up the balance. Besides such "hidden" reserves, there are large open reserves on the balance sheets, for renewal of equipment, workmen's welfare funds, and the like. The Pittler Co., for instance, paid a 30 per cent dividend, but its net profits are higher than the share capital. The Magdeburger Machine Tool Co., manufacturer of high-speed lathes and turret lathes, which had a profit of one million marks in 1920, netted four million marks last year. The gross profits, however, exceeded the capital. The turnover of most companies has more than trebled. A 25 per cent dividend is the average return of the machine tool business.

Screw Thread Commission Lays Plans for Future

Sheet metal and wire gage numbers; tap-drill sizes; bolt, nut and rivet proportions; bolt-head, nut and screw-head standardization; standardization of instrument threads and those cut on brass-tubing; standardization of acme, square, and other special threads, and a study of tolerances and stock sizes for cut and rolled threads, are some of the matters which will occupy the attention of the National Screw Thread Commission during its term which has just been extended until March 21, 1927. In addition it will continue the study of its tentative report on screw threads with the view to certain rearrangements and the insertion of suitable notes with reference to the application of various classes of fit.

A tentative discussion of the work which is to occupy the commission during the next five years was held at a meeting held in Washington on March 17. Eight of the nine members of the commission were in attendance. Dr. S. W. Stratton presided and led the discussion.

A report on tap-drill sizes was submitted to the commission by the sub-committee which has been studying that problem. After some discussion of the report it was decided to recommit the report to the sub-committee so as to embody certain changes agreed upon during the discussion. As soon as the sub-committee completes the tap-size report, it will be submitted to the industries concerned for comment and criticism before the commission takes any final action toward making it a national standard.

In connection with the study being made of sheet metal and wire sizes, Col. E. C. Peck submitted a decimal system in accordance with the proposal made by the American Society of Mechanical Engineers in 1895. At that time the mechanical engineers recommended the discarding of all gage numbers with the idea that wire and sheet metal could be described better by decimal parts of an inch—the number of thousandths of an inch indicating the gage number as well as the exact size.

Arrangements have been made for co-operation between the National Screw Thread Commission and the sectional committee of the American Engineering Standards Committee which is studying bolt, nut and rivet proportions. The sub-committee which will work with the American Engineering Standards sectional committee on the matters pertaining to bolts, nuts, rivets and screw-heads, is composed of F. O. Wells, E. H. Ehrman, and Commander J. N. Ferguson. A sub-committee consisting of Dr. Stratton, Commander Ferugson and Mr. Wells will make a tentative study of the standardization of instrument threads and brass tubing threads. Another sub-committee composed of Major J. O. Johnson, R. E. Flanders, Lieut.-Commander C. A. Jones, and Earl Buckingham will take up a study on acme, square and other special threads. These sub-committees will do some preliminary work on the problems assigned to them and will present some of their conclusions at another meeting of the full commission which will take place the latter part of April.

Washington Notes

By Paul Wooton

Increased purchases of industrial machinery will be made in Asia and Latin-America, it is indicated by reports reaching the Department of Commerce from widely separated sources throughout the Far East and from various industrial centers in the Spanish-speaking republics. It is pointed out that American business men are too prone to center their attention on the European exchanges. That Asia is recovering its buying power is indicated clearly in a number of ways, while its exchange rates are approaching 1913 levels. While recovery in Latin-America is not proceeding so rapidly, the situation is very greatly improved with the prospects favoring its acceleration.

Development in the Far East is proceeding much more rapidly than is generally realized. In the last three years, the United States has sold Asia more than $200,000,000 of industrial machinery. This exceeds the total sales of industrial machinery during the fifty-year period between 1863 and 1913. An idea of the expansion of commerce generally in the Far East may be obtained from the fact that the commerce of the island of Formosa alone in 1920 was greater than that of all Japan in 1904. Comparable expansion is taking place in the commerce of the Philippines, of China, and of British India. The social evolution which is progressing so rapidly in Asia carries with it much higher standards of living, from which results a great demand for goods.

Some fear has been expressed that the reduction in naval construction in Japan would interfere with the demand for metal working machinery. In the opinion of W. H. Rastall, chief of the heavy machinery division of the Department of Commerce, such reduction of orders as may result from that cause is entirely insignificant when compared with the general industrial expansion which is certain to take place in the Far East. He also points out that while our exports of machinery are low at present, this applies to the German and British exports as well. The German exports particularly are running much below the volume of 1912 and of 1913. The British in 1913 exported 103,592 tons of heavy machinery. In 1920 their exports were 89,794 tons and in 1921, 55,012 tons.

Grover C. Loening Heads Aeronautical Chamber

The board of governors of the Aeronautical Chamber of Commerce of America, Inc., at a meeting at the executive offices in New York City on March 15, elected the following officers: President, Grover C. Loening; first vice-president, Charles F. Redden; second vice-president, C. C. Witmer; treasurer, B. E. Bushnell; secretary and general manager, S. S. Bradley, Manufacturers Aircraft Association, Inc.

The Maryland Legislature has petitioned Congress asking that the Indian Head, Md., Proving Ground be re-established, and that ordnance machinery and equipment be returned thereto from Dahlgren, Va.

Chicago Letter

After summarizing the reports of the machine tool dealers in the Chicago district, it might be said that there is just enough activity in the machine tool market to keep the outlook optimistic. The demand for tools and equipment is slowly but surely growing more pronounced. Inquiries continue to come from miscellaneous and widely scattered sources.

The Western Clock Co., LaSalle, Ill., which was reported last week as having purchased twenty-four automatic screw machines, has made additional purchases in the form of two geared-head motor-driven engine lathes, one geared-head motor-driven 26-in. shaper and three bench lathes with side heads.

The local railroads are doing practically no buying against their outstanding lists. The Santa Fe System has not made any further inquiries this week but it is expected it will issue a list shortly for a proposed boiler shop at Albuquerque, N. M. Regarding the Burlington list which has been expected for some time, it is now thought that because of the recent fire which did considerable damage to the office building and destroyed many valuable records, the list will be further delayed. It is understood that the Illinois Central is working on a three-year machine tool program and for some time past it has been expected to issue a list for the requirements of the first year. The Great Northern R.R., St. Paul, Minn., has issued a list calling for bids on twelve machines.

Although the railroads are slow in purchasing machine tools they seem to be very optimistic in other lines. The Chicago, Burlington & Quincy is receiving bids for the superstructure of a freight house to cost $3,000,000 at Canal, Harrison and Polk Sts., Chicago. Recently this road completed the construction of one of the largest sheep yards in the United States, at Montgomery, Ill. The yards include seven barns, 1,000 acres of pasture, an elevator with a capacity of 100,000 bushels, and various other buildings.

The Chicago Great Western R.R. recently awarded a contract to the Roberts & Schaefer Co., engineers and contractors, Chicago, for the erection of a fireproof automatic two-track, 100-ton capacity coaling and sanding plant for installation at its Forty-sixth Ave. yard, in Chicago. The plant will be equipped with Strait scales for recording all issues of coal taken by engines. The Chicago, Rock Island & Pacific Ry. is planning to build a locomotive shop at Little Rock, Ark., to cost $225,000. C. A. Morse, Chicago, Ill., is chief engineer.

The Chicago & Northwestern recently inquired for 2,700 freight cars, 1,250 forty-ton box cars, 500 forty-ton stock cars, 254 forty-ton refrigerator cars, 250 fifty-ton gondola cars, and 500 fifty-ton flat cars. The Chicago, Burlington & Quincy placed an order with the Illinois Steel Co. for 8,000 kegs of spikes and recently closed bids on 81,200 tie-plates.

The radio craze which has taken a good hold all over the country has gripped Chicago and the demand for sets is so great that it has resulted in numerous firms being formed to manufacture sets and supplies.

About $45,000 worth of equipment and property was recently damaged by a fire in the plant of the Elaborated Roofing Co., Forty-Fourth and LaSalle Sts., Chicago.

Alfred S. Alshuller, architect, 28 E. Jackson Blvd., awarded a contract for the construction of a three-story automobile salesroom and service station, 100 x 390 ft., on Michigan Ave. and Twenty-third St. for the Hudson Motor Car Co.

Cervine & Horn, architects, 310 Safety Building, Rock Island, Ill., have plans under way for the Illinois Oil Co., of that city, for a new three-story plant, 40 x 150 ft. It is estimated that the project will cost about $165,000, including equipment.

The Vienna Model Bakery Co., 1040 Vernon Park Ave., finally awarded the contract for the construction of its new bakery at Congress and Racine Avenue, to the Krahl Construction Company, 350 N. Clark St.; cost $150,000.

M. Alter, 2656 Potomac Ave., was awarded a contract for the construction of a two-story garage, 72 x 107 ft., at Taylor and Garibaldi Aves.; cost $50,000.

The Boyle Ice Co., 847 Larrabee St., awarded contract to A. C. Thielberg, 154 W. Randolph St., for the construction of a two-story ice-manufacturing-plant to cost $40,000.

Franklin to Build New Car at Syracuse

After many conflicting rumors had gone the rounds in the automotive field, plans were finally announced last week by H. H. Franklin, president of the Franklin Automobile Company, for the building of the new model "Franklin Four." The plant will be located in Syracuse, N. Y., and production of one hundred four-cylinder cars a day will start about April 1, 1923. This new model will sell in the $1,000 class. Running at full time the proposed plant will employ about five thousand men and the payroll will aggregate $10,000,000 annually.

Machinery Dealers at Birmingham Next Month

Plans for the twenty-first annual convention of the Southern Supply and Machinery Dealers' Association are rapidly maturing. Headquarters have been established at the Tutwiler Hotel, Birmingham, Ala., where all the sessions will be held. Three days, April 24, 25 and 26, have been set for the convention. J. H. McKinnon, president of the association will preside and he will be assisted by N. A. Gladding, president of the American Supply and Machinery Manufacturers' Association, which will hold joint conventions with the Southern association during the three days.

The speakers have not all been assigned, but those accepted are as follows: W. H. Kettig, of the Sixth Federal Reserve District, on banking and its relation to business; C. H. Houston, of the Department of Commerce, on that department's activities; Robert S. Carter, Whitman-Barnes Co., on the twist drill situation; J. H. McKinnon on standardization of stocks; and L. Z. Larzelere on handling credits.

Cleveland Letter

Plans for actual manufacture of the Zeder automobile, at the Cleveland Tractor Company's plant in Cleveland, Ohio, were being completed last week. The car will be a light six-cylinder, according to the design of Fred Zeder, who is at present in Newark, N. J., where his engineering headquarters are. Mr. Zeder is closing his connection as chief engineer of the Willys interests. Distribution of the new car will be supervised by E. B. Wilson, formerly sales manager of the Willys Corporation. Meanwhile the selling campaign is being planned by R. T. Hodgkin, of the Cleveland Tractor Company and it is expected that J. O. Hahn, formerly branch manager in Cleveland and Pittsburgh for the Studebaker Corporation, will become identified with the firm. It is probable, officials state, that the capital of the Cleveland Tractor Company, now $6,000,000, may be doubled to provide for the new Zeder enterprise.

The Fisher Body Company's plant at Cleveland, Ohio, will be enlarged at an early date to care for the new business now being booked, it was announced last week. Lease has been taken on the Briggs Manufacturing Company's plant, adjoining the Fisher factory, providing 175,000 sq.ft. additional floor space. It will be used largely for the finishing end of the Fisher production, which at present is for the Chandler, Cleveland and Chevrolet cars.

Indianapolis Metal Trades Elects Officers

The sixteenth annual meeting of the Indianapolis branch of the National Metal Trades Association was held in Indianapolis on March 22. The meeting was well attended and the discussions were participated in by many of the members. The principal address of the day was made by Charles Piez, president of the Link Belt Co. and one-time director-general of the Emergency Fleet Corporation. Mr. Piez devoted his words to a discussion of the work of the citizens of Chicago to enforce the Landis award. He scored the building trades unions in that city and gave some interesting facts concerning their control over municipal affairs.

The election of officers for the coming year resulted in the following choices: President, Stanley Whitworth; vice-president, William Taylor; treasurer, L. M. Wainwright; secretary, A. J. Allen. The executive committee is composed of Arthur R. Baxter, George O. Lockwood and O. B. Iles, elected for two years; and H. G. Myers, Harvey G. Shafer and Alfred Kauffman, elected for one year. The new eleventh district committee is composed of C. C. Hanch, of Connersville, chairman; A. G. Seiberling, of Kokomo; R. P. Johnson, of Muncie; D. E. Ross, of Lafayette; and George M. Dickinson, of Indianapolis.

Another Patent Bill

Under a bill introduced by Senator Ladd, N. D., a patent would expire within five years after its issuance unless the patentee exercised the right to make or use the invention or discovery. In event of the assignment of the patent, the patent rights would extend for two years only if not worked.

Newark To Be Mapped from the Air

The Fairbanks Aerial Camera Corporation, of New York City, has secured a contract to make an aerial map of the City of Newark, N. J. This is said to be the first contract of its kind let by a municipal government.

The city will be sectioned off by topographical experts and each section will be photographed from the air. The photos will then be assembled into a single map which is claimed to show every detail of housing, highway and waterfront construction and layout. The camera used is the invention of Sherman N. Fairchild, president of the corporation.

Pays $100,000 Cash for Factory

Arthur M. Barrett, president of the Barrett Bindery Co., and vice-president of the Barrett-Cravens Co., both of Chicago, Ill., has purchased from the American Chicle Co. the factory building containing 45,000 sq.ft. of floor space, at 1328 West Monroe St., Chicago. Mr. Barrett paid $100,000 cash for this property, and will expend about $25,000 in alterations to meet the particular requirements of the two companies in which he is interested, and which will later occupy the property.

Business Items

Repair shops of the Pennsylvania Railroad at Olean, N. Y., were damaged by a fire which threw 350 men out of work and caused a loss of $100,000.

The Commerce Radiophone Co. has been organized in Detroit, Mich., to manufacture and sell complete radio telephone sets. Production is expected at an early date.

The plant of the Pelton Water Wheel Co., in San Francisco, has been purchased by the Wm. Cramp & Sons Ship and Engine Building Co., of Philadelphia. The Pelton organization will continue operations under the old name, with H. B. Taylor, president; E. C. Hutchinson, vice-president and general manager; and W. M. Moody, second vice-president.

The American Supply and Machinery Manufacturers' Association has removed its headquarters to the Gotham National Bank Bldg., 1819 Broadway, New York City.

The Taft-Pierce Manufacturing Co. of Woonsocket, R. I., has moved its Detroit office from 1311 Majestic Bldg., to 2230 First National Bank Bldg. William Fairhurst is manager of this office.

The Hartford Special Machinery Co., Hartford, Conn., recently added ninety shares of common stock, par value $100, leaving its outstanding stock $247,000.

The factory of the Eastern Woodworking Co., South St., Wallingford, Conn., was destroyed by fire on March 18, causing a loss of about $20,000.

The Singer Manufacturing Co., Bridgeport, Conn., announced last week that its plants will operate on a five-day-a-week schedule. The company has been on a three-day-a-week basis for over a year. A 15 per cent cut in wages will be made also.

The Remington Arms-Union Metallic Cartridge Company's plants at Bridgeport, Conn., resumed a forty-eight-hours per week basis last week. The company has recently received several large orders.

The Shelton Tool and Machine Co., 235 Canal St., Shelton, Conn., recently filed a certificate with the Secretary of the State of Connecticut, changing the name of the concern to the Shelton Cutlery Company.

Handley Bros., Inc., 82 Myrtle St., Meriden, Conn., was recently incorporated under the laws of Connecticut, to take over the plating and buffing business of Handley Bros., same address. The following officers were elected: President, George Handley; secretary and treasurer, John Handley.

The Kenyon Bearings Co., Inc., 102 Allyn St., Hartford, Conn., has been incorporated under the laws of Connecticut, to engage in the machinery and tool business. The capital stock of the concern is $20,000. The company was organized with the following officials: Harold M. Kenyon, president and treasurer; C. C. Thompson, secretary. The directors are the two above-mentioned and William B. McDonald.

The Stacks Engineering Co., Hartford, Conn., recently filed papers of incorporation with the Secretary of State of Connecticut, to engage in the manufacture of machinery, and to render engineering advice. The capital stock is $50,000 and the incorporators are: Don H. Stacks, of 181 North Whitney Ave., Hartford; W. H. Marrin and J. H. Lancaster, both of Litchfield, Conn.

The Bridgeport Rolling Mills, Inc., Bruce and Stratford Aves., Stratford, just over the city line of Bridgeport, Conn., held its annual meeting this week, and elected the following directors for the ensuing year: William R. Bull, George D. Stearns, Anker S. Lyhne and Anton C. Raffauf. Officers elected were: President, William R. Bull; vice-president and general manager, George D. Stearns; secretary and treasurer, Anton C. Raffauf. The company is now working on a 55-hours-a-week basis, and the shop is operating at 90 per cent capacity.

The United States Hoffman Machinery Corporation, a Delaware corporation, has filed papers with the secretary of state at Indianapolis qualifying it to do business in Indiana. The company has $5,500 of its capital stock represented in Indiana. The concern will manufacture and deal in pressing machines. Joseph F. Dunn, of Indianapolis, is named as Indiana agent.

The Meadeville Machinery Co. has leased the Huntington, Ind., shops of the Erie Railroad, including the roundhouse and back shops, or what is known as the locomotive department.

D. C. Oviatt & Co., dealer in new and used machinery, has removed from Euclid Ave., to 1106 St. Claire Ave., Cleveland, Ohio.

Personals

J. R. CAMM, of the Milwaukee office of Kearney & Trecker, has been appointed assistant manager of the Cleveland, Ohio, office.

J. F. HAGAR has been appointed chief engineer of the St. Louis Automatic Corporation, St. Louis, Mo.

ROBERT M. GATES has joined the Superheater Co., with headquarters in the home office, 17 East 42nd St., New York City.

HAROLD D. RICHARDS, formerly in charge of the materials department of the Kewanee, Ill., plant of the Walworth Manufacturing Co., manufacturers of tools and heating supplies, recently returned to the Gilbert & Barker Manufacturing Co., Springfield, Mass.

HUGO BILGRAM, president of the Bilgram Machine Works, Philadelphia, Pa., was held up by bandits on March 21 and robbed of $800, part of a payroll he had just drawn from a bank. The thieves were not captured.

ROBERT GREGG was elected president of the Atlantic Steel Company, Atlanta, Ga. Mr. Gregg has been with this concern for sixteen years. He succeeds Thomas K. Glenn, who recently resigned.

CHARLES MORGANA has resigned as vice-president and director of the C. H. Wills Co., Marysville, Mich. He will become general superintendent of the Detroit plants of the Maxwell Motor Corporation. Mr. Morgana was at one time in charge of the machine tool department of the Ford Motor Co.

FRANKLIN G. SMITH, president and general manager of the Osborn Manufacturing Co., Cleveland, Ohio, returned on March 25 from a two months' business trip to Europe.

S. M. KINTNER has been appointed manager of the research department of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

HENRY HARNISCHFEGER, president of Pawling & Harnischfeger, Milwaukee, Wis., and also of the Associated Machinery Corporation, has arrived in Rangoon, Burma. Mr. Harnischfeger is on a business trip through Europe and the continent. He reports a good outlook for business.

CHARLES A. SARGEANT has been elected president of the Domhoff & Joyce Co., Cincinnati, Ohio, pig iron brokers. He succeeds his father, the late Col. John Sargeant.

W. H. ASHBAUGH, of Leechsburg, Pa. has been appointed successor to William H. Weichsel, as superintendent of the Dover, Ohio, works of the American Sheet and Tinplate Co. Mr. Weichsel resigned to become manager of the Inland Steel Company's plant at Indiana Harbor, Ind.

A. F. MURPHY, superintendent of the Zanesville plant of the American Rolling Mill Co., has been made plant manager. W. R. Barnett, who has been assistant superintendent, will become superintendent.

FRED W. HEISER, superintendent of the Timken-Detroit Axle Co., Canton, Ohio, has resigned.

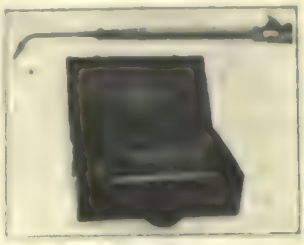
Condensed-Clipping Index of Equipment

Patented Aug. 30, 1918

Welding-Torch Outfit, Oxy-Acetylene, Garage

Davis-Bournonville Co., Jersey City, N. J.

"American Machinist," November 24, 1921.



The outfit is intended for repairing broken metal parts of all sorts and is capable of handling the usual types and sizes of welding work encountered in the small shop. The floor case is provided with partitions for holding the various parts. The outfit consists of the [illegible] welding torch, with three extension tubes and connecting pipe and fittings, an oxygen and a hydrogen regulator, with hose and connections, a spark lighter, goggles, and a torch wrench and regulator wrench. Various types of rods and fluxes can be furnished for use with the torch.

Screwdriver Set, Detachable-blade, No. 60

Consolidated Tool Works, Inc., New York, N. Y.

"American Machinist," November 24, 1921.



The tool is intended for heavy work and is strongly made. Four hardened and ground tool-steel blades are provided, the widths being ⅛, 5/32, ¼ and ⅜ in. The handle is turned from a solid bar of cold-rolled steel, and is knurled. The blades are interchangeable in the handle. The two smaller blades are fitted at one end and the two larger ones at the other. They are secured without the use of any moving jaws. The blad is prevented from turning in the handle by a stop which bear against the flat surface on the tang. The assembled tool is 6¼ in. long.

Planer, "Maximum Service"

G. A. Gray Co., Cincinnati, Ohio.

"American Machinist," December 1, 1921.

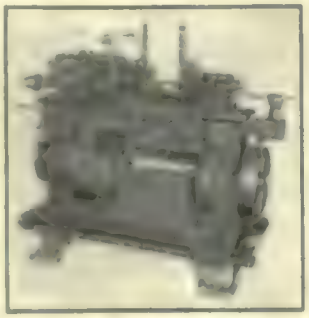


The control of the machine is centralized. The feed motion is positive, and adjusted by knobs until the required feed is indicated on graduated dials. The rail-head and side-head feeds are independent. The rapid traverse motion is applied to the side-heads, as well as to the rail-heads, while neither the motion nor any part of the rapid-traverse mechanism is in motion unless a head is actually being moved. A stirrup controls the rail elevation. The motor that operates the rapid traverse motion also furnishes the power for setting the rail. The bed of the planer is made full length, forming a rigid support. Helical gearing drives the table while bronze thrust collars take the resultant end thrusts.

Lathe, Engine, Full Automatic

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," December 1, 1921.

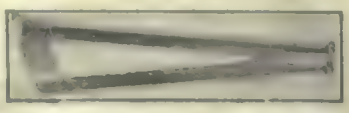


The lathe is completely automatic in introducing and gripping the work, turning shoulders and ejecting finished pieces. It has all the features of an engine lathe: a pair of centers to support the work, a bevel-gear driven cross-slide carriage and a toolpost. The traverse movement is actuated by drum and face cams. The work is fed from a magazine. The machine is made in two sizes, and with cone or geared head. Four changes of speed of the automatic movement are provided for each spindle speed on the larger machine and three on the smaller. Length of work, large machine, 3¼ to 15 in.; small machine, 2½ to 11 in. Diameter of work, large machine, ⅛ to 1¼ in. and ¼ to ⅜ in., respectively. Weight, 2,750 and 1,625 lb., respectively.

Caliper, Thickness

Bausch & Lomb Optical Co., Rochester, N. Y.

"American Machinist," November 24, 1921.



The device is intended to give a means of easily measuring diameter or thickness, being originally developed for determining the thickness of lenses. The two legs are of U-form, to give strength. The pivot is provided with a bronze bearing adjustable for wear. The measuring points are made of hardened steel, and the ends have a spherical form. A locking screw adjustment is provided at each point. The scale fastened to one of the legs can be graduated to read in either thousandths of an inch or in tenths of a millimeter. The maximum capacity is 12 mm. or ½ in.

Tag, Identification, Toolmakers'

L. J. Hogarty Co., 5 Beekman St., New York, N. Y.

"American Machinist," November 24, 1921.

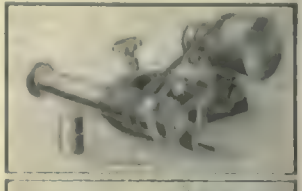


The device is intended for use by toolmakers and machinists, where one man is not assigned permanently to one machine. Each operator has one tag, bearing his check number. His name is on a metal band so fastened on the tag that it can be removed and replaced by another band. When an operator starts to use any machine in the shop he attaches to it his identification tag, which indicates that the machine is occupied. This method is intended to displace the more common one of putting a tool or cutter in a machine to show that the latter is in use, or else being held for future use. On the face of the tag are printed some rules regarding the care and operation of machine tools.

Grinding Spindles, Internal and Face, "Fortuna"

Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.

"American Machinist," December 1, 1921.





The type J spindle is for horizontal internal grinding where no heavy axial thrusts are encountered. The work sizes are from a ½-in. hole and 2½-in. depth to a 2½-in. hole and a depth of approximately 20 in. The type D spindle is for both internal and face horizontal grinding. The type DD spindle is for vertical internal and face grinding, as well as for grinding internal radial grooves. The minimum work diameter with types D and DD is 1⅞ in. with a maximum depth of 9½ in., and a minimum diameter of 4⅛ in. with a maximum depth of 36 in. With abrasive pencils, holes 5/64 in. in diameter may be ground to a maximum depth of ½ in., or ⅞ in. with a maximum depth of 1½ in.

Drilling Machine, High-Speed, Horizontal

Acme Machine Tool Co., Cincinnati, Ohio.

"American Machinist," December 1, 1921.



The machine is especially adapted to drilling small deep holes. The work-spindle and chuck operation is identical with that of a hand-screw machine. The drill spindle has a No. 1 Morse taper for holding the drill chuck. It is driven by a flanged pulley and is moved backward and forward by a pilot wheel, while the spindle collar acts as a stop gage. The spindle is held in a casting adjustably mounted on a sliding saddle. It is ordinarily run at about 3,000 r.p.m. Since the work spindle speed is 500, a drilling speed of 3,500 r.p.m. is obtained

WALTER RADTKE, chief metallurgist at the plant of the Canton Sheet Steel Co., Canton, Ohio, has resigned.

PETER G. SCHILLING, formerly associated with H. S. Johannsen, New York City, is now chief engineer for the American Krupp System-Diesel Engine Co., New York.

ELWOOD B. CROCKER has resigned as a trustee for bondholders of the Havana Bridge Works of the Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.

HARRY G. MOOCK, general manager of the National Automobile Dealers' Association, has resigned that position to become director of merchandising with the Hudson and Essex automobile companies.

FRANK E. SMITH has been elected president of the Republic Motor Truck Co., Alma, Mich.

HARRY FOWLER has been appointed district sales manager of the Cincinnati sales territory for the Carborundum Company, Niagara Falls, N. Y.

CHARLES R. COX has been appointed sales statistician for the Carborundum Company, Niagara Falls, N. Y. He was formerly in charge of the Cincinnati sales territory for that company.

JOSEPH F. DUNN has been appointed Indiana agent for the United States Hoffman Machinery Corporation. His headquarters will be in Indianapolis.

W. C. ALLEN, former manager of the Philadelphia branch of the Black & Decker Co., has been appointed district manager of the Chicago territory. This includes the states of Wisconsin, Illinois, Missouri, Iowa, Minnesota and North Dakota.

C. E. SKINNER, manager of the research department of the Westinghouse Electric and Manufacturing Co., has been appointed assistant director of engineering in that company. His duties will cover research, standards and other work along those lines. He will be located in the main engineering offices of the company at East Pittsburgh, Pa.

S. W. LINDHEIMER, formerly vice-president of the Walter A. Zelnicker Co., St. Louis, dealers in sheet piling, track accessories, railroad and contractor's equipment, who on October 1, 1921, was placed in charge of Zelnicker's Chicago office, has now gone into business for himself, handling similar lines as above. He is located at Room 428, First National Bank Bldg.

G. H. PFEIF has been appointed director of industrial relations at the Schenectady plant of the General Electric Company, succeeding E. B. Merriam who recently became executive engineer of the switchboard department. As director of industrial relations Mr. Pfeif will have supervision over the employment, education and training, compensation, hospital and safety work of the Schenectady plant.

ARTHUR WHITCRAFT, for a number of years successively with the Marion Steam Shovel Co., American Locomotive Co., and New York Central Railroad, in charge of erection, operation and supervision of heavy excavation machinery, and for twelve years with the American Manganese Steel Co., as sales engineer engaged in the design application and sale of manganese steel castings, has assumed charge of the manganese steel sales department of the Hadfield-Penfield Steel Co., with headquarters at Bucyrus, Ohio.

WILLIAM J. SMITH has recently joined the Gilbert & Barker Manufacturing Co., Springfield, Mass., organization, as assistant superintendent of the foundry division. Mr. Smith was formerly equipment engineer with the McNab & Harlin Co.

ALLAN D. COLVIN, assistant general manager of the Hartford Electric Light Co., Hartford, Conn., has been appointed as a graduate lecturer of the Department of Electrical Engineering, at Yale University, New Haven, Conn.

W. J. METCALF, manager of the stock and order department of the Yale & Towne Manufacturing Co., Stamford, Conn., has been appointed as assistant to president Walter C. Allen of the company, and will take up his new duties immediately. Mr. Metcalf, has been with the company since 1902.

Obituary

EDWARD M. BARR, manager of the Chicago office of the Chisholm-Moore Manufacturing Co., of Cleveland, Ohio, died suddenly in Chicago on March 15.

HENRY A. LAUGHLIN, director in the Jones & Laughlin Steel Co., Pittsburgh, Pa., died at his home in Philadelphia on March 22. He was 83 years old and had been in the steel business for the past sixty years.

JOHN A. HURLEY, retired manufacturer of Bridgeport, Conn., died at his home in that city on March 20. Mr. Hurley has been ill for the past two years, and was confined to his home for some time past. He was head of the Hurwood Manufacturing Co., manufacturer of sheet metal goods, etc., which was organized in Meriden, Conn., removing to Bridgeport in 1903. In 1911 the Hurwood Manufacturing Co., sold out to the Coe-Stapley Manufacturing Co., which later removed to West Haven.

JAMES A. DOUGHTY, president of the Torrington Manufacturing Co., manufacturer of machinery, brass goods, etc., Torrington, Conn., died suddenly at his home on March 15. Mr. Doughty was seventy-one years old, and was well known in industrial circles of the eastern states.

Book Reviews

Survey of Elevator Interlocks and an Analysis of Elevator Accident Statistics. Technologic Paper No. 202 Bureau of Standards; can be obtained from Superintendent of Documents, Government Printing Office, Washington, D. C., price five cents.

This report presents the results of an inspection of the interlocking mechanisms on several thousand elevator landings, the performances being classified into groups on a basis of service and maintenance conditions; a comparison of the advantages and disadvantages of the various types of devices is given, together with causes of breakdown under service. A number of tables of elevator statistics is given, the statistics being further classified as "shaft-door" and "non-shaft-door." A general discussion of the statistics follows. The interlock requirements of the A. S. M. E. Elevator Code are quoted in conclusion.

The report was prepared by C. E. Oakes, electrical engineer, and J. A. Dickinson, mechanical engineer, of the bureau.

Electric Arc Welding. By E. Wanamaker and H. R. Pennington, electrical engineer and supervisor of electrical equipment, respectively, Chicago, Rock Island & Pacific Railroad. 257 6 x 9-in. pages. Simmons & Boardman Publishing Co., New York City. Price $4.

This is a practical book by practical men, and contains much information for those who would apply the electric arc process of welding to their own problems. Starting with a brief outline of the origin of the process, the reader is informed upon the theory and principles of the process, the apparatus and equipment required, and is shown practical applications of arc welding to railroad and structural repairs.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

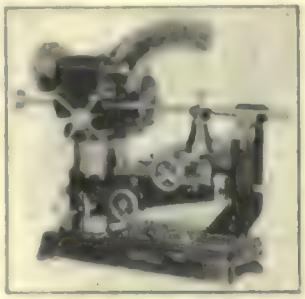
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 30, 1918

Combination Machine, Bench-Type, Lathe, Milling and Drilling
Tropics Machine Tool Corp., 18 E. 41st St., New York, N. Y.
"American Machinist," December 1, 1921



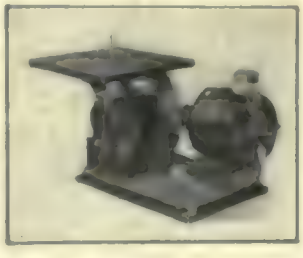
The machine provides a complete machining equipment for quarters with bench space, and a motor drives and hand-feed throughout with the exception of the feed when screw cutting. The head can be shifted so as to operate at any angle. The spindle is driven by a ½-hp. reversible ball-bearing motor running at a speed of 1,750 r.p.m. It will hold either a fa[illegible] spring collet or a chuck. There are six spindle speeds of from 90 to 1,150 r.p.m. Table, 5 x 14½ in. Feed: longitudinal, 10 in.; transverse, 6 in.; vertical, 4½ in. Spindle travel, 3 in. Swing over table, 8 in.; over ways of bed, 14½ in. Center distance, maximum, 14 in. Diameter of milling arbor, ½ in. Spring collet capacity, ¼ in. Bench space, 16 x 26 in. Maximum height, 61 in. Weight, 450 lb.

Welding Machine, Arc, Semi-Automatic, G. E.
General Electric Co., Schenectady, N. Y.
"American Machinist," December 1, 1921.



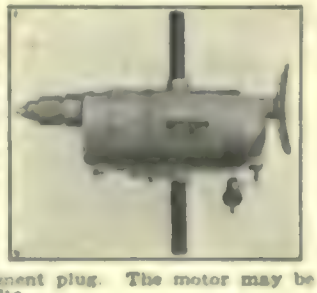
The welding tool is directed by the operator and guides the electrode arc. It has a switch in the handle for operating the control on the panel. The device has a 10-ft. length of flexible steel tubing, to which is attached the automatic welding head. The wire passes from the feed rolls of the head through the flexible tubing and guide nozzle to the arc. The machine may be used for welding seams of irregular contour or for large work where the travel mechanism and clamping would be too complicated. It is adapted to building up metal rapidly, filling up blow holes in castings, or building up worn spots.

Filing Machine, Die, Bench
R. G. Haskins Co., 27 S. Desplaines St., Chicago, Ill.
"American Machinist," December 1, 1921.



The machine is motor driven through a friction disk at speeds ranging from 300 to 700 strokes per minute, filing steel as well as brass and other soft metals at their proper cutting speeds. The motor is ¼ hp. and is provided with ball bearings. A hardened and ground steel block and guide impart the reciprocating motion. The grooved table is 9 in. square and is adjustable to any angle. The driving spindle is of nickel steel, heat-treated and ground. Standard filing-machine files are furnished in sets of twelve in various shapes, the shanks being ¼ in. in diameter. The machine is light and portable.

Drill, Electric, Portable, "Power King"
Jones, MacNeal & Camp, 533 S. Clinton St., Chicago, Ill.
"American Machinist," December 1, 1921.



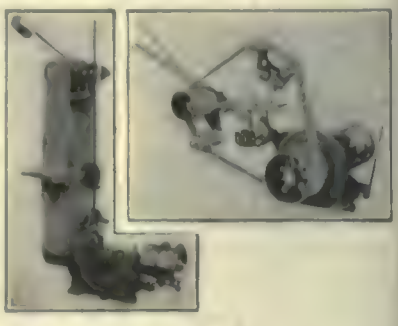
The body of the drill is built in three sections, that nearest the chuck containing the gears. The middle section holds the motor, switch and wiring, while the rear section is a protecting cap. The barrel plate is interchangeable with a handle or a feed screw. The spindle, armature shaft and drive shaft run on ball bearings, the spindle bearings being of the combination radial and thrust type. The drill is made in eight sizes for drilling holes from ¼ to 1 in., and with spindle speeds of 1,400 to 2,400 and 200 to 370 r.p.m. The equipment includes fifteen feet of cord and an attachment plug. The motor may be furnished for either 110 or 220 volts.

Drilling Machine, Heavy-Duty, Upright, No. 6
Colburn Machine Tool Co., Cleveland, Ohio
"American Machinist," December 1, 1921.



Speed and feed controls are centralized on the front of the machine. Sliding gears give two quick changes of speed, and transposing gears furnish 48 spindle speeds from 30 to 375 r.p.m. A handwheel controls two feeds having a ratio of 3 to 1, and change gears give 36 feeds from 0.005 to 0.154 in. per spindle revolution. A geared tapping attachment, an extended base, or a machine having gangs of two, three or four spindles can be furnished. Capacity in steel 3 in. Swing 28 in. Vertical table adjustment, 13 in. Total height, spindle up, 115 in. Floor space, plain table, 53 x 68½ in.; compound table, 66 x 71 in. Net weight: with plain table, 4,020 lb.; compound table, 4,545 lb.

Sanding Machine, Belt, "Variety," No. 127
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," December 1, 1921.



This machine is equipped with an edging attachment and a fork idler for oval sanding. The edging table is 10 x 12 in. and can be tilted 30 deg. The backing plate is 10 in. wide. It is adjustable to vary the belt tension, and is replaceable with special flexible pads. Both the main and tension idlers are adjustable, roll on ball bearings and are leather covered. The sanding belt is 10 in. wide and 14 ft. long. The machine can be furnished with either belt or motor drive. Weight boxed for export, 650 lb.

Drilling and Boring Machine, Crankcase
Manufacturers' Consulting Engineers, Syracuse, N. Y.
"American Machinist," December 1, 1921.



The machine is equipped with a driving motor and two movable heads, which can be fed in opposite directions by a hand lever. Each head carries a number of drills and a boring head, the number depending on the character of the operation. The machine illustrated carries three drills and one boring head in each of the movable heads, and is intended for drilling and boring crankcases for the attachment of starters and generators.

Fixture, Drilling, Universal
Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn.
"American Machinist," December 1, 1921.



The fixture is used in drilling irregular-shaped pieces, and consists of an accurately scraped base block and two adjustable angle plates. One edge of each of the small angles on the plates is bevelled to 45 deg., forming a V for holding round pieces, or with the angles out of parallel holding tapered pieces with the upper surface either level or at a slant. By rearranging the angle blocks, an internal angle or two parallel surfaces can be secured. The base, angle blocks, and clamping arms are cast iron, while the swivel posts and clamping bolts are heat-treated steel. Base, 8 x 12 in. Height of posts, 7½ in. Weight, approximately 60 lb.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ala., Birmingham—The Brilliant Coal Co., American Trust Bldg.—one electric drum hoist to be used for pulling loaded mine cars from mine.

Ala., Birmingham—The East Pratt Coal Co., 601-3 Chamber of Commerce Bldg., T. Morgan, Genl. Mgr. and Purch. Agt.—one small lathe, 30 in. between centers and three speed pulley for cast iron and forged work.

Ariz. Nogales—G. Corella, Jr., P. O. Box 1175—creamery machinery.

Ark., Dukey Heights (Sulphur Springs P. O.)—F. L. Armstrong, farmer—small tools and sawing machinery.

Ark., Fort Smith—H. N. Hall, 316 First Natl. Bank Bldg.—machinery for the manufacture of paper boxes including candy boxes, etc.

Conn., Stratford—J. F. Stone, Canaan Rd.—one power rip and cut-off saw, and one jointer, (used).

Cal., Los Angeles — The Westinghouse Electric & Mfg. Co., Van Nuys Bldg.—five traveling cranes for proposed warehouse on 5th and San Pedro Sts.

Ga., Atlanta—The Fulton Bag & Cotton Mills, 10 South Blvd., Atlanta, N. E. Elsas, Secy. and 643 Security Bldg., Minneapolis, Minn.—machinery and equipment for proposed factory at Minneapolis.

Ga., Dalton—The Farrar Lumber Co., F. F. Farrar, Secy.—10-12 in. outside moulder and small band resaw, must be thoroughly modern and up to date.

Ga., Macon—J. S. Schofields Sons Co., Hammond and Boundary Sts., V. A. Vail, Purch. Agt.—heavy duty plate drill to drill plates for boilers, delivery Macon, (used).

Ia., Des Moines—The Des Moines Printing Exchange, 310 2nd St.—one 16 x 19 in. lever cutter.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt. $724,281 worth of shop machines and tools.

Ill., Chicago—The Merkle-Korff Gear Co., 313 South Clinton St., A. Merkle, Purch. Agt.—shop machinery complete outfit.

Ill., Chicago—The Paragon Mfg. Co., 3225 Ravenswood Ave., A. Roehri, Purch. Agt.—one No. 2 Brown & Sharpe milling machine, late type, and one surface grinder.

Ill., Chicago—F. H. Rawson, 7 South Dearborn St.—two Yale & Towne, 3 ton gear chain hoists.

Mass., Boston—A. B. Croke Co., 143 Federal St.—all kinds of photo engravers machinery and equipment, (used).

Mass., Fall River—Fyans, Fraser & Blackway, 83 Anawan St.—one 3 cylinder "Kitson" roving waste machine, (used).

Mich., Detroit — N. J. Aulbach, 4040 Greenwood Ave.—band saw and equipment, 30 in. or smaller.

Mich., Detroit—F. E. Will & Son, 6661 West Fort St.—small bench lathe and drill press.

Mich., Holley—Grinnel Bros.—30 x 72 in. hydraulic veneer press with clamps complete.

Minn., Minneapolis—The Electric Short Line Ry. Co., 7th St. and 23rd Ave., N., W. L. Luce, Pres.—several power machines for handling wheels.

Minn., Minneapolis—The Northwestern Ice Cream Co., 309 19th St., N. E., G. A. Ball, 1942 Hennepin Ave., Secy.—machinery for the manufacture of ice cream, also refrigerating machinery. Estimated cost, $27,000.

Minn., St. Paul—The Twin City Woodworking Co., 450 Cleveland Ave., C. R. Stone, Secy.—woodworking machinery.

Miss., Sessums—J. M. Greene, Middleton, Greene and Dunn Sts.—portable air riveting equipment to handle up to ¾ in. rivets.

Mo., Hammond—Lawsen Bros., J. Lawsen, Purch. Agt.—planer.

Mo., Joplin—The Hibbard Mfg. Co., 1019 East 3rd St., E. H. Shackleford, Purch. Agt.—woodworking machinery, shafting, belting and planing machine.

Mo., Joplin — The Joplin Center Cord Tire Co., 813 Main St.—vulvanizers, rollers, molders and automobile tire making machinery.

Mo., Joplin—The Monarch Garage, 410 Penna St., R. A. Nisely, Purch. Agt.—drill press, lathe, belting and shafting.

Mo., Joplin—The Peerless Motor Sales Co., 409-11 Virginia Ave., G. McFall, Purch. Agt.—drill press, lathe, emery wheel and stand for electric power.

Mo., Kansas City—E. Warren, c/o Coates House—printing press for job work.

Mo., Pineville—The Pineville Canning Co., J. S. Armstrong, Purch. Agt.—machinery and equipment for canning plant.

Mo., St. Louis—J. J. Connors, 3900 Easton Ave.—electric drill.

Mo., St. Louis—Schoellborn-Albrecht Machine Co., 721 North 2nd St.—machinery for machine shop (used).

Mo., Webb City—The Webb City Stone Co., A. S. Kerr, Purch. Agt.—shafting, belting and stone sawing machinery.

Neb., Lincoln—The Lincoln Welding Co., 330 South 10th St.—one 18 in. lathe 10 ft. bed and drill press, (used).

N. J., Jersey City—The Horne Mfg. Co., 243 Mercer St.—one disc grinder.

N. Y., Adams—O. D. Greene Lumber Co.—one adjustable saw table and rack, also one heavy swing cut-off saw.

N. Y., Adams—Shelmidine & Moore Co., Spring St., R. F. Bundy, Purch. Agt.—heavy machine bench vise and hand tapping and threading machine up to 2½ in.

N. Y., Bath — The Pine Grove Stock Farm, D. M. White, Purch. Agt.—electric driven milk and cream handling, cooling and pasteurizing and ice cream making machinery and equipment.

N. Y., Brooklyn—P. W. Stange, 64 North 9th St.—one electric spot welder.

N. Y., Buffalo—The Behringer Planing Mill Co., 177 Imson St.—one 30 in. shaving fan and one automatic knife grinder.

N. Y., Buffalo—D. Calabuse, 655 Ellicott St.—tinners tools; 30 in. roller; 30 in. folder; small edging machine.

N. Y., Buffalo—Whistler & Schanland, 1283 Niagara St.—japaning oven and tumbling barrel.

N. Y., Burts Mills—The Cascade Milk Corp., C. A. Brown, 235 High St., Watertown, Purch. Agt.—milk handling machinery and transmission equipment.

N. Y., Cameron—The C. Meyers Co.—drill press, bench miller power grinder and hack saw, (new or used).

N. Y., Carthage—The Champion Paper Co., Lathrop St.—pipe threading machine.

N. Y., Dolgeville—The Dolgeville Felt Shoe Co., Faville Ave.—three 1½ ton triple chain hoists, also roller conveyor equipment.

N. Y., Elmira—The Bd. Educ., City Hall—eleven paper baling presses.

N. Y., Elmira—J. L. McInerny, 311-17 State St.—forge and blower equipment; light lathe, (used); arbor press and power hammer, (light).

N. Y., Harrisville—J. De Graff—portable forge and blower, also concrete brick machine.

N. Y., Jamestown—The Falconer Street Garage, 253 Falconer St.—large chain hoist.

N. Y., Little Falls—The Barnet Leather Co., Inc., 598 East Mill St., E. L. White, Purch. Agt.—special machinery for handling, treating and manufacturing of leather.

N. Y., Lowville—The Virklers Machine Shop, A. N. Virkler, Purch. Agt.—hydraulic trunk tire setter, also parts for built-in forger including electric driven blower and equipment.

N. Y., Lyons Falls—The Gould Paper Co.—pulp stone dressing tools, 2½ ton triple geared hoist.

N. Y., Newburgh — The Hudson River Woolen Mills—one 40 in. cloth opening machine.

N. Y., New York—The Amster Constr. Co., 705 East 133rd St.—one cornice brake, 8 ft.

N. Y., Ogdensburg—The Monnet Bedding & Upholstery Co., Inc., E. O. Monnet, Purch. Agt.—machinery and equipment for the manufacture of mattresses, also upholstery spring winding machinery.

N. Y., Ogdensburg—The Universal Reclining Chair Co., Inc., (wooden chairs), A. F. Whalen, Purch. Agt.—electrical sanding equipment and swing cut-off saw.

N. Y., Rochester—The Continental Products Co.—elevating, screening and grading machinery for proposed sand and gravel storage bins.

N. Y., Rochester—G. Erlwein, 568 Lake Ave—complete outfit and machinery for bakeshop.

N. Y., Silver Creek—The Thompson Fdry. Co., Oliver St., F. Thompson, Purch. Agt.—iron and brass foundry equipment and heat treating equipment.

N. Y., Silver Creek—F. R. Thompson—one engine lathe, one drill press and other machinery for small foundry.

N. Y., Syracuse—W. M. Wischeroth, 100 Otisco St.—boiler to develop about 40 hp or more, also two or three vats, 4 x 4 x 12 by ¼ in. thick.

N. Y., Troy—The Troy Yarn Co., 20 River St., one Davis and Furber twisting machine for making 2 ply yarn, (used).

The Weekly Price Guide

THIS WEEK'S MARKET

Prices of gray iron machinery castings quoted in nine cities in this week's issue. Weekly quotations on casting rates will hereafter include several additional centers of importance.

Producers of structural shapes, plates and mild steel bars continue to quote $1.50 per 100 lb., Pittsburgh; but the market is not yet firmly established on that basis. Actual buying is possible at $1.40@$1.45 f.o.b. mill. New York warehouses quote steel shapes and plates at $2.48 as against $2.63; bars at $2.38 as compared with $2.53 per 100 lb. Cleveland quotes shapes and plates at $2.31 as against $2.46; bars at $2.21 as compared with $2.36 per 100 lb. one week ago. Demand for steel sheets greater than for any other steel product, and prices are beginning to show upward tendencies.

Spelter quoted in New York warehouses at 5¾c., as against 5¼c.; antimony at 5c. as compared with 5¼c. per lb. last week. Copper shows no improvement in demand but rising tendency in prices seems somewhat checked. Lead market steadier; tin firm.

Linseed oil quoted at 83c. as against 84c.@87c. per gal. in New York.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.52
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	17.65
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.76
Virginia No. 2	20.74
Basic	21.00
Grey Forge	19.65
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	18.75
Basic	18.00
Bessemer	19.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.5
Philadelphia	8.75	5.5	2.65
Atlanta	5.0	4.0	3.5
Detroit	7.0	4.5	3.0
Birmingham	...	8.0	3.0
Denver	8.0	6.0	5.0
New Orleans	9.0	6.0	3.0
Minneapolis	9.0	6.0	4.5
New York	8.5	6.0	3.0

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.44
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.48	2.31	2.63
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
½"	8.50		12@13
⅜"	7.15		11@12
⅛ to ¼	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	30.25
Lead (up to carlots), St. Louis, 4.65; New York	5.00
Zinc (up to carlots), St. Louis, 5.02½; New York	5.37½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.75
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	44.00	.....	.....
Solder (½ and ¼), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.0
Babbitt metal (commercial)	16.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.50
Copper, heavy, and wire	9.50	10.00	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.25	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.83	.99	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	.....
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4 95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	....	3.20

N. Y., Watertown — Lucas & Smith, Jackson St., R. Smith, Purch. Agt.—small size vertical post drill; carbon twist drills ⅜ cut; woodworking saw table for 24 in. saw.

N. Y., Watertown—The Watertown Paper Wks., West Main St., D. Corbet, Purch. Agt.—compressor, tank and pneumatic riveter.

N. Y., Woodside (Flushing P. O.)—The Star Novelty Mfg. Co., 35 Lovrich St.—one No. 19 Bliss press; one Anderson rotary [illegible] machine; one small shaper.

N. Y., Woodville—G. D. Chester—wooden weaving machinery, line shafting and transmission equipment.

N. C., Elkin—C. W. Rothrock & Sons, manufacturers of wood products, C. W. Rothrock, Purch. Agt.—self feed rip saw, tenon saw, 3-sp hp engine, 40 hp. boiler, etc.

N. C., High Point—The Boyer Ferguson Co., R. Ferguson, Mgr.—locomotive crane to handle 1 yd. clam shell or orange peel bucket, full revolving, rail truck or road traction mounting (used); also a small locomotive, Plymouth or Burton preferred, and about 10,000 ft. of 24 in. gauge 20 lb. industrial track.

N. C., Salisbury—The Wyatt Granite Paving Block Co., P. O. Box 10 R.F.D. No. 2—small gasoline engine and hoister combined, capacity one or two tons.

O., Cincinnati—The Eastern Mchy. Co., 426 East Pearl St., A. Smith, Purch. Agt.—one No. 1½, 2 or 2½ universal milling machine; power punch press, 1,000 lb. pressure, Willard or Bliss.

O., Cincinnati—Jones Machine Tool Co., 435 Pearl St., C. Jones, Purch. Agt.—one 1,000 ampere plating dynamo, 10 volts; standard stamping press equal to No. 5 Toledo; small quick change lathe 14 in. or 16 in. swing, with 6 ft. or 8 ft. bed; one 1½ in. bolt cutter; two 8 ft. bending rolls, one for ½ in. and one for No. 10 plate.

O., Cleveland—The Amer. Steel & Wire Co., Western Reserve Bldg.—various size lathes.

O., Cleveland—The Bd. Educ., Rockwell Ave. and East 6th St., S. E. Hyre, Clk.—two printing presses; two lever paper cutters; two proof press stands; type; two stitchers and imposing tables; two variety bench saws; two 30 in. band saws; two hand jointers; two combined oil stone grinders; two quick change gear lathes; two bench drill presses; two wheel electric grinders; two 30 in. squaring shears; two bar folding machines; two combined punch and shear machines; two forming machines; two burring machines; two turning machines; two wiring machines and two hand forges.

O., Cleveland—The A. H. Robinson Co., 5102 Detroit Ave.—one electric arc welding machine.

O., Marietta—Patton Bros. (foundry)—one large pneumatic rollover.

Okla., Ponca City—The Municipal Water & Light Dept., P. R. Dunton, Supt.—one 31 in. x 4 ft. bench lathe with milling attachment and draw chuck (used).

Pa., Erie—The Blyestone Mfg. Co. of Cambridge Springs, will take over the plant of the Triangle Tool Co., 8th and Holland Sts., here, and install material and machinery for the manufacture of concrete block and concrete mixing machinery. This plant is to be operated (it is reported), only until Cambridge Springs plant, which was destroyed by fire, can be rebuilt.

Pa., Monongahela—The Coshocton Iron Wks., Adams St.—one 10 ton, one 5 ton and two 2 ton cranes.

Pa., New Britain—H. A. Voss—automatic hosiery machines for new mill at Lansdale.

Pa., Phila.—The Andross Worsted Co., Bridge and Charles Sts., J. Lee, Pres.—loom winders, throwers, machine shop equipment, shafting, belting, etc.

Pa., Phila.—J. G. Boggs, 1910 North 4th St.—lathes, shapers, millers and belting.

Pa., Phila.—J. A. Dodds, 2929 Ellsworth St.—small double drum, hoist engine and boiler.

Pa., Phila.—The J. C. H. Automatic Machine Wks., 2424 North Fairhill St.—one 2 ton high speed chain hoist.

Pa., Phila.—F. W. Mauer & Sons Co., Wayne Ave. and Bristol St.—five thousand 3 x 5 spools for Prince Smith roving frames.

Pa., Phila.—The North Eastern Ice Mfg. Co., Front and Luray Sts.—ice manufacturing and conveyor machinery.

Pa., Phila.—The Sobel Machine Co., 980 North 40th St.—one No. 7 Brown & Sharpe or similar surface grinder.

Pa., Pittsburgh—The Allegheny County Comrs., R. D. Schorley, County Rd. Comr.—mechanical conveying equipment for two asphalt plants.

Pa., Pittsburgh—R. M. McAnulty, Park Bldg.—jack hammer and air compressor.

Pa., Pittsburgh—The West Leechburg Steel Co., Farmers Bank Bldg.—sixteen inch continuous hot strip mill with auxiliary equipment.

S. C., Charleston—M. A. Deegan, East Henrietta St.—complete line of machinery and equipment for the manufacture of cement roofing tile.

Tenn., Memphis—The Memphis Fender & Enamel Wks., 52 South 4th St., F. H. May, Prop.—machinery, equipment, etc., for use in straightening fenders.

Tex., Austin—N. K. Brown, State Hy. Dept.—ten ton ice manufacturing plant.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St.—one 54 in. boring machine; 18 in. x 16 ft. lathe and milling machine.

Va., Leesburg—B. H. Branch—canning machinery and outfit (new or used).

Wash., Aberdeen—The Port of Grays Harbor, office of Comm., 206 East Wishkah St., F. H. Lamb, Pres.—receives bids until April 11 for one 5 ton, 95 ft. traveling hammerhead crane.

Wis., Antigo—Mattefs Bros., G. Mattefs, Purch. Agt.—rip saws (power).

Wis., Darlington—F. Fiedler—mechanical baking equipment.

Wis., Eau Claire—E. Peterman, 312 Gibson St.—dry cleaning and laundry machinery and equipment for proposed dry cleaning plant on Chippewa Rd.

Wis., Elkhorn—F. J. Schmidt—refrigerating and ice cream making machinery.

Sask., Guernsey—A. Bergen—one barley crisp machine, No. 2.

Wis., Marinette—H. A. White, 2000 Hall Ave.—gas storage tank and pump.

Wis., Milwaukee—The M. B. M. Mfg. Co., 27th and Lake Sts., W. J. Meyer, Purch. Agt.—one or two lathes.

Wis., Milwaukee—The Right Laundry Co., 124 Howell Ave.—belt driven laundry machinery.

Wis., Milwaukee—H. C. Schauer, 1146 25th Ave.—Universal woodworker, electric motor power.

Wis., Milwaukee—M. A. Weinreis, 241 Lake St.—one 10 x 10 x 10 and one 8 x 8 x 8 air compressor, also one 8½ x 9 x 10 d.c. d.d. skeleton hoist and two 7 x 10 d.c. d.d. hoists with boilers.

Ont., Clinton—D. S. Cluff—special machinery and equipment for cabinet woodworking plant. Estimated cost, $15,000.

Ont., Mitchell—The Wettlaufer Fdry. Co.—modern equipment for proposed foundry.

Ont., Port Arthur—The Provincial Paper Mills, Ltd., A. G. Poundsford, Div. Mgr.—seventy-three book machines capable of turning out 15 ton of book paper per day.

Que., Montreal—The Frontenac Fdry. Co., Ltd., 388 Cartier St.—equipment for new foundry on Lapalileur St.

Metal Working Shops

Conn., Georgetown—Greenwood & Noorr, Archts. and Egrs., 847 Main St., Hartford, are receiving bids for the construction of a 3 story, 52 x 150 ft. addition to plant of Gilbert & Bennett Mfg. Co., manufacturers of wire goods. Estimated cost, $75,000.

Conn., Torrington—The Amer. Brass Co., Waterbury, plans to build a rolling mill on Water St., here. Private plans.

Ill., Chicago—N. Forte & Bros., 2059 Ogden Ave., are receiving bids for the construction of a 1 story, 100 x 124 ft. garage at 251-57 North Crawford Ave. Estimated cost, $50,000. J. T. Fortin, 600 Blue Island St., Archt.

Mass., Whitinsville — The Whitin Machine Wks. is receiving bids for the construction of a 3 story, 75 x 200 ft. garage and fire house at plant. Estimated cost, $150,000. J. D. Leland & Co., 41 Mt. Vernon St., Boston, Archts.

Mass., Whitinsville — The Whitin Machine Wks. is receiving bids for the construction of a 4 story, 95 x 300 ft. addition to its machinery plant. Estimated cost, $300,000. J. D. Leland Co., 41 Mt. Vernon St., Boston, Archts.

O., Youngstown—The Kalman Co., 42 West Monroe St., Chicago, has had plans prepared for the construction of a 400 x 420 ft. steel fabricating plant (in 2 units), on Poland Ave, here. Estimated cost, $200,000. Private plans.

Pa., Kennedy—The Koppel Car Repair Co., subsidiary of the Pressed Steel Car Co., Farmers Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 60 x 500 ft. car [illegible]. Private plans.

Pa., Phila.—The city will soon award the contract for the construction of a 100 x 280 ft. office and machine shop on 28th and Cambria Sts. Estimated cost, $75,000. A. E. Davis, City Hall, Engr.

Va., Norfolk—The Atlantic Iron Wks., Water St., plans to rebuild its machine shop and iron works on Southampton Ave., which were destroyed by fire. Estimated loss, $250,000. F. H. Masi, Pres.

Wis., Marinette—T. Klaver, Jr., Archt., 1861 Dunlap St., is receiving bids for the construction of a 1 story, 115 x 117 ft. garage on Court St. for H. A. White, 2000 Hall Ave. Estimated cost, $40,000.

Wis., Racine—W. J. Redden, Archt., 2819 Arlington Ave., is receiving bids for the construction of a 2 story, 80 x 100 ft. garage for the Jacobson Auto Co., 1713 West 6th St. Estimated cost, $45,000. Noted March 9.

Ont., Mitchell—The Wettlaufer Fdry. Co. will build a 70 x 80 ft. addition to its foundry. Estimated cost, $15,000.

General Manufacturing

Ill., Chicago—A. S. Alschuler, Archt., 28 East Jackson Blvd., is receiving bids for the construction of a 6 story, 125 x 125 ft. printing plant on Jackson Blvd. and Laflin St. for the U. S. Sample Co. Estimated cost, $350,000.

Ill., Chicago — F. D. Chase, Archt., 645 North Michigan Ave., is receiving bids for the construction of a 2 story, 150 x 150 ft. factory on Diversey Pkway. near Ashland St. for the Paasche Airbrush Co., 1219 West Washington St. Estimated cost, $50,000.

Ill., Chicago — Newhouse & Bernham, Archts., 4630 Prairie Ave., are receiving bids for the construction of a 2 story, 60 x 170 ft. ice cream factory (1st unit), on Federal and 45th Sts. for the Goodman American Ice Cream Co., 100 West 45th Place. Estimated cost, $75,000. Total cost of project $400,000.

Ill., Rock Island—The Illinois Oil Co., 215 Safe Bldg., will build a 3 story, 40 x 150 ft. office and factory. Estimated cost, $160,000. F. J. Welsh, Pres. Noted March 23.

Mo., East Joplin (Joplin P. O.)—The Wilhoit Oil Co., 718-21 Woodruff Bldg., Springfield, is receiving bids for the construction of a 1 story oil refinery here. Estimated cost, $100,000. Private plans.

O., Utica—The Licking Window Glass Co. plans to rebuild its blowing and packing plant which was destroyed by fire. Estimated loss, $150,000.

Pa., Phila.—J. B. Van Sciver Co., Market St. Ferry, Camden, N. J., manufacturers of furniture, will soon award the contract for the construction of a 7 story, 57 x 61 x 119 x 220 ft. warehouse and factory on Arch St. and Delaware Ave., here. Estimated cost, $600,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—Wittman-Moriarity Co., 4th and Vine Sts., has awarded the contract for the construction of a 3 story, 100 x 350 ft. leather factory on Westmoreland and Broad Sts. Estimated cost, $75,000.

R. I., Pawtucket—The Potter Fine Spinners, Inc., Newport Ave., has awarded the contract for the construction of a 2 story, 40 x 75 ft. mill on Newport Ave.

Tenn., Nashville—The Union Ice Cream Co., 817 Broad St., is having plans prepared for the construction of a 3 story ice cream factory on 12th and Broad Sts. Estimated cost, $200,000. Mann & Holman, Stahlman Bldg., Archts.

Tex., Arlington—J. P. King and J. Davis are promoters of a company which has had plans prepared for the construction of a 10 ton ice manufacturing plant. Estimated cost, $40,000.

Wis., Milwaukee — The Interior Woodwork Co., 521 Park St., has awarded the contract for the construction of a 3 story, 67 x 160 ft. and 2 story, 70 x 100 ft. factory and storage plant on Park St. Noted March 9.

Wis., Milwaukee — The Natl. Knitting Co., 905 Clinton St., has awarded the contract for the construction of a 4 story, 40 x 42 ft. manufacturing plant on Clinton St.

American Machinist

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Making a Punch Press Department Safe

How a Manufacturing Company Has Greatly Reduced Accidents—Securing the Necessary Co-operation—Methods and Devices That Helped Make for Safety

By C. B. AUEL

Manager, Employees Service Department, Westinghouse Electric and Manufacturing Co.

A POWER press is among the most dangerous tools to operate, so that a press department may be considered as having one of the greatest accident hazards in the average manufacturing plant.

An exception to this general statement is to be found in the works of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., where the safeguarding of the press department has been systematically studied and developed. All safety work is under the direction of the manager of the employees' service department, reporting to the vice-president in charge of engineering and operations. A supervisor of safety appliances has, however, immediate charge of the details of operation and routine.

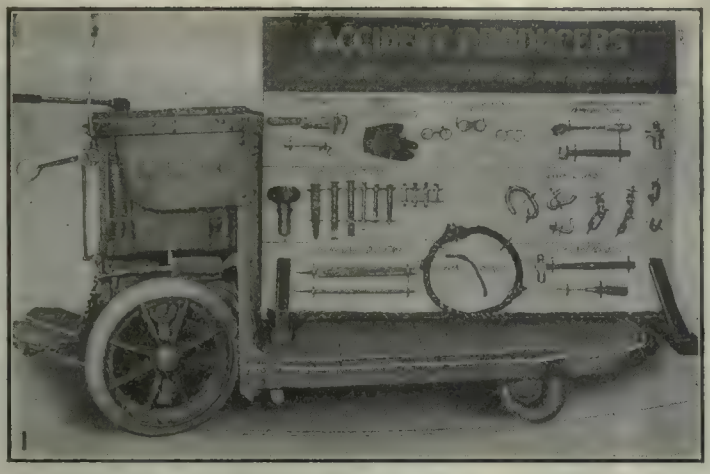


FIG. 1. EXHIBIT OF ACCIDENT PRODUCERS.

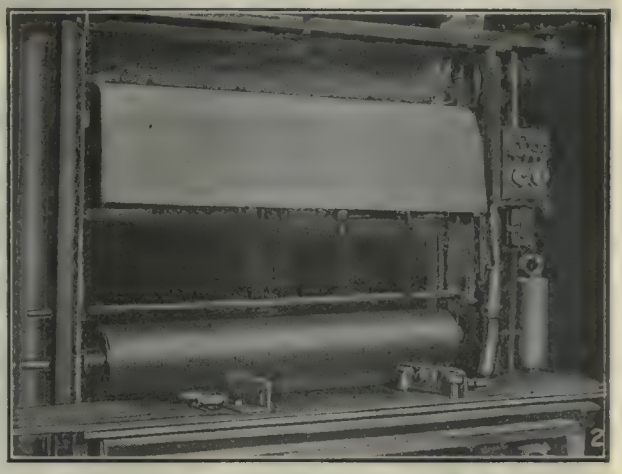


FIG. 2. FIRE HOOD FOR ENAMELING ROLLS

In the purchase of new tools and equipment, preference is given, other things being equal, to those best guarded; further, when a tool is taken out for repairs, it is guarded if need is shown, before being put back on production.

To assist in keeping every one on the mark, a safety patrol of about fifty members has been organized, most of whom are workmen. Their duty is to patrol their departments one of more times weekly, in order to see that the workers are handling themselves and their tools properly, that gloves are not worn when gloves would be dangerous, that goggles are worn when their non-use would be a hazard, that guards are being used or are not removed, that fire plugs and lights are not covered or blocked by material, etc. Should any infraction of rules be observed by them, the matter is usually reported to the foreman of the department involved. For their service in this safety work, they are paid at their average earned hourly rate.

Meetings of the safety patrol are scheduled at intervals, at which safety matters are discussed by the members and by various of the works personnel as well as by outside experts. In addition, meetings of the department superintendents and their staffs are held from time to time when actual accidents in their departments are reviewed and ways and means discussed to prevent any recurrence. Occasional meetings of the rank and file of the workers likewise take place.

Thermometer charts are posted throughout all departments so that employees may see the record of their individual departments, the average number of accidents per month for the preceding year as well as the accidents each month for the current year, being given.

Bulletin boards as well as the shop magazine are also utilized to convey information to the employees; but, even they do not fully cover "safety advertising" requirements, so a traveling bulletin board or exhibit has been constructed, on both sides of which are shown actual "accident producers." This exhibit, Fig. 1, is mounted on an electric battery truck, travels slowly up one aisle and down the other, in and out of buildings, reaching the various floors by means of elevators, until practically all employees have had their attention drawn to some of the things that cause accidents.

It is being more and more generally recognized that the mechanical guarding of tools, does not constitute the solution of the problem of accident prevention in the industries, and is but one of a number of considerations entering into this work. Among other items requiring solution as a part of this problem may be mentioned: Labor turnover; good health; cleanliness and neatness (personal and plant); good lighting; pro-

hibition; education (English language at least); carefulness. In carrying out this program in part at least, the press department is kept scrupulously neat and clean; and the aisles are regularly maintained. Excellent lighting, both natural and artificial, has also been provided, the latter consisting of general illumination as well as

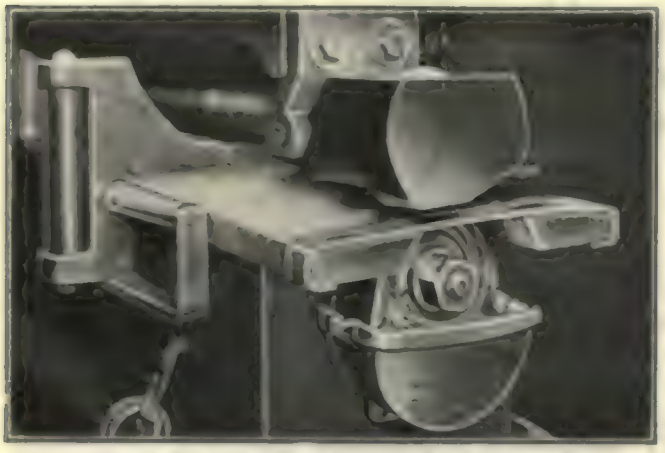


FIG. 2. GUARD FOR ROTARY SHEARS

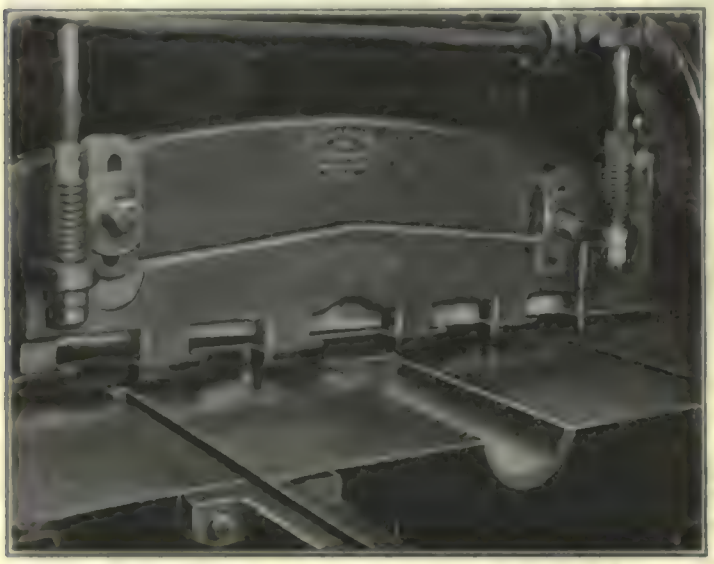
individual lights at the tool where needed. The number of sizes and grades of sheet metal used are kept at an absolute minimum and arrangements have been made with the suppliers to ship on wooden skids.

In this way the band irons formerly used for tying the material into bundles, have been dispensed with, and unloading, transporting and piling have been greatly simplified. Protective corners, toe boards, or cleats are placed on the floors at corners and along the sides at a suitable distance from the piles, so that passing workmen will not come in contact with sharp edges.

Much of the material used is enameled, some of it in sheets before punching, and where this is the case a device which might be called a box tongs has been constructed, to insure the safe handling of the finished product. In the enameling process, there is a fire hazard since the enamel which is baked on, is of an inflammable material. A very effective hood, Fig. 2, has been provided to smother any fire starting from this cause, the hood being simply lowered over the enameling rolls through which the sheets pass, after which a hand fire extinguisher is quickly turned into the hood.

In cutting the sheets, danger from injury is provided against by simple guards shown in Figs. 3 and 4, the first for slitting shears, the second for the squaring shears.

In the actual punching of material, every effort is made to do the work automatically. If an automatic operation is not feasible, the work is arranged to



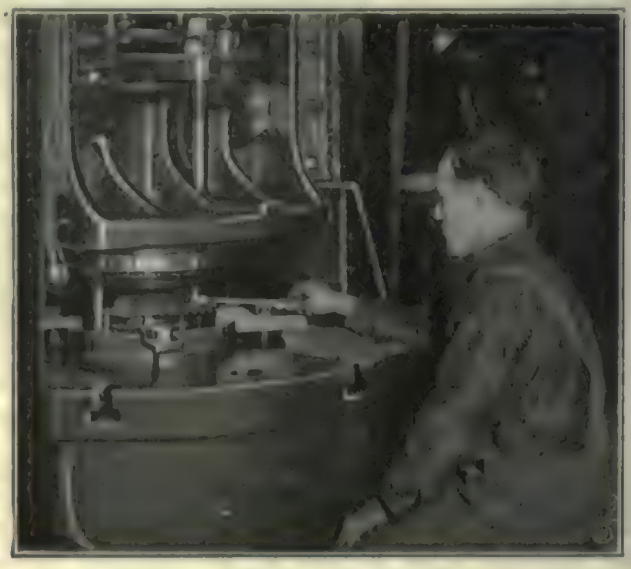


FIG. 4. GUARD FOR SQUARING SHEARS. FIG. 5. USING A SUCKER

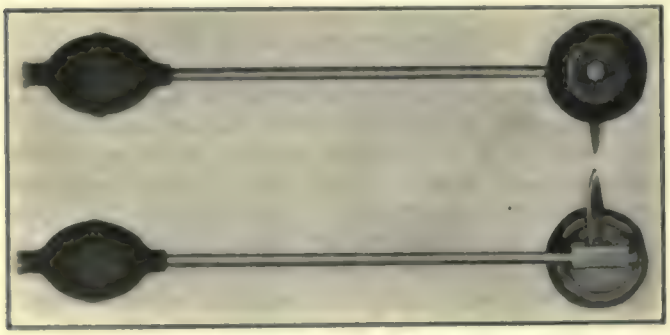


FIG. 6. AN IMPROVED SUCKER

avoid the necessity of the hands of the operator being placed at any time within the danger zone. Punch presses will almost certainly repeat sooner or later, and bolts, nuts, etc., will become loose, so that any guard which is depended upon to throw the operator's hand out of the danger zone as the press goes into action, is not so reliable as a guard or device which requires the hand to be moved to a safe position before the operation commences.

A unique device for feeding small approximately flat material both into and out of a press is shown in use in Fig. 5. It is a hand sucker (operated by means of a suction pump) which is placed on top of the material, a valve in the handle being opened by pressure of the thumb on a button and the sheet then lifted either into or out of the press. The sheet is released by removing the pressure on the button. This device is also made with two or more suckers at different levels attached to the same handle, for use with punchings of more or less irregular shape. A recent improvement, Fig. 6, has eliminated the necessity for the pump, the suction being secured by squeezing a bulb in the handle

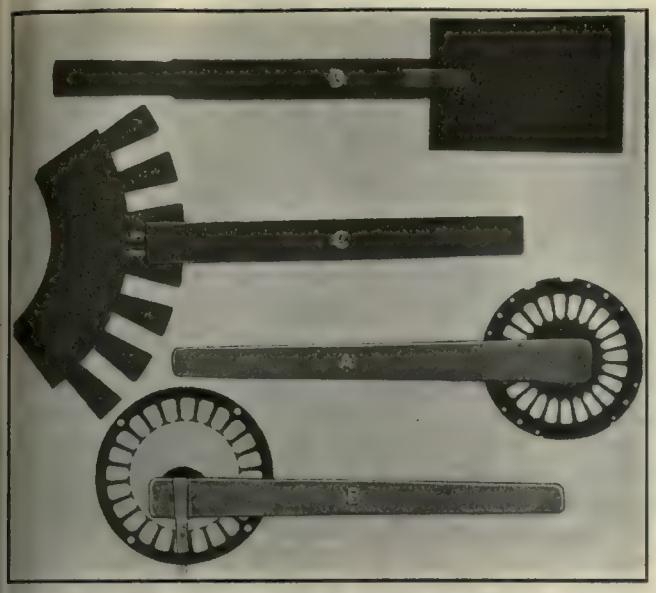


FIG. 7. LIFTERS FOR SMALL WORK

into position in the press. Closing the valve releases the sucker from the sheet.

In Fig. 8 is shown a battery of presses and illustrates the type of guard used for flywheels. These guards are provided with hinged doors so that no difficulty is encountered in getting at the interior when necessary.

In Fig. 9 is shown a press equipped with an interlocking safety trip compelling the use of both hands. A seat is attached to the frame of the press and can be readily raised or lowered to suit the height of the operator. When not occupied, it can be swung around to the side of the press.

The removal of scrap is at all times an awkward matter, but has been rather simplified by having it gathered from each press before any considerable accumulation occurs and placed in metal cointainers. These containers are then taken to a baling press, and the scrap baled into approximately 190-lb. cakes. The containers are provided with hinged sides and bottoms so that their contents are easily unloaded.

The work of safety is one that should be participated in by everybody, individually and collectively, by em-

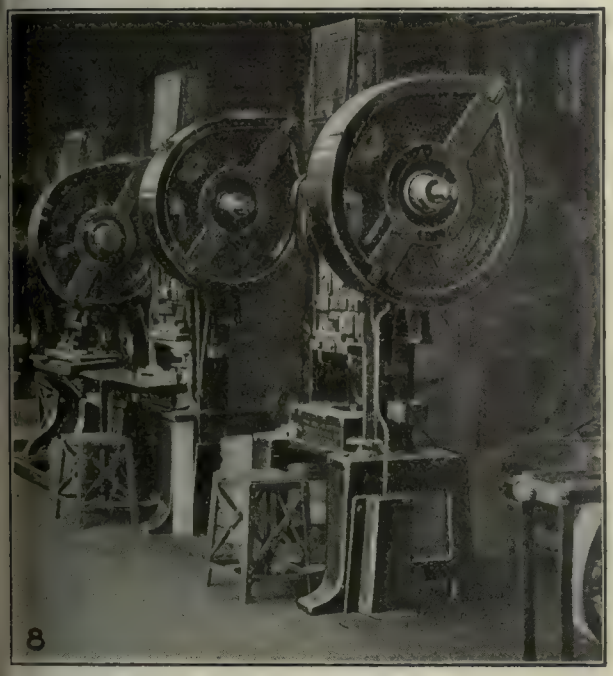




FIG. 8. FLYWHEEL GUARDS. FIG. 9. PRESS WITH INTERLOCKING SAFETY TRIP

and the release obtained by squeezing the bulb again.

Simpler devices are shown in Fig. 7 but they have a more limited range of application. *A* and *B* are of wood, *C* and *D* of metal; the former being provided with felt swabs at the working end which are used for lubricating the dies. The hairiness of the felt enables the punching to be lightly gripped and swept out from under the punch. Should an occasional punching stick, it can be readily loosened by means of the metal finger. Magnetic lifters and special pliers are also used.

A suction device has been developed to apply to the drawing into the press of long heavy sheets. The sucker runs back and forth on a monorail at the rear of the press and is controlled by two parallel rods extending through to the front, one on each side. The handles are gripped by the operator and pushed to the rear until the sucker comes directly over and rests upon the top sheet of the pile of material. When the valve is opened the sucker grips the top sheet which is pulled

ployers and employees, by the public, by organized bodies and by the Government; it cannot be carried on by any one group alone, if the most headway is to be made.

The necessity for this co-operation is quite evident when the statement is made that the industries are becoming even safer than the homes and the highways. Of 80,000 fatal accidents happening annually in the United States, approximately 22,000 occur in the industries and 58,000 in the homes, on the streets and along the highways. The knowledge gained by anyone along this line, should be placed at the disposal of the general public, so that the greatest good will result to the greatest number and the sum total of human suffering be the more quickly minimized.

As a contribution to this end, the Westinghouse Electric and Manufacturing Co. will gladly supply, without charge, working drawings, photographs, or other information about the guards in use in its plant.

Machining Automobile Crankshafts

Approved Methods of Machining and Balancing Crankshafts—Data as to Wheels for Various Grades of Steels—Wheel Speed and Wear

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE machining of automobile crankshafts may be divided into comparatively few kinds of operations, although the number of handlings are often more than might be imagined. Roughly speaking, they may be classed as centering, rough-turning,

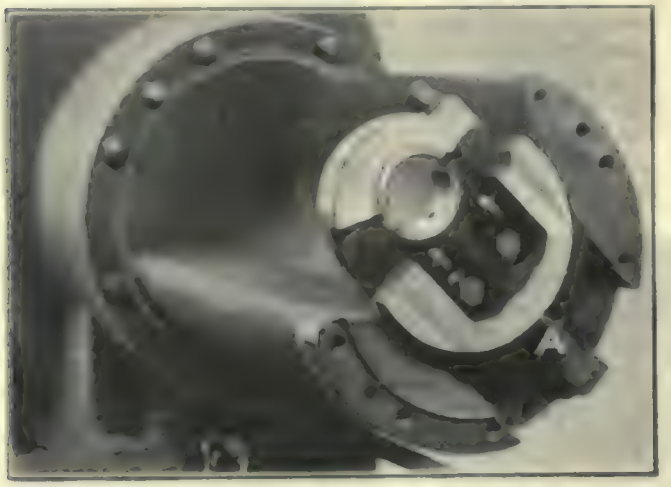


FIG. 1. CHUCK FOR CRANKSHAFT LATHE

heat-treating, grinding, drilling for pressure oil-feed and in some cases milling the cheeks or webs.

In a few instances, the crankpin bearings are ground from the rough forgings, but this is not customary. Occasionally the main bearings are also ground from the rough after the center bearing has been spotted or rough-turned for a steadyrest support. The usual method, however, is to rough-turn all the bearings, both main and crankpin and then finish on the grinding machine, generally dividing the grinding into a number of operations. These grinding operations are frequently sandwiched in between other operations, such as drilling, milling the cheeks, etc., in order to remove any distortion due to springing of the crankshaft by the various operations.

There is an increasing tendency toward pressure feed for lubrication, which means drilled crankpins and main bearings. The oil connection between the two is usually secured by drilling down through the crankshaft cheeks, while in some designs this connection is made by a small copper tube on the outside.

The method of oiling depends on whether the oil is pumped through the crankshaft to the bearings, or whether it is pumped to the main bearings and flows from here through holes in the bearings and oils all connections from the main bearings to the crankpins. In either case, there is an increasing tendency to give a definite allowance for the oil film, usually about 0.015 in., which effectively separates the bearing surfaces and at the same time insures the oil being forced to the crankpins.

There is a tendency in some quarters to abandon alloy steel for crankshafts and use low carbon steel which has been carburized very deeply and hardened so as to present an extremely hard wearing surface. This is bound to secure long life to the bearings and at the same time secure a very tough crankshaft. Unless used with bearings between each crank, such as seven bearings on a six cylinder crankshaft, it might be necessary to increase the diameter to some extent but the results are, generally speaking, very gratifying.

Taking up the turning of crankshafts we find that the regular engine lathe has been practically abandoned for this work, but that several engine lathe builders make special machines for handling crankshafts. These machines are practically double-headed engine lathes equipped with special chucks so as to clamp the shaft easily and quickly. It is customary to locate from the main bearing and to clamp and drive by the web of the crank. The chucks have adjustments so that the shaft can be moved to give the correct throw to the crankpin. A detail of such a chuck is shown in Fig. 1.

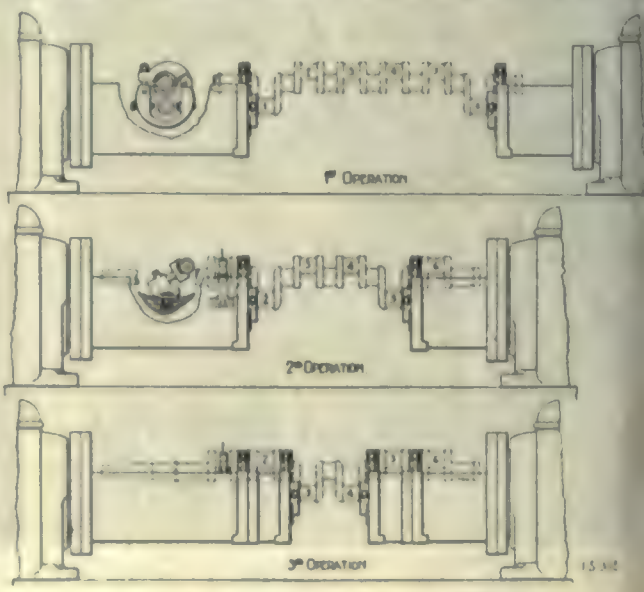
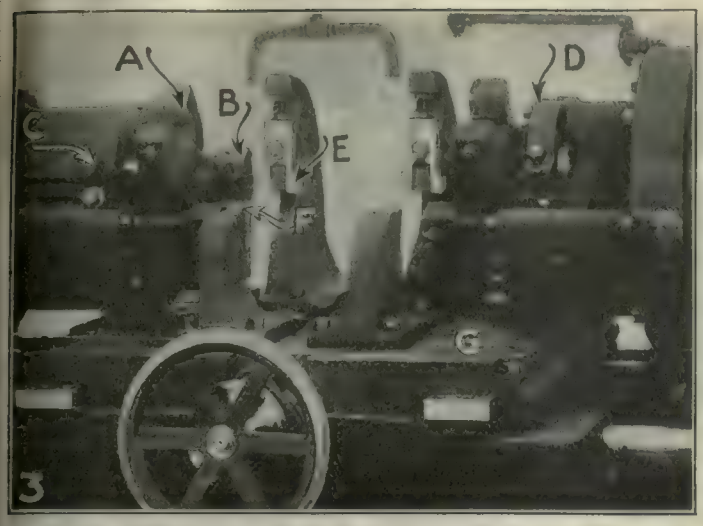


FIG. 2. DIAGRAM OF OPERATIONS

where *A* is a spacing block used to secure the proper throw of the crank.

The outline drawing shown in Fig. 2, shows how the work is planned to always have the cut next to the chuck where it will be supported against springing. Pins Nos. 1 and 6 are turned in the first operation. The heads are then moved toward each other and pins Nos. 2 and 5 are next turned. The third operation turns pins Nos. 3 and 4, the crankshaft being supported in each case by the chuck jaws which grip the crank web beside the pin being turned.

The arrangement of the chuck jaws *A* and *B*, the clamps *C* and *D* and the cutting tools *E* and *F* are shown in Fig. 3. The tool *E* faces down the sides of the crank webs while *F* rough-turns the pins. This illustration shows how the tools are mounted on the flat carriage *G* which has a crossfeed movement only. Lengthwise adjustment, for positioning only, is secured



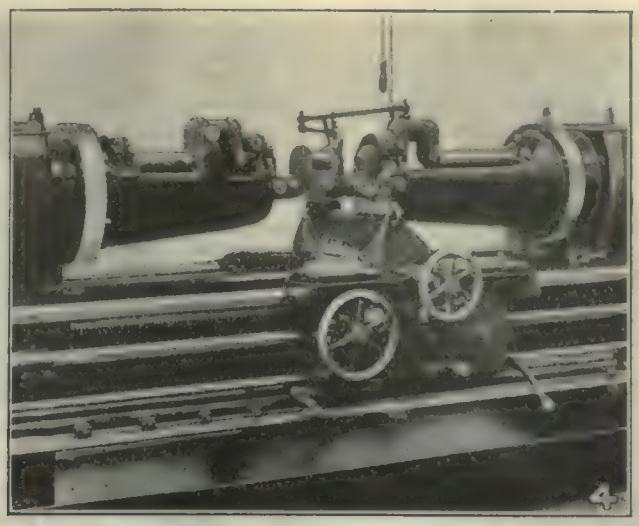


FIG. 3. TOOLS AND CHUCKS IN CRANKSHAFT LATHE. FIG. 4. TURNING A TRACTOR CRANKSHAFT

by the rack shown. Fig. 4 shows a Holt caterpillar crankshaft in place. Both Figs. 3 and 4 show the Lodge & Shipley method of handling crankshaft work. As before stated, somewhat similar machines for this purpose are built by other engine lathe builders.

A somewhat different method of machining crankshafts may perhaps best be distinguished as the multiple-tool method, citing the Lo-Swing lathe as an example of this class. A layout of the tools used in such cases is shown in Fig. 5. This illustration, however, does not show the pin and bearing turning tools, but only the tools for squaring up the crank webs and turning the end of the shaft with its various diameters, shoulders and taper.

The sequence of operations is as follows:

First Operation—	
1. Turn H, G, F 2. Rough square 3. Finish square	Time—12 min.
Second Operation—	
1. Turn A, B, C 2. Turn D and E 3. Neck	Time—10 min.
Total time	22 min.

Further details concerning methods of machining in the lathe will be shown in later articles, from the practice used in making the Peerless and the Rolls-Royce crankshafts.

The details of grinding which follow are largely due to the courtesy of the Norton Company.

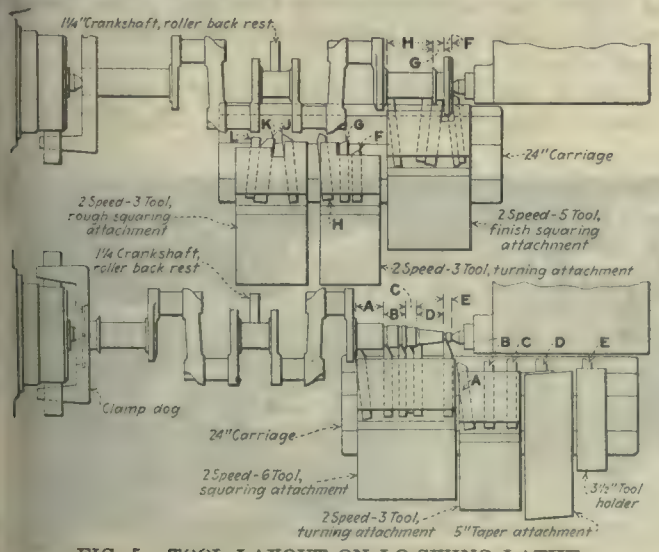


FIG. 5. TOOL LAYOUT ON LO-SWING LATHE

Several factors affect the successful grinding of crankshafts, the material itself being one of the main considerations in the selection of the proper grinding

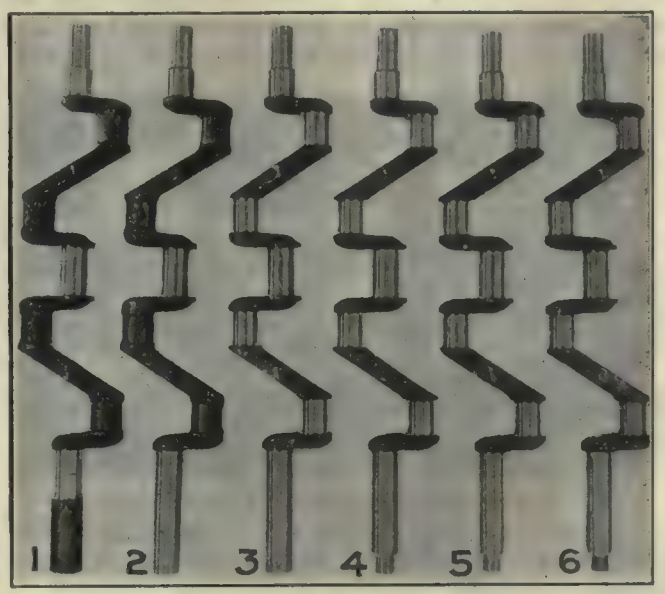


FIG. 6. OPERATIONS ON AN ALL-GROUND CRANK

wheel. For grinding a high tensile strength steel an aluminous abrasive is recommended while a carbide of silicon wheel is suggested for low tensile steel. It is the physical and not the chemical properties of the wheel which are to be considered. The following quotations from W. T. Montague are of interest:

The two physical properties which affect abrasive action most are:

Resistance to penetration. In order to remove a chip, the abrasive must first penetrate the metal being ground.

Tensile strength of the material. The abrasive must stand up to the cut while being forced through the metal.

High reistance to penetration and high tensile strength do not necessarily go together. These two conclusions may be drawn regarding the grinding of materials of high resistance to penetration.

The greater the resistance to penetration, the more brittle should be the abrasive. An abrasive of brittle temper usually fractures with sharper points and cutting edges than a tougher abrasive, hence there is a better opportunity for it to penetrate a hard dense surface.

The greater the resistance to penetration the finer should be the grain of the abrasive. On hard materials the fine

grits penetrate more readily, for the coarse ones seem to ride over the surface of the metal, in doing which they get dull and gradually produce a glazed face on the grinding wheel.

The tensile strength of the material probably exerts a considerably greater effect on grinding action than resistance to penetration. The metal opposes the removal of chips with a force that is proportional to its tensile strength.

The higher the tensile strength of the metal, the harder it is to remove a chip and the tougher the abrasive must be to prevent fracture while the grain is making the cut. Alundum, the tougher abrasive, is the type to use for grinding steel of high tensile strength.

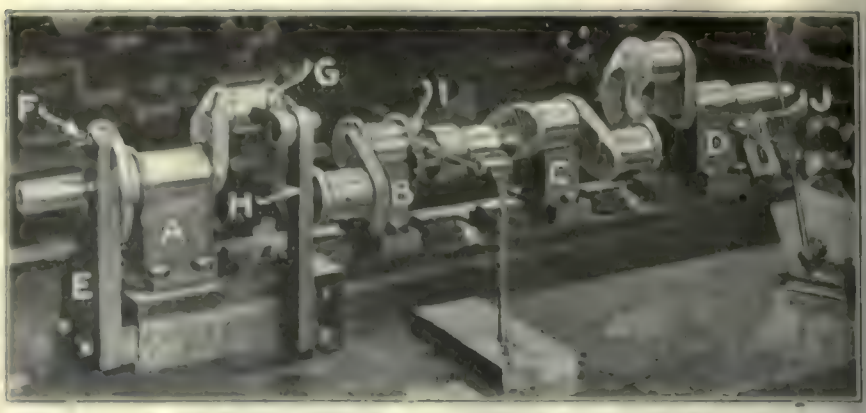


FIG. 8. INSPECTING STUDEBAKER CRANKSHAFT

Crystolon is the correct type for material of low tensile strength. In such materials the brittle crystolon grain is able to cut through without breaking off before it has done its work. Low tensile strength materials offer enough resistance to keep the wheel sharp.

The wheels recommended for roughing carbon steel crankshafts (30 to 45 points) are grain 36, Grade O, alundum; for finishing, grain 24 combination, grade M is recommended. For harder materials, such as nickel steel, wheels as soft as grades N for roughing and L for finishing, or their equivalents are advisable.

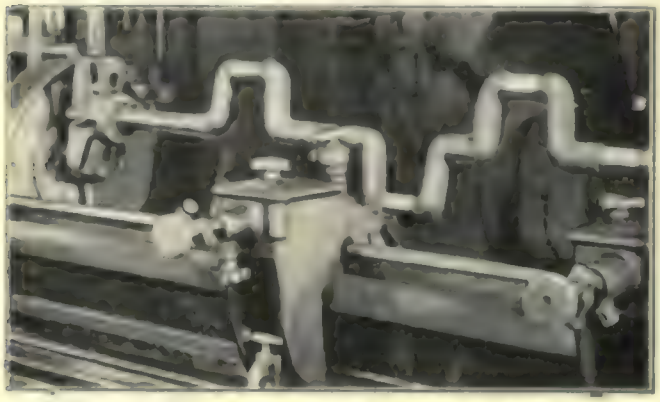


FIG. 7. GRINDING A 3-THROW CRANK

When the wheel is as wide as 4 in. a grade softer than that of the corresponding 2-in. wheel will be found satisfactory.

An "all-ground" crankshaft is shown in its different stages in Fig. 6. The sequence of operations can be easily followed without further description. Fig. 7, shows an unusual crankshaft for agricultural machinery. It has three throws and a central bearing but is not for motor work.

Two tables showing the grinding equipment necessary to secure a desired production may be of service either in equipping a new department or in checking up present performance. Table I is for a small production, 15 four-throw crankshafts per hour, while Table II is for a production of 80 per hour. The stock removed is approximately the same in both cases. Table I is an estimate. Table II is the result of actual production.

A little data on grinding wheel performance is given in Table III. This shows the exact number of crankpins ground, the life of the wheel, the frequency of wheel dressing, the amount of wheel wear, etc. As with the other tables, the figures are of value in checking up your own practice.

There are many points to be inspected on a carefully made crankshaft and many methods used in the final inspection. Fig. 8 shows the method used in the Detroit plant of the Studebaker Co. The shaft has four bearings which are supported by the blocks *A*, *B*, *C* and *D*. The upright *E* is cut away at the top to clear the straight end of the shaft and carries an index pin at *F*, which holds the crankshaft in the three positions

TABLE I. APPROXIMATE GRINDING EQUIPMENT NECESSARY FOR PRODUCING FIFTEEN FOUR-THROW CRANKSHAFTS AN HOUR

No. of Machines	Size	Operation	Stock Removed In.	Hourly Prod.
1	10x50 in. regular	Rough 2 end bearings	0.020	15
1	16x36 in. double head pin machine	Rough pins Nos. 1 and 4.	0.020	15
1	16x36 in. double head pin machine	Rough pins Nos. 2 and 3.	0.020	15
1	16x36 in. double head pin machine	Finish pins Nos. 1 and 4.	0.020	15
1	16x36 in. double head pin machine	Finish pins Nos. 2 and 3.	0.020	15
3	10x50 in. regular	Rough and finish grind center bearing and finish two end bearings.	0.020	15
1	10x50 in. regular	Finish grind, gear fit and pilot, outside flange	0.020	20

necessary to test each pair of crankpins. As shown, Nos. 1 and 6 are in position for testing.

The correctness of the throw angle is tested by the arm *G* which swings on the upright *H*, positioned for each pair of throws in turn. Indicator *I* tests the truth of the shoulders of each main bearing, a multiplying lever showing minute deviations. The dial indicator at *J* tests the roundness of the bearings. Other gages test the length of the bearings and their realization to each other.

One of the crankshaft testing fixtures used by the Lincoln Motor Co. is shown in Fig. 9. The shaft rests

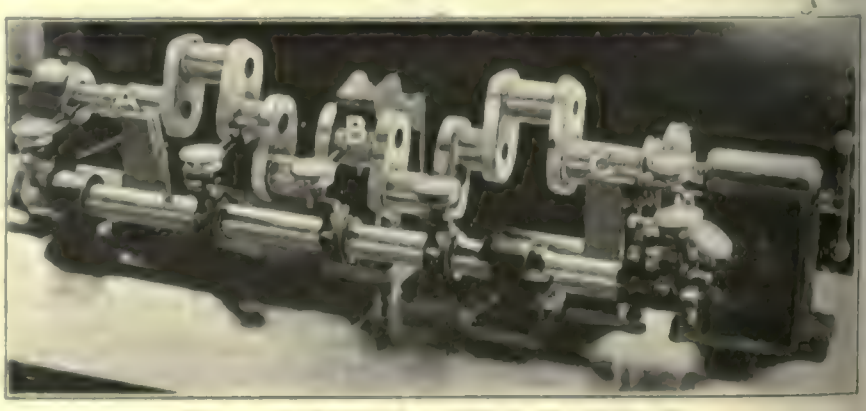


FIG. 9. INSPECTING LINCOLN CRANKSHAFT

on three bearings *A*, *B* and *C* and is held endwise by a spring tension plunger. The lower bearing *B*, is a post set in a fixed position, but capable of adjustment for wear. The upper half is hinged.

The center bearing must show within 0.003 in. total indicator reading when resting on the end supports. It must show within 0.001 in. total indicator reading on the bearing each side of the center when the center bearing is clamped down. This fixture also indicates the flywheel pilot for concentricity and the flange for

TABLE II. CRANKSHAFT PRODUCTION REQUIRED 80 PER HOUR

Operation No.	Description of Operation	Name of Machine	Capacity One Machine Nine Hours	Machines Required
1	Rough grind center bearing for steadyrest	Norton Gr. 10x36	400	2
2	Face web on No. 3 line bearing	17 in. Wickes lathe	400	2
3	Turn and straddle side of center bearing, leaving 0.030 in. for grinding			
4	Turn rear bearing, leaving 0.030 in. for grinding	21 in. x 8 ft. LeBlond and 17 in. x 6 ft. Wickes lathes	400	2
5	Straighten	Straightening press	500	2
6	Semi-finish grind center bearing	10x50 in. Norton grind	275	3
7	Face rear bearing to length	17 in. x 8 ft. LeBlond	400	2
8	Straddle face flange	LeBlond lathes	300	3
9	Turn flange and space, No. 1 bearing	17 in. LeBlond or Wickes	300	3
10	Turn grooves at flange	17 in. LeBlond or Wickes	275	3
11	Rough turn 1.625 in.-1.375 in. and 0.999 in. diameters	17 in. x 8 ft. LeBlond or Wickes	275	3
12	Form oil slinger and turn 2 1/4 dia. on flange	17 in. x 6 ft. LeBlond	600	2
13	Neck 1.375 in. and 0.999 in. diameters for grinding	17 in. x 6 ft. Reed lathe	500	2
14	Cut off and recenter	16 in. x 6 ft. Reed lathe	600	2
15	Recenter flange end for grinding	Allen drill press	1,800	1
16	Finish turn 1.375 in. and 0.999 in	17 in. x 8 ft. LeBlond	425	2
17	Semi-finish grind Nos. 1 and 3	10x50 in. Norton grinds	250	3
18	Rough turn 4 pins	26 in. x 10 ft. LeBlond crank pin lathes	100	8
19	Drill 6 holes in flange	Rockford drill pr	225	4
20	Rough grind Nos. 2 and 3 pins	Landis 16x32 in	200	
21	Rough grind Nos. 1 and 4 pins	Landis 16x32 in	200	16
22	Finish grinding Nos. 2 and 3 pins	Crank pin grs	200	
23	Finish grind Nos. 1 and 4 pins		200	
24	Straighten	Straightening press	500	2
25	Grind flange O.D	10x36 in. Norton gr	550	2
26	Finish grind center bearing	10x50 in. Norton gr	275	3
27	Finish grind No. 1 line brg	10x50 in. Norton gr	275	3
28	Finish grind No. 3 line brg	10x50 in. Norton gr	250	3
29	Grind 2 gear fits	10x36 in. Norton gr	275	3
30	Drill 0.374 hole	Allen drill press	500	2
31	Mill 2—No. 28 Woodruff keyways	Bristol and steptoe mill'g machines	275	3
32	Mill 1—No. 3 Woodruff keyways	Bristol and Steptoe mill'g machines	500	2
33	Burr six holes	Allen drill press	800	1
34	Ream six flange holes	Prentice sldg. hd. dr. pr.	800	1
35	Grind face of flange	10x36 in. Norton gr	550	2
36	Balance	No. 8-B Ransom and Bridgeport grs	275	3
		20th Century bal. stand		6
37	Face back of flange and chamfer	16 in. x 6 ft. Reed lathe	500	2
38	Hand ream 0.374 in. hole and 2 1/2 in. holes; also file burrs	4 men		
39	Lap pins and bearings	Blount speed lathe	250	3
	Straighten	Springfield str. pr	500	2
				110

trueness. The arrangement of indicators on the substantial bar beside the shaft shows how they are used on the bearings and the flange.

Another fixture is used to check the crankshaft shoulders, using spacing blocks and feeler gages. This also checks the radial location of the crankpin bearings. Fig. 10 shows the running balance test on an Akimoff machine.

A convenient method of balancing a crankshaft is shown in Fig. 11, this method being used in the shop of the Lexington Motor Co., Connersville, Ind., in

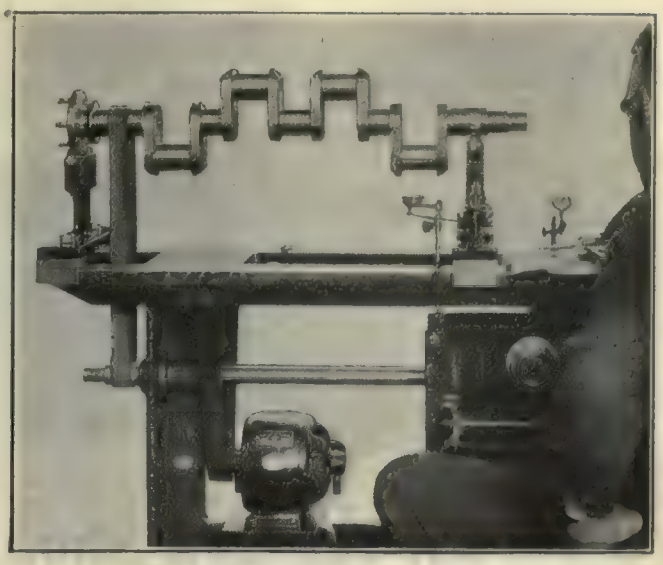


FIG. 10. TESTING FOR BALANCE

marking the Ansted motor. The balancing machine is of the Carwen type but, as will be noted, an electric drill has been mounted conveniently at the back so as to drill out a little weight at any desired point. One

TABLE III. DATA RECORDED AT UNION SWITCH AND SIGNAL CO., SWISSVALE, PENNSYLVANIA

	6636R No. 1	6636R No. 2	36R No. 1	36R No. 2	36Q No. 1	36Q No. 2	46Q
Cranks ground	291	292	270	333	403	356	209
Hours life	20 1/2	25 1/2	22	27 1/4	38 1/4	29 1/2	14 1/4
Cranks per hour	14.4	11.5	12.2	12.2	10.5	12.1	14.1
Dressings	17	23	22	24	26	24	20
Cranks per dressing	17.1	12.7	12.2	14	15.5	15	10.5
Cubic inches wheel wear	465	319	495	369	495	369	495
Cranks per cu.in. wheel wear	0.62	0.91	0.54	1.1	0.81	0.96	0.42
Machine used	Landis	Norton	Landis	Norton	Landis	Norton	Landis

Note. The first two wheels are made of No. 66 alundum, 36 grain, grade R. The others are regular wheels.

of the handwheels moves the drill to the desired position and the other wheel feeds the drill into the work. This arrangement saves handling the crankshaft in and out of the balancing machine and enables the proper balancing to be secured easily and quickly.

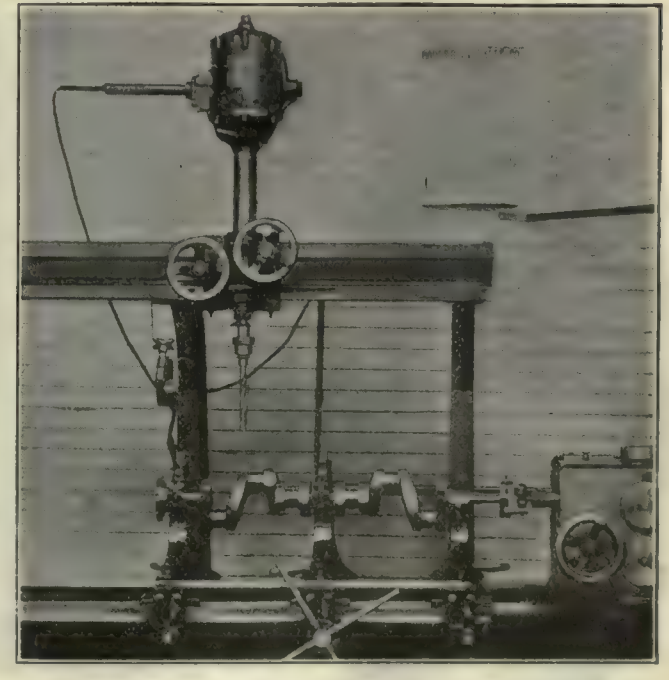


FIG. 11. BALANCING LEXINGTON CRANKSHAFT



FIG. 1. EXTERIOR VIEW OF THE PLANT

An Eastern Shop of Modern Design

Machine Tool Plant with Saw-Tooth Roof and Reinforced Concrete Frame—Mercury Vapor Lamps for the Shop—Good Railroad and Power Facilities

BY C. E. CLEWELL

THE new plant of Gould & Eberhard, at Irvington, N. J., furnishes a unique example of the good results which may be accomplished by careful advance planning of the shop buildings and their equipment so as to fulfil the exacting requirements of highly efficient production. Fig. 1 shows the general plan of these shops with the main office entrance in the foreground, the plant having a floor area of 135,200 sq.ft., not including the powerhouse.

PLAN OF THE BUILDINGS

In Fig. 1 the shops are shown with their total length of 520 ft. extending to the left, and with a 260 ft. width to the right. This width is made up of eight low bays each 20 ft. wide on the side nearest the reader in Fig. 1, with two high bays, each 50 ft. wide, on the far side of the structure. The low bays have a clearance height of 13 ft. and that of the high bays is 25 ft.

The walls of the shops are of Fisk lock brick which gives an unusually good appearance to the plant and the roof construction and all columns are of re-inforced concrete instead of structural steel. The concrete used was made of cement mixed with suitably screened Bethlehem steel slag, no stone being used. The concrete trusses used for the roof construction were all cast on the shop floors and assembled in place as the building was completed.

The roof consists of red cement tile. The floors are of 6-in. concrete covered with master builders hardener. Back of the shops, the powerhouse and a 40 x 60-ft. heat-treating building are located. These buildings with the 165-ft. Heinicke stack are seen at the right of the center in Fig. 2. The roadways at and about the shops are constructed with a base of slag obtained from a near-by smelting works. Near the powerhouse a sub-structure oil tank with 12,000 gal. capacity is located, with a feeder to the railroad spur, and provided with steam coil to prevent freezing. A 500-ft. artesian well is used for the supply of all drinking water and for the toilets, Newark city water being used, however, for the boilers of the powerhouse.

The outlines of the saw-tooth roof construction and the side wall windows are indicated in Fig. 1. All roof sash has a northern exposure and the window glass is of the ribbed type with the ribs vertically placed so as to diffuse the light in horizontal directions. All sash is of this ribbed type both in roof and side walls except in the two lower sashes of the side wall windows, which are equipped with clear glass for psychological purposes, the management taking the stand that there is a natural tendency for employees to look out of the windows occasionally, and that the use of ribbed glass for all sash to prevent this is a hardship to the men with little or no gain in time.

The Fenestra sash used throughout, is arranged in the saw tooth construction so that every sash in the high bays may open, while the sash in four only of the eight low bays across the shop are arranged for opening. All movable roof sash is hand operated. To avoid excessive glare from direct sun light through the side windows with a Western exposure, a row of oriental planes is planted along the West side of the shop in the adjacent yard space. The shade from these trees is intended ultimately to tone down the bright Western sunlight, which may at times prove objectionable otherwise, due to the absence of near-by buildings of other plants.

The natural lighting is unusually soft and adequate in these shops, even at noon on a summer day, due to the Northern exposure of the roof windows and the diffusing effect of the ribbed glass, and it furnishes an excellent example of the splendid results which can be accomplished in one-story structures even where the width is nearly 300 ft., as in this case.

A good deal of attention was given in the preliminary planning of these shops to the question of a one-story versus a multiple-story structure. The matter of increased land space with the one-story building was not a factor, however, because of the location of the plant in a comparatively unsettled suburb of Newark, with a large tract owned by the company.

The attitude taken in favor of the one-story plan

was based partly on the prevention of delays which always enter into high buildings, because of elevator service, and partly because of what was felt to be a distinct advantage of the one-story building in the flexibility of department arrangements and in the important matter of effective routing of material. Natural lighting is, of course, simplified in the one-story plant if the aisles are wide.

Some of the advantages in routing with the one-story structure will be apparent from the methods used in this plant. Fig. 3 shows a general plan of the shops. A spur of the railroad enters the shop at the left and raw materials are unloaded here. Light parts progress to the right along the low bays, all heavy work being done in the high bays, this also progressing to the right as in Fig. 3. The finished parts meet for assembly at the right end of the shops and shipping is done from entrances at the extreme upper right-hand corner to the railroad spur which runs along the upper side of the shops. The simplicity of this routing scheme with the one-story building could not be realized in a building with a number of stories, and its obvious advantages form the underlying basis for the choice of the one-story shop.

The management has, furthermore, standardized on the unit assembly system and on the method of returning each part after an operation or group of operations to one central inspection department, from which it goes to the next succeeding operation or group of operations.

Ball bearing Chapman hangers and compression supports are used throughout and the efficiency of the line shafting system as a whole is shown by the relatively small power demands on the powerhouse, in comparison with preliminary estimates based on older equipment. The use of single-pulley shaft drives with geared tools is illustrated by this diagram and will be referred to again.

The use of numerous cases of individual motor machine tool drives has reduced the need of line shafting considerably and has been provided for in advance by a well designed layout of floor conduit containing the branch circuits to individual machine tools in conjunction with the two trenches or tunnels which extend the full length of the shop down the center, and which run back to the powerhouse as indicated in Fig. 3.

The supports for line shafting are made up of I-beam framework suitably attached to the concrete shop columns by special clamps, and a great degree of flexibility in the alignment of pulleys and adjustment of belts has been found to result from this scheme. A given line shaft with its single pulleys is driven by a group motor supported from overhead, belted to a larger pulley on the line shaft. The generating equipment of the powerhouse consists of a 500-kw. Sprague direct-current generator, direct connected to an 800-hp. slow-speed Corliss engine. Two Sprague 15-hp. balancers are employed with the main generator, to make possible the use of a three-wire system which gives pressures of 110 and 220 volts throughout the shop.

For break down service, a 100-kw. rotary converter is installed, by which the alternating current supply of the public service station may be converted into 110 and 220 volts direct current in case of emergency. An additional safeguard in the event of a powerhouse break down, is a transformer outside the shops, which is connected to the public service lines and which can be used for certain lights, for the watchman's lamps and for the dictating machines. In this way, it is possible to operate the Mazda lamps in the offices and drafting rooms for artificial lighting independent of the shop powerhouse, in case of necessity.

Attention, in the design of the powerhouse, has been given to additional space in case of expansion to the plant and to details which add greatly to the appearance of the plant. Thus, room has been allowed in the generating room for an additional engine and generator as a duplicate of the present equipment. As an example of the care to details of appearance, the pit under the generator frame is lined with white enamel bricks and a generous supply of natural light is afforded by the side wall windows. Complete switchboard arrangements are available for the convenient changeover from the powerhouse supply to the breakdown service of the public service company.

The boiler room, as part of the powerhouse, contains three 250-hp. Babcock & Wilcox boilers, two of which are used at a time with a third as a reserve and with provision of extra floor space for one additional boiler if required later. Superheaters are used with the boilers and all boiler fittings are made of brass, which are expensive but more lasting.

The coal is transferred from the adjacent coal bunkers to bins above the furnaces, which are equipped with Murphy rocking grate stokers. The coal bunkers are on a level with the boiler room floor and are under two tracks of the railroad, provision being made in the roof for unloading the coal from the cars either through the floor of the car or by shoveling it over the side of the car through openings in the roof beside the tracks.

At the base of the stairway leading from the engine room to the boiler room there is a tunnel opening, this tunnel extending from the powerhouse across the open yard space to the shops and through the entire shop under the center of the floor space. This tunnel is 7 ft. high and is constructed in two sections, with a concrete partition between. One section carries the electric supply circuits in conduit, and the other contains the steam, water and sewer piping. This tunnel is open at the north, or extreme shop end for ventilation pur-

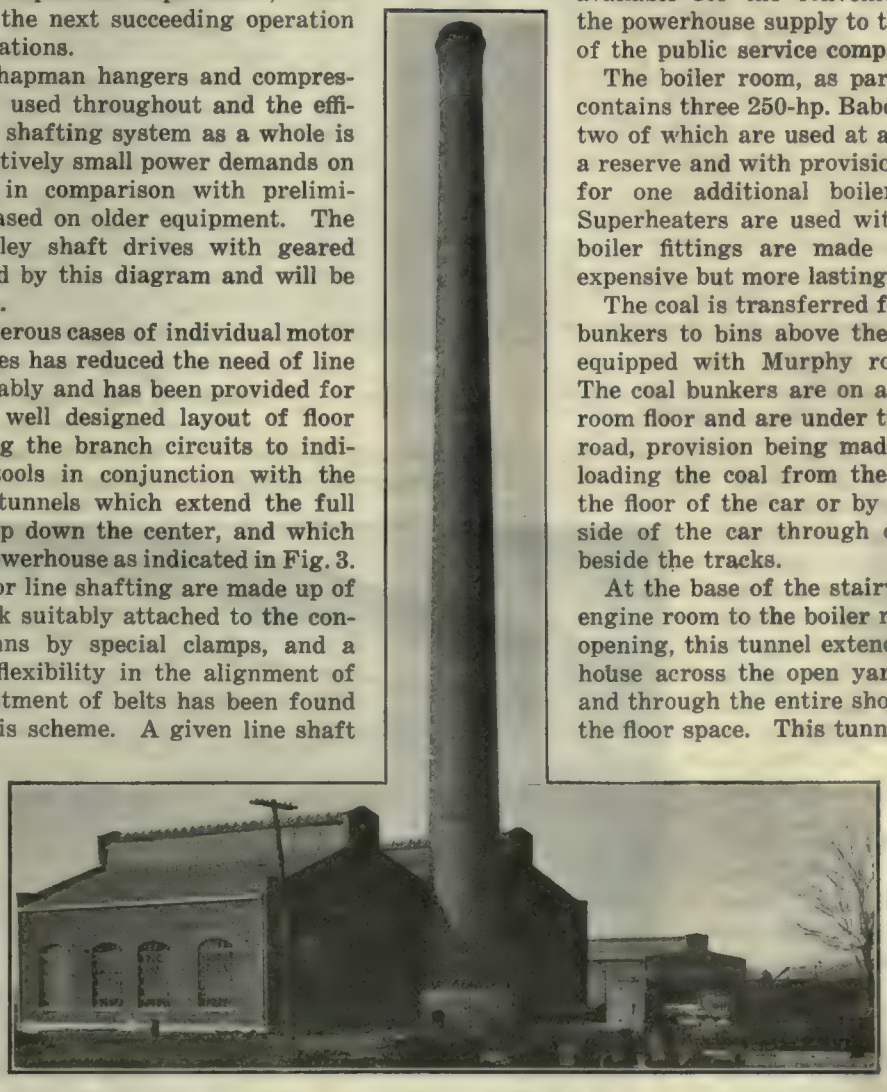


FIG. 2. EXTERIOR VIEW OF POWERHOUSE. THE RAILROAD TRACKS FOR COAL SUPPLY AND SHIPPING PURPOSES RUN BESIDE THE POWERHOUSE

poses, is properly drained and lighted, and is provided with a manhole every 100 ft. throughout its length. The tunnel serves as the distributing point for the electric power branch circuits for lamps and motors.

The disadvantage of having a separate office building as a hindrance to the expansion of the shops, led to the adoption of a portion of the shop space for the offices and the drafting, production and planning room, shown in Fig. 4. In other words the bays of Fig. 4 are provided with the necessary support openings in the roof trusses and in every respect are adapted to quick conversion into manufacturing space if this should be necessary at any time. It may be stated here that it is possible to extend the plant at any time 100 ft. on the North, 150 ft. on the East and 100 ft. on the South. An excellent idea of the general arrangement of the 60 x 100 ft. drafting and associated departments is given in Fig. 4. At the left the large special 8 x 16 ft. desks are shown, each of which provides space for six employees. The concrete roof trusses are also clearly visible in this view and the space between the sloping trusses and the roof may be seen, this providing incidentally a good space for holding the conduit used for the lighting or power circuits. Note the side wall windows and the light color of the concrete surfaces.



FIG. 4. DRAFTING, PRODUCTION AND PLANNING ROOM, SHOWING LARGE DESKS ACCOMMODATING SIX PEOPLE EACH. NOTE ROOF DETAILS

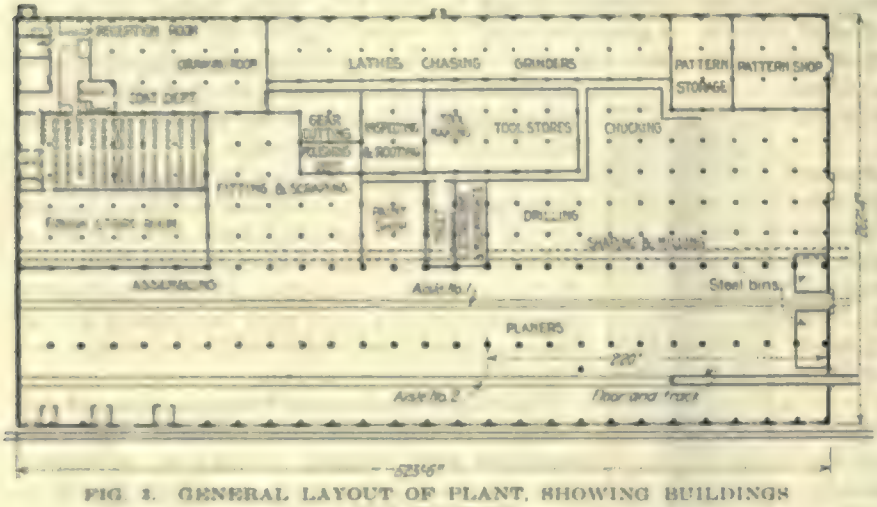


FIG. 3. GENERAL LAYOUT OF PLANT, SHOWING BUILDINGS FOR SHIPPING

The offices are adjacent to and north (at the left in Fig. 4) of the drafting room, with a partition between. Practically no partitions are used, however, for individual offices except in one or two instances, and where such is the case 4-in. hollow tile is employed for the partition. An interesting feature of the office is the use of skylight sash horizontally placed over the offices which conceal the saw-tooth construction and give a finished appearance to the space. This auxiliary sash is slightly separated from the holding frame to produce ventilation. In Fig. 5 the aisle of one of the high bays is shown, this being a general view of the assembling department. In the distance, the entrance for raw materials may be seen, this doorway being large enough to admit a freight car. This assembly section is near the north end of the shop and near the shipping department. Note that these two high bays contain the large sizes of work, while the smaller work is mainly confined to the low bays at the left, seen in the distance. This view shows the reinforced concrete runway for the cranes, which is an interesting structural detail of the plant.

In Fig. 6 there is a view of the scraping department that shows a portion of the low bays. This picture gives a good idea of the method of mounting clamps on the concrete columns for holding the small crane runway.



FIG. 5. GENERAL VIEW OF ASSEMBLING DEPARTMENT SHOWING THE HIGH BAYS. NOTE REINFORCED CONCRETE CRANE RUNWAY

One of the most interesting details of this plant is the absence of vibration and the greatly reduced noise in comparison with a structural steel shop. It is difficult to realize in the drafting room, separated from the shop only by a 4-in. hollow tile partition, that the shops are running under normal conditions. The use of concrete runways for the cranes, with pine boards under the track, almost completely removes crane vibration.

The shop work is conducted on the hourly basis with the addition of a premium system. Time keeping is based on the periodograph. Due to the distance of the shops from the nearest trolley line, the company maintains the equivalent of a bus service to and from the plant in the morning and afternoon by converting its freight trucks into buses, temporarily, by putting a special body on the truck shortly before it is needed.

The fireproof construction of the plant makes a shop fire alarm system unnecessary and no fire protection is provided except an extinguisher system for the shipping room. The watchman uses a portable clock with keys at set stations, as usual in such cases. The trucking

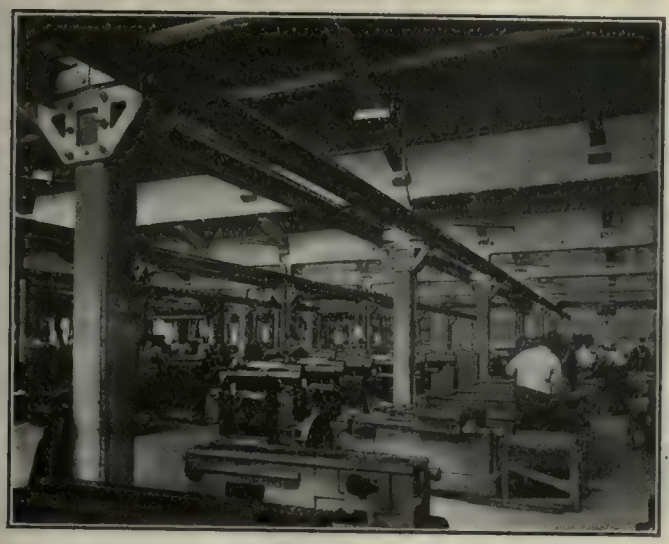


FIG. 6. SCRAPING DEPARTMENT. NOTE CLAMPS ON THE CONCRETE POSTS FOR SUPPORTING CRANE RUNWAY

problem is simplified by manufacturing as far as possible from platform to platform. Hand trucks are used with no electric trucking devices.

(*To be continued in next month's issue.*)

Tap and Die Standardization

To effect economies for consumers by introducing improved, and eliminating archaic styles, types and sizes is a primary purpose of the Tap and Die Institute. It is estimated that since 1917 when intensive work of this character was actively taken up, the total reduction of lines in the small tool industry has approximated 40 to 50 per cent. In this it functions somewhat as a central laboratory for the receipt and analysis of information which is distributed throughout the industry and among consumers in the form of a standard catalog containing standards based upon consolidated experience.

This catalog being the summarized demand is an educational influence and, because it is known to embody the best and most modern engineering practice, tends to induce consumers to adopt its recommendations. No attempt is made to force their acceptance.

What Are the Worker's Prospects in the Machinery Building Industry? —Discussion

BY GEORGE J. BUCKNER

Having read the article on page 667, Vol. 55, of AMERICAN MACHINIST, under the above heading, I have thought the matter over from as nearly an impartial point of view as possible, and I must say that I cannot agree with the writer in the position he takes toward the college man.

I am a college graduate, have worked in machine shops with and for both college and practical men, and have found very admirable men of both types. I have been very much disgusted with graduates at times because of their apparent lack of ability to go ahead with a job without constant help. But I have come to the conclusion that these are rather the exception than the general rule.

There are misfits in every trade and profession and diploma holders are no exceptions. I believe that the "boss" who has received his training through the school of hard knocks is too apt to judge the whole class of college men by the small group known as "rah rah boys," whose fathers sent them through school in luxury and ease. These boys amount to little on their own merit.

Consider the average graduate. He is eager to work, to learn and to move ahead. He very seldom makes as good a mechanic as the boy who started at fourteen. And why should he? He is handicapped with an eight years' start on a job which requires more skill in manipulation than quick thinking and general knowledge. The latter is the field in which the student has been trained. But turn him loose on a new problem, such as re-arranging the equipment of the shop for large production on a new type of work, and he will surprise you with the number of unseen details which he will take into account in his scheme.

If he has a half a chance, the college graduate will become a leader, not because he is a better mechanic than the others, but because he has a bigger, broader view of the work around him. The supply of jobs for leaders is relatively low and there will necessarily be many college men, who have been side tracked into positions of small importance. But you will usually find them ready and equipped to step into a vacancy above.

To quote from Mr. Bruce Barton's interview with Dr. James R. Angell in the November issue of the *American Magazine:*

"A notable instance of the value of college men is furnished by the Western Electric Co., which began employing college men about 1896 and which has found that 90 per cent of them made good, as compared with 10 per cent of the men who enter business on leaving high or grammer school."

In looking over the list of executives in our own company, at the local plant of which about 7,000 men are employed, I find that 80 per cent of the highest officials, 70 per cent of the superintendents and 60 per cent of the assistant superintendents are college men. And only 1 per cent of all the men in the country are college graduates! I am very reluctant to believe that fathers are spending thousands of dollars, states and cities spending millions, and men and women spending four good years of their lives to find out that it is all in vain.

Apprenticeship System at Rock Island Arsenal

Devices for Teaching—Use of the Slide Rule—Action of Gear Teeth and the Selection of Proper Views for Drawings—An Outline of the Courses Given

By WILLIAM BAUMBECK
Superintendent of Production

DURING the past year much has been written about the apprentice system established in manufacturing plants and very valuable information has been given regarding the methods to educate boys for a trade and later for better positions. The public at large, and especially the machine tool manufacturers, possibly do not know that the Government in its several arsenals and navy yards has established an apprentice school system for machinists, patternmakers and other trades. This article has been written to tell about the apprentice school and the course of instruction given to the boys at the Rock Island Arsenal.

The school was established May 16, 1910, with one student. Since that date, and up to Dec. 31, 1920, one hundred and three students have been graduated, and on May 1, 1921, eighty-three apprentices were employed. The year 1920 being the most successful and the one in which the largest class was graduated, the system of instructions used during that year will be shown.

The instruction courses are made as practical as possible with the idea of making efficient mechanics of boys who have not had high school or special training. Mechanical drawing and mathematics have been selected to fit conditions, and each student is expected to and must make such progress as his capacity and interest to learn will permit.

The course of instruction is divided into nine grades. Six months' service constitutes one grade, with the exception of the ninth grade which requires twelve months' service and is known as the fifth-year course. In a way it is what is commonly known as the "part time, short unit course," as advised by William A. O'Lary and Charles A. Drosser in United States Bulletin No. 159, with the exception that this course aims to develop the initiative and resourcefulness of the apprentices more fully.

A schoolroom with drawing tables, library and other study facilities is provided as shown in Fig. 1. Drawing paper, ink, pencils, etc., are provided by the Government. The students are required to furnish their own drawing tools. Mechanical drawing plates are used from those issued by the International School of Correspondence and the Santa Fe System, but mostly copies of drawings used on production work at the arsenal are furnished for test uses.

Students are given four hours each week for instruction in the classroom—two hours on drawing and two hours on mathematics. They are required to work examples, make detailed drawings and submit them for correction. Every two months examinations are held and work rated accordingly. No specified day is set for examination so that no special efforts can be made in advance by the boys, who, in consequence, are sometimes caught unprepared.



FIG. 1. THE APPRENTICE SCHOOL.



FIG. 2. LARGE MODEL SLIDE-RULE

Records of attendance, class work and deportment are kept on permanent cards.

The following instruction books on mathematics are used:

1st year—"Shop Mathematics" Part 1, Morris & Smith.
2nd year—"Shop Mathematics" Part 2, Morris & Craig.
3rd year—"Practical Applied Mechanics," J. W. L. Hale.
4th year—"Practical Mechanics and Allied Subjects," J. W. L. Hale.

First Year: The first two periods of the first year course involve a review of much of the eighth-grade work in the common schools, passing on to studies in shop mathematics, drawing and applied science. In the review work much emphasis is placed on those subjects which pertain to shop practice, as ratio and proportion as applied to pulleys and gears and mensuration as applied to volumes and areas. After this review the subjects of levers, inclined planes, horsepower, hydraulics and heat units are covered in turn.

The arsenal is fortunate in having a well-equipped testing laboratory at its command and much of the instruction received in the schoolroom is further supple-

Note—Instruction procedure and special instruction devices contributed by the originator G. E. Stanford, instructor of apprentice school.

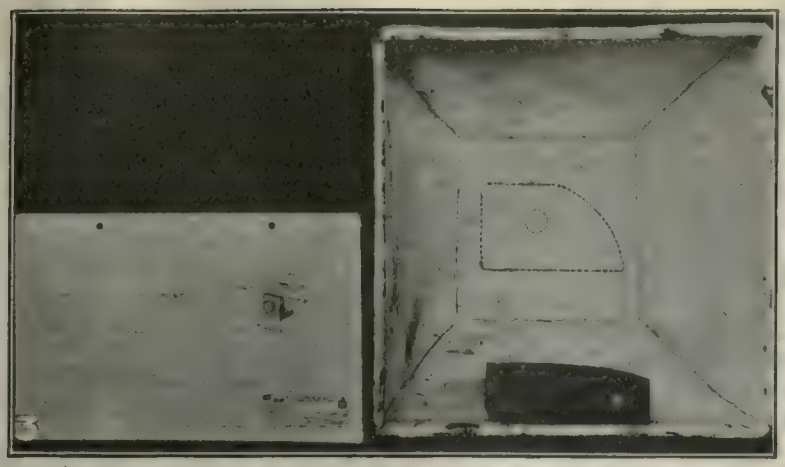




FIG. 3. MODEL TO TEACH PROJECTION. FIG. 4. MODELS OF GEAR TEETH

mented by instruction in the testing laboratory. Individual instruction is the rule at all times, this method maintaining the interest of the student while the instructor is better able to meet the individual needs of the student, and to inspire and influence him.

Second Year: The third and fourth periods, or second year instructions, are given in what might be called shop mathematics, involving algebra, geometry, trigonometry and logarithms, in so far as these subjects pertain to shop practice. Before the apprentice is through with the above he has passed from the second year and is well along in the third year or fifth and sixth periods.

Third Year: By the time the boy has reached the sixth and seventh periods he is usually well enough advanced in age and experience to understand and appreciate the value of the school in respect to learning a trade, and is in need of guidance more than encouragement and inspiration. Much time is devoted to review of subjects already given and many practical applications relating to trade problems are made at this time.

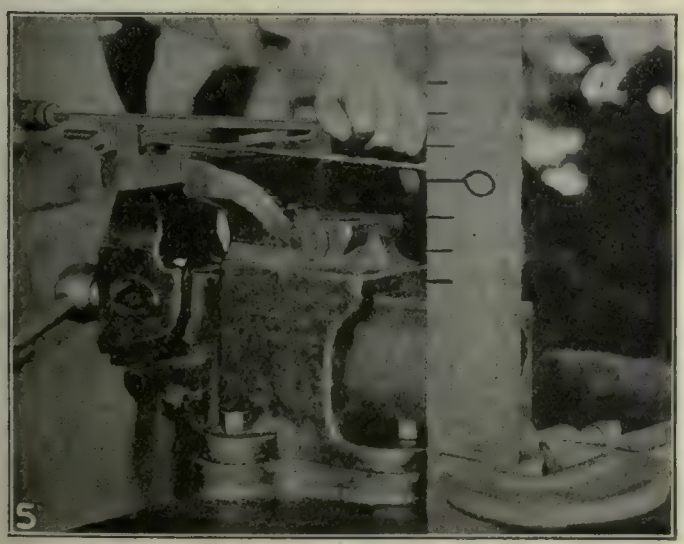
Fourth Year: Through the seventh and eighth periods, or the fourth year, some special subjects are taken up such as electricity and strength of materials, in so far as they pertain to shop practice.

Fifth Year: The fifth year, or ninth period, is optional and the boy is in fact graduated in his fourth year. If he chooses the fifth year, and the majority of boys do so, and has at the same time completed all the subjects prescribed, he is given further instruction relating to application of principles already learned. This course is largely made up of laboratory work pertaining to practical mechanics. Most of the apparatus can be made by the apprentice as he proceeds in the studies. In this particular he gets much experience in the testing laboratory, previously mentioned in this article.

During the entire time very simple principles of teaching are employed. No attempt is made to organize classes as such and every effort is made to inspire a boy to do his best. Practically the whole system of teaching is based upon the one word "interest" which, interpreted in every-day language, means "it is between us." The instructor feels that in order to teach successfully he must first know well the subject, be able to impart this knowledge and also to inspire the pupil.

The purpose of this course is not to make finished draftsmen, but to enable the boy to read correctly certain drawings as used at this arsenal. The course in drawing as given here is what might be considered by some "a mongrel course" inasmuch as it is made up of drawings taken from several sources, always with the idea in mind of the particular needs of the boys.

Much that is considered worth-while in a complete course is omitted here; for example only eight plates are given in geometric construction and intersections. Throughout the entire course an effort is made to teach



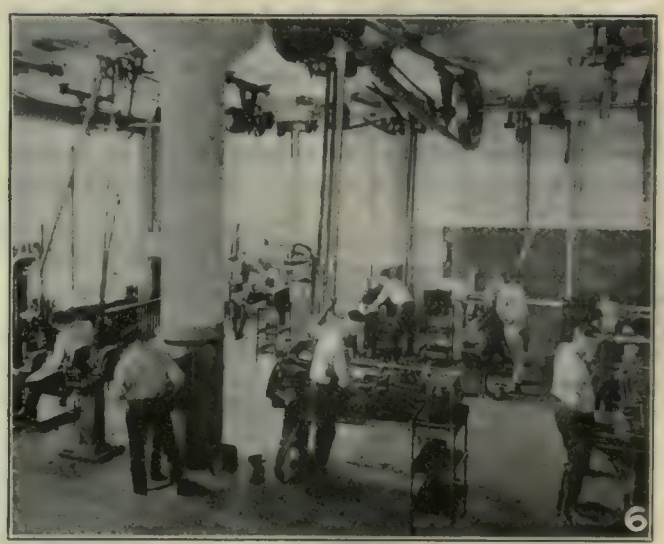


FIG. 5. TEST FOR FILING FLAT. FIG. 6. THE SCHOOL SHOP

a boy not only to draw, but to teach him to think. For this purpose the instructor has prepared many plates of parts known to the boys, but incomplete as to procedure and detail. This forces the boy to ask questions.

In some cases the blueprint which is to be used is marked with a warning to watch for wrong projections or incorrect dimensions. The method forces the boy to be resourceful and at the same time prevents him from becoming a mere copyist. For the purpose of making the boy think for himself much original work is required. For example, he is given a blueprint and information for a tie rod sleeve. After he has completed this drawing he is asked to draw a fixture to hold the sleeve in a milling machine. Again he is given a plate showing a projection of a center crank which he is supposed to draw, and this is followed by a request to make a double-throw crank from the same data given and then following this, a three-throw crank of 120-deg. centers.

Toward the end of the course, boys are required to produce drawings that conform to usage and standards, as used by the Government at this arsenal, and the so-called "Green Book" of instructions, used by the Government, becomes in part a text book of the school.

Special Devices Used

There are some devices used here as aids in teaching that might be considered special, if not unique, as the writer has not seen them used in any other school of this kind. A particular case is the method of teaching the use of the slide rule. A large rule, 8 ft. long, having numbers and graduations large enough to be seen across the room, is screwed to the wall as shown in Fig. 2. This rule not only answers the purpose of instruction but becomes a tool for the student as well, having the advantage that the instructor is able to see at a glance and from a distance, just how the user proceeds with the problem at hand.

Another unusual device in use is one that might be called, in a mechanical drawing course, a "view determinator." This device, along with the standard drawing showing the system of projections, is illustrated in Fig. 3. It is made to represent the form of a square tin pan, the top view of which is rectangular in shape, while the sides are given an even curve down to a flat rectangular bottom. The effect is that if an object is placed within the pan and then pushed to the right on the right-hand side, while the pan is before you, a right-hand view of the piece will be shown, and so on for the rest of the view, i.e., the left-hand view, upper and lower views, except the rear which must be explained, as it takes its place at the left of the left-hand view. This device has the advantage of the folding glass cube in that the piece itself is presented to the eye direct.

In studying gear teeth another device is used which, like the slide rule, is an attempt to show on a large scale the forms of the different kinds of gear teeth used. This device, as seen in Fig. 4, is nothing more than sections of large gears made to rotate about centers that would otherwise be the centers of the shafts to which the gears would be fitted. These sections have only the pitch lines, addendums and dedendums shown and are used in very much the same way as the teacher in the grammar school teaches geography with a map on which the names of the rivers and cities are left off. The student, from the models shown, is required to give the kind of gear, the diametric pitch, the circular pitch, the pressure angle, etc. Experience has taught the writer that the matter of interference is best taught by itself, and is best explained in connection with the different forms of teeth, and is partly brought out in connection with the stub tooth model.

Another device that is claimed to be original is for indicating the amount of deviation a boy makes from a perfect plane while filing a flat surface, and is shown in Fig. 5. It consists of a frame that is held in the vise and in which a flat piece of stock is held between centers. Near the end is a long pointer pointing to a graduated scale having a zero mark at what would indicate a level with the plane of the stock.

As the left hand is extended beyond the center line the weight of the hand tends to hold the file hard at the outer edge of the stock; also the opposite effect is produced when the right hand is farthest away from the center. The real value of the device is to show to what extent the boy is in error and also shows how few there are who are able to use the file and at the same time keep the pointer at the zero mark.

A vestibule machine shop, Fig. 6, is provided with standard machines—shapers, planers, milling machines, drilling machines, etc. Here the student receives first hand instructions in the use and care of machines; is instructed regarding the feed and speed of them and is given minor parts to manufacture. From time to time students are sent into the shop for observation purposes and when advisable they are given production work.

The following schedule is used on machine-shop work:

First Year

Machinists' helper	2 mo.
Steel room	1 mo.
Toolcrib	2 mo.
Drilling machine	1 mo.
Plain milling machine	2 mo.
Small engine lathe	4 mo.

Second Year

Slotting machine	1 mo.
Smaller shaper	1 mo.
Bench work	2 mo.
Planer	2 mo.
Hardening and annealing	2 mo.
Tool grinding	2 mo.
Erecting	2 mo.

Third Year

Large lathe	2 mo.
Universal milling machine	1 mo.
Gear cutting	1 mo.
Boring mill	1 mo.
Turret lathe	1 mo.
Millwright	1 mo.
Large shaper	1 mo.
Large slotter	1 mo.
Millwright work in assembling	3 mo.

Fourth Year

General Shop Work, or a twelve months' review of the first, second and third years.

NOTE.—The apprentice will not be held on one line of work more than one month.

Fifth Year

Die sinking	1 mo.
General toolroom work	2 mo.
Smith shop work	2 mo.
Foundry	2 mo.
Physical laboratory	1 mo.
Chemical laboratory	1 mo.
Planning room	2 mo.
General shop work	1 mo.

Several instructors are in constant touch with apprentices in the shop, giving instruction on the manufacture of parts used for regular ordnance material. This work is then submitted and ratings made accordingly.

The rate of pay for apprentices, for the year 1920-1921, was as follows:

1st period	$2.08 per day	5th period	$3.44 per day
2nd period	2.24 per day	6th period	3.76 per day
3rd period	2.64 per day	7th period	4.24 per day
4th period	2.96 per day	8th period	4.56 per day
9th period, 5th year	5.12 per day		

The results obtained from using apprentices in the shop after graduating have been very satisfactory. The boys are considered very high grade mechanics. Several apprentices have become assistant foremen, toolmakers and experts on experimental work.

It is entirely up to the boy to take advantage of the opportunities given, as the schooling and instruction as given at the Rock Island Arsenal are of the best that can be given in any special purpose or technical school anywhere, and the arsenal is very proud of its purpose and its accomplishment.

Wear on Various Automobile Gear Steels

Results of Tests Showing Wear Due to Difference in Quality of Material Heat-Treatment and Shape of Teeth—A Tooth-Profile Indicator

By E. R. ROSS
Experimental Engineer, Warner Gear Company

THE purpose of gears is to transmit power at different speeds, efficiently, quietly and with maximum life. To do these three things two additional considerations must be taken into account; namely strength and wear, the latter being the more important. If the gear tooth is made of suitable material and of such proportions as to minimize wear, generally speaking the tooth will be amply strong.

Quoting R. J. Chapman in his article "Research Work on Gears Needed," which appeared in AMERICAN MACHINIST, July 1, 1920: "Success in designing gear drives to operate satisfactorily under specified conditions is very largely a matter of appreciation of what has been done before under very similar conditions. The Lewis formula, being a formula for strength only, is of no assistance in selecting the most suitable combination of pitch, diameter, face width and material for the purpose. Experience can only determine these proportions, because, even though the gears be made to a fine degree of accuracy, and be capable of transmitting the load without tooth breakage, it does not necessarily follow that they will be satisfactory in operation.

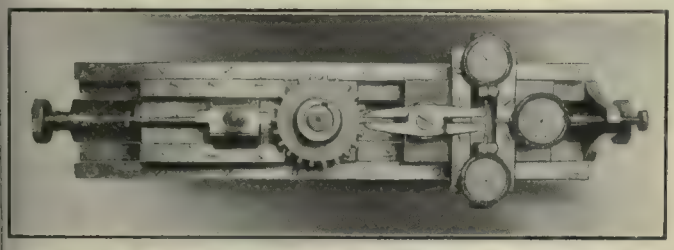


FIG. 1. SPECIAL INDICATOR FOR DETERMINING WEAR

"Further investigation should be made to establish reliable data relative to the various factors that determine the smooth operation and life of gear trains. The research could be divided into three classes. The work in section one would be to establish the most suitable material for use under given conditions, the allowable stress, the allowable pressure, the resistance to abrasion, the elasticity and such things being found for different materials. Section two would deal with methods of manufacture, and an attempt would be made to define the degree of error permissible with various grades of workmanship. Research in section three would determine the influence upon life and quiet operation of gears of such variables as peripheral velocity, load per unit of breadth, number of impacts, ratio of reduction, grade of workmanship, heating, and the disposition of metal in the gear rims and arms; methods of gear mounting to absorb vibration, and the lubrication of gears would receive attention.

"It will be agreed that successful research along these lines would provide dependable data for the design of gears to meet any conditions in regard to load, speed, quiet running, life and such points. Alone, the Lewis formula can be used only to ascertain the maximum permissible load to insure freedom from tooth breakage. With many gears this is the only point checked by the gear designer, with the result that they are transmitting excessive pressure, so that backlash and noise develop in a very short time."

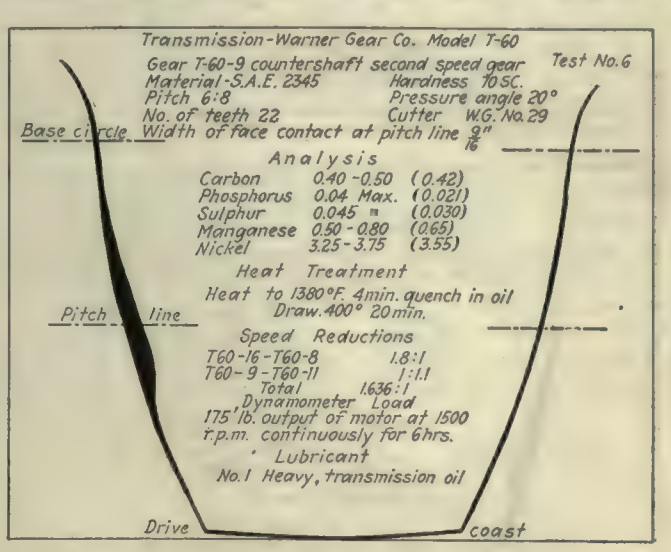


FIG. 2. WEAR OF A COUNTERSHAFT GEAR

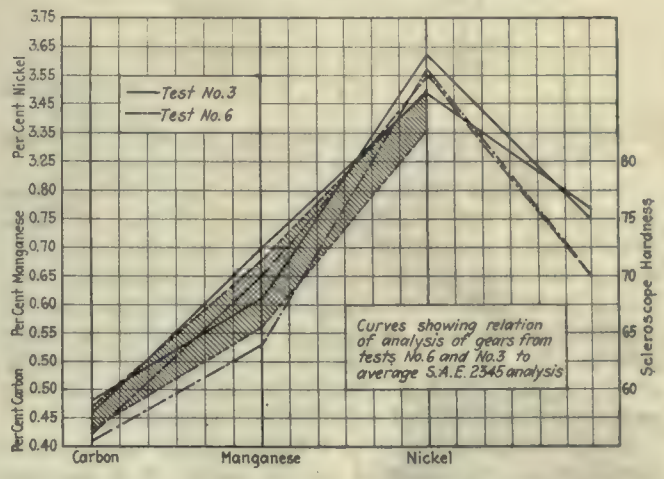


FIG. 4. ANALYSIS OF STEELS USED

Mr. Chapman in this article not only placed a very just criticism, but has gone a step further in that he suggested the line of procedure that must be inevitably followed if gears are to maintain the important position they now occupy in the automotive and allied industries in the transmission of power. With this outline before us in compiling the data of our tests, we have attempted to solve some of the most important problems that face the gear manufacturer today.

The work we are now doing has been confined largely to the selection of materials best suited for the purpose

Paper presented at the Rochester meeting of the American Gear Manufacturers' Association.

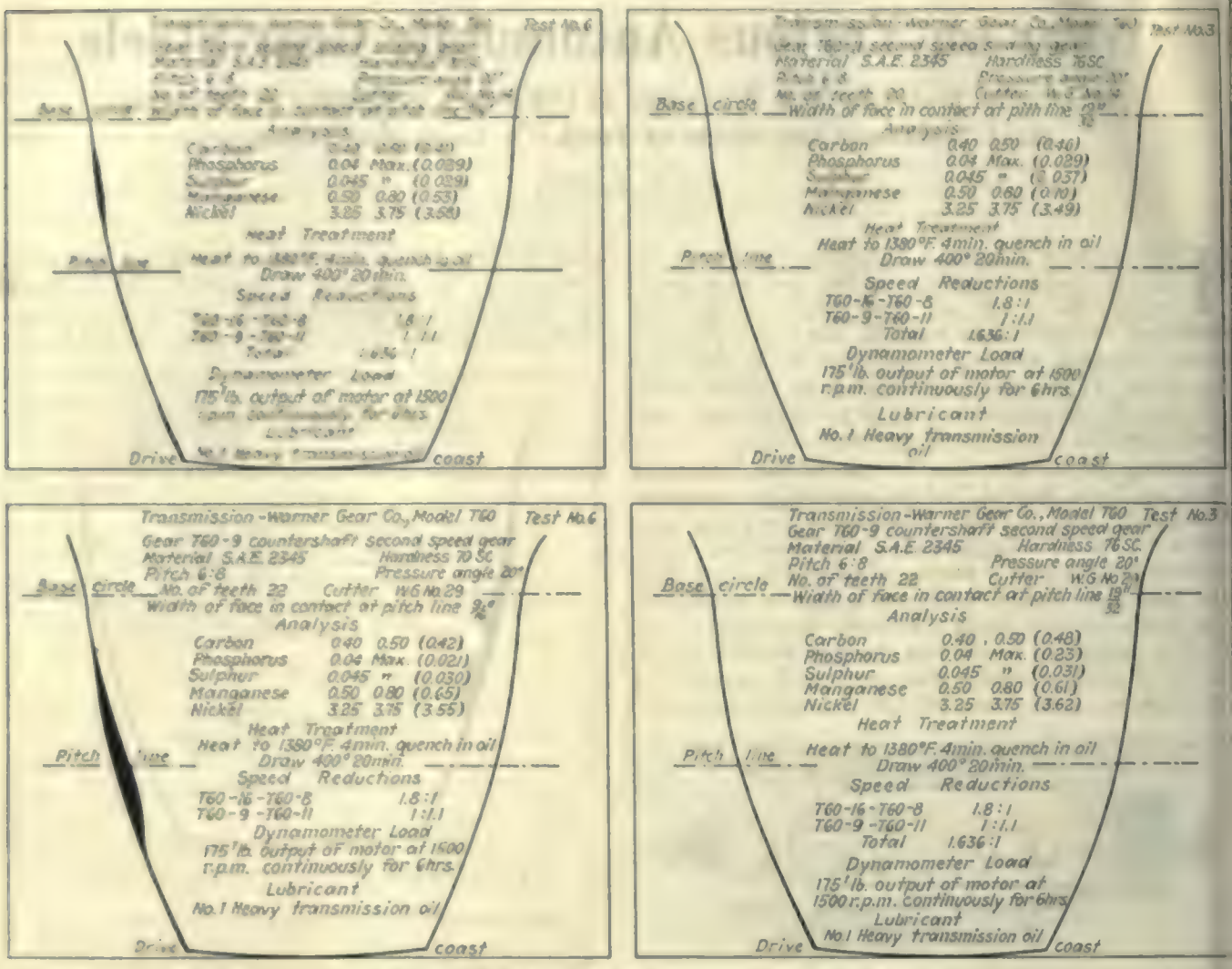


FIG. 2. WEAR OF GEARS OF DIFFERENT HARDNESS

of automotive transmission gearing, the selection being upon the basis of resistance to abrasion or wear.

Two standard transmissions were used which were checked over very carefully to assure us that we were not risking a possibility of error in our results by confining our tests to one transmission. Satisfying ourselves upon this point we proceeded with the test by alternating the two, preparing the one while we were testing the other. All parts were checked carefully after tearing down the transmission, likewise all new parts were carefully checked before assembling.

The transmission carries 6-8 pitch gears having ¾-in. face and is well adapted to the needs of a medium weight and medium powered passenger car or light-weight truck.

The test was run upon the material used in the second speed gears, or the third and fourth of a train of four gears. This selection was made on account of being the most used of the speed reductions in passenger car service, also on account of the difficulties presented in the manufacture of a sliding gear with internal clutch teeth. It is frequently used with a very high percentage of the full motor torque. These are also "clash gears" and accordingly a portion of the face width which they otherwise would have, has to be sacrificed in rounding the corners upon one end of the teeth to assist in meshing the gears. They have a combination of a higher pitch line velocity than the other reductions, together with a correspondingly lower maximum torque.

In order that we might duplicate the conditions o each individual test with those of any other test of the series, constant torque and constant speed were the first considerations. In order to accomplish this stand and, dynamometer equipment was used.

To be able to properly and impartially classify ou results, it was necessary that very careful measure ments be taken of both the new and the worn tooth To do this, we developed a tooth profile indicator, Fig. 1

The gear is mounted upon a stud in the center of the instrument. At the left and pressing against the to and side of a tooth is a stop which is held in this posi tion by the spring behind the block. This holds the gear rigidly in position. Diametrically opposite thi stop on the gear there are two fingers carrying point over the edge or profile of the tooth. At the right are two dial indicators, one for each of these points whic operates through a 1:1 lever. To the right and in the center is a third dial indicator used to determine the depth or distance in from the point of the tooth to the points of the indicating fingers. The indicating finger carry knife edge points so that the readings upon the leverage of the fingers do not change from the 1:1 ratio and at the same time making the readings upon the indicators a true indication of the contour of the gear tooth.

In Fig. 2 is shown a plot of the countershaft gear of test No. 6. The shaded portion of the tooth is the amount of metal that has been worn from its face,

showing the location with reference to the pitch line and base circle. The point of maximum wear upon this gear was 0.012 in. deep and from 0.010 to 0.020 in. above the pitch line.

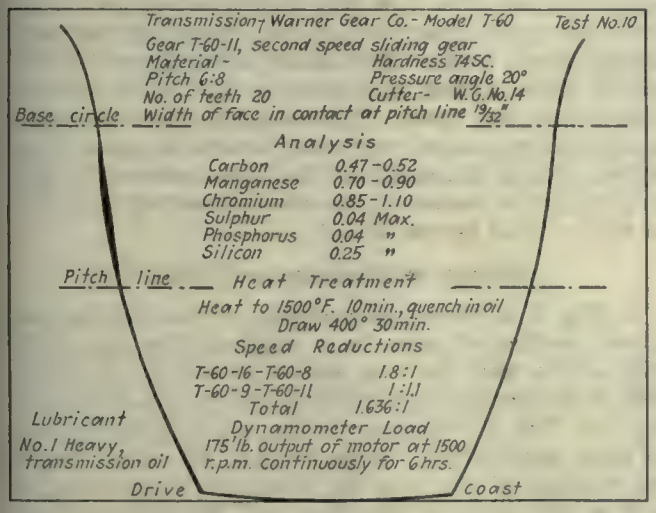
Since the wear is often unequal and we are unable to predict before the test just where it will be greatest, we select for measurement the tooth that shows the most wear. Fortunately the chamfered end of the mating gear leaves an unworn portion which can be measured after the run, enabling us to compare it with the worn portion of the same tooth. The plot is a comparison of the original outline with readings taken in the center of the worn portion of the tooth.

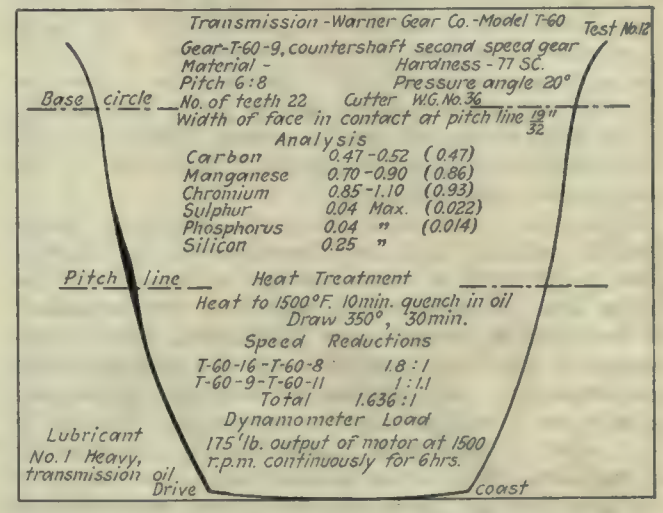
The Gear Tested

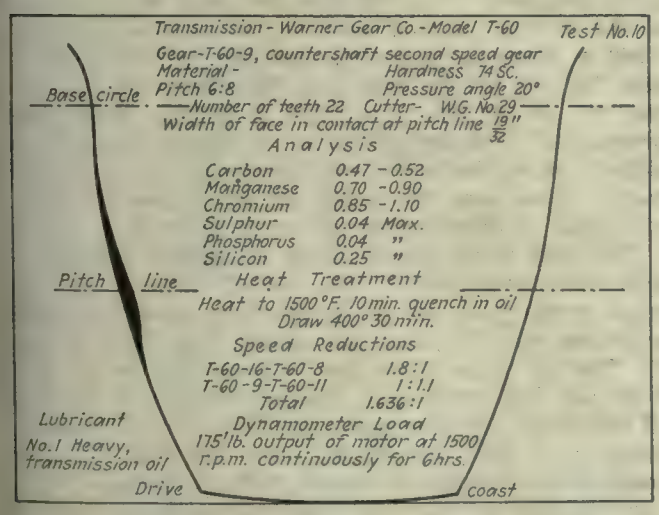
Covering the various items as they appear printed upon the chart, this plot is from the countershaft second speed gear, the material used in this test was from S.A.E. No. 2,345, having a hardness of 70, scleroscope. The gear was 6-8 pitch and 20 deg. pressure angle, having 22 teeth and was cut by our cutter No. 29. The tooth had a ⅝-in. width of face in contact at the pitch line. The analysis given with limits is the standard specification for the material used, the values in parenthesis are the values by actual analysis of this gear. The heat-treatment given this set of test gears was a heat to 1,380 deg. F., followed by quenching in oil and drawing in oil at 400 deg. for 20 min. The speed reductions are: From the main drive gear to the countershaft drive gear, having 15 and 27 teeth respectively (27:15 or 1.8:1), the countershaft second speed gear to the second speed sliding gear, having 22 and 20 teeth respectively (20:22 or 1:1.1), making a total reduction of 1.636:1. A 50-hp. load was applied to the transmission by the motor dynamometer (175 ft.-lb. torque at 1,500 r.p.m.) continuously for 6 hours.

At such a motor speed 175 ft.-lb. represents an overload for this particular set of gears quite beyond anything to which they would be subjected in actual service. Preliminary runs demonstrated, however, that some such overload was necessary if we were going to have any measurable amount of wear in a test of reasonable length of time. The six-hour test would represent, in a car having 32-in. wheels and 4¾ to 1 axle ratio, running in intermediate at a speed of 19 miles per hour for a total distance of 114 miles. The transmission lubricant used was an oil designated as No. 1, heavy.

The test was conducted by holding the power output (speed and torque) of the motor dynamometer constant for the six hours, readings being taken of oil temperature, mechanical efficiency and room temperature at one-minute intervals for the first five minutes, the same readings taken ten minutes after the start of the test and by ten-minute intervals thereafter till the end of the test. The same amount of new lubricant was placed in each transmission when set up for test and not changed during the test.







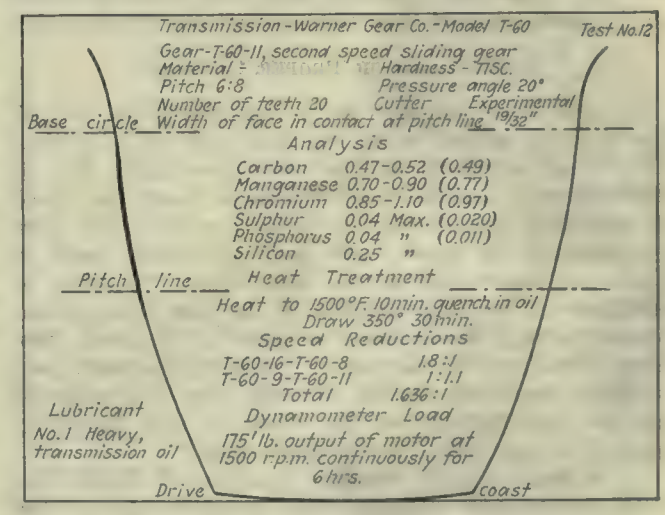


FIG. 5. EFFECT OF PROPER TOOTH FORMS

Fig. 3 represents two tests showing the best and worst conditions of wear on the oil-treated gears tested. You will note that they are both of S.A.E. No. 2,345 steel heat-treated in the same manner and cut by the

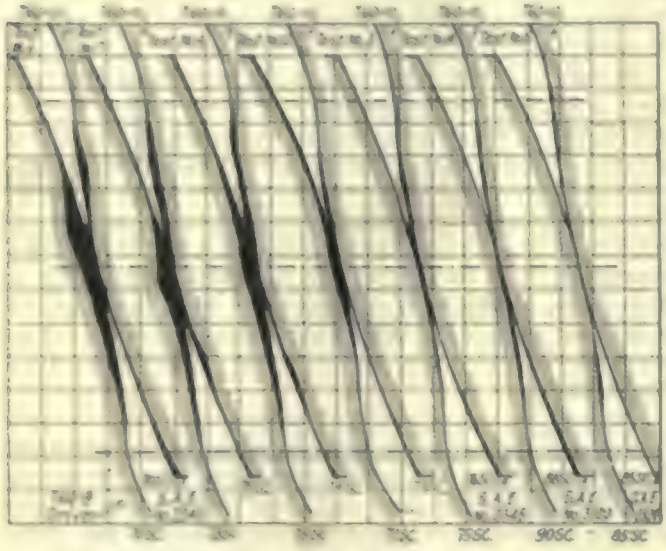


FIG 4 EFFECT OF HARDNESS ON WEAR

same cutters, but test No. 6 (shown at the left) has a scleroscope hardness of 70 on both gears, while test No. 3 (shown at the right) has a scleroscope hardness of 75 on the countershaft gear and 76 on the sliding gear. Note the variation in the analyses of these gears, also the relation existing between the carbon content and the amount of wear. In the latter connection the wear is greatest upon the driving gears, even though it may contain slightly greater carbon. This is a condition which we would expect when the action of the gears under load is analyzed.

If the gear action were ideal, the two gears would have no backlash and any movement of the driving gear would have a corresponding movement of the driven gear. In gears as cut, there is a certain amount of backlash to accommodate lubrication, slight inaccuracies in the cutting of the teeth and warpage from heat-treatment. Any increase of backlash due to wear permits an uneven or slightly intermittent velocity to exist, which once started, rapidly destroys the contour of the tooth. This action is more rapid upon the driving gear due to its having to absorb variations in load and velocities resulting from the breaking down of the curvatures of both the driving and driven gear.

Importance of Proper Cutters

In order that we may get a representative test of the wearing properties of the steel and not a premature breaking down of the tooth curvature due to intermittent velocities or interferences, great care must be exercised in the selection of the cutters used upon the gears to be tested, also upon the other gears in the train under load at the same time. In order to eliminate all possible variation of the load being transmitted through the first pair of gears in the train, new gears were used for each test. The heat-treatment used on these gears was limited to either that recommended by the manufacturer of the steel, or that found by experience best suited to the steels used.

As a result of 325 separate analyses of S.A.E. No. 2,345 we secured a fairly representative idea of the average analysis of the steel with regard to carbon, manganese and nickel. We found that the carbon averaged between 0.43 to 0.47, the manganese from 0.56 to 0.68, and the nickel from 3.36 to 3.50 per cent. The S.A.E. limits are so wide upon this steel that it is difficult to get uniform structure from a common heat-treatment in quantity production.

In Fig. 4 is given the analysis of the S.A.E. No. 2,345 steels used in tests Nos. 6 and 3, as shown in Fig. 3. The average analysis is shown as the shaded portion between the dotted lines. The gears of test No. 3, which had the least amount of wear and the higher hardness show a higher carbon content, a higher average manganese and about the same average nickel as compared with the gears of test No. 6, which were more worn and softer. This will also be explained in a measure by the difference in the structure. The presence of more troostite in the gears having the low carbon may be accounted for by considering that when a heat is used that is correct for the steel having the higher carbon, it is not high enough for the one having the low-carbon content.

In the tests shown in Fig. 5, the gears are of the same material and have a difference of only three points in hardness. Here is very clearly illustrated the point mentioned before in the importance of using gears cut with cutters having as nearly correct outline as possible. The gears of test No. 10 were cut with the same cutters as were used upon the gears of tests Nos. 6 and 3, but from the time that the gears were cut for these tests until used for test No. 10, the cutter used upon the countershaft gear had cut 240 gears and had been ground eight times. The cutter used in cutting the second speed sliding gear had cut 142 gears and had been ground five times. This change in the cutter gave an interference which was noted before the gears were tested. When this condition had been removed by getting the proper curvature, the steel showed up very well, as will be noted by test No. 12.

Effect of Hardness on Wear

In Fig. 6 is shown an assembly of the driving and driven profiles of seven tests ranging from the condition of the most wear as shown by test No. 6 at the left, to the condition of minimum wear as shown by test No. 15. The driving gear is the one at the lower left of each combination. Here we may get some idea of the relation of the wear as compared to hardness, as well as the action of the wear and the different steps in its progress. You will note the small worn portion of the driving gear of test No. 15 at approximately 0.040 in. above the base circle and also the worn portion near the top of the tooth and the conditions in tests No. 12, No. 3, No. 7 and No. 6, as this action has progressed. The destructive action having moved from slightly above the base circle up toward the top of the tooth. When once this action has set in upon the faces of a gear, it progressively grows in intensity.

The tests of oil temperatures, mechanical efficiencies and room temperatures were also of interest. At the start of the tests the oil temperatures and room temperatures were the same and ranged from 60 to 80 deg. F. The oil temperature rose very rapidly for the first hour and had practically become constant at the end of two hours, the maximum conditions for oil temperatures on a test (not shown) was 370 deg. F. The mechanical efficiencies started with an average of 96 per cent and had practically become constant at the end of an hour. The average maximum efficiencies for the

tests shown were 98.7 per cent with a maximum of 98.9 per cent. This is a power loss of 1.1 per cent or 0.55 hp. for a 50-hp. load on this transmission. Properly constructed and properly lubricated, the automobile transmission is a very efficient unit.

The mechanical efficiencies had a gradual rise and a falling off shortly before the end of the test where the wear had been very great, but did not give any marked indication of the wear as is shown by the rise in oil temperatures which were practically without exception in proportion to the amount of wear as shown when indicated and plotted.

Considering that at this speed the tooth picks up its load more in the nature of an impact blow, especially when the tooth becomes slightly worn, we have another interpretation of the tests in the order the load is transmitted to each gear of the train as follows:

Order of gear in train	Number of teeth in gear	Speed in r.p.m.	Pitch line velocity, ft. per minute	Load at pitch line, lb.	Load in lb. per inch of face (assuming 9/16 in. face)	Total number of impacts on each tooth
1	15	1,500	982	1,680	2,986.66	540,000
2	27	833.3	982	1,680	2,986.66	300,000
3	22	833.3	800	2,063	3,667.55	300,000
4	20	917	800	2,063	3,667.55	330,120

From a careful study of the figures and curves, which are representative of the tests we are making on steels for gears, we would recommend for oil-treating steel that it possess a minimum analysis of 0.45 per cent carbon; be capable of treating to obtain a scleroscope hardness of 75 or over without brittleness; that it be as clean as it is commercially practical to make it, and that the specification limits of the analysis be of close enough range to insure uniform results from a standard heat-treatment.

Letters from Practical Men

By F. P. Terry

The accompanying letter is from an old reader and contributor in Belfast, Ireland. He has stated the case clearly; the American Machinist does want letters from practical men—not pipe dreams or pot boilers—but honest-to-goodness experiences of men who have done some unusual job, or a usual job in an out-of-the-usual way. We hope Mr. Terry's experience as given below will inspire others to follow his example. [Editor.]

On the editor's page of the American Machinist (444, Vol. 55) it was stated in connection with the contributions under the above heading, "If they do not measure up to your standards, why not send in what you consider good ones?"

After reading these letters, I am fully satisfied that they are good, and I think that what the editor is getting at and what some of us want, is more of them.

During the twenty-five years that I have been a reader of the American Machinist, I have always enjoyed the letters from practical men, more so, of course, if a contribution of mine appeared therein, and I have often thought that these letters would, like Tennyson's "Brook," "go on forever" without becoming stale or uninteresting and that the practical machine shop man would always insure a busy time for the editor in making a selection. If the opposite is the case now, it is greatly to the discredit of the practical man and is very difficult to explain.

Perhaps some are keeping their ideas to themselves with the notion that they are so much wiser than the rest of the machine shop world. Sometimes this is better known as "swelled head," and if any reader has symptoms of this complaint, there is nothing better than trying to write letters for the practical column to reduce his head to normal. With this type of reader there is every chance of a complete recovery if the course is once started, but there is very little hope for another type known as the "grab-all." He is easily recognized by the shifty eyes that look at you always with suspicion that you are robbing him, or going to, at the first chance. He reads all he can but never tells you about it because he is afraid you might get a little information, which, like everything else he has, is never given away. This type is hopeless and can be left to go down unhonored and unsung.

There is yet another type with which we can all sympathize and offer encouragement. I refer to the practical man who fears to put his ideas into print. His modesty is often his undoing in the machine shop. He sees others going ahead, while he remains in the same old groove, and he is put down as lacking initiative when it is only shyness, which, if overcome, would change his whole outlook in life. To this type I would also advise the writing of letters on practical subjects.

Always a Place for Ideas

Many men are convinced that their contributions will be refused because they are poor draftsmen and scholars, and, if they got anything published, it would only show up their shortcomings. This is an entirely erroneous idea. The American Machinist never will let you down or show you up, and, although all editors like nice things, it does not matter how rough the case if the "goods" are inside, and hundreds of men can testify that this interesting hobby has made them better writers and better draftsmen, has assisted them to better positions and improved their standing in many ways and last, but not least, has put many dollars into their pockets.

Perhaps my own case may start some faltering brother along this interesting road. My first contribution brought in one dollar. The small sketch took me several hours, as I was a poor draftsman. Today I could make a better freehand sketch which would take about five minutes. I can also do a bit at the board, the desire to be able to draw having been created by the American Machinist. Thanks also to the same source, I got the desire to possess and read all the histories I could get about old engineers and old tools, and today I have a bookcase fairly complete which has brought me more than twenty times the cost. Since my first attempt at writing when I was a young journeyman, I have passed through all stages in machine shop control up to getting a business of my own. During this time I have kept on writing, and for several years the American Machinist's monthly check arrived as regularly as my salary. A few photographs and one evening's work brought me in fifty dollars; I have also made friends all over the world.

There is no reason why any reader should not do the same. Why not start now?

Eliminating the Hit and Miss Method of Hiring Men

By F. T. MacFeely

There was a time when the first man who came along got the open job, providing he wasn't totally blind or a hopeless cripple. It made no difference whether or not the applicant was fitted for the work for which he was employed; if the first impression was favorable to the superintendent or foreman who did the hiring, the man was set at work without further ceremony. This method of hiring men is no longer used at our plant, but has been discarded for a better one. Now each man is interviewed thoroughly, to determine his qualifications and to fit the right man to the right job.

This is accomplished through job specifications. The form shown here is the one we use. There are others which are no doubt just as good, but this one fits our requirements better than any others we have tried.

As will be seen, it is divided into five sections, one giving general information, the second stating the requirements of the worker, third the physical aspects of the job, while the last two are left blank for the convenience of the interviewer.

The blank forms are applicable to all departments of our factory. They are completed in accordance with the form, shown herewith, from information obtained at a conference between the interviewer, the superintendents and the foremen. First, the foreman and the interviewer get together and decide on the requirements and qualifications for each occupation in the department, after which a copy is sent to the division superintendent for his approval. If he takes exception to any items, he calls in the foreman and interviewer for a consultation.

It is no easy matter to get one of these forms properly filled in, as the wide difference of opinion as to the requirements for some occupations necessitate much thought and study. The foreman and interviewer may agree on certain qualifications, but the superintendent's ideas may be quite different. The job specifications are worthless without the positive agreement of all three persons concerned, but when they are once completed satisfactorily they are worth many times the trouble and expense involved.

We have found these job specifications, or "hiring specifications," as they might be called in our case, among the most valuable records we have in our employment department.

JOB SPECIFICATION

General Information:

Occupation *Engine Lathe Operator* Dept. *Machine*
Duties *Machine Brass, Mall. and Iron Castings on Engine Lathe*
Tools Required *See attached list*
Furnished by Company *Attached list* By Employee *Attached list*
Experience Necessary *Drill and Turret Lathe* How Long to Learn 1 *Yea*
Start Rate *M F* Max. Rate *C F X* Promote from *Turret Lathe* To *Tool Lath*
Day Work × Piece Work Bonus Combination

Requirements of Worker:

Man ×	Age Limits Desired 20–40	Set up Work ×	Quick
Boy	Age Limit Acceptable 20–50	Read Scales ×	Deliberate ×
Tall	Weight—Maximum	Use Jigs	Patient ×
Medium	Weight—Minimum	Use Templates	Careful ×
Short	Read Micrometer ×	Use Gauges ×	Thorough
Strong	Read Blue Prints ×	School Grade 8	Accurate ×

Physical Aspects of Job:

Hand Lift ×	Standing ×	Floor	Dusty	Wet
Crane Lift	Sitting	Bench	Noisy	Dry ×
Medium Hvy.	Stooping	Heavy	Acids	Hot
Variety	Walking	Light ×	Fumes	Cold
Repetition ×	Exacting	Close ×	Quiet	
Monotonous	Indoor ×	Rough	Alone	
Machine ×	Outdoor	Dirty *Some*	Pairs	
Pleasant ×	Greasy	Clean	Group	

Questions to Ask:

Can you cut threads without reverse belt or dial in carriage?
How would you bore a taper hole without taper attachment on lathe?

Remarks:

If possible, employ a young man for this position, one who is ambitious, as th opportunity for advancement is good.

Selling a New Gage to a Competitor

By Frank C. Hudson

It always pays to know your competitors and your competitors' friends.

One day in the early stages of our business we got an order from the Blank Company for one of our special gages which we had just announced. The first thing which aroused our suspicions was that it was a carte blanche order with no query as to price. Now this company had always been a very close buyer, with an emphasis on the "close." Furthermore, we knew that it was having a hard time to keep the sheriff's sign off the door, so that an order of this kind set us to thinking.

Then we saw the light.

Our worst competitor, not in real competition but worst in the worst way you can use the word, was a personal friend of the grand mogul of the Blank Company. So we knew at once why the gage was ordered. The Grabem Company wanted a chance to take one apart and copy it as nearly as possible in order to compete in bidding for a big order which has loomed in sight.

Did we refuse to supply the gage? We did not. We thanked the company for the order and proceeded to make a good instrument in every way. It would function properly and to all appearances was like our regular product. But it wasn't. It would do all the name implied but it lacked a couple of features which we knew would be specified in the order and was not like our regular product in many ways. The rest is easy to guess. The Grabem Company copied our instrument as usual, spent some of their good money on tools and submitted an instrument which did not meet specifications.

We got the order. If we had sent one of our regular gages there's no telling what might have happened.

As I remarked before, it pays to know your competitors and who your competitors' particular friends are

Automotive Service Methods and Equipment

VIII. Some Operations in a Standard Oil Company Service Plant—Ford Rear-Axle Tools —Turning Crankpins—Grinding Cylinders in a Lathe

By HOWARD CAMPBELL
Western Editor, AMERICAN MACHINIST

SOME of the tools in use at the Chicago service plant of the Standard Oil Co., at 14th and Leavitt Sts., will undoubtedly be interesting to those engaged in work of a similar nature.

The operator shown in Fig. 1 is removing an axle housing cap from a Ford rear axle. The method of

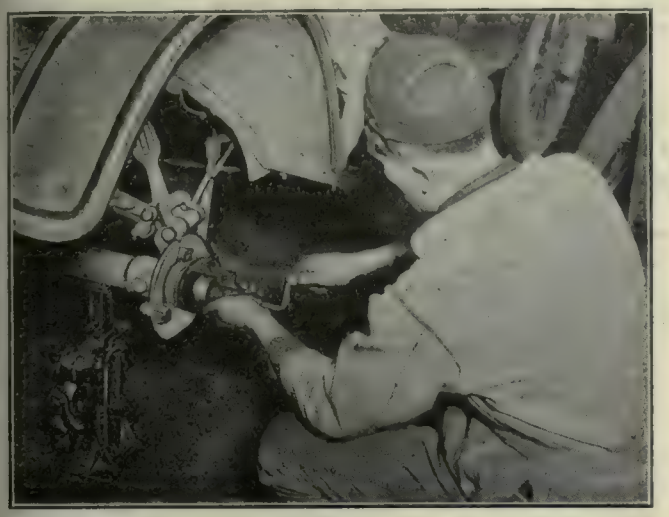


FIG. 1. PULLING OFF A FORD AXLE HOUSING CAP

using the puller can be seen at a glance, while the details of the tool used are shown at *A* in Fig. 3. The wheel is removed from the axle as shown in Fig. 1, and the puller applied over the cap. Then the screw *C* is turned, shoving the key *D*, which has a slight lip at the end, in through a slot so that the lip catches over the inner end of the cap. Then the crank *E* is turned, the screw of which it is a part feeding in against the end of the axle shaft, thus drawing the body of the tool, with the axle housing cap, off the shaft.

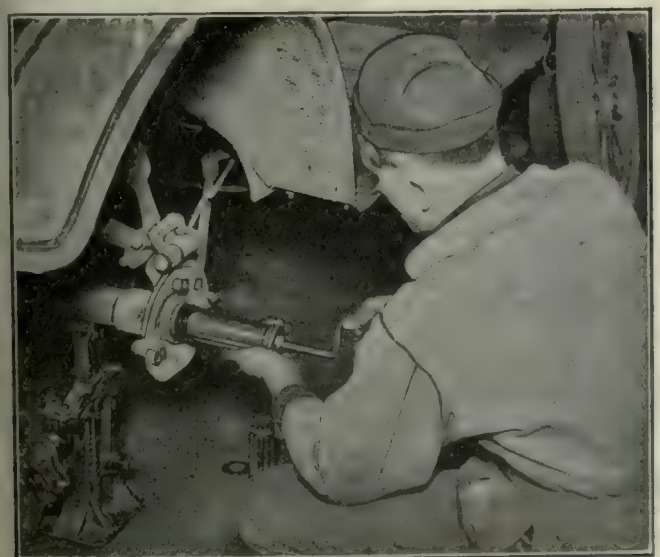


FIG. 2. PULLING THE ROLLER BEARING SLEEVE FROM A FORD REAR AXLE

In Fig. 2 is shown how a roller-bearing sleeve puller is applied. This tool, which is shown at *B* in Fig. 3, is inserted into the axle housing, and slips into the roller bearing sleeve. The pin *F* which is operated by the handle *G*, is connected to the pin *H* through an eccentric so that when the handle is turned, the pin can be made to recede until it is flush with the outside diameter of the tool, or it can be made to protrude.

There is a hole in the roller bearing sleeve through which grease is fed to the roller bearing. When the sleeve puller is in place, the handle is turned so that the pin protrudes, and the tool is turned until the pin slips into the grease cup hole. Then the sleeve can be removed from the housing by turning the crank *I*, which feeds a screw against the end of the axle shaft.

The test fixture shown in Fig. 4 is of simple design, but does the work required of it very nicely. The pin *A*, which is the exact size of a Ford crankshaft, is slipped through the large end of a connecting rod, as shown. Pin *B* which is the size that a piston pin should be, is inserted in the small end of the rod. When the rod is in the position shown, if a heavier feeler can be slipped under one end of the pin than under the other end, it is obvious that the piston-pin hole is not parallel with the crankshaft hole. To test the rod for twist, it is simply swung over until the pin rests

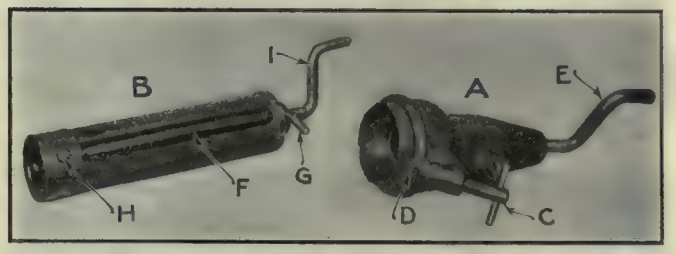


FIG. 3. AXLE HOUSING CAP PULLER AND ROLLER BEARING SLEEVE PULLER

on the blocks indicated at *C*. Any twist can be detected immediately by the use of the feeler gage.

A pair of clamps which make it possible to turn the throws on any crankshaft is shown at *A* and *B* in Fig. 5. The hole in the clamp is large enough to receive the end of the shaft, which is held in place by the setscrew *C*, as shown. The centers of the lathe fit into the sliding blocks, one of which is shown at *D*. This block is turned and threaded on the end opposite the center hole, to receive nut *E*, which is screwed down to hold the block in place.

The blocks are set as nearly in line with the pins to be turned as possible, before the shaft is put into the lathe. Then an indicator is used to finish the job of lining up, the blocks being adjusted until the pin is running true, after which the turning can be done.

To obtain the best results in working on crankshaft pins, a counterweight should be used as shown at *F*. Otherwise the weight of the shaft itself will spring it "out of true" as it turns.

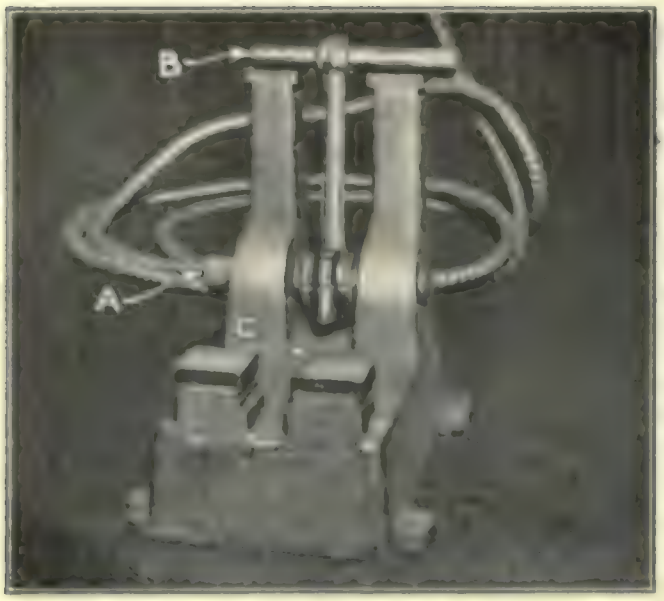


FIG. 4 FIXTURE FOR TESTING STRAIGHTNESS OF CONNECTING RODS

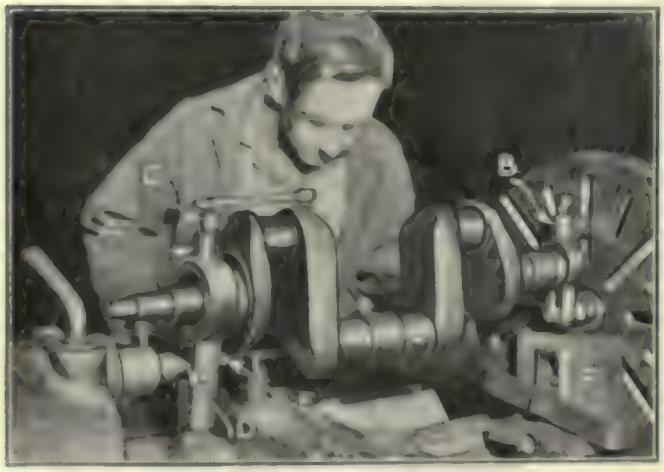


FIG. 5 TURNING CRANKSHAFT PINS

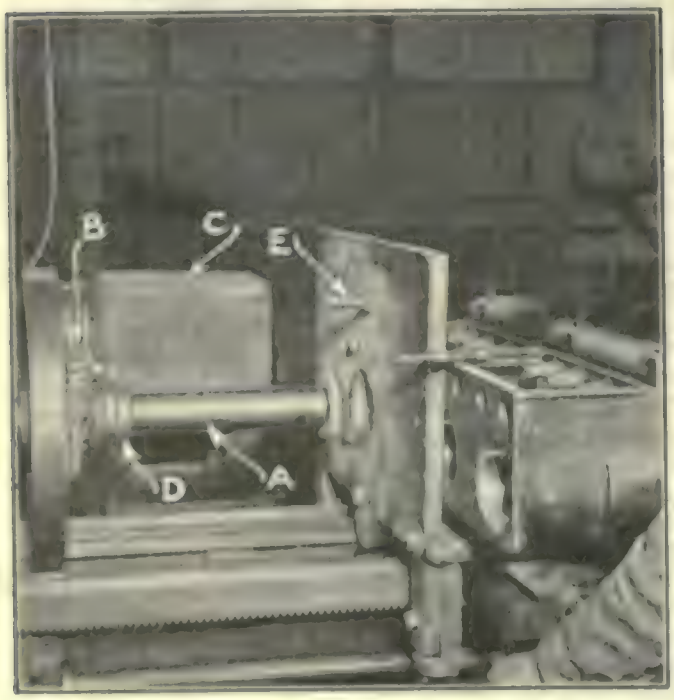


FIG. 6. GRINDING CYLINDER BORES ON A LATHE

The operation of grinding cylinder bores on a lathe that has been converted into a cylinder grinder is shown in Fig. 6. The grinding attachment, as can be seen, is bolted to the faceplate. The sleeve *A*, to which the wheel is attached, runs on ball bearings on a shaft which is attached to a sliding head. This head is dove-tailed and gibbed into the plate that is bolted to the faceplate of the macihne. The shaft can be adjusted to the amount of eccentricity required by means of the screw *B*. Power is supplied through a 1 hp. motor which is covered by the box *C*, by belt to the pulley *D*, which is a part of the spindle. The wheel is a "grade 46," furnished by the Heald Grinder Co. expressly for cylinder grinding.

The speed of the faceplate is about 15 r.p.m., and that of the wheel is about 4,000 r.p.m. This spindle is furnished by the Acme Grinder Co., Minneapolis, Minn.

The cylinder is bolted to the angle plate which in turn is bolted to the cross-slide of the machine, and the bore is indicated until it is straight and true with the spindle. Then the operator proceeds as with any other cylinder grinder.

A small ring bolt is screwed into the faceplate at *E*, which is used to hold the wheel dresser. The hole in the bolt is just large enough to receive the dresser, and the small screw which can be seen in the picture holds the dresser in position.

An efficient, though simple, tool is shown in Fig. 7.

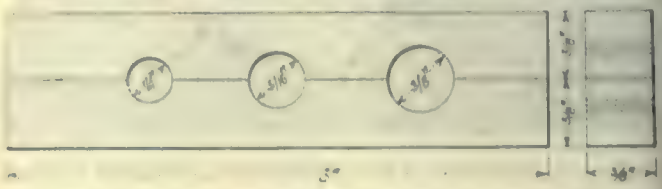


FIG. 7. TOOL FOR FLANGING COPPER TUBING

This is composed of two straight pieces of ½-in. square cold-drawn steel, with three holes drilled in the two pieces as shown, so that each piece contains only one-half of each hole. The holes are ¼ in., ⅜ in. and ½ in.

When it is desired to put a union or coupling on one end of a piece of copper tubing, the coupling is slipped over the end of the tubing, then the end of the tubing is caught between these two pieces of steel, the size of the tubing determining the size of the hole to be used. Then the pieces are clamped into a vise so that the end of the tubing sticks up above the steel blocks about ¼ in. One blow of a hammer on a round nosed punch that has been inserted into the end of the tubing puts a flange on the tubing sufficient to hold the coupling.

Standardization of Shotgun Shells

Early in 1920 a campaign was launched with jobbers and dealers to standardize on and restrict their orders to the smallest necessary number of shotgun loads. At that time, for instance, in 12 Gage smokeless loads alone, there were 4,213 combinations.

The jobbers and dealers responded readily to the suggestion that the loads be reduced to a common sense basis and suggested possible eliminations.

The information was passed on to the ammunition companies with the result that in the 12 Gage smokeless loads 85 per cent were eliminated and 72 per cent of the black powder 12 Gage loads were eliminated. The same proportion holds good all through the list of loads in all gages.

Shafts Weakened by Grinding Cracks

By K. Heindlhofer

Causes which appear insignificant and escape general attention oftentimes produce serious results. This is illustrated by an experience on hardened and ground shafts, two of which broke in succession at a load considered to be within the safe limit. Due to the fact that the acting forces and running conditions were well defined and known, a record of this incident may be of interest to both the shop and engineers.

The shafts which broke were made of a 1 per cent carbon, 1.5 per cent chrome steel of high quality. They were heat-treated, which resulted in a hardness of 600 Brinell. The shafts were ground to the dimensions shown in Fig. 1 and carried four ball bearings equally spaced at a distance of 3.8 in. The two inner bearings carried a vertical load of 4,550 lb. each. Practically no torque was transmitted. Due to the equal spacing the outer bearings furnished an identical reaction load. The maximum stress due to bending was 31,800 lb. per square inch. The speed of rotation was 1,450 r.p.m. A revolution counter indicated the total revolutions of the shaft.

The first shaft broke after 195,000 revolutions or 2¼ hr. A second shaft, which was made exactly the same as the first, met the same fate after 10,000 revolutions or less than 7 min. This was a surprise, as smaller size shafts under similar stresses, had given continuous service.

After the second shaft broke both failures were closely investigated. The investigation revealed the presence of grinding stresses and cracks, due to excessive pressure of the wheel when grinding the shaft. In both cases the fracture started at the defective surface. The pressure of grinding was caused by a hump in the shafts, which were warped in quenching. Fig. 2 is a photographic reproduction of the cracks in both

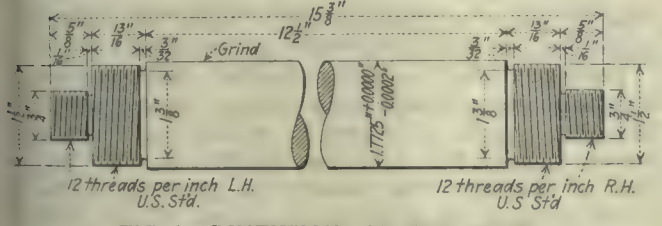


FIG. 1. DIMENSIONS OF THE SHAFT

shafts. The cracks were rendered visible by deep etching in boiling 50 per cent hydrochloric acid.

The third shaft, which was identical in dimensions, material, and heat-treatment, with its foregoers, was ground with care under small wheel pressure. It was then put in service and has made 57,484,000 revolutions, which corresponds to a 660 hr. run. It is still in perfect condition, in spite of the fact that it ran under the same load and speed as the first two.

The great difference in life of the shafts, caused by improper and proper grinding, shows the evil effect of forced grinding. The forced grinding may render the piece useless, which fact may easily escape inspection, because even hair cracks are generally invisible to the eye.

To explain the failures recorded above, let me call attention to the behavior of a thick glass, into which hot water is suddenly poured. One would not be surprised to see the glass cracked after this experiment. Something similar happens in forced grinding. A hard wheel at excessive pressure will produce an instanta-

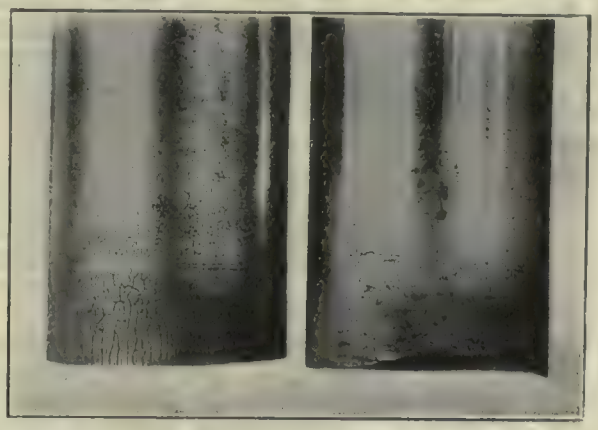
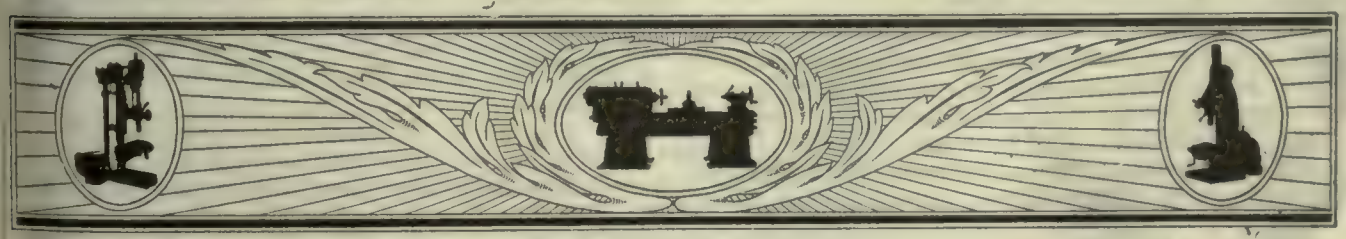


FIG. 2. THE CRACKS IN BOTH SHAFTS

neous local heating on the wheel. The locally heated area will expand and produce stresses. In addition to the heat effect at high wheel pressure, considerable friction is created between the work and wheel which transmits tangential forces between the two. These forces act on a very small area, thus the unit tangential or shearing stress may reach a considerable magnitude. A combination of the heat and frictional stresses is, in all probability, responsible for the cracks. These cracks, if on the surface, are not very dangerous at steady load. Assume the shaft was not rotating but subjected to a constant load, no fracture would have occurred. It was stated above that the shaft broke after a certain length of time (2¼ hr. in the first, and 7 min. in the second case). The influence of the time to produce fracture is explained by the fact that the stresses on the top, caused by the bending, are opposite in direction to those on the bottom of the shaft. After each half revolution the compression and tension stresses reverse; thus at each revolution two reversals take place. It is a well known fact that alternating stresses cause fracture in the material even below the elastic limit. In this case no appreciable permanent deformation will occur, thus the local high stresses at the ends of cracks will not be reduced by permanent stretch such as would be the case on a still-standing shaft. Therefore, fracture will start at the cracks as soon as the metal is fatigued at these severely stressed points.



Experimental Use of Liquid Air and Explosives for Tightening Body-Bound Bolts

Cylindrical and Taper Bolts Contracted by Liquid Air and Allowed To Expand After Insertion—Cylindrical Bolts Expanded in Place by Explosives

By H. L. WHITTEMORE
U. S. Bureau of Standards, Washington, D. C.

BODY-bound bolts are used in the Navy for attaching the lugs of turret guns to the supporting girder, and for other purposes. Taper bolts have been successfully used, but other possible means of securing the same results were made the subject of investigation and experiment.

The experiments described in this report, undertaken at the request of the Bureau of Construction and Repair, Navy Department, were made to determine the force required to cause slipping of a body-bound bolt. Two methods of obtaining a metal contact between a bolt and the material surrounding it were used.

Tests were made on bolts which had been body-bound by the following methods: (1) Liquid air, shrinking the bolt by immersing in liquid air and allowing it to expand in the hole; (2) explosives, inserting the bolt which was a loose fit in the hole and expanding it by an explosive charge placed in a small hole in the axis of the bolt.

Liquid Air Tests on Cylindrical Specimens

Theory: The boiling temperature of liquid air is about —190 deg. C. (—310 deg. F.) and room temperature is about 20 deg. C. (68 deg. F.). It seems that a temperature range in the bolt of about 200 deg. C. can be obtained. The co-efficient of linear expansion for steel is at least 0.000010 in. per deg. C., at normal temperature, although this value may not be correct at very low temperature. For the temperature range available, the change in dimensions will be about 0.0020 in. per inch. It seems, therefore, that a bolt or pin 1 in. in diameter would become 0.002 in. smaller (0.998 in. in diameter) if immersed in liquid air until it had reached the boiling temperature of the air and would return to its former diameter upon reaching room temperature.

Specimens: In order to demonstrate the practicability of this method of body-binding bolts the following tests were made. Six blocks of mild steel were prepared, each 1½ x 3 x 6 in. A hole was bored through each piece in the center of the largest face. The holes were carefully hand reamed with an expansion reamer and had a diameter of 1.0056 in.

Three machine steel pins, 3 in. long were made for the holes. The diameters were 1.0066 in., (mark 0.001), 1.0071 in., (mark 0.0015), and 1.0076 in., (mark 0.002), the "mark" is the amount that the pin diameter exceeded the diameter of the holes.

Assembling of Specimens: The pins were held by blacksmiths' tongs and dipped vertically into liquid air. When ebullition ceased, indicating that they had reached the temperature of the air, one pin was withdrawn and placed in the hole in one of the blocks; the second block was placed over the pin. If the blocks failed to meet on the pin the upper block was driven with a hand sledge.

The pin, marked 0.001, entered the holes readily and the specimen was assembled without driving. The pin, marked 0.0015, stuck and although driven quickly only projected about ⅛ in. through the top block and lacked about ¼ in. of passing through the lower block. After entering the holes the pin was immovable in about one half minute.

TABLE I. PULL REQUIRED TO SEPARATE THE BLOCKS.
(STRAIGHT PINS)

Spec. Mark	First Block To Slip	Starting Load Lb.	Slipping Load Lb.	Second Block To Slip	Starting Load Lb.	Slipping Load Lb.
0.001	bottom	6,420	5,300 to 4,000	top	9,470	6,310
0.0015	bottom	7,060	.....	top	8,080	6,700 0.12 in.-6,230 0.25 in.-6,000 0.50 in.-3,000
0.002 (0.0014)	top	8,800	6,200* 5,900* 0.02 in.-5,820 0.106 in.-5,800 0.200 in.-5,800	bottom	10,990	6,000

* After slipping started the testing machine was stopped. Slipping continued at lower loads.

As it was obviously impossible to assemble the third specimen, pin marked 0.002, it was filed down in a lathe to a diameter of 1.007 or 0.0014 in. larger than the hole.

TABLE II. UNIT FRICTIONAL RESISTANCE

Specimen Mark	Top Block Lb. per Sq.In.	Bottom Block Lb. per Sq.In.
0.001	2,410	1,635
0.0015	2,060	1,800**
0.0014	2,240	2,800

** The pin did not extend through the hole.

This pin required some driving to bring the blocks together but no difficulties were encountered.

Testing: After reaching normal temperature the specimens were loaded in a Riehle testing machine, having a capacity of 100,000 lb., so that the blocks were forced apart. The load was applied parallel to the axis of the pin. The results are given in Table I.

The area of the cylindrical surface of the hole is about 3.98 sq.in. The unit frictional resistance shown in Table II, may be found by dividing the slipping load by this area.

Examination of the pins and holes after their separation showed that the surfaces were perfectly smooth where they had been in contact. All of the holes showed some depressions below the reamed surface where the metal had been torn previous to the hand reaming operation. In general these areas did not exceed perhaps 5 per cent of the total surface.

Conclusions: These results show practically no difference in the friction between the pin 0.001 and the pin 0.0015 in. larger than the hole. The average for both of these was 1,9978 lb. or practically 2,000 lb. per square inch.

The average for pin marked 0.002 was 2,520 lb. per square inch. This may have been due the fact that the holes in these blocks apeared to have less torn surface than the others so that a larger surface was in contact with the pin.

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If the pin 0.001 in. larger than the hole caused a comprehensive stress in either the pin or the block equal to the yield point of the material, as appears probable from computation, then the pin 0.0015 in. larger would not cause an appreciably higher stress. It would merely cause permanent deformation of the material in the pin or block, possibly both. The fact that the starting loads appear to be about the same for all the specimens, within the limits of the experimental errors involved, tends to show that the highest loads for these materials were reached.

Apparently by the use of liquid air, pins or bolts can readily be assembled if their diameter is larger than that of the hole by 0.001 in. for every inch of pin diameter.

Liquid Air Experiments on Taper Pins

Since in the use of liquid air on cylindrical pins difficulty was found in inserting the pins in holes after cooling, it was suggested that experiments with taper pins be made. The experiments described here were made on taper pins.

Specimens: Six pieces of mild steel 1¼ x 3 x 6 in., the same as used in the previous tests, were used for the plates in these tests. The blocks were secured in pairs and a taper hole bored through them in an engine lathe. A steel pin about 4½ in. long was turned to fit each of the three pairs of blocks.

The diameter of each pin was measured at each one-half inch along its length, and the measurements plotted to an enlarged scale. The taper was somewhat irregular but an average value was obtained from a line drawn through the points. The average values are given in Table III.

Assembling: The blocks were placed so that the holes were in line and the pins which had been cooled in liquid air were inserted in the holes and seated by a few light blows followed by one comparatively heavy blow from a hand sledge. The pins and blocks were easily and quickly assembled due to the taper of the holes.

Testing: After attaining room temperature the blocks were separated in a Riehle testing machine

TABLE III. AVERAGE TAPERS AND DIAMETERS OF PINS.

Pin No.	Taper In. per Ft.	Approximate Value	Block	Mean Diameter of Hole, In.
1	0.0535	1/16	upper	1.1593
			lower	1.1547
2	0.024	1/32	upper	1.0802
			lower	1.0776
3	0.0456	3/64	upper	1.0954
			lower	1.0903

having a capacity of 50,000 lb. The load was so applied as to cause slipping of the pin in one block at a time, except for No. 3. This was loaded so as to force the

TABLE IV. PULL REQUIRED TO SEPARATE THE BLOCKS (TAPER PINS)

Block No.	Area of Contact Sq.In.	Amount of Shrinkage In Diam. In.	Starting Load Lb.	Unit Frictional Resistance Lb. Sq.In.
1 upper	4.55	0.0024	14,300	3,140
1 lower	4.53	0.0022	12,400	2,740
Average	4.54	0.0023		2,940
2 upper	4.24	0.0022	13,100	3,090
2 lower	4.23	0.0016	10,800	2,550
Average	4.23	0.0019		2,820
3 upper / lower	8.53	0.0024	27,000	3,240

pin out of both blocks at the same time, slipping occurring in each simultaneously.

Results: The results of the test are given in Table IV. The values reported for the unit frictional resistance are obtained by dividing the starting load by the area of contact between the block and pin. The starting load was the maximum load, the slipping load being considerably lower and rapidly falling to zero. The amount of shrinkage in diameter of the pins included in the table, was determined from the change of the position of the plates on the pins, after the pins had been contracted by liquid air. The values are based on the assumption that all the deformation took place in the pin.

A comparison of the results obtained with cylindrical and taper pins shows that the average unit frictional resistance is about 40 per cent higher for the taper pins than for the cylindrical ones. The table shows that the value of the unit frictional resistance is dependent upon the relative shrinkage of the pin to the plate and is approximately proportional to the amount of shrinkage. The load necessary to force pin No. 3 out of the two blocks is approximately twice the load necessary to

TABLE V. SIZES OF BOLTS AND CHARGES OF EXPLOSIVE

Bolt	Diam. Bolt Hole In.	Outside Diam. In.	Plate Hole Dia. In.	Detonator	Charge	Computed Pressure Lb. per Sq. In.
2	0.502	1.250	1.264	15 grains	10 grams	125,000
3	0.502	1.250	1.264	15 grains	8.5 grams	107,000
5	0.381	1.248	1.264	15 grains	5 grams	125,000
6	0.384	1.250	1.264	35 grains	none	25,000
4	0.632	1.250	1.252 –1.309	15 grains	5 grams	37,500
1	0.637	1.250	1.277 –1.310	15 grains	7 grams	51,000

force the other pins out of each block, since the area of contact is about double. The results are in close agreement with the experimental data upon the slipping loads for shrink and force fits, published in the American Machinist, Feb. 16, 1899, by John H. Wilmore.

Test of Body-Bound Bolts Expanded by Explosive Charge

In order to determine the effect of expanding the bolts by means of high explosives, two sets of plates with six

TABLE VI SLIPPING LOADS

Bolt No.	Load in Pounds for Different Amounts of Slip 0.05 Inch	¼ Inch	½ Inch	¾ Inch	1 Inch	1½ Inch	3 Inch	Through Top Plate	Maximum Load Lb.
1	22,000	27,500	26,700	25,000	24,000	.....	.....	7,000	27,500
3	29,600	28,000	29,600	29,200	27,200	24,000	19,300	23,000	29,600
5	23,000	20,000	21,700	21,000	18,000	10,000	7,000	600	23,000
6	4,250	1,700	1,000	.....	.....	.....	.....	.....	4,250

1¼-in. bolts were submitted for test and examination. The thickness of the plates submitted was 1⅞ in. One set of plates contained bolts Nos. 2, 3, 4, 5 and 6, and the other set contained bolt No. 1. Bolts Nos. 2 and 3 were driven about ⅛ in. out of the plates, and the threaded portion carried away due to the method of firing as described in the report of the Naval Proving Grounds. The size of the bolts, and the charges used are given in Table V.

Bolt No. 6 fired with detonator alone was the only one that could be moved after testing as none of the others could be turned with a 24-in. wrench.

Testing: Bolts Nos. 1, 3, 5 and 6 were tested in a 50,000-lb. Riehle testing machine. The amount of slip was measured and the corresponding load necessary to force the bolt out of plates was observed.

Results: The slipping loads for different amounts of slip are given in Table VI.

It will be seen that the starting load was not necessarily the maximum load. In fact, for some of the bolts, the maximum load was not reached until the bolt had slipped from ¼ to ½ in. For all the bolts tested except No. 6, which was not expanded sufficiently, a load near the maximum was necessary to produce a slipping of 1 in. or more.

In Table VII the charge and pressure used in expanding the bolt, the maximum slipping load and unit frictional resistance are given. The percentage of metal of the bolt remaining after drilling the hole for the charge is also given.

After the bolts had been forced out of the plates, the surfaces of both the bolts and holes were examined to determine if the bolts had been in contact with the holes.

TABLE VII. CHARGES AND PRESSURES IN EXPANDING, SLIPPING LOADS AND UNIT FRICTIONAL RESISTANCE

Bolt No.	Diameter of Hole in Bolt	Detonator Charge	Charge	Pressure	Maximum Slipping Load	Unit Frictional Resistance	Amount of Metal of Bolt Remaining After Drilling Hole
	Inch	Grains	Grains	Lb. Sq. In.	Lb.	Lb. Sq. In.	Per Cent
1	0.617	15	7	51,000	27,500	2,240	75.0
3	0.502	15	6.5	107,000	29,000	2,410	84.0
5	0.381	15	5	125,000	23,000	1,880	91.0
6	0.384	35	none	25,000	4,250	350	91.0

For bolts Nos. 3 and 5, surfaces appeared to have been in good contact while bolt No. 1 showed only about four-fifths of the surface in contact. Bolt No. 5 showed only about one-twentieth of the surface in contact near the head end.

Conclusions: The results of the test show that with the use of liquid air, a tighter fit can be obtained with a tapered bolt than with a cylindrical one. The average unit frictional resistance of the test on cylindrical pins is 2,150 lb. per square inch while the average value for the tapered pin is 3,000 lb. per square inch.

Moreover, less difficulty was encountered in assembling the blocks with a taper pin than with a straight one.

The test of the bolts expanded by explosive charges shows that satisfactory results can be obtained by this method. The average unit frictional resistance of bolts Nos. 1, 3 and 5 was 2,120 lb. per square inch, which is the same as that developed in the experiments of shrinking cylindrical oversize pins by liquid air.

It appears from these tests that the size of the hole drilled in the bolt has a greater effect in producing a tight fit, than the pressure due to the explosive charges. A 1¼-in. bolt containing a hole larger than about ½ in. in diameter would be materially weakened, because of the reduction in cross-sectional area. It appears however, that a correct combination of the size of the hole and pressure of explosive charge, could be used to produce a very satisfactory fit without weakening the bolt more than 10 per cent.

What Is the Most Economical Belt?

By W. F. Schaphorst

A belt user recently wrote to a dealer in belts and asked: "What kind of belt is the most economical in the long run?"

The dealer replied: "The belt that will transmit the most power per square foot of its area during its natural length of service is the most economical."

This answer may be correct. In fact, it is correct. But, now that the belt user has the answer what is he going to do with it? The answer is certainly a very vague one. Very likely the user knew that much about it before he asked the question. What the user wants to know is I believe: What kind of belt is the most economical in the long run—leather, cotton, rubber, camel's hair, balata, etc.?

In spite of all of the substitutes that have been manufactured, leather belting still predominates. It is the superior belting for general machine shop work. Where belts must be shifted from pulley to pulley there is nothing better. In fact where finger shifters are employed nothing but leather belts should ever be permitted. Leather belts are also superior for use on quarter turn drives, reversing drives, or wherever there is constant side pull, slipping and jerking.

The cotton belt has largely replaced the leather belt in outdoor power transmission as in connection with threshing machines. It has also largely replaced the leather belt in industries where much dirt and grit is encountered, as in cement mills, brick plants, flour mills, crushing plants, etc. It is an excellent belt for use in hot and dry places. It is very strong and durable, but must never be used in connection with finger shifters because such shifters wear the edges rapidly causing them to fray and unravel and fail prematurely.

There are a number of rubber composition belts on the market, and it is claimed by many users that these belts are superior to the leather belts, which may be true for their own conditions. It is the writer's belief that the rubber belt is superior to the leather belt for use in wet or damp places, as in paper mills, dye houses, laundries, etc. In fact, it has practically replaced the leather belt in all of these industries. Like the cotton belt, however, it must never be used in connection with finger shifters because of the fact that it has a fabric core which gives it its strength and which will cause premature failure when the edges are once worn or frayed.

The life of a belt depends largely upon the good start that it gets, in the same way that the success or failure of a man depends largely upon the care given him during his childhood. Therefore, when putting a new belt on the pulley too much care cannot be given to it to see that it is put on right. The ends should be cut square. If the joint is glued there should be no "kinkiness" in the belt.

Shafts and pulleys should be aligned as perfectly as possible so that there will be no side slipping, no forcing, no everlasting running off and no sidepull.

Occasionally there is something inherently wrong in the belt itself so that after a few days of operation it will run crooked in spite of the care first given it. This may be due to the fact that one side of the belt was stronger than the other, consequently the weaker side stretched most and as a result the belt began operating imperfectly. When this happens the belt should be taken off and the imperfection carefully removed. Unless this is done it is obvious that there will always be some side slip or side pull and the life of the belt will be materially reduced. It pays to watch new belts carefully and see that they get a proper start in life. By so doing much money will be saved.

It is impossible of course, to answer the above question completely and with absolute accuracy, but the writer feels that his reply is at least more definite and more satisfactory than the reply given by the dealer.

Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Milling a Scroll

By J. A. Camm

An unusual example of milling with the machine set-up for the operation is shown in the accompanying illustrations.

The work, Fig. 1, consists of a cast-iron disk, 17 in.

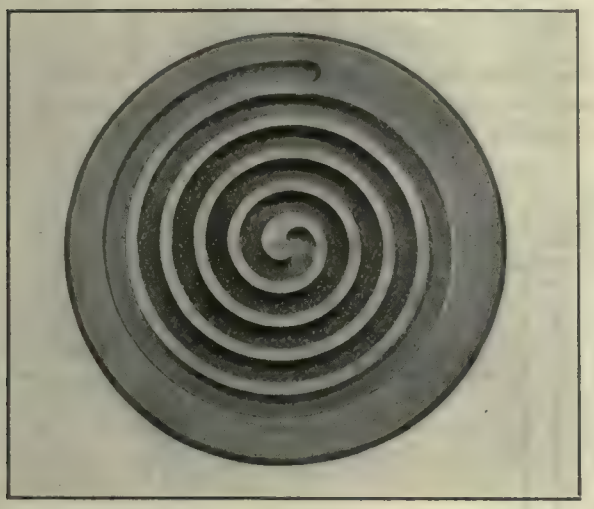


FIG. 1. THE FINISHED SCROLL

in diameter and 2 in. thick, and is used for a mold for spiral packing. The groove is 1 in. wide and 1 in. deep with a ½-in. wall making the pitch of the scroll 1½ in.

In order to secure the circular pitch of 1½ in. it was necessary to revolve the 4-pitch screw in the table of the milling machine six times to one revolution of the rotary table holding the work. This was accomplished by rigging up a standard dividing head, as shown in Fig. 2, by attaching the universal joint to the worm shaft and driving through the wormwheel to the screw by means of change gears.

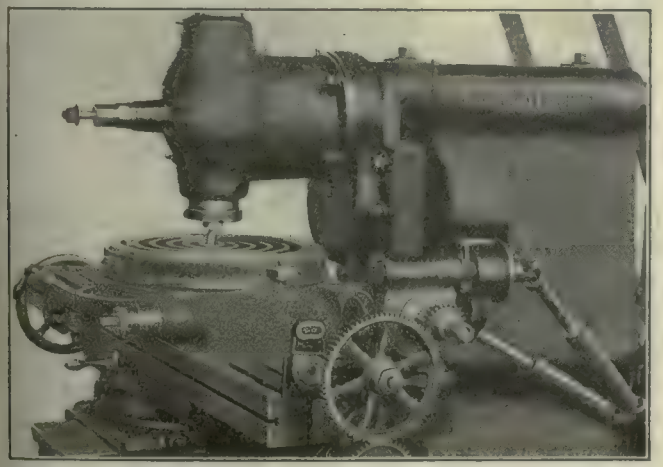


FIG. 2. MACHINE SET-UP FOR MILLING THE SCROLL

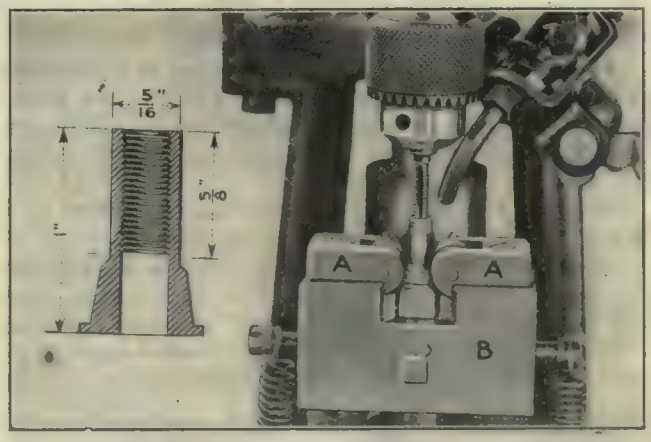
A Difficult Piece to Hold for Tapping

By Amos Ferber

Because of its thin walls and small diameter in proportion to the size of the tap, the piece shown in the illustration gave all sorts of trouble in holding it for the tapping operation. After many experiments, the device here described was made, enabling the operator to reach a production of 680 pieces an hour.

The jaws *A* are fastened to the top of the block *B* and have no movement except for purposes of adjustment. In the end of each jaw is a hardened steel roll, grooved to fit the contour of the work and serrated circumferentially with a number of sharp V-grooves like a thread without lead. Through the center of the block passes a hollow spring-operated plunger which presses the work upward, where its tapered portion enters between the rolls, the serrations of which match the corrugations of the work.

This results in an extremely strong grip on the work, without tendency to crush it, and has the further advantage of releasing quickly and cleanly. The operator has but a single lever to move and the operation of tapping is correspondingly rapid. Slippage rarely occurs.



TAPPING FIXTURE FOR THIN WALLED WORK

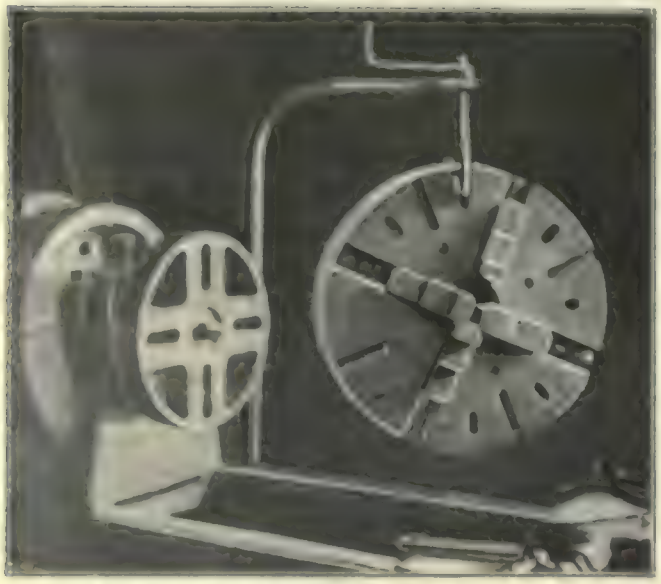
The device was designed and made by the Anderson Die Machine Co., and is used on an Anderson reversing spindle tapping machine.

Crane for Handling Lathe Chucks

By L. H. Gibbs

I am enclosing a photograph showing a very convenient time- and labor-saving lathe-chuck crane which we made and applied to our 18- and 20-in. lathes. The device is so simple that I don't think it is necessary to go into details. It can be made in any shop that has a blacksmith's forge.

The crane revolves in a bracket bolted to the bed of



THE CRANE ATTACHED TO LATHE

the lathe, and by adjusting the lever-nut which screws on the hook, the chuck can be raised sufficiently to clear the shears, and lowered so that the threads on the lathe spindle will engage properly with those in the chuck.

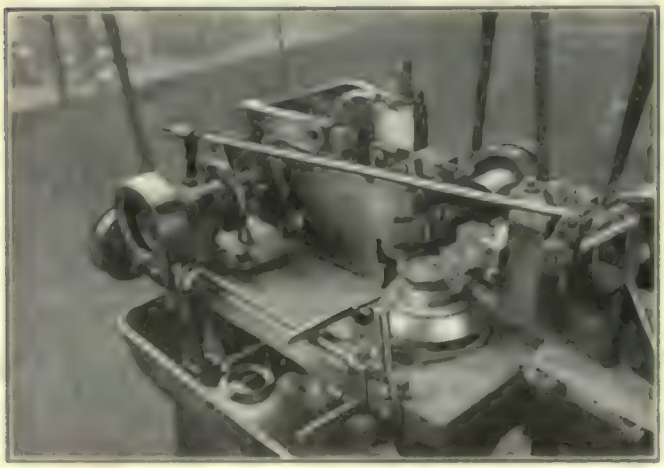
I hope that this device will prove as useful to some of your subscribers as some of those published in your magazine have been to me, even though I have been a subscriber a very short time.

Making a Standard Pinion Cutter Do Double Duty

By Milton Wright

The machine shown in the illustration is a standard pinion cutter except for the additional slide at the front, and the cam and connections that actuate it. The work is a bronze ring which forms the top of the needle cylinder of a knitting machine.

The rings are produced in large quantities and in a variety of sizes. Each ring is cut with a series of closely-spaced, rectangular-shaped notches or grooves around its circumference like teeth in a pinion, and with a corresponding number of similarly shaped, radially disposed, notches across its beveled upper surface. The two series of grooves must bear a certain definite relation to each other with respect to position, and within very close limits, but they do not coincide.



STANDARD PINION CUTTER WITH EXTRA HEAD

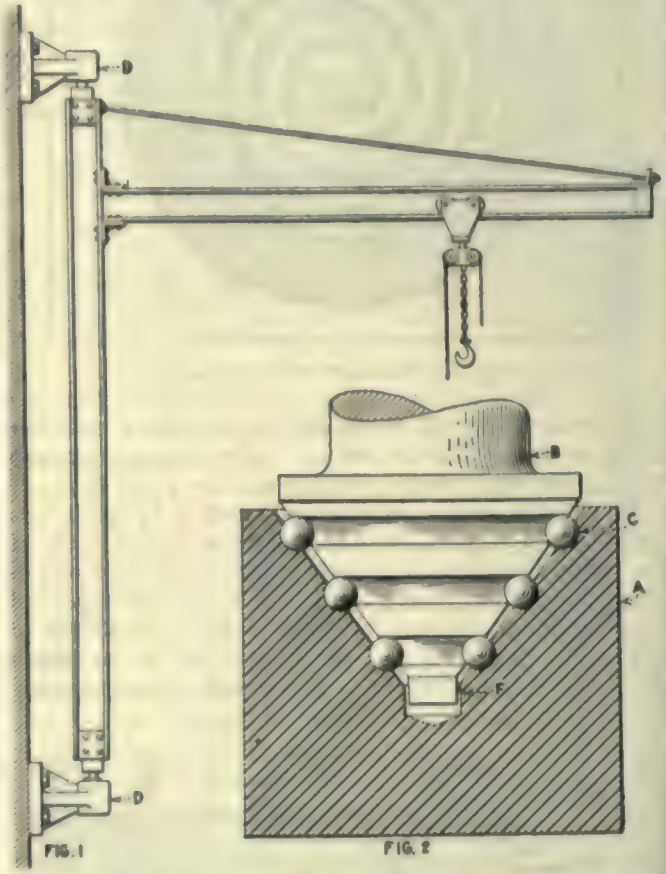
The pinion cutter as originally built would cut either series of grooves separately, or would cut them both at one setting in two revolutions of the indexing mechanism, provided the machine was reset between each turn. But this would require more time than the cutting, so the attachment was devised that enables the machine to complete both operations simultaneously, making a finished ring at each revolution.

The construction of the device is amply evident from the picture and needs no description. The production ranges from eleven to fourteen completed rings per hour, according to diameter. One operator handles six machines.

Step Bearings for a Light Jib Crane

By W. Burr Bennett

The accompanying sketches show the bearings designed for a light jib crane to serve lathes, boring mills and similar machines. The thrust and radial features



FIGS. 1 AND 2. CRANE WITH BEARINGS IN POSITION, AND BEARING DETAILS

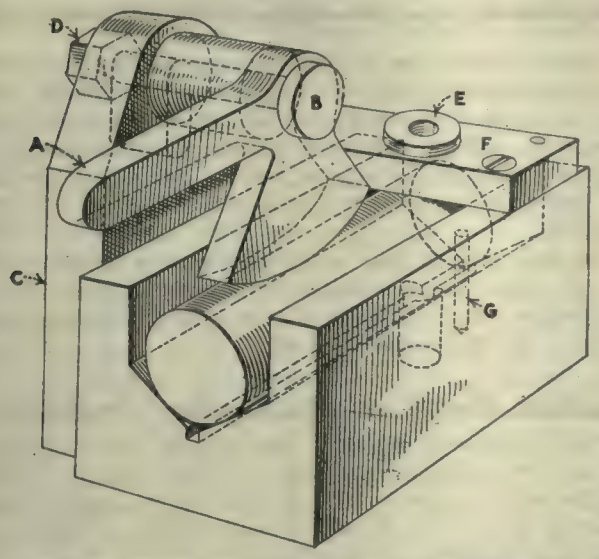
have worked out satisfactorily. Fig. 1 indicates the position of the bearings at the top and bottom of the crane, while Fig. 2 gives a sectional view of the bearing construction. The outer race *A*, detailed in Fig. 2, is supported in the bracket *D*, shown in Fig. 1. Part *A* is made of oil quenching, non-warping tool steel, while the races are polished out after hardening and are not ground. The inner race *B* is of the same material as part A and is finished in the same manner. The balls *C* are hardened and ground steel. Pilot *F* is used merely as an aid in assembling.

Jig for Drilling Pin Holes in Round Work

By Francis Paquin

Herewith is a sketch of a jig for drilling holes in pins from ⅜ to 1 in. diameter.

The jig body consists of a hardened V-block. The



JIG FOR DRILLING PIN HOLES IN ROUND WORK

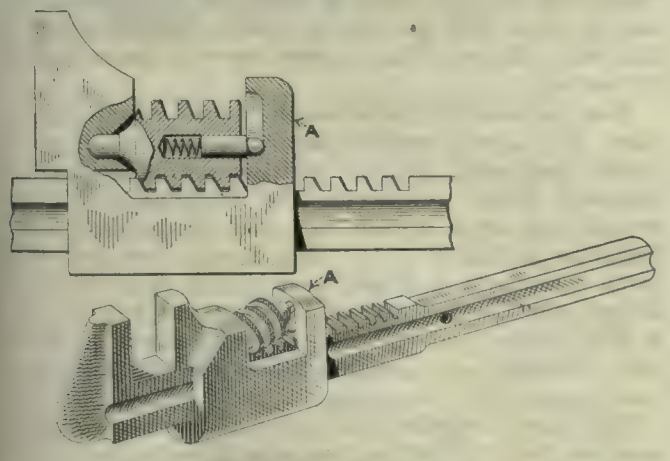
clamp *A* is a slow rise cam pivoted on stud *B* and may be adjusted to take different diameters of work by means of a slot in side piece *C*. After adjusting, nut *D* is tightened. Bushing *E* is held in crosspiece *F*. The work is located horizontally by pin *G*. The form of the cam should be such that on clamping, the work is forced towards the pin.

Quick-Acting Wrench

By Chas. H. Willey

One of the boys in the shop had an old automobile wrench, and having an inventive mind and some spare time he converted it into a quick-acting wrench as shown in the accompanying sketch.

A hole was drilled in the worm and a pin with a spring was inserted as indicated. The lower lip *A* of the wrench jaw was machined to allow the worm to slide out of engagement with the rack teeth when upward pressure was applied. The sketch tells the story and the inventor passes the idea along to those who may care to use it.



THE ALTERED WRENCH

Attaching a Wire Rope to a Socket —Discussion

We are in receipt of a letter from the National Bureau of Casualty and Surety Underwriters that refers to the article on the subject of attaching a wire rope to a socket, a brief account of which appeared on page 309 in our issue of February twenty-third.

The Bureau states that while it understands that this method of attachment is advocated also by others, it seems that we should point out certain limitations to proper execution that are likely to exist. The limitations are indicated by the following quotations from the letter:

"While this method of attachment when properly done gives good results, so much depends on having the job done under perfect conditions that it should not be attempted by anyone unless he is certain that the materials he uses and the conditions under which he works are perfect.

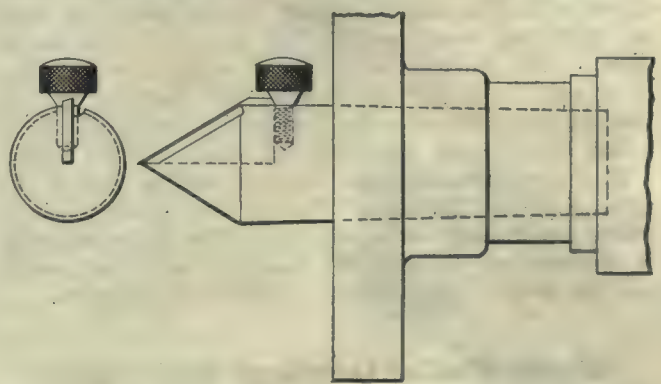
"Frequently an elevator cable will have to be hitched to a socket in a limited period of time. At times the work may be done in some place where the repairman can not have the proper equipment with which to work. As a result and regardless of his skill, the job may be imperfect.

"If you will refer to the 'Safety Code for Elevators,' published by the American Society of Mechanical Engineers, you will find that they advocate the turned-in method of attachment, which position, I believe, was taken largely because of their realization that with that method there is a greater chance of success in a greater number of cases than would be the case if the plan suggested by your writer were followed."

Combined Lathe Center and Center Scraper

By J. A. Raught

The illustration shows a combined lathe center and scraper for drawing over centers in work that has not been truly centered. The advantage of the contrivance



SCRAPER FOR DRAWING A CENTER

is that the work does not have to be removed from the lathe centers.

In using it, place an indicator against the work, chalk the side to be scraped off and turn down the thumbscrew, to cause the cutter to press against the work. Roll the shaft part way around and back by hand, then relieve the pressure on the cutter by turning back the thumbscrew. Repeat if necessary until the center is drawn over the desired amount. The groove will take care of the chips.

EDITORIALS

An Aid to Foreign Trade

IT MAY surprise some people to learn that there is coming to be an efficient, active and much-consulted governmental aid to foreign commerce in Washington. It is the Bureau of Foreign and Domestic Commerce in the Department of Commerce, and some idea of the esteem in which it is now held may be gained from the fact that it received a larger appropriation from Congress this year than last, a really remarkable tribute in a time of retrenchment like the present.

The director of the bureau, Dr. Julius Klein, whose interesting job it is to make Secretary Hoover's dream of a government department to which business men can look with confidence for aid, come true, attributes the granting of the increased appropriation to the voice of American business which made itself audible to the representatives in Washington at the crucial moment. That American manufacturers and merchants are awakening to the usefulness of this bureau is indicated by the increase in the number of daily inquiries from 750 to over 2,000. The inquiries now coming in are not general ones, but very specific requests for tariff rates, market conditions, shipping instruction, etc.

A significant fact is the way in which several recent foreign loans have been handled. The banks which have been approached for loans have applied to the State Department for advice as to the advisability of granting them. The State Department has given its opinion from the political point of view, but has asked the Department of Commerce for its judgment on the economic side.

In several cases the Department of Commerce has been able to render valuable service by pointing out that no possible return could be expected by American merchants either because the money wanted was to be used for bolstering weak budgets, or because it was to be spent in the purchase of materials under specifications so written as to bar Americans from bidding. If all foreign loans followed this procedure we should be in a fair way toward having a real foreign trade policy.

Machinery concerns that are not making use of the services of the Bureau of Foreign and Domestic Commerce are missing an opportunity. The more inquiries it receives and answers, the more service it can render and the more support it can expect from Congress.

It's the Kind of Overhead That Counts

THERE is much loose talk of "overhead" and perhaps more men deceive themselves regarding it, than about any other item of business. Roughly speaking, the overhead charges of many businesses seem to average about 150 per cent of direct labor. This means very little unless we know all the circumstances. It isn't the percentage of overhead but the *kind* of overhead that really counts.

If the work is such that no machine equipment is required, the overhead should be low for a high overhead would mean too much rent or too high a cost of inspection and supervision, or both.

On the other hand a high overhead may be a sign of good management for it is the total cost of the product which counts, and not any single item which enters into that cost. If the increased percentage of overhead is due to a decreased labor cost, owing to the introduction of improved machinery, it may easily mean a real economy.

Be sure that no item in the overhead is unnecessary. Be sure that each one helps to make the product better or cheaper. But remember it's the *kind* of overhead that counts; not the overhead itself.

Machine Tool Users Really Buy Production

FEW buyers of machine tools realize the instability of the market or how limited is the demand. Even fewer buyers appreciate how much they depend upon machine tools for carrying on their work, or how helpless they would be without them.

Without machine tools there would be no manufacturing—our industrial development would cease. An unhealthy condition among builders of machine tools affects all other industry.

Owing to the high production secured from machine tools and their long life, the demand can be supplied by comparatively few machines. This means that the cost of development of special tools and fixtures must be charged to a small number of machines and shows why machine tools cannot and should not be sold at a price per pound which compares with that asked for other machinery.

As a matter of fact, the purchaser of machine tools really buys productive capacity, rather than so many pounds of iron and steel. He buys the ability to produce machinery of various kinds in tremendous quantities and at a relatively insignificant cost. Whether the machine tool be large or small, light or heavy, is of little importance if the production is satisfactory. The cost can be spread over so many thousands of pieces manufactured as to be almost negligible.

This is one of the things which it is difficult for the manufacturer who uses machine tools to understand. Thanks to efficient machine tools his own product is low in price, and he fails to realize that because of this very efficiency the market for the machine tool is limited.

Take the case of a special machine for a certain motor part. It is a very ingenious machine and does its work rapidly and well. It cost something over a hundred thousand dollars to develop the first one and there probably is not a market for over one hundred such machines in this country. This means that each machine must carry a development burden of a thousand dollars added to the cost of building and selling, plus a fair profit. And yet some buyers attempt to value such machines on a pound basis as though they were just so much pig iron or coal.

They must remember that they are not buying merely machine tools, but productive capacity—and they must be willing to pay accordingly.

Shop Equipment News

Clark Gasoline Elevating Platform Truck

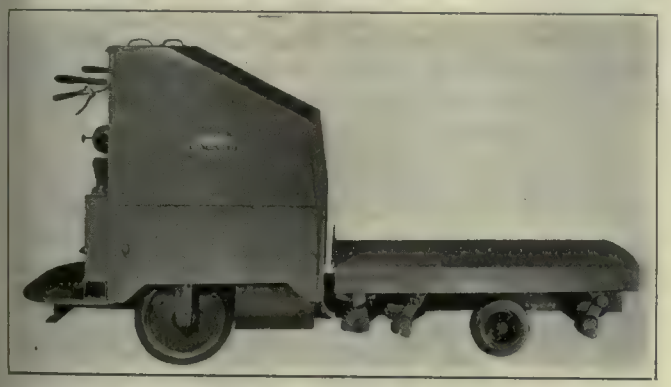
The accompanying illustration shows a gasoline-driven, elevating, platform truck that has recently been placed on the market by the Clark Tructractor Co., Buchanan, Mich. The truck conforms in appearance and uses to the electric lift truck. It is stated to have ease of maintenance and flexibility, and to be capable of continuous 24-hour service if necessary.

The loading platform is 26 in. wide and 54 in. long. It will elevate a load of 4,000 lb. from a minimum height of 11 in. to a maximum height of 16 in. in 8 sec. Automatic stops are provided to control both the upper and lower limits of travel. The elevation can be stopped at any point by means of a control lever. The lifting mechanism is operated by hydraulic pressure.

The power for both the locomotion of the truck and the elevation of the load is derived from a 15-hp., 4-cylinder tractor engine, having 3⅛-in. bore and 4½-in. stroke. The motor is mounted in the closed compartment at the rear, in which are placed also such parts as the transmission, governor, vacuum tank and radiator.

In order to provide three-point suspension for the entire tractor, the forks carrying the steering wheels are supported on a steel casting pivoted at the center of the frame. The two steering wheels are of cast steel, and have 16 x 3½-in. tires. The two rear wheels under the loading platform serve for driving, and are equipped with 10½ x 5-in. rubber tires.

The drive from the motor is through a bevel geared axle equipped with ball and roller bearings. Two speeds are provided in each direction. The construction re-



CLARK GASOLINE ELEVATING PLATFORM TRUCK

sembles very much the standard automotive type, so that the truck can be cared for by an automobile or truck mechanic.

The driving and elevating controls are mounted on the rear of the engine compartment, where the driver rides in a standing position. The brake lever pedal is under the driver's foot, so that the tractor stops automatically if the operator steps off the machine while it is running. The machine is especially useful for departmental and inter-plant haulage. It will climb a grade of 10 per cent with a 4,000-lb. load. The overall length is 107 in., width 35½ in. and height 51 inches.

Baker Locomotive-Type Industrial Crane

The photograph shows in operation a three-movement, locomotive-type industrial crane recently placed on the market by the Baker R. & L. Co., 2180 West 25th St.,



BAKER LOCOMOTIVE-TYPE INDUSTRIAL CRANE

Cleveland, Ohio. The crane is intended for lifting and carrying work of all sorts about shops and yards. It has a capacity for lifting 2,000 lb. at a radius of 4 ft. from the pivot of the crane, and 1,600 lb. at a radius of 8 ft. With these loads held on the hook, the cargo can be transported from one place to another. It is easily possible to raise and lower the boom, which is 96 in. long, in order to vary the radius at which the lifting is done. When it is not necessary to transport a load, but merely to lift it, out-riggers can be employed.

The operator stands on a platform at the rear, and has all of the controls on the dash in front of him. The machine is driven by a series-wound, totally inclosed motor running at 1,150 r.p.m. It is capable of a speed of 6 miles per hour in either direction. It drives on all four wheels, and steering is also done on all four wheels. The operator steers the truck by means of the horizontal tiller handle.

The controller is of the drum type and provides three speeds in each direction. A quick make-and-break switch interlocks with the controller, and is operated by the brake pedal, so as to break the circuit when it is desired to stop. Four pairs of helical springs serve to cushion shocks from the road bed. The tires are solid rubber, 20 in. in diameter, and 3½ in. in width in the front and 5 in. in width under the crane end. Worm-type axles having radial and thrust ball-bearings are provided. The wheels are of steel.

A 21-plate Ironclad battery or an Edison battery may be used. The battery is inclosed in a steel compartment, the sides and top of which are removable. The battery

and the crane-operating mechanism are mounted on a base that swings with the load to counterbalance it.

The lifting mechanism is controlled by a push-button located on the dash of the truck. It consists of a Sprague electric 1-ton hoist, having spur and worm gear reduction, and driven by a totally inclosed motor. An electric brake is provided on it. The boom may be hoisted by means of a similar 1-ton hoist operated by a totally inclosed motor, and provided with a brake.

In order to swing the crane, another inclosed motor with an electric brake is provided. The battery and crane swing about a large center stud on a bearing 28 in. in diameter equipped with eighty-seven 1-in. balls.

The hooks can be hoisted at a speed of 45 ft. per minute without load, 20 with 1,000 lb. load, and 15 when carrying a 2,000-lb. load. The boom can be raised from the bottom of its travel to its highest position in 10 sec. when not loaded, and in 15 sec. when carrying 1,000 lb. The crane can be swung through 270 deg. in 12 sec. whether loaded or unloaded. The machine weighs 6,600 lb. when equipped with an Edison battery, and 6,730 with an Ironclad battery.

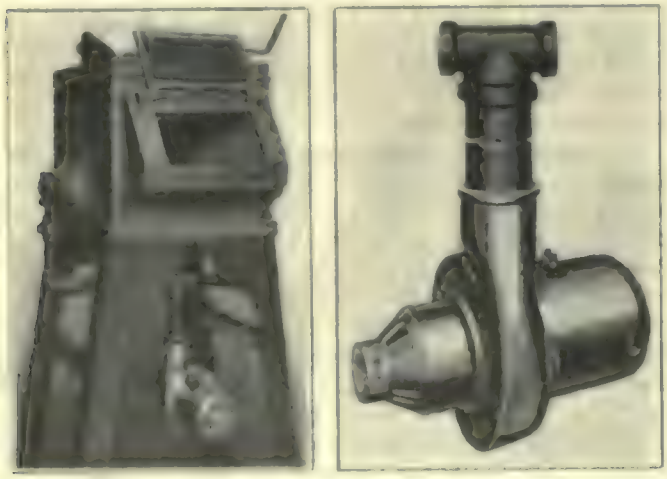
Cadillac Electric Furnace Blast

The Clements Manufacturing Co., 601 Fulton St., Chicago, Ill., has just placed on the market a motor-driven blast for attachment to small gas furnaces such as are employed for heat-treating. The blast consists primarily of a ¼-hp. universal motor operating on any specified voltage from 32 to 250, and propelling a small blower.

A view of the blast is shown on the right of the accompanying illustration, and the manner of attaching it to the furnace is shown at the left. The blower is connected to the gas pipe, draws in air from the room, and delivers the mixture directly to the furnace. A damper is provided for regulating the mixture.

The motor can be driven from the lighting circuit merely by attaching a plug to a convenient socket. It can thus be operated without the necessity of having the line shaft turning, as is often necessary with the ordinary style of blower equipment. Due to the speed of the motor, the furnace can be brought to the working temperature very quickly.

Fluctuations in the gas pressure do not affect the operation of the blower or of the furnace, so that constant conditions can be maintained in the furnace. The blast delivers 210 cu.ft. of air per minute when running at 10,000 r.p.m. It weighs 9 lb., and 13 lb. when packed.



CADILLAC ELECTRIC FURNACE BLAST

Lewis-Shepard Stacker

The accompanying illustration shows a machine intended for lifting, transporting and tiering materials in a shop or warehouse. The device, designated as a



LEWIS-SHEPARD STACKER

stacker, has recently been placed on the market by the Lewis-Shepard Co., 560 East First St., Boston, Mass. It is made of structural steel and is mounted on three roller-bearing wheels 7 in. in diameter, so that it can be conveyed about the shop either loaded or unloaded.

The handle at the front of the machine serves for both pushing and steering. This can be done with the handle upright when working in cramped quarters. The front or single roller can be lifted when the machine is in position to operate, so that the two steel legs rest on the floor and prevent the stacker from moving.

The work rests on the platform at the right. The platform can be supplied with either a roller top or a plain top, its minimum height from the floor in the two cases being 10 and 8 in. respectively. The platform is 36 in. wide and 24 in. long, and the size of the whole base 39 x 50 inches.

The platform travels vertically on 5-in. channels, one at each side. Easy movement is given by the rollers running on the edges of the channels. It should be noted that these vertical channels are hinged, so that the top portions may be lowered. It is thus possible to move the stacker through doorways. The height at which this hinge is placed, as well as the length of the channels, can be furnished to suit the work at hand. The standard machines are supplied in heights up to 14 ft. The joint can be locked when the stacker is in use.

The machine may be operated either by hand or by electric power. As shown, the hand crank is connected through gearing to the drum on which the cable connected to the table is wound. The 500-lb. capacity stacker has a lifting speed of 13 ft. per minute when the crank is turned at 60 turns per minute. With the

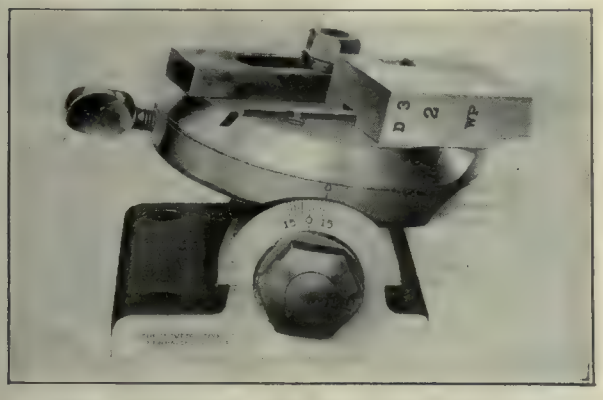
same speed of the crank, the lifts are 11, 8, 5 and 4 ft per minute, respectively, for the machines of 750, 1,000, 1,500 and 2,000 lb. capacity. On all except the smallest size, an additional speed is provided that doubles the speeds just mentioned. In this way the platform may be lifted rapidly when lightly loaded.

When lowering the platform it is not necessary to turn the crank. By pulling on the lever above the gearing, the brake is released, so that the weight of the load causes the platform to descend. As soon as the operator ceases to pull on the lever, it returns to its original position and the clutch engages, so that the platform is held stationary. The speed of lowering depends upon the force with which the lever is pulled. The combined clutch and brake is of the automobile type, and has a single dry plate. It is completely enclosed and is self-adjusting.

Geometric Chamfer Grinding Fixture

The illustration shows a grinding fixture recently placed on the market by the Geometric Tool Co., New Haven, Conn., for grinding chamfers on the milled chasers made by the concern. The fixture may also be used for grinding tapped chasers, although in the latter case the grinding is straight and does not conform exactly to the contour of the threads. The use of the fixture permits of grinding equally all chasers of a set. When the chamfers are ground unevenly most of the cutting is done by one or two chasers, which is apt to result in threads having incorrect lead or taper.

Either left-hand or right-hand chasers may be ground on the fixture. The table of the fixture is graduated and can be set for grinding either long or short chamfers. The narrow key on the top engages the keyway in the chaser and acts as a guide while grinding. An adjustable stop governs the position of the chaser with respect to the grinding wheel. The side of the fixture is graduated to permit of tilting the table to the desired angle of chamfer clearance. One grinding fixture accommodates all sizes of chasers. When used for ¼-in.



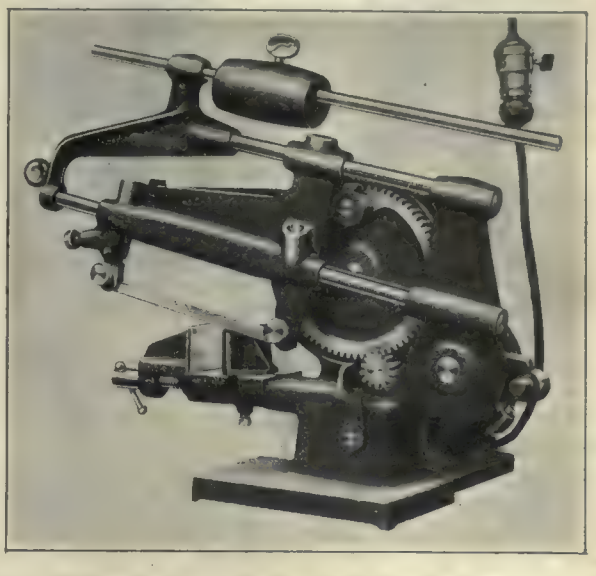
GEOMETRIC CHAMFER GRINDING FIXTURE

chasers, it is necessary to remove the key at the top of the table and guide the chaser in the keyway.

The fixture may be bolted to the table of the grinding machine, and the chaser slid forward by hand to the wheel and against the stop provided. It may be set forward by means of the machine handwheel or lever. The fixture can also be mounted on the machine slide, and the chasers ground by passing them across the edge of the grinding wheel. For this purpose, a wheel of sufficient size must be available.

Edlund Bench Hack Sawing Machine

The machine shown in the accompanying illustration is a power-driven portable hack sawing machine for mounting on a bench. It has recently been placed on the market by the Edlund Machinery Co., Inc., Cortland, N. Y. It is intended for fast cutting on small jobs ordinarily performed by hand, or on work regularly



EDLUND BENCH HACK SAWING MACHINE

performed by larger machines. It can be used on tool steel as well as softer metals.

The power is supplied by a small electric motor, connected to the machine through gearing. Current for the motor can be taken from any convenient lighting socket. The saw arm has two rods on which the saw frame slides. The arm stays in position when raised by the operator for placing work in the machine. Cutting is performed on the backward stroke, and the arm raises on the forward stroke, so that the saw blade is relieved from the work.

The position of the weight on the top of the arm is adjustable, so that the pressure of the feed can be varied to suit the type of work being cut. An 8-in. blade is used, and it may be changed without the use of any tool. The machine stops automatically when the cut is finished, although it can also be stopped and started at any time during a cut. A screw-operated vise is provided for holding the work. The wearing parts can be easily replaced when they have become worn.

Yankee Safety Hook

Frank W. Trabold, 30 Church St., New York, N. Y., has recently placed on the market the "Yankee" safety hook for use on hoists and cranes when lifting loads. The accompanying illustration shows the hook in both the open and closed positions. It will be noted that the load hangs directly on a curved member pivoted on the other longer member shown at the left side.

It will be noted that in the closed position, the hook engages with a dovetail on the straight member. Engagement is made possible by an elongated hole in the top of the hook, so that it can be raised slightly. At the top of the longer straight member is pivoted a member to which is ordinarily attached a swiveling ring. The lower portion of the top member rests against the top

of the hook, so that the hook cannot be swung out of position unless the top member is also swung to the side. Thus all load must be off the hook in order to



TRABOLD "YANKEE" SAFETY HOOK

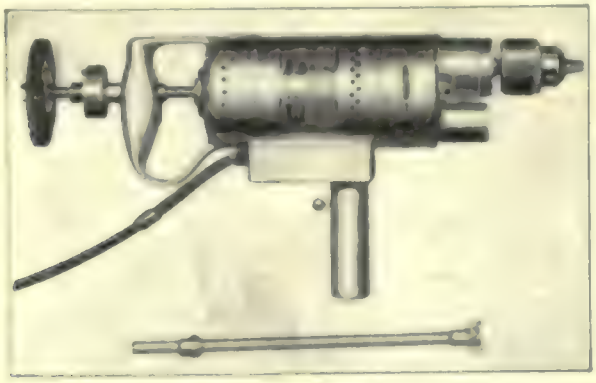
open it. The hook member ordinarily carries the load alone. When the load becomes excessive, then the straight member shares in the load, due to the engagement of the dovetail.

The two pins in the hook are made of monel metal. Although they are intended to be the weakest points of the hook, their shearing strength is four times the rated load. Due to the fact that the outer end of the hook is supported, the hook does not straighten out when the load exceeds the elastic limit of the metal in it. Thus, failure of the hook can occur only when the load exceeds the ultimate strength, and not when it exceeds the elastic limit. Due to the fact that the point of the hook is covered, it cannot catch on parts which it strikes while the load is being lifted.

For attachment directly to a cable, the third or swiveling member may be omitted. When the hook is attached to a block for either a pulley or a chain, the top member ordinarily swivels directly in the lower part of the block. The hoist is ordinarily made in sizes having capacities of 1, 3, 5, 15 and 25 tons.

Louisville Electric Drill Grinding Attachment

The accompanying illustration shows a grinding attachment in place on a ¾-in. portable electric drill, so as to adapt the tool to such work as sharpening toolbits



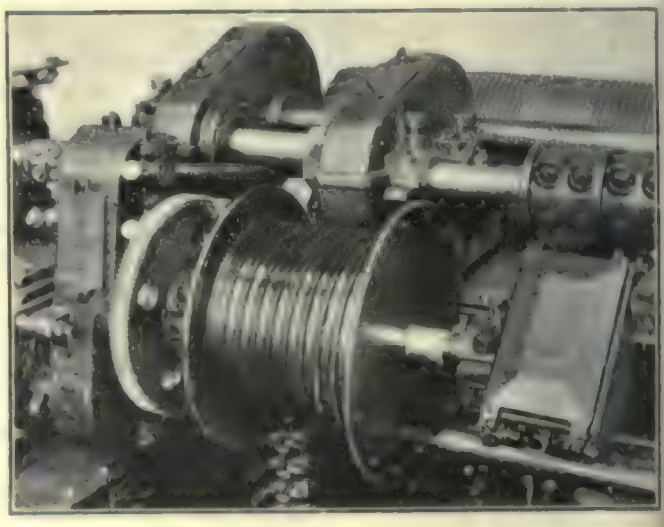
GRINDING ATTACHMENT ON LOUISVILLE DRILL

This attachment has recently been applied by the Louisville Electric Manufacturing Co., Thirty-first and Magazine Sts., Louisville, Ky., to its Pioneer "garage special" drill. The drill has the usual drilling spindle as well as a device for oscillating the valve grinding tool. The tool for driving the valve while grinding is shown below the drill in the accompanying illustration.

The grinding attachment fits in the rear of the armature shaft and passes through the handle. It may be put in place and removed quickly. The bearing that fits in the handle is equipped with ball bearings for the spindle, the speed of which is normally 9,000 r.p.m. The tool can be furnished to operate on either alternating or direct current of either 110 or 220 volts. The abrasive wheel usually carried is 2 or 3 in. in diameter.

Pawling & Harnischfeger Feeder-Cable Retriever

The Pawling & Harnischfeger Co., Milwaukee, Wis., has recently placed on the market a winding device or retriever for the cable supplying current to a lifting magnet carried by a crane. The accompanying illustration shows the device applied to the carriage of a



PAWLING & HARNISCHFEGER CABLE RETRIEVER

5-ton crane having a 70-ft. span. The large, flanged drum is driven by the motor that hoists the magnet.

The retriever keeps the cable taut at all times, so that no slack is allowed. The cable thus winds evenly on the drum, and cannot work over the flange. The drum is driven only while the magnet is being hoisted. Although the drive is through gears, the final drive is through friction members. The gearing is so proportioned that it tends to drive the drum at a peripheral speed 20 to 50 per cent in excess of the speed at which the magnet is being hoisted. If there should be any slack in the feeder cable when the hoisting starts, it is immediately taken out. After that, the friction members slip and keep a constant tension in the cable of about 40 lb. This tension is adjustable.

When the magnet is being lowered, the cable drum is not driven. A pawl engages in a ratchet wheel to prevent revolution. The pull of the magnet thus unwinds the cable from the drum against the retarding force of the friction mechanism, so that a uniform tension is always maintained.

All the bearings are bronze bushed. The current is brought to the drum through collector rings and carbon brushes that operate in the same manner as the

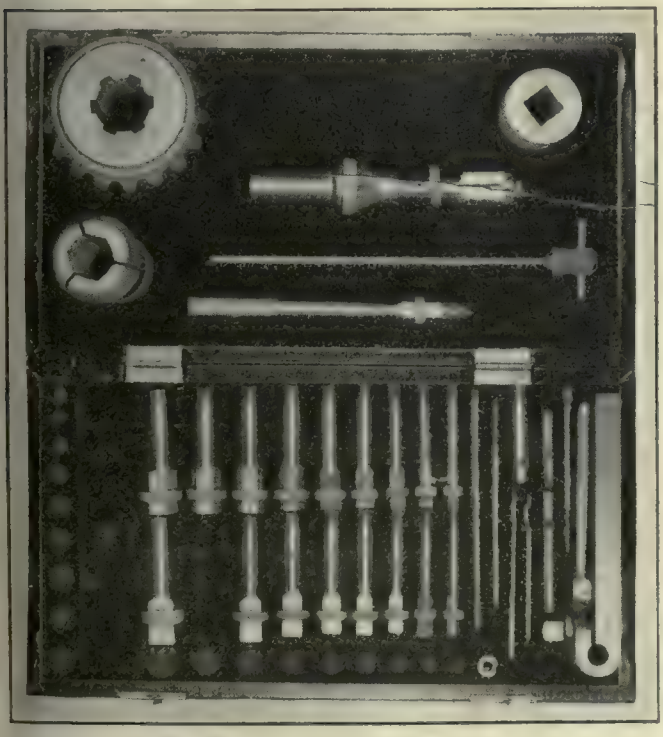
slip rings of alternating-current motors. The collector is mounted at the end of the shaft and inclosed in a metal housing, so as to be completely protected, although available for inspection. The cable is attached to the collector rings, passes through a hole in the center of the shaft, then along the drum arm, and through a hole in the rim. It is then wound on the drum itself. There are no exposed electrical contacts.

Hollander Adjustable Broaches

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has recently placed on the market a line of adjustable broaches, a set of which is shown in the accompanying illustration. The tool is intended for use primarily in a shaper, although it can be used in a drilling machine, lathe or screw machine. Its chief application is in shops where a broaching machine is not available. Although adapted chiefly to tool room use, it is applicable to regular production.

With the tool it is possible to broach holes that do not go entirely through a part, so as to enable an ordinary broach to be employed. It is necessary, however, that there be some recess at the bottom of the hole. An example of this sort of work is the broaching of a hole through one side of a hollow cylinder. A number of strokes are necessary in order to bring the hole up to size. The tool is started at its smallest size in a drilled hole, and its size increased with each stroke. It is stated that it leaves a very fine finish on the work and that it is very accurate. Samples of work are shown on the cover of the box. Splines can be cut in holes, as well as the squares and hexagons for which this set is intended.

The tool is made in two styles. The simplest form, type B, is shown lying on the cover of the box near the hinges. It consists of a shank, on one end of which are the cutting edges. This end is slit in the center of each flat face, so that it can be expanded when a conical member is screwed into it. The screw is on the front end of the tool, and is turned by means of the slender rod shown that can be passed entirely through the hole while the shaper is running.



HOLLANDER ADJUSTABLE BROACHES

The type A broach is shown lying on the center of the cover. It consists of a holder that can be held in any suitable shank, and that has a mechanism for expanding the cutter. By means of graduations on the collar, the expansion of the tool can be read directly in thousandths of an inch. Any size of cutter can be secured to the front end of the holder. In the set shown cutters for holes from $\frac{1}{4}$ to $\frac{3}{4}$ in. across the flats are furnished in $\frac{1}{16}$-in. steps. The smaller sizes are held by means of a reducing coupling. It will be noted that cutters for both square and hexagon holes are furnished.

The small parts shown along the edges of the box are the conical expanding members. These members serve as guides for the cutters and bear against the sides of the cylindrical hole. The tools ordinarily cut to a depth of $2\frac{1}{2}$ in., although an extension attachment is provided that enables cutting to 5-in. depth. Cutters either smaller or larger than those in the set can be furnished for use with the same holder.

The rings shown around the cutters in the box hold the cutting edges together, so that they do not spread outward on the first cut. The cutting edges are spread for each succeeding stroke, as shown by the tool lying on the cover of the box. The micrometer adjustment on the type A holder enables bringing the holes to exact size. The expanding mechanism enables the putting of relief on holes that are broached through die plates.

Sharpening of the cutters is done by merely grinding the front face. It is stated that fifty holes can usually be cut without grinding. The cutters can be furnished either individually or in sets to suit any requirements. At the right side of the box can be seen a shank for holding the broaches, and wrenches for use in changing the cutters in the holder.

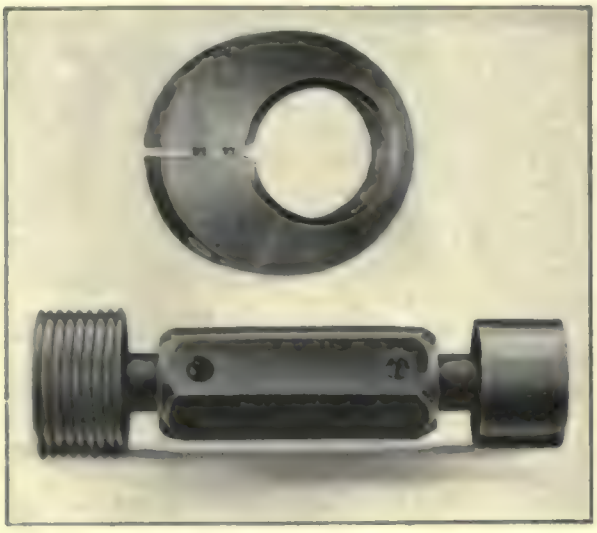
"Superior" Thread Gages

The Superior Thread Gauge Manufacturing Co., 1985 Troy Ave., Brooklyn, N. Y., has recently placed on the market the ring thread gage shown at the top of the accompanying illustration. The principal feature of the gage is that the hole is eccentric to the outside diameter. In this way, sufficient spring is obtained at the small section of the gage to enable adjustment of size.

It is not necessary to put one or more saw cuts partially through the ring, as is ordinarily done when the hole is concentric with the outside of the gage. Thus the continuity of the thread is not broken, except at the one cut which is necessary to provide adjustment of size. The threads are more apt to retain their correct form during the hardening process than if they are cut into several sections. By placing the hole eccentrically, a smaller outside diameter is possible than with the concentric style.

The size is adjusted by means of the screws that are shown dotted on the top of the gage. A hole near the threads contains a small rod, against which at each end a setscrew bears. By tightening the screws, the gage is expanded. The other screw is used for drawing the ring together, so that the gage may be held rigidly at any size in its range. The gage is intended especially for work on production where an adjustment of size is necessary.

At the bottom of the illustration is shown a plug gage, the ends of which are removable. At one end, a plug thread gage of the size desired is fitted, while



"SUPERIOR" THREAD GAGES

a plain cylindrical plug equal to the root diameter of thread is held at the other. Setscrews bearing on milled recesses in the shanks of the ends hold the gages securely in the handle. Both the ring and the plug gages are made in sizes for U. S. S. and S. A. E. threads from ¼ to 2 in. in size. They can be furnished larger to suit special work.

American Amplifying Gage

In the accompanying illustration is shown an amplifying gage that has recently been placed on the market by the American Gauge Co., Dayton, Ohio. The tool is similar to the larger gage made by the concern, although it is more limited in its range and does not have all of the attachments that are furnished on the large gage. The gage is intended for use in grinding and inspection departments, but it is particularly well adapted to grinding departments, where a number of gages are required and the flexibility of the equipment is not so important.



AMERICAN AMPLIFYING GAGE

The tool can be furnished in two sizes, one for measuring round work from ¼ to 2 in. in diameter and the other for work from 2 to 4 in. in diameter. The adjustments and the movements provided can be seen in the illustration. The anvil block can be removed and its position adjusted, as can also the stop for the work. The height and position of the measuring point a controlled by moving the entire arm of the machin Clamping levers serve to lock the adjustments in plac

The gage stands on a bench, and can be easily move to the place required.

Fundamentals of Budget Control

In an address before the Taylor Society in Phila delphia, on March 7, George E. Frazer of Chicag outlined the fundamentals of budget control as follow

I. ELEMENTS IN CONTROL.
- (1) A responsible organization.
- (2) Accounts that lead to accountability.
- (3) The business budget, i.e., estimates future accounts as basis for future ac countability of responsible organization.

II. RESPONSIBLE ORGANIZATION.
- (1) Separation of policy making from executiv powers.
- (2) Executive clothed with complete executiv authority.
- (3) The line of authority.
- (4) Staff assistants to the president.

III. TYPES OF ORGANIZATION IN THEIR RELATION T ACCOUNTABILITY
- (1) Functional.
- (2) Territorial.
- (3) Commodity.
- (4) Combinations of three basic types.

IV ACCOUNTS REFLECTING ACCOUNTABILITY.
- (1) Functional accounting.
- (2) Territorial accounting.
- (3) Commodity accounting.
- (4) Classification of accounts must reflect th accountability actually existing, not th theoretical accountability.

V. BUSINESS BUDGETS.
- (1) Estimates of future accounts in terms o future accountability.
- (2) Functional estimates.
- (3) Territorial estimates.
- (4) Commodity estimates.
- (5) Future budgets in terms of present per sonalities.

VI. BUDGET ADMINISTRATION.
- (1) Must be in terms of organization.
- (2) To be practicable must be reduced to ratios i.e., standard percentages or variable per centages.
- (3) Illustrations as to sales quotas.
- (4) Illustrations as to production standards e.g., machine rates.
- (5) Illustrations as to credit standings, e.g., th conventional ratio of quick assets to cur rent liabilities as used by commercia bankers.

He emphasized the necessity for a separation of th policy making and the executive functions, the necessity of responsibility with control, and a classification o expense to show accountability.



NEWS SECTION

German Machine Tool Exports Decrease

The following analysis by the industrial machinery division of the Department of Commerce, based on the latest figures received from Germany, indicates that there has been a considerable decrease in the volume of Germany's machine tool exports during 1921, as compared with 1920 and the pre-war year 1913:

	7 Months May-Nov. 1921 Metric Tons.	12 Months 1920 Metric Tons.
Belgium	7,547.7	7,452.7
Denmark	780.8	2,806.6
Alsace-Lorraine	468.4	1,827.0
France	5,087.9	13,668.3
Great Britain	1,057.7	1,619.7
Italy	3,466.7	7,546.3
Netherlands	4,559.3	19,054.1
Norway	360.6	1,535.1
Austria	2,823.7	4,978.7
Czecho-Slovakia	1,796.6	3,360.4
Sweden	533.3	5,433.5
Switzerland	1,738.5	11,760.7
Spain	1,238.4	3,268.9
South America	1,582.8	2,949.4
Other countries	6,003.7	7,659.8
Total	39,046.1	94,921.2

Taking the total of 39,046 metric tons for the seven months of 1921 and employing the same ratio for the missing months, 1921 would give a total of approximately 67,000 metric tons, a falling off in volume of 27,921 tons from 1920 and of 23,279 as compared with 1913.

Safety Engineers Affiliate with A. S. M. E.

The council of the American Society of Mechanical Engineers, at a meeting held March 6 in Kansas City, accepted the petition of the American Society of Safety Engineers for affiliation with the A. S. M. E. By this action 600 new affiliate members are added to the A. S. M. E. membership role, which is rapidly reaching 20,000.

The affiliation was effected under the provisions of the A. S. M. E. by-laws, according to which the privilege of affiliation with the A. S. M. E. may be obtained by any regularly organized engineering society which by constitution, by-laws and practice is in accord with the A. S. M. E., on the approval of the governing boards of each. The society so affiliated has independence, autonomy and self-control under its own constitution and by-laws, and the A. S. M. E. is not responsible for its acts.

Mexican Chamber Organized in New York

Sponsored by several prominent New York business men, the Mexican Chamber of Commerce of the United States, has been organized and has established itself in offices in the Woolworth Bldg. in that city. The chamber has been incorporated under the laws of New York.

The directorate is composed of citizens of both countries who are actively engaged in important industries. Among the directors are: Gumaro Villalobos, Elbert Gary, Carlos B. Zetina, James W. Gerard, S. L. Alatriste, Grafton Greenough, Francisco P. De Hoyos, Russell R. Whitmann, George L. Le Blanc, Carlos R. Felix, Jose Miguel Bejarano, Joseph Hodgson, G. G. Cano, Jerome S. Hess, L. J. Roel, M. L. Gallagher. Officers are: President, S. L. Alatriste; vice-presidents, James W. Gerard, Jerome S. Hess and Russell R. Whitmann; treasurer, Jose Miguel Bejarano.

Hendey Machine Co. Publishes Anniversary Book

In celebration of the completion of fifty years in the machine tool business, the Hendey Machine Co. has published a limited edition of a 112-page book dedicated "To the men who build our machines and in the building strive for perfection; to the friends who use our machines and in the using realize our aims." The book is beautifully printed on heavy paper and illustrated by photogravure portraits of the presidents of the company and by halftones of the different shops occupied and the product produced in them.

The story opens with a tribute to the founder, Henry J. Hendey, and his ideals, and tells of the early struggles of Mr. Hendey and his brother Arthur to establish a business in the years 1870-73. The foundation of the joint stock company followed in 1874. Then follow descriptions of the various buildings and the different machines built by the company.

A brief account is given of the war activities of the Hendey Machine Co. and its adherence to the high standards of its founder. Then comes a word on the work of the company since the armistice and a conclusion telling of the fulfillment of Mr. Hendey's vision of a successful combination of the ideal with the practical.

Gear Manufacturers at Buffalo This Month

Plans are rapidly being completed for the annual convention of the American Gear Manufacturers' Association, which will be held in Buffalo, N. Y., on April 20 to 22, with headquarters in the Hotel Lafayette.

The papers to be presented at the technical sessions cover a wide variety of subjects pertinent to the gear manufacturing field. Among those already scheduled are: "The Use of the Projection Comparator in Testing Gear Teeth," by Ralph E. Flanders of the Jones & Lamson Machine Co.; "Good Practice for the Cutting Faces in Clearance of Hob, Gear and Form Cutter Teeth," by H. E. Harris of the Harris Engineering Co.; "Proportions of Industrial Gears," by G. E. Katzenmeyer of the R. D. Nuttall Co.; "The Grinding of Gear Teeth and Its Future in Industry," by R. S. Drummond.

Besides the committee reports and the various entertainment features, there will be presented an explanation of the Gleason Works system of bevel gears by F. E. McMullen of that company.

The secretary of the association is F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Government Bureaus to Study Drill Steels

A mining engineer and a metallurgist are to be selected by the Bureau of Mines and by the Bureau of Standards in the near future to make an intensive study as to present practice in the heat-treatment of drill steels and the extent to which breakage occurs. These engineers are to make a much more exhaustive survey than ever has been attempted before. They will submit a report to the advisory board which is co-operating with the bureaus in the study of rock drill steels and other steels which must withstand impact stresses. The advisory committee is composed of B. F. Tillson, T. R. Lawson, George T. Cousins, H. S. Brainard, J. A. Mathews, George H. Clark, H. M. Boylston, Van H. Manning, F. W. Deonton, Walcott Remington and Bradley Soughton.

The survey about to be undertaken is under the immediate supervision of D. A. Lyon, chief metallurgist of the Bureau of Mines, and G. K. Burgess, of the Bureau of Standards.

The Trend of Business Improvement—Plants Resuming

The Bridgeport Casting Co., Bridgeport, Conn., has increased operations at its plant from a four-day week to a full six-day week basis.

C. H. Wills & Co., Marysville, Mich., manufacturers of the Wills-Sainte Claire automobile, have advanced production from 15 to 20 cars a day, giving employment to about 600 operatives at the plant.

The Ames Shovel and Tool Works, Elwood, Ind., have resumed operations on a full time, full week basis.

The Harrisburg Pipe and Pipe Bending Works, Harrisburg, Pa., have adopted a double-shift operating schedule in a number of departments at the plant, including steel works, coupling shop and coil shop.

The Cyclone Motors Co., Benton Harbor, Mich., will commence operations at its new local plant this month, with a production schedule of 50 motorcycles per day.

The Osgood Bradley Car Co., Worcester, Mass., has received a contract from the Connecticut Co., for twenty-five one-man cars for its traction lines, totaling $150,000. The company has orders on hand to insure full operations for some time to come.

The Autocar Co., Ardmore, Pa., manufacturer of motor trucks, has increased the working schedule three hours a week at its plant. Orders received for the first quarter of the year are 25 per cent in excess of those for the corresponding period in 1921. The plant is giving employment to about 2,000 men.

The Singer Manufacturing Co., Bridgeport, Conn., manufacturer of sewing machines and parts, has advanced operations from 3 to 5 days a week at the local plant.

The Haynes Automobile Co., Kokomo, Ind., is doubling its output, as compared with the basis of production for a number of months past.

The Stover Manufacturing and Engine Co., Freeport, Ill., is increasing production at its plant and is now operating at close to normal.

The Burden Iron Co., South Troy, N. Y., manufacturer of horse shoes, bar iron, etc., has resumed production at its plant after a shut down of about a month. About 1,000 men will be employed.

The Reo Motor Co., Lansing, Mich., is giving employment to a full working force, with entire plant operating on close to full time. The working hours in a number of departments will be increased at an early date.

The Frick Co., Waynesboro, Pa., manufacturer of agricultural implements, is increasing operations at its plant, with incoming orders about 50 per cent in excess of those received at this time a year ago. A complete new foundry will be erected, with daily capacity of about 60 tons of iron castings, designed to give employment to over 500 molders. The present foundry will be demolished upon the completion of the new structure, and the site used for the construction of additions to the machine shops.

The Moon Motor Car Co., St. Louis, Mo., has adopted a 25 per cent increase in production schedule for April and May, as compared with the same months of last year. The company has sufficient orders on hand to insure capacity operations until well into July.

The Remington Arms Co., Bridgeport, Conn., has advanced production to a 48-hour week basis at its local firearms plant, replacing a three-day week schedule, operative for some time past. The works will give employment to 3,000 persons. The cutlery division is employing approximately 800 workers under an increased production basis.

The Motor Axle Co., Flint, Mich., has adopted a full time operating schedule in all important departments at its plant, replacing a short-time working basis, prevailing for a number of months past.

The Peerless Motor Car Co., Cleveland, Ohio, is operating on the highest production schedule that has been attained since May, 1920. Record shipments of complete cars are being made.

The Mullins Body Corporation, Salem, Ohio, manufacturer of automobile bodies, has increased its working force by about 500 men.

The John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire, wire rope, etc., is operating on a 60 per cent capacity, as compared with a 35 and 40 per cent basis a few months ago.

The General Motors Corporation, Detroit, Mich., is operating its different plants on a production basis of 60,000 passenger cars, motor trucks and tractors during the current quarter of the year, as compared with an output of 24,600 cars of all kinds in the corresponding period of a year ago. The Buick division is leading all others in output. The total production in February was 21,000 cars as against a total manufacture of 8,900 cars in the same month of 1921.

The Foote-Burt Co., St. Clair Ave., Cleveland, Ohio, manufacturer of machine tools, etc., is increasing production to handle incoming orders.

The Chicago, Milwaukee & St. Paul Railroad Co., Chicago, Ill., has arranged an appropriation of $10,000,000 for new equipment, to include cars and other rolling stock, rails, repair shop equipment, etc. An order has been given to the Pullman Co., Chicago, for 1,000 box cars, and to the Western Steel Car and Foundry Co., Chicago, Bettendorf Axle Co., Bettendorf, Ia., and the General American Tank Car Co., New York, for similar cars, totaling 1,000, 1,500 and 500 cars, in the order noted.

The Ruggles Motor Truck Co., Saginaw, Mich., is increasing operations at its plant, with the adoption of a production schedule calling for 2,000 motor trucks during the present year. A branch plant has been established at London, Ont., and is now in operation to handle Canadian business.

The Pressed Steel Car Co., Pittsburgh, Pa., has secured an order for 2,000 seventy-ton coal cars from the Norfolk & Western Railway Co.

The Hendee Manufacturing Co., Springfield, Mass., manufacturer of motorcycles, has arranged a production schedule of 1,400 complete machines for April and the succeeding months of the year. Up to the present time the monthly output has been on a basis of 600 motorcycles.

Foreign Markets for American Farm Machinery

An opportunity for American manufacturers of potato machinery to extend their markets is presented in the increased development of that industry in Ireland. A list of dealers in agricultural implements and machinery in Ireland can be secured from the Bureau of Foreign and Domestic Commerce.

Horse-drawn wheel plows, duck-foot chain harrows, cultivators, and seed-drills are in demand in Sardinia, the Department of Commerce is informed. This market is attracting the attention of British exporters and should also prove to be well worth the attention of American manufacturers of such implements.

Tooth harrows are used more than any other in South Africa, but there is a constantly increasing demand for the disk type. In the Northern Transvaal there is considerable increased farming activity, and the demand for implements and machinery in this section merits consideration.

In East Africa, agricultural development is making rapid progress and the demand for machinery and implements is now greater than it has ever been in this region. The tractor market in South Africa is largely in the hands of American exporters, and according to our British competitors, this is largely due to American enterprise and superior selling methods.

Windmills and well-drilling machinery offer a good market in South Africa. Both the government and private firms and individuals are excellent prospects. The year 1921 showed an increase in buying of these articles as compared with 1920 and the demand for them continues unabated with excellent prospects for a further increase in 1922. The trade in windmills is largely in the hands of American manufacturers and, although British manufacturers are showing an increased interest in this market, there is no reason why the American product can not hold its leading position.

Census Shows Distribution of Machinists in 1920

Additional figures from the Bureau of Census show the re-distribution of machinists and toolmakers during the ten years between 1910 and 1920. A few comparisons are given herewith:

St. Paul, Minn., had 2,251 machinists and toolmakers when the 1920 census was taken. There were 1,760 in 1910.

Camden, N. J., had 2,042 machinists and toolmakers when the 1920 census was taken. This compares with 1,391 in 1910.

Vermont had 3,135 machinists and toolmakers when the 1920 census was taken. This compares with 2,321 in 1910. New Mexico had 1,137 machinists and toolmakers in 1920 and 518 when the 1910 census was taken.

Reading, Pa., had 1,980 machinists and toolmakers in 1920. This compares with 1,534 in 1910. Salt Lake City, Utah, had 838 machinists and toolmakers in 1920, and 516 when the 1910 census was taken.

Nashville, Tenn., had 988 machinists and toolmakers when the 1920 census was taken. This compares with 711 machinist and toolmakers in 1910.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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At a private dinner given in New York last week sixteen important and well informed men of large affairs were present. They were all bitterly opposed to the passage of the bonus bill but they were nevertheless unanimous in saying that they believed that the Senate would attach to it a rider providing for the necessary revenue by a sales tax, and that in this shape the bill would be returned to the House of Representatives and passed by a large majority. They all agreed that if this happened a period of wild inflation and speculation was likely to follow because the money distributed would be rapidly spent and because a sales tax would provide a comparatively painless method of raising a revenue so large that it would incite further extravagance on the part of Congress.

While I am not entirely in sympathy with this view and still hope that the Senate will have the good sense to quietly inter the bonus bill, I feel that it is my duty to present both sides of the picture, and if the bonus bill is passed and the sales tax produces the revenue that many people expect it will yield, I must admit that the result will be an era of political extravagance during which prices will at first advance sensationally and afterward decline disastrously, because the purchasing power of the nation will be dissipated by the drafts made upon it to support a program of unbridled extravagance. We now face an estimated Treasury deficit of about $300,000,000 for the next fiscal year, and the prospect of increased taxes to meet this deficit and to pay the interest on the sums which states and municipalities are borrowing with apparently so little thought of the day of reckoning is not alluring, although the prosperity resulting from the expenditure of these sums, by inducing what I once termed the "anasthesia of inflation," may render us temporarily insensible to its possible after effects.

Markets Still Strong

The resumption of the upward movement in the speculative markets last week, after a reaction to allow trade and industrial improvement to catch up, is due, I think, to a renewed appreciation of these conditions. The forces which have been making for recovery, particularly of the easing money markets, are as strong as ever. There is no decrease in the avidity of the demand for good investment securities. Last week Liberty third 4¼s, which sold at 83 in 1919, crossed par for the first time since their issue, and the continued strength of the market would seem to foreshadow further cuts in rediscount rates in addition to the reductions announced by the Atlanta and Chicago Federal Reserve Banks last week.

Stocks are strong. They have recovered most of their recent decline and in some instances have advanced to new high levels for the year, a gain which clearly could not have been supported had not a sufficient number of people believed that industrial recovery is destined to go further or that we are on the eve of an orgy of expenditure. What they call it depends entirely on how far ahead they are looking and is immaterial as long as their belief in higher prices and better business in the near future is strong enough to lead them to buy stocks.

With the sole exception of sugar the same renewal of strength is evident in all the commodity markets. Cotton, which has been rather droopy as a result of the extension of the New England textile strike, is higher as this is written and, though trade may remain apathetic until the trouble is settled, the statistical position is too strong to allow much of a decline. Secretary of Labor Davis seems to think that the prospects of a settlement are much brighter, though he does not indicate what direction it may take. The coal strike has been utterly without effect on any market and the apathy with which the public regards it is the surest sign that it is beaten before it starts. Even though all union miners answer the strike call disintegration of their forces is likely to set in before a fortnight has passed. Old cotton merchants and stock traders are disposed to buy on strike news.

Industrial Improvement Continues

The advance in coffee bears out frequent predictions made in these letters and strengthens our confidence that sugar will go higher despite the reaction of the past week, which is simply one of the temporary recessions by which all upward movements are punctuated. The rapidity with which the surplus supply of sugar is being distributed is one of the most impressive examples the markets have ever shown of the effect of low prices in increased demand. Grains also are higher, though they have a long way to climb to regain the peak of a month ago.

While these markets are recovering from their hesitation, industrial improvement is unabated. Freight car loadings continue substantially above the levels of a few weeks ago and railway earnings so far announced for February indicate a net return for the Class I roads of close to $55,000,000, or less than $2,000,000 short of 6 per cent return contemplated in the Transportation Act. These figures reflect business which was initiated all the way from two to four months ago, when sentiment was less optimistic than it has been lately, and there are no indications of any decrease in buying since.

If figures on unemployment are any indication, other industries are going ahead in much the same way. In New York last week there was a demonstration of the extent of idleness which was intended to be impressive but turned out to be amusing. The Council of the Unemployed arranged a parade to call attention to the numbers who have no means of supporting themselves and more than a hundred policemen were detailed to care for the traffic arrangements. As a result there were about four policemen to each parader, for the crowd which finally turned up at the City Hall numbered twenty-eight men, not enough to carry the banners which had been prepared.

Both by sections of the country and by industries, reports show improving business and better prospects. Eugene Meyer, Jr., managing director of the War Finance Corporation, who is touring the West, is convinced that even the sheep and cattle growers are now in a position to operate profitably. Refreshing optimism comes from the agricultural implement trade and business improvement is reported from such divergent sources as Pacific Coast distributors, Southern grocers and the Kansas City Reserve Bank, which tells of increased buying power throughout the rich area which it serves and describes the outlook as the most encouraging in any time during the past two years.

There are many other specific items which are significant of the trend. Steel companies are obtaining higher prices without difficulty and the *Iron Age* states that March orders will show the largest total in nearly two years. Department store trade in volume, allowing for price declines, equals or exceeds last year's remarkable showing. The widespread building activity is a very encouraging feature of the situation. Increased orders for automobiles are reported from the West and the output has been gaining steadily since the first of the year.

The Foreign Outlook

Ratification of the treaties negotiated at Washington, the Irish peace, better prospect of a settlement in the Near East, and increasing possibility of an early recognition of Mexico, are important facets of the most favorable international outlook in months. If the Genoa conference yields anything of importance it will surprise most people in this country, but the opportunity is so great that Europe's statesmen may rise to it. The decline in marks to 0.00288 almost certainly heralds the quick ending of Germany's "catastrophe boom." Prices are said to have advanced 50 per cent since last fall and it is absurd to expect that the wage earners of Germany will much longer be willing to accept near-worthless paper in exchange for their labor.

Otherwise it has been difficult to find unfavorable items in the news of the week. John Moody states that "In all my experience in over 30 years in Wall Street, I never saw the stage so completely set for a constructive period such as I believe is ahead of us for the next year or two."

Business Conditions in England

BY OUR LONDON CORRESPONDENT

The lockout in the engineering trade has started. Confined at present to members of the Amalgamated Engineering Union, it cannot at the moment effect more than about 400,000 men and youths, nearly a quarter of whom would be out of work anyway. But it may perhaps affect the whole of the engineering and even the shipbuilding industries, and several of the unions have been given another fortnight in which to decide whether they will agree to the employers' terms regarding management, or join the skilled mechanics shutout. The dispute arose ostensibly on account of the working of overtime, but the employers' terms having been rejected by ballot in the course of which not one-quarter of the members voted, the leading engineering trade union was then faced with the lockout, with the certainty that the whole question of management would be raised and the almost sure prospect that wages and ordinary hours of labor would be revised. The condition of the industry as a whole is such that whether the works are shut or open will not make much material difference to the employers; they may lose less by shutting down than by keeping open. This applies mostly to the machine tool side but least to the electrical engineering section. On the other hand, the engineering trade union, like most of the other unions, has had its funds depleted as the result of a long spell of bad trade, and generally speaking is in no position to make a lengthy fight; in fact its only hope is to draw funds from other unions who may be in no better pecuniary position.

Idleness Decreasing

In the world outside engineering it really does seem that some improvement can be noted, as for the last five or six weeks the numbers of the unemployed have shown decreases, and some decline has been visible in the cost of living as officially calculated. The latest available figures show 1,837,233 persons registered as wholly unemployed, which is a decline of 97,000 in the last seven weeks; and 131,000 are on emergency work provided by the government and other authorities. Then too money has been easier and since the last letter was written the bank rate here has been reduced to 4½ per cent. With this decline the clearing banks reduced their deposit rate from 3 to 2½ per cent, this being 2 per cent below the bank rate as compared with 1 per cent below in the pre-war period.

The improved employment figures hardly apply to the engineering and metal trades, though in some districts more blast furnaces have been put into operation and the coal output has considerably improved; indeed the miners have been setting up records. But their wages have been reduced and the low rates in some districts have caused disquietude in the minds of people, both in and outside the industry, as it is recognized that even with commodities at pre-war prices the earnings could hardly provide a living of reasonable standard. As to shipbuilding, it has been estimated that work is in actual progress on only 28 per cent of the slips.

The machine tool industry certainly shows no improvement in trading conditions (one firm of machine tool merchants will shortly open a restaurant, using most of its showroom area for that purpose), and the depressing circumstances are reflected in the annual report for 1921 of the Machine Tool Trades Association. This report states that during the year twelve firms resigned, "nearly all in consequence of having ceased to be machine tool makers." The membership is put at 142, compared with the year previous which showed 162. This shows a decline, not of twelve as reported, but of twenty. Moreover, during the year previous six applications for admission were refused. The concerns who have withdrawn are not specified, but it is stated that one firm resigned after having been fined £100 for participating in an engineering exhibition organized by a Glasgow corporation. This exhibition policy has possibly led to the resignation of two or three other concerns, both makers and agents. One firm that has come out of the lists had previously been known as printers' engineers, and during the war entered the ranks of machine tool makers owing to circumstances, being then engaged in the production, by arrangement, of an American grinder and a lathe.

The report of the association gives no survey of the year but, as usual, contents itself with recording matters of domestic interest. One of the paragraphs relates to the fencing of machinery, members having been supplied with copies of a letter on the subject written by an inspector of factories in which they were "urged to make every effort to manufacture machines in such a way that they should be safe to operators." This subject naturally interests the British Industrial Safety First Association and the latest report provides an analysis of the causes of 317 deaths which occurred during a number of years as "issued by a prominent company." Apparently the accidents analyzed are not confined to a single industry. A point is that they show the deaths from mechanical causes to form 35.6 per cent, and from non-mechanical causes 64.4 per cent. Thus it is pointed out, supporting the statement made by the deputy chief inspector of factories here, that only about 30 per cent of all accidents involve machinery to any extent and that even with the fullest provision of safeguarding a decline of about 10 per cent only could be expected. At the annual meeting of the association, held in London on March 8, little of a technical character was discussed, the chief points raised relating to publicity matters. Individual members were undoubtedly cheerful, but the sombre character of the outlook was shown by the reference made by the president, Sir Alfred Herbert, to the prospects of the exhibition to be held by the association towards the end of 1924.

The small tool trade has been maintained better than the trade in machine tools, but of course not on anything like the ordinary scale. There can be little doubt that stocks to a considerable amount are still in hand, and this fact has been used in some instances as an inducement to buyers, on the ground that for the tools in hand no charges on account of safeguarding of industries duty will be made. By this duty of course measuring instruments become key industries and are subject to an import duty of one-third their value. The effect has been definite and has shown itself particularly in the case of some Swiss products where, in addition to the duty the exchange works to the disadvantage of the importer, sterling being quoted lower in Geneva than anywhere else. In certain lines, particularly micrometers, the competition offered by British manufactured goods may be regarded as negligible, and though a few firms have mentioned that they "would be shortly placing on the market, etc.," little that is tangible has resulted. Vandervell & Co., a firm of automobile fitting manufacturers is entering the small tool market and with a separate factory near Brighton, about 50 miles from the main factory, at Acton, W., produces calipers and similar implements, V-blocks and other aids to the engineering workman and to the toolmaker; but up to the present the micrometer has been left alone.

The usual order for small tools is of meagre proportion—a dozen twist drills being specified at a time by large firms—and the high-speed steel, etc., market experiences the same conditions. Stainless irons are common, but as applied to tableware—spoons, forks, etc.—seem to be too leaden in appearance. Rumors have concerned themselves with the sale here of German small tools, but the writer has had some difficulty in locating these and is disposed to think they have reference to pliers, combination tools and the like, rather than with the small tools of the machine shop.

Engineers To Co-operate

The various British technical institutions of engineers, including civil, electrical, mechanical, mining and so on, have always acted somewhat independently, the idea of each apparently being to form a self-contained unit with its own house and organization. Now as the result of a visit by engineers from America, the Institution of Civil Engineers agreed to call a conference to consider a closer connection, and the Institution of Mechanical Engineers at any rate will co-operate. The Institution of Electrical Engineers, it may be worth mentioning, has been celebrating its jubilee. For although it was founded in 1871, being then known as the Society of Telegraph Engineers, the first ordinary meeting was not held until February 28, 1872. The chief feature of the celebration was a series of discourses, chiefly by way of reminiscences of experiences in electrical engineering, one of the speakers being able to state that as a lad he attended certain of the lectures given by Faraday at the Royal Institution. Another feature of the program was a lecture by Prof. J. A. Fleming on "Michael Faraday" and the foundations of electrical engineering, demonstrated by experiments with much of the apparatus used by Faraday himself at the institution. The Institution of Electrical Engineers is the largest of the British technical societies, the membership now exceeding 10,000.

Chicago Letter

March business in the machine tool industry in the Chicago center has held its own in spite of the "see-saw" trend. Although the dealers as a whole have not yet arrived at definite figures, many of them have stated that March will prove as good if not better, than February which was a very good month. The outlook and business conditions appear to be improving throughout the entire country and trade activities in the iron and steel products market for the Chicago district are keeping pace.

Inquiries are growing in number but many are for small and miscellaneous machinery. One of the most extensive lists is that issued by the U. & J. Carburetor Co. That company was burned out by the recent disastrous fire near the machine tool district and is looking for a new factory location. The temporary location of the firm is 510 West Van Buren Street.

Railroads are still inactive with the exception of the Santa Fe which is inquiring for the following: One 500-ton double-end hydraulic wheel press; one 90-in. motor-driven, driving wheel lathe; one heavy-duty double-end car axle lathe with motor drive; one 300-lb. Beaudry hammer; one 52-in. car wheel lathe; one 4-ft. radial drill, and one 15-ton crane.

Activities in the crane market in this center are also optimistic. Among the recent orders booked by a local firm are two 40-ton cranes for the Sterns-Rogers Co., Denver, Col.; three cranes for the Coshocton Iron Co., Monongahela City, Pa., one each 10, 5 and 2-ton. This same firm is also active in the foundry machinery market and recently received an order for thirty-six tumbling barrels, and nine No. 8 cupolas from the Ford Motor Co.

A very nice word of optimism comes from the report of the seventh district of the Federal Reserve Bank, that the per cent change in the machine tool employment situation since a year ago shows a decrease of 12.5 per cent. This figure is 27 points smaller than that of last month.

It is understood that the Illinois Central R.R. purchased 15,000 tons of rails. The Chicago, Burlington & Quincy received bids recently and is expected to award the contract soon for 1,000 tons of structural material for its new Chicago freight terminal. The Chicago, Rock Island & Pacific is receiving bids for 1,600 tons of steel for bridge construction.

Plans have been drawn for a one story plant, 120 x 180 ft. to be located at 4603-19 Fullerton Ave. Henry Newgard & Co.. 947-55 West Washington St., manufacturer of electrical specialties, is the owner. The cost of plant and equipment will amount to $75,000, it is estimated.

Black & Decker Declare Dividend

The Black & Decker Manufacturing Co. has just declared a dividend for the first quarter of this year at the rate of 3 per cent on the preferred stock. The company set its sales quota for this year a half million dollars higher than the actual sales last year and for the first quarter of this year it advises that 100 per cent of this quota has been made.

Idle Freight Cars Total 216,661 on March 15

Freight cars idle because of business conditions on March 15 totaled 391,797 compared with 398,982 on March 8, a decrease of 7,185, according to reports just received from the carriers of the country by the car service division of the American Railway Association.

Of the total 216,661 were surplus freight cars (cars in good repair and immediately available for use if traffic conditions warranted) while the remaining 175,136 represented freight cars in need of repairs in excess of the number normally regarded as being unfit for service owing to their condition.

Surplus coal cars in good repair numbered 79,803, a decrease within a week of 6,661 but owing to a falling off in the loading of grain principally in the Northwest, an increase within that period of 382 cars was reported in the number of surplus box cars, the total being 89,356. Surplus coke cars amounted to 2,561, a reduction of 899 within a week while a decrease of 138 was reported for stock cars which totaled 19,739.

Engineering Advertisers Elect Officers

At the annual meeting of the Engineering Advertisers' Association held recently in Chicago, Julius Holl, advertising manager of the Link-Belt Co., was elected president. J. B. Patterson, of the P. H. & F. M. Roots Co., was chosen vice-president. The new secretary is H. N. Baum, of the Celite Products Co., and the treasurer is C. H. Connell, of the Weller Manufacturing Co.

Mr. Holl, the new president, has been with the Link-Belt Co. for ten years. During the war he was head of the publication section of the Emergency Fleet Corporation and was later assistant to the Director General of that body.

Elimination of Waste Effective in Many Countries

Millions of dollars can be saved to the nation by the elimination of waste in industry, L. W. Wallace, of Washington, executive secretary of the American Engineering Council of the Federated American Engineering Societies, declared at a joint meeting of the Chicago Chapter of the Society of Industrial Engineers and the Western Efficiency Society at the Auditorium Hotel in Chicago, recently.

Mr. Wallace, who as vice-chairman directed the nationwide assay conducted by the Hoover Committee on Elimination of Waste in Industry, said that the publication of the Committee's report was "an event that will be far-reaching in its beneficial effects on industry, not only in the United States but throughout the world." He added that engineers and industrialists were coming to agree with Secretary Hoover that the opportunity for advance in living standards in this country lies more surely in the steady wiping out of industrial wastes than in great inventions.

Mr. Wallace said that the Hoover Committee's findings had already borne fruit in Europe as well as in America. Inquiries have already been set on foot by governments and private industry in other nations and the Republic of Czecho-Slovakia has officially distributed the report as a guide for its industrialists in the upbuilding of the new nation's manufacturing enterprises.

In the United States, results of the committee's work are now evident in the building trades, printing trades, metal trades and boot and shoe, textile and ready-made clothing trades.

Edward P. Maguire Dead

Edward P. Maguire, general manager of the Lapointe Machine Tool Co., of Hudson, Mass., died on March 28. Mr. Maguire had been connected with the Lapointe interests for many years and was general manager since 1914.

Machinery Exports Fall Down in February

The increase in metal-working machinery exports was short lived. The value of February exports was $715,245, a decrease from $925,825 in January. The value of exports in February, 1921, was $2,781,781. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, follow:

EXPORTS OF METAL-WORKING MACHINERY

	—February, 1921—		—February, 1922—	
	Number	Value	Number	Value
Lathes	..	$442,491	44	$35,521
Boring and drilling machines	..	.....	127	36,212
Planers, shapers, and slotters	..	.....	10	12,073
Bending and power presses	..	.....	12	103,135
Gear cutters	..	.....	251	3,583
Milling machines	..	.....	27	23,791
Sawing machines	..	.....	28	7,735
Thread-cutting and screw machines	..	.....	43	8,011
Punching and shearing machines	..	.....	21	38,579
Power hammers	..	.....	48	8,871
Rolling machines	..	.....	1	189
Wire-drawing machines	..	.....	6	60
Polishing and burnishing machines	..	.....	4	1,853
Sharpening and grinding machines	..	148,410	786	65,211
Chucks, centering, lathe, drill and other	..	.....	1,455	13,112
Reamers, cutters, drills, and parts for machine tools	..	.....	100,735	82,556
Pneumatic portable tools	..	.....	278	21,242
Foundry and molding machinery	..	.....	127,883	14,230
Other metal-working machinery and parts thereof	..	2,190,880	795,341	239,281
Total metal-working machinery	..	2,781,781	.....	715,245

Thirty machine tools, valued at $13,763, were imported in February. In February of 1920 the number of machine tools imported numbered 271 and their value was $29,633. During the eight months ended with February, there have been 2,583 machine tools imported, valued at $115,338.

War Department Disposes of Remaining American Tools in Belgium

Only a Few Tools on Hand and Most of Them Incomplete—Deal with La Construction Metallique Reflects Credit on Our Sales Organization

By C. E. CARPENTER
President, C. E. Carpenter Co., Société Anonyme, Paris

The United States War Department's stock of machine tools in Belgium has been purchased by E. R. Frederick, who for the past two and a half years, has represented the Director of Sales in connection with the shipment of War Department surplus machines to Belgian manufacturers.

It will be recalled by readers of AMERICAN MACHINIST that shortly after the armistice an agreement was entered into between the Director of Sales and a syndicate of Belgian manufacturers, known as La Construction Metallique, whereby the United States War Department undertook to supply the machine tool requirements of Belgian manufacturers out of its surplus equipment on the basis of 1914 prices plus 55 per cent, less a graded amount for depreciation depending upon the condition of the machines.

An American army officer, Lieut. J. F. Osterlag, a machine tool expert, was assigned to duty with the Construction Metallique to ascertain the needs of the Belgians and under this agreement, approximately 2,200 machine tools were ordered from the War Department and delivered in Belgium during 1920 and 1921. These machines were of great assistance to Belgian industry. The transaction, it can be claimed, was equally advantageous to the American machine tool industry, since it discouraged importations of machines from Germany and introduced into Belgium many makes and types of American machines which might otherwise not have become known there except through years of patient missionary effort.

Ninety Per Cent of Tools Satisfactory

Less than ten per cent of the machines shipped to Belgium were found to be unsuited to the needs of the Belgian manufacturers who specified their requirements. This is a remarkable record when it is considered that the War Department of a government is not supposed to be equipped to carry on a business in a highly technical article like machine tools, and, particularly, when it is considered that the machines in question were probably brought together from plants situated all over the United States, with all the attendant difficulties in the shape of examination, appraisement, inspection, shipment and packing.

The policy adopted by the Director of Sales in the case of machines that did not meet the requirements of the Belgian buyers was a wise and liberal one that reflected great credit both on the United States Government and on the officials who negotiated the transaction and carried it through to completion. All machines that were not satisfactory were taken back by the Government and stored in the American Army Base warehouses in Antwerp. It is this machinery that has just been sold "en bloc" to Mr. Frederick, who plans to dispose of it not only in Belgium, but wherever the market calls for such equipment.

Altogether, about 180 machines are involved in the deal, about half of them being lathes from 16 to 30 in. swing and 6 to 20 ft. beds, the makers' names including Leblond, Whitcomb-Blaisdell, Fulton, Reed-Prentice, Canada, National, Wickes, etc. Next in importance to the lathes are turret lathes, made by Gisholt, Foster, Warner & Swasey, Libby and Steinle. There are also a number of automatics of Gridley, Acme, Cleveland, New Britain and Cone types, and a few grinding machines made by Norton, Fitchburg, Bryant, Diamond, Sellers and Blanchard. The single Blanchard grinder is a No. 16 with motor on spindle, the motor being wound for 60 cycles, whereas the Belgian practice is 50 cycles. There are several sensitive radial drilling machines, made by Carlton and Hammond, but no other types of drilling machines and no milling machines with the exception of two Ingersoll slab millers, two or three hand milling machines, a number of one- and two-spindle profiling machines and several thread milling machines for internal work.

Some Machines Incomplete

Among the miscellaneous machines that complete the list are two 48-in. Putnam planers, a Cincinnati 24 in. x 4 ft. crank planer, several Pratt & Whitney spline milling machines, three or four Toledo and Ferracute presses, a Beaman & Smith two-spindle horizontal boring machine, one Rockford horizontal drilling machine, a No. 60 Heald cylinder grinder and several Pratt & Whitney shaving machines.

Many of the machines are incomplete and will require new parts from America to fit them for work. The 24-in. Gisholt turret lathes, for example, are without side carriages and possess no tools. The Warner & Swasey No. 2 and No. 4 turret lathes are likewise without side carriages and bar feed mechanism. Incomplete machines are, of course, useless to the average machine shop, and as no one in Belgium has up to the present made a practice of reconditioning machine tools it is quite likely that these incomplete machines will eventually have to be sold at very low prices to buyers willing to assume the risk and expense of completing them.

The price at which the machines were sold to Mr. Frederick is not known, but undoubtedly it was based upon the present stagnant condition of trade in Belgium and upon the realization that much of the equipment in its present state is useless except to those prepared to try it with the full knowledge that many parts will have to be made here or imported from the United States. The sale will likewise free the American Army Base warehouses in Antwerp of several hundred tons of cumbersome material and reduce the military operating expenses in that part.

Prior to entering the employ of the Director of Sales of the United States War Department in 1919, Mr. Frederick was president of the Allied Machinery Company de France, of Paris the French subsidiary company of the Allied Machinery Company of America.

Progress Report of Standards Body

Important developments that have taken place in the movement to nationalize engineering and industrial standards are set forth in detail in a report now being issued relating to the work of the American Engineering Standards Committee during 1921.

The activities of the committee have developed to such an extent that work is now under way on seventy nine distinct projects which have reached an official status. In their work, 160 bodies of national importance are co-operating, these having designated more than 500 individuals as official representatives to serve on sectional committees working under the auspices of the committee.

During 1921 the committee approved standards for seventeen different projects. A list of seventy-nine projects remains to be developed during the coming sessions. This list will be supplemented by other standards as soon as the work is systematized.

Among the standards approved during 1921 were: Specifications for portland cement, soft or annealed copper wire, copper wire, bars, cakes, slabs, billets and ingots, electrolytic copper wire bars, etc., cold-drawn bessemer steel automatic screw stock, cold-drawn open-hearth steel automatic screw stock; standard methods of testing distillation of bitumunious materials for road treatment, sampling of coal, assay of copper, chemical analysis of manganese bronze and gun metal; safety codes for protection of heads and eyes of industrial workers, national electric code and industrial lighting code; and a standard test for toughness of rock.

A statistical summary included in the report is interesting. It contains the following data: Member bodies, 20; organizations represented, 28; representatives on main committee, 52; approved standards, 17; standards up for approval, 17; projects having official status, 79; projects for which sponsorship has been accepted, 51; organizations acting as sponsors, 43; co-operating bodies, 160; individuals on sectional committee, 548.

The report also contains a list of the committee members, participating organizations and the constitution and rules of proceedure of the committee.

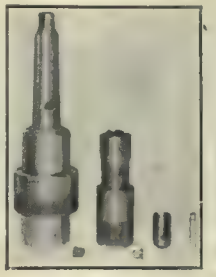
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Chuck, Drill, Quick-Change, Positive, Safety

SaveAll Tool Co., 59 River St., Waltham, Mass.

"American Machinist," December 1, 1921.

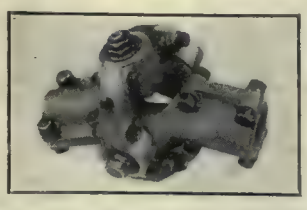


The chuck has a safety device to prevent breaking and burning of drills, taps, reamers and counterbores, and it consists of the chuck body, collet, ejector, shearing pin and jaws. The collet holds the drill and slips into the chuck. It has a solid bearing surface at each end and a lock for automatically taking up wear and eliminating end motion. The ejector in the small end of the collet releases the drill. The collet is driven by a renewable soft steel pin, which shears off when the cutting tool is overloaded. The capacity of No. 2 chuck is ¼ to 2-in. taper-shank drills, i. e., Nos. 1, 2, 3 and 4 Morse tapers.

Joint, Universal, Adjustable, "American"

Hartman Manufacturing Co., 308 Pearl St., Hartford, Conn

"American Machinist," December 1, 1921.

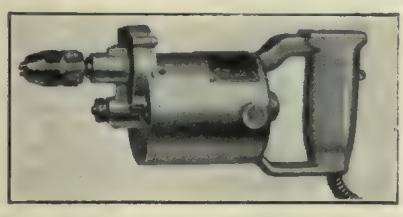


The joint is intended to transmit relatively large powers. A ring surrounds the forks and carries the hardened steel studs, which have tapered bearings in the fork ends. This ring is in two parts, so that the joint may be assembled or disassembled, and adjustments made to compensate for wear. An annular oil chamber within the ring holds a large supply of oil. The sleeves also are split, and may thus be applied to shafts without disturbing the endwise position of the latter. The castings are bronze, but may be supplied in malleable iron or steel. The joint is made in all commercial sizes for shafts from ⅝ to 2 in. in diameter.

Drill, Electric, No. 3

Lovejoy Tool Works, 319-331 West Ohio St., Chicago, Ill.

"American Machinist," December 1, 1921.

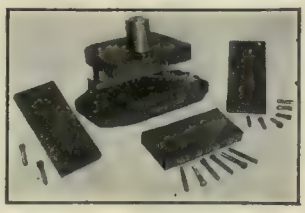


The drill has a capacity for drilling ¼-in. holes in steel. It weighs only 4 lb. and is furnished with either a 110 or 220-volt motor suitable for direct or alternating current. The switch is conveniently placed and is operated by the thumb. The drill has ample ventilation and provision for oiling, and is driven through a bronze gear.

Punch and Die, Standard Sets

Diamant Tool and Manufacturing Co., 91-97 Runyon St., Newark, N. J.

"American Machinist," December 1, 1921.



The sets are made in five sizes capable of a large number of combinations, to save the purchaser's time in making patterns and castings. The die sets are furnished complete with the exception of the die openings and the holes for inserting the punches in the punch plate. Screw holes are drilled and countersunk and all screws and dowels required are furnished. The die blanks are of oil-hardened steel and are from 0.006 to 0.010 in. oversize to allow for shrinkage in hardening and for final grinding.

Boring Bar, Taper, Portable

Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa.

"American Machinist," December 1, 1921.



The bar is adaptable to boring holes with any degree of taper, as well as to facing the hub on work too large for a machine. The tool is shown set up for boring a cylindrical casting, that serves as a support for the crossheads holding the boring bar. Each crosshead has four setscrews for adjusting and aligning the bar after centered in the hole. The taper is derived from a cross-slide and yoke, the degree of it being controlled by the distance the slide is moved from the central axis. The driving gear is stationary. The feed case, shown with a weighted handle, provides a constant and automatic feed.

Caliper, Indicating, Extension-Beam

F. W. Horstman Co., 196 Colt St., Irvington, N. J.

"American Machinist," December 1, 1921.

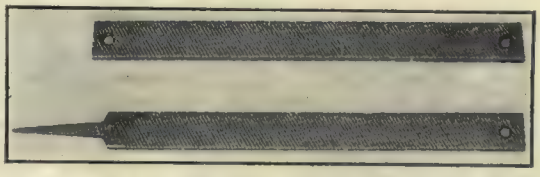


The caliper may be used on a lathe for gaging across the face of chucked work, and on a planer for duplicating wide pieces. By reversing the arms on the beam, the tool becomes an inside indicating caliper, and can be used in any size hole above 4¾ in. The dial is graduated in thousandths of an inch, so that the operator may see directly the size of the work in relation to the desired size. The rear surfaces of the arms are flat, and, when laid on a plane surface, keep the plunger and adjusting screw in alignment. The beam is ordinarily 6 in. long and ¼ in. in diameter, although any length can be furnished.

File, "Hygrade Hand Miller"

Steele-Sayward Co., 79 Milk St., Boston, Mass.

"American Machinist," December 1, 1921.



The teeth of the file are milled instead of being forced up by the usual process of file cutting. It is claimed that the process of forming the teeth does not harm the grain structure of the steel; that the steel is especially heat-treated to give maximum hardness and toughness to the teeth; that the tool works equally well on all metals and alloys, and that when used on lead, solder or babbitt the teeth do not become clogged. The files can be furnished in either the blade or the tang type.

Hoist, Electric, "LiftAbout"

Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.

"American Machinist," December 1, 1921.



The electric hoist is applicable to all load-moving jobs and can be installed wherever a chain block might be used, providing that electric current is available. The motor is especially designed for hoisting service, and can be furnished for either direct or alternating current.

Clip, paste on 3 x 5-in. cards and file as desired

Business Outlook in Foreign Markets

Reports coming to the Department of Commerce from foreign countries provide an accurate barometer of business conditions abroad and indicate to American manufacturers where their best markets lie. Dr. Klein, director of the Bureau of Foreign and Domestic Commerce, at Washington, stated recently that his department is receiving an average of 600 inquiries per week from business men regarding Latin-American markets. This indicates a growing interest in Latin-American business and disproves the reports that Germans have secured these markets to the exclusion of all other countries.

Developments in the Far East are also encouraging. The Shanghai market for steel products is generally quiet but the demand for tin plate and wire nails is noticeable. By the failure of German concerns to deliver steel products according to contract, American firms are placed in a strong position. Contracts which were concluded in China by the Germans last year for the erection of cement plants evidently called for German machinery equipment as quantities of such machinery are now being shipped to that country. German automobiles have also appeared in China, the first since pre-war days.

Competition too Strong

In Australia the Newcastle Steel Works, owned by the Broken Hill Proprietary Co., will be entirely shut down this month. It is said by officials that the production cannot compete with the following steel prices in England and in other countries. Reports are current that the Commonwealth government's merchant marine may be sold to private operators.

The Belgian industrial situation during the past month has been marked by decreased orders, falling prices, wage reductions and increased fuel stocks. The metallurgical and window-glass industries are the most seriously affected. All grades of pig iron have declined 5 francs per ton since Feb. 15. Owing to the reduced foreign demand and somewhat increased production, semifinished steel, both bessemer and open-hearth, have generally declined about 35 francs per ton. Most varieties of finished iron and steel likewise registered reduction varying from 1 to 2 francs per hundred kilos, while under pressure from British and Luxemburg competition the decline on sheets was more marked, ranging from 4 to 8 francs per hundred kilos. American competition in wire nails resulted in reduction of 1s. per hundred kilos in Belgian export prices. On March 1, twenty-two blast furnaces were operating, with a production of 400 tons of foundry iron and 3,215 tons of basic pig per 24 hours. This compares with eighteen blast furnaces in operation on Feb. 1, producing 646 tons of foundry iron and 2,470 tons of basic pig per 24 hours. Of the larger plants, the Ougree-Marihaye has four blast furnaces in operation; Usines de la Providence, two; and the S. A. John Cockerill, two. The latter plant has halted all steel-producing installations and is concentrating on the construction of a large, modern rolling mill which it is hoped to have ready for operation by October. Some of the iron and steel firms are planning to have extensive exhibits at the Rio de Janeiro exposition. A 90-ton express locomotive will be shown by the Cockerill Co.

In Spain the government is expected to refuse the railroads further increases in rates as the earnings have been very satisfactory the past year. The Norte Railroad earned 29,600,000 pesetas in 1921, which will allow a dividend of 57 pesetas per share. This company is issuing bonds for repair and equipment to the amount of 50,000,000 pesetas. In a recent session of the Council of Ministers it was resolved that the government would abandon, after April 1, the practice of extending state aid to the railroads, which during the current fiscal year has averaged about 7,000,000 pesetas a month.

Zeppelin Dirigibles

It is reported that the new dirigibles for the service planned between Spain and South America will be constructed in Spain under the direction of engineers sent by the Zeppelin Co. Aerodrome space has been secured near Seville and near Buenos Aires, and it is expected that within a month work will begin on the sheds. The Minister of War was granted a supplemental credit of 65,834,219 pesetas on Feb. 14. In addition he has solicited a credit of 17,500,000 pesetas for aviation, and it is planned to create ten squadrons with eighteen machines each. In addition six large bombing planes will be secured and necessary hangars constructed. The Minister of Marine is negotiating for the purchase of hydroplanes in England and dirigibles in Italy.

Business Items

The Sandvick Steel Co., Inc., has combined its general steel and steel belt conveyor departments in the one office at No. 2001, Woolworth Bldg., 233 Broadway, New York City. The following officers are now established in these quarters: W. D. Thomas, president and general manager; Anders Johnson, vice-president; G. M. Spencer, secretary; Harry Carlson, sales manager.

The Wunsch & Ter Kuile Company has been organized with offices and warehouses at 302 McDougal St., Brooklyn, N. Y. The new company will act as selling agents for manufacturers of material handling machinery and industrial engineering equipment. Mr. Wunsch is the founder of the Silent Hoist Co., and Mr. Ter Kuile was formerly engineer with the E. I. du Pont de Nemours & Co.

The Weed Engineering Works, Inc., Bridgeport, Conn., was recently incorporated under Connecticut laws to manufacture metal products, tools, machinery and miscellaneous devices. The capital stock is $25,000 and the incorporators are: Fred R. Carstensen, Nichols, Conn.; Lorenz F. Carstensen, 72 Fifth St., Bridgeport; and H. W. Carstensen, of Nichols.

Davis Welding and Manufacturing Co., of Cincinnati, Ohio, manufacturer of truck tanks, storage tanks and seamless cans, has opened branch offices in the American National Bank Bldg., San Francisco. The company will introduce in Pacific Coast territory a standardized truck tank body for carrying gasoline and oil, which body is claimed to posses safety features that largely eliminate fire hazards. C. F. Chambers, Pacific Coast manager for the company, will make his headquarters in San Francisco.

The Columbia Foundry Co., of Columbus, Ga., has been consolidated with the W. L. Lemley Foundry Co., of Bessemer, Ala. The soil pipe plant of the Columbia company is to be moved to Bessemer.

An Interstate Commerce Commission examiner has recommended that the rate on bulk coke from Tupelo, Miss., to Atlanta, Ga., is unreasonable, in deciding the complaint of the Pratt Engineering and Machine Co.

Advances in aid of exports made by the War Finance Corporation from Jan. 4 to March 11 of this year include $470,966 for sugar mill machinery and $500,000 for agricultural machinery.

The Lyons Level and Tool Co., of New Haven, Conn., manufacturer of levels and tools, recently changed the name of the concern to the Lyons Manufacturing Company, and filed a certificate for an increase in capital stock from $50,000 to $150,000.

The Hartford Blower Company, 618 Windsor Ave., Hartford, Conn., has recently filed papers of incorporation with the Secretary of State, to manufacture and deal in blowers and fans. The officers chosen are: President, George W. Christoph; treasurer, Robert A. Briggs; secretary, George W. Christoph, Jr.

The Steel Co. of Canada, Ltd., reports, for the year ended Dec. 31, 1921, a net income of $817,292, which, after deducting preferred dividends, is equal to $3.15 per share on the common stock, compared with a net income of $1,855,404, or $12.19 per share in 1920.

The plant of the Sinker-Davis Company, of Indianapolis, Ind., manufacturer of boilers, engines and saw mill machinery, was badly damaged by fire recently.

The All-Metal Valve Co., has been organized at Detroit, Mich. Capital stock is $200,000 and incorporators are F. L. Klingensmith, C. Nalinz and F. Beall. Mr. Klingensmith was formerly vice-president of the Ford Motor Co.

The Bernard E. Mohr Machinery Co., of St. Louis, Mo., has moved from Easton Ave. to 1213 Pine St.

The Bryan Harvester Co., Peru, Ind., manufacturer of steam tractors, has bought the real estate and holdings of the Weigle Machine Tool Co., the buildings of which adjoin the harvester company's property. The new property will be used for storage and assembling of tractors. The new tractor recently completed is a three-plow puller, and has 100 horsepower.

The Tool Equipment Sales Co. has been organized at Chicago, Ill., with sales offices at 18 South Clinton St. Jesse B. Alton and C. B. Cole are the owners. The company now represents the Alvord Reamer and Tool Co., of Millersburg, Pa., and the Standard Saw and Tool Manufacturing Co., of Boston, Mass.

The Edward Hollander Tool Co., 142 Miller St., Newark, N. J., has just been organized to manufacture the Hollander adjustable broach. The product will be sold through dealers as well as direct.

Condensed-Clipping Index of Equipment

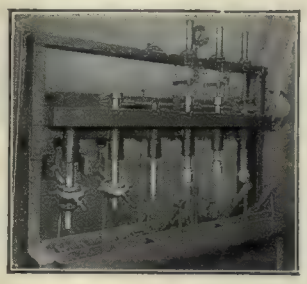
Patented Aug. 20, 1918

Trailer, Heavy-Duty, "Brute"
Sharon Pressed Steel Co., Sharon, Pa.
"American Machinist," October 6, 1921



The trailer can be pulled by an industrial tractor or motor truck. It is intended for carrying heavy loads, and cannot be easily tipped. The frame is made of pressed steel, the outer members being 4⅜ in. channels of ⅜ in. steel. It can be made in any length up to 72 in. and width up to 50 in. The rear wheels are made of malleable iron, and have 3 in. Hyatt roller bearings. The front casters are bolted to pressed-steel stampings and equipped with ball and roller bearings. The top is of oak, with the edges placed under the rails. The truck can be equipped with one or two couplers. It weights 362 pounds.

Operator, Nut-Tapping Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921



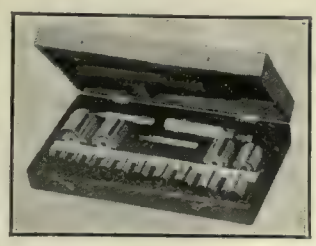
The device controls the rise and fall of the spindles and feeds the blank nuts into the tapping position. As soon as a nut is tapped, the spindle and tap are raised, carrying the tapped nut on the tap, and another nut is fed into position and the tap lowered into it. When the tap shank is filled with tapped nuts, the spindle rises to be removed and emptied. The regulating and feeding mechanism take care of all sizes of nuts within the capacity of the machine. This attachment can be applied to all makes of machines.

Grinder, Tool, Electric, "Dimo"
Luther Grinder Manufacturing Co., Milwaukee, Wis.
"American Machinist," December 8, 1921



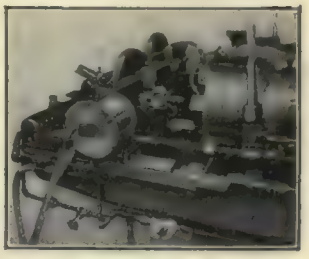
The machine is for use in manufacturing or repair shops where electric current is available. The motor is dust proof, and runs in S.K.F. bearings. The arbor is rigid, and allows considerable space between the bearings and the wheels. Dimo-grit wheels are used. The grinder can be furnished with either a high or low pedestal, and also with toolrack and guards. The machine is built in five sizes with either single-phase motors for 110 or 220 volts, or two or three-phase motors for 110, 220 or 440 volts. It can be furnished for belt drive if desired.

Gages, Plug, Standard, Leonard
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," December 8, 1921



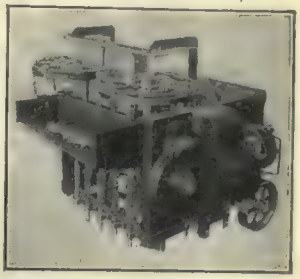
The gages are fitted with renewable heads, are made of hardened steel, and are guaranteed accurate to within 0.0001 in. of nominal size. The No. 1 standard set comprises 14 sizes from ¼ to 1½ in. The No. 2 standard set comprises sizes from 1⅜ to 2¼ in. Renewable limit plug gages can be supplied in various sizes in English or metric units to any given limits, in sets or singly. Standard ring gages are made from ¼ to 6 in. in size, to cover the same range as the plug gages. Any of the Leonard tools can be supplied.

Operator, Bolt-Cutting Machine, Automatic, Air-Operated, "Clay"
Key Boiler Equipment Co., East St. Louis, Ill.
"American Machinist," December 8, 1921



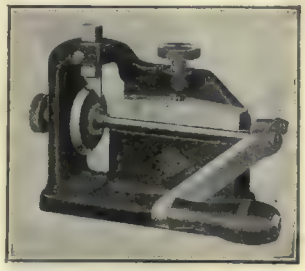
This device can be applied to all makes of machines. It clamps the work, feeds it into the dies, opens the dies after the thread has been cut, returns the carriage to its starting position and closes the dies for the next cut. The finished bolt is ejected from the holder, thrown clear of the machine, and another bolt pushed in from the magazine. When the starting lever is pulled by the operator, the movements are repeated. If the machine has a lead screw, the device can cut a thread with a continuous lead on the opposite ends of a bolt. For threading square or hexagon-head bolts from ⅜ to 1⅛ in. in diameter, a special feed and ejector can be furnished.

Heater, Rivet, Electric, Portable
United States Electric Co., New London, Conn.
"American Machinist," December 8, 1921



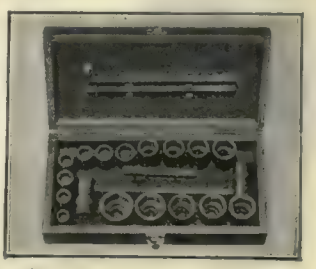
This machine can be used in shipyards, boiler and car works, and in any steel construction. It is built with two, four, or six electrodes for manual operation, or with an automatic movement for carrying the rivets between the electrodes and discharging them when heated. The automatic machine is illustrated. In the manually operated machine the electrodes are opened by pedals and closed by heavy coil springs. The machine is provided with casters, and with eyebolts for picking it up. It is furnished for 220, 440, or 550-volt, 60-cycle, single-phase alternating current, or may be specially constructed for other voltages and frequencies. It is 33 in. in height, 22 in. in length, and varies in width according to the number of electrodes.

Tool, Valve Facing, Adjustable
New Britain Tool and Manufacturing Co., New Britain, Conn.
"American Machinist," December 8, 1921



This device for resurfacing automobile engine valves will handle poppet valves of any commercial size of stem, and is designed for the use of individual automobile owners. The valve stem rests in a long V-groove and is held down by a flat steel shoe bearing on top of the stem, giving a three-point bearing. The valve is rotated by a crank handle. A screw is used to regulate the pressure on the stem. The removable cutting tool has an edge accurately ground to the original angle of the valve. The upper surface of the valve abuts against the screw at the left, by means of which the valve is fed to the cut.

Wrenches, Socket
Viking Specialty Co., 25 Bartlett St., Worcester, Mass.
"American Machinist," December 8, 1921



The wrenches are put up in sets of various combinations for automobile work. The general service set comprises a double-end ratchet wrench, sixteen sockets for hex-head screws and nuts, three extensions and a handle. The extensions and handle are fitted with ball frictions to prevent the sockets from slipping off. They are also put up in factory sets for shop assembling work, and in owners' sets to fit the bolts and nuts on any particular make of car.

Personals

GEORGE A. DAVIES, formerly with Wickes Bros., Saginaw, Mich., is now in Los Angeles. He is looking for good lines of machine tools to represent in the Western territory. At present he may be reached at 1031 S. Gramercy Drive.

P. R. HOOPES has severed his connection with the Automatic Machinery and Equipment Co., of Philadelphia, Pa., and is now associated with Lorenz & Lorenz, of Hartford, Conn., as mechanical engineer.

FRED MATHEWS, formerly vice-president of the Union Metal Products Co., has been appointed general railway sales representative of the A. O. Smith Corporation, manufacturer of pressed steel products, of Milwaukee, Wis.

O. B. ILES, general manager and treasurer of the International Machine Tool Co., Indianapolis, Ind., has been elected president of the Indianapolis Chamber of Commerce. Mr. Iles recently served as chairman of the committee on revision of the constitution of the National Machine Tool Builders' Association.

J. C. MILLER, manager of the Columbus, Ohio, division of the American Rolling Mill Co., has been transferred to Ashland, Ohio, as manager of the Ashland division. The Ashland Iron and Mining Co. was recently taken over by the American Rolling Mill Co. In a recent organization of the Ashland Coal and Iron Railway Co., also owned by the American Rolling Mill Co., Mr. Miller was elected first vice-president and general manager.

ELMER W. DE VED has been appointed manager of the stock department of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. De Ved has been with the company since 1897.

F. G. VALPEY, has recently accepted a position as sales manager of the Kenloc Manufacturing Co., Providence, R. I., manufacturers of special machinery and roll covering equipment. Mr. Valpey, was formerly sales manager of the Frank Mossberg Co., Attleboro, Mass.

JOHN F. TINSLEY, vice-president and general manager of the Crompton & Knowles Loom Works, Worcester, Mass., returned to this country recently after a two months' tour of the European countries. Mr. Tinsley, was accompanied by Irving H. Verry, also a vice-president of the Crompton & Knowles Co.

HENRY C. M. THOMSON was re-elected president of the American Hardware Co. at the annual meeting of the stockholders, held last week in New Britain, Conn.

CHARLES GLOVER has resigned as first vice-president of the American Hardware Co., New Britain, Conn., after serving that concern for forty years.

HOWARD S. HART has been elected to the board of directors of the New Britain Machine Co., New Britain, Conn. Mr. Hart is chairman of the board of the Hart & Cooley Manufacturing Co., and also of the Fafnir Bearing Co.

FRED W. HOWE, vice-president and sales manager of the Crompton & Knowles Loom Works, loom manufacturers of Providence, Worcester and Philadelphia, has booked passage for a three months' business trip in China and Japan.

CHARLES F. MARBLE, treasurer of the Curtis & Marble Machine Company, textile machinery manufacturers, Worcester, Mass., was recently elected a member of the executive committee of the Worcester branch of the National Metal Trades Association.

HENRY F. FAVOR, superintendent of the Providence, R. I., plant of the Crompton & Knowles Loom Works, sailed for China on March 16.

SYDNEY R. MASON, secretary of the Whitin Machine Works, Whitinsville, Mass., has sailed from San Francisco for a trip to Japan. Mr. Mason plans to return to this country in June.

J. H. WINDLE, sales agent of the Woonsocket Machine and Press Co., textile machinery manufacturers, of Woonsocket, R. I., has returned to this country after a six months' business trip in Japan and China.

W. C. MURPHY, treasurer of the Providence Mill Supply Co., Providence, R. I., returned to this country last week, after a six months' business trip in China and Japan.

Catalogs Wanted

Horace L. Smith & Co., Inc., Petersburg, Va., would be pleased to receive catalogs on wood-working machinery, lathes, shapers, drilling machines, power hacksaws and other metal-working machines for handling metal up to ½ in. thick. The company is building a plant for manufacturing farm machinery and implements. Catalogs should be sent to Horace L. Smith, Jr., 1009 So. Sycamore St., Petersburg, Va.

Lefax, Inc., 9th and Sansom Sts., Philadelphia, Pa., would like to receive catalogs on all kinds of engineering materials and equipment.

Book Reviews

Proceedings of the Twenty-fourth Annual Meeting of the American Society for Testing Materials. Published by the society. Paper $10; cloth $11, and half leather $12.50; 1,197 pages 6 x 9 in.

In addition to the annual address of the president, George S. Webster, and the reports of thirty-one standing committees on various materials, the book contains tentative standard specifications for ferrous and non-ferrous metals; cement, lime, gypsum and clay products. Also for miscellaneous materials such as preservative coatings, petroleum products, lubricants, road materials, coal, coke, insulating materials, shipping containers, rubber products, and textile materials. The twenty-four papers presented at the meeting are given in full, together with discussions by various members. These papers contain valuable information on the results of investigations by experts in the field of engineering materials.

A Course in Mechanical Drawing. By Louis Rouillion, B.S., A.M., director Mechanics Institute, New York City. Norman W. Henley Publishing Co., 2, 4 and 6 West 45th St., New York. Cloth, ninety-two 6⅝ x 7½-in. pages, thirty-five illustrations, $1.50 net.

This book is the result of a number of years' work in the instruction of evening classes and is intended for the use of students either at school or at home. The course covers a period of two school years of about twenty-four weeks each. As may be expected, the subjects are treated in an elementary way. Under the head of instructions a list of drawing materials and instruments required, their prices and use are given. The illustrations cover lettering, projection and isometric drawings all of which are accompanied by concise explanations and instructions. Under the head of notes on working drawings, directions are given for size of drawing sheets, titling, making sketches, laying out work, relation of views, sectioning, inking, dimensioning and blueprinting.

Report of the Fourteenth Annual Conference on Weights and Measures. Miscellaneous Paper No. 48, of the Bureau of Standards, Department of Commerce, S. W. Stratton, director. Complete copy of the paper may be purchased from Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 20 cents.

This publication, a verbatim report of the conference, contains addresses by the Secretary of Commerce, the president of the conference, and others. The papers and discussions deal with liquid-measuring devices, mine scales, railroad weighing of coal, and the metric system. Specifications and tolerances for liquid-measuring devices as amended are contained in the appendix.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore Atlantic City, N. J., April 25 and 26. Ernest E. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

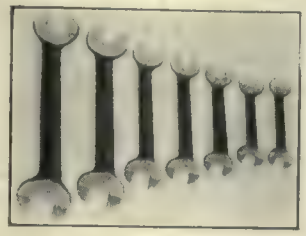
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Wrenches, Double-End

Mechanics Tool Co., Rockford, Ill.

"American Machinist," December 8, 1921



These wrenches are drop-forged from tool steel and oil tempered. The angle of the jaws makes it possible for the user to work in tight places and secure a firm hold on the nut or screw head without slipping. The opening in the larger end of each wrench is of the correct size to fit a U.S. standard nut, while the small end is made to fit an S.A.E. standard nut or bolt head. This feature makes the wrenches useful to the automobile mechanic. The set covers fourteen sizes of openings without duplication.

Vise, Hand, Pin

Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.

"American Machinist," December 8, 1921

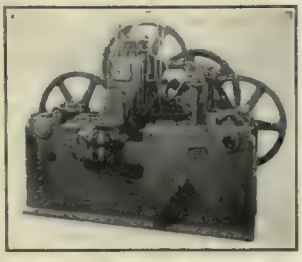


The upper part of this device consists of a flat lyre-shaped spring and two movable jaws, both held together by a frame fitted with the clamping screw and knurled adjusting screw. These screws are provided with hardened pin ends, which project into the jaws and prevent them from sliding. A straight or tapered piece or one of irregular section, is gripped rigidly along the entire length of the jaws when the clamping screw is tightened. Long pieces extend through the hollow handle and are centered by means of the knurled adjusting screw.

Nut Pressing Machine, Hot, Automatic

Acme Machinery Co., Cleveland, Ohio

"American Machinist," December 15, 1921



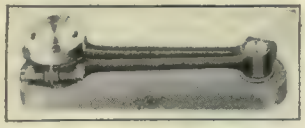
A heated bar of special section is used, and the first operation indents it on both sides. The cut-off slide advances, shears off the blank and carries it into the die box. Two punches advance from opposite sides and go part way through the blank, compressing it in the center. The short punch retreats, while the piercing punch advances and punches out the core; and the nut is then ejected from the die. The machine is equipped with an automatic relief device. The indenting tools are operated from the upper shaft while the punches and cut-off slide are operated by the shafts at the opposite ends of the machine. The machine is built in four sizes: ⅜ to ¾ in., ½ to 1 in., ¾ to 1¼ in. and 1 to 2 in. The number of strokes per minute varies from 70 or 75 for the smallest to 35 or 40 for the largest machine.

Babbitting Fixtures, Ford Automobile Engine

New Britain Tool and Manufacturing Co., New Britain, Conn.

"American Machinist," December 15, 1921





The two fixtures are intended for repairing the main bearings and connecting rods of Ford engines. The main bearing fixture, shown in the upper view, can be set in place on the inverted cylinder block and positioned by the studs in the camshaft bearings. Crossbars hold the arbor central with relation to the bearings. The under-sized arbor allows stock for finish reaming the bearings. The connecting-rod fixture, shown in the lower view, consists of a flat base block of cast iron with two vertical studs and collars. The wristpin end of the rod, placed over the smaller stud, brings the crank end in proper relation to the larger stud, which is the babbitting arbor. The upper collar, pushed over the projecting end of the stud, bears against the rod. Recesses in the collars take care of the fillets. The bearing is finished when taken from the fixture.

Reamer, Line, Ford Crankshaft Bearing

New Britain Tool and Manufacturing Co., New Britain, Conn.

"American Machinist," December 8, 1921



This line reamer is especially constructed for reaming the crankshaft bearings of Ford automobile engines, and employs the same principle of expansible diameters and pilot blades as other reamers made by the concern. The blades are ground to a true circle for a distance equal to about one-third of their length from the entering end. This diameter follows the hole left by the babbitting fixture in the newly babbitted bearings. The range of expansion is from normal to about ⅛ in. oversize.

Drilling and Tapping Machine, Upright, "Electro-Magnetic"

W. Gaterman Manufacturing Co., Manitowoc, Wis.

"American Machinist," December 15, 1921

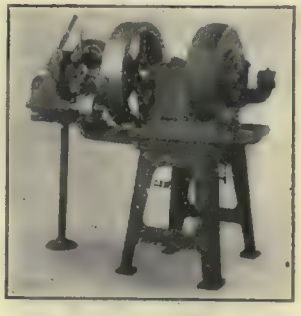


By this machine hand tapping can be automatically imitated. The tap is held in a floating spindle, which is driven through two coil springs, to avoid shocks and jars on the tap. The spindle automatically reverses for one-sixth of a turn when too great a torque is transmitted, and immediately takes up its original speed, which varies from 300 to 2,000 r.p.m., according to the size of the tap. The reversing action is accomplished by the spring balance in the drive and by electro-magnets. The machine can be furnished in different sizes, the No. 4 size having a range up to ⅜ in. Either belted or motor drive can be employed. The machine can be set so as to run the tap to a certain depth and automatically return it.

Swaging Machine, Roller-Cage Type

Langelier Manufacturing Co., Arlington, Cranston, R. I.

"American Machinist," December 15, 1921

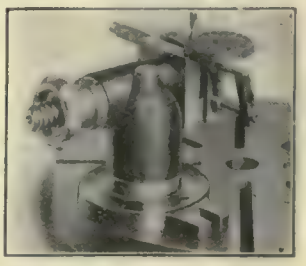


In this machine the rolls are carried in a floating ring or cage instead of being fixed in the head, and are made of a tempered carbon steel. A similar roll is carried in the outer end of each hammer block. A roll feeding attachment is mounted on the machine, to withdraw the work with a slow, even motion and give straightness and uniformity of reduction. The attachment has a capacity for stock from 0.375 to 1.313 in. in diameter. It is movable to and from the head through a distance of 5 in. by means of a screw underneath the baseplate. The flywheel is held to the spindle by a two-bolt clamping hub, closing over a key.

Vise, Combination, Drill Jig, Milling Fixture, Swiveling, Victor

W. B. U. Tool Co., 104 Harding St., Worcester, Mass.

"American Machinist," December 15, 1921



The device holds the work on a drilling machine, shaper, grinding machine or milling machine. The vise can be swung to change the position, both horizontal and vertical swivels being graduated to 360 deg. The fixture can be used on the bench when filing small dies and punches; or as a drill jig, for which it is equipped with a bushing plate having eighteen holes varying from 7/64 to ⅜ in. in diameter. It can be set to drill round stock from ⅛ to 1 in. in diameter, and square or flat stock from ¼ to 1 in. thick. A V-groove is provided for the gripping of cylindrical work. The jaws have an opening of 2⅜ in., and can be furnished either soft or hardened.

The Weekly Price Guide

THIS WEEK'S MARKET

THE quotation of $1.40@$1.45 for structural shapes, plates and mild steel bars has very nearly disappeared from the market; leaving $1.50 per 100 lb. as the official Pittsburgh mill price. The gradual stiffening of the mill price has not as yet been reflected in warehouse quotations. Chicago warehouses, however, quote floor plates at $4.98 as against $3.40 per 100 lb.; but announce reductions of 25c. per 100 lb. on cold finished steel products. Pig iron, No. 2 foundry, shows slight upward tendency in price.

Electrolytic copper is quoted in New York warehouses at 13½c. as against 13⅜c.; tin at 29⅝c. reduced from 30¼, and lead at 5⅛c. as compared with 5c. per lb., one week ago. Zinc market steadier with quotations unchanged. Chinese antimony quoted in Chicago at an advance of ¼c. per lb. Solder quoted in New York at drop of 1c. per lb. and babbitt metal also slightly reduced owing to recent declines in the tin market. Prices on old metals (non-ferrous) down about ¼c. per lb. in Chicago.

Linseed oil is quoted at 82c.@83c. as against 88c. in New York; at 90c. reduced from 97c. per gal. in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	21.54
NEW YORK Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.16
BIRMINGHAM	
No. 2 Foundry	15.78
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	21.34
Virginia No. 2	27.74
Basic	21.00
Grey Forge	20.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	21.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	19.00
Basic	18.00
Bessemer	19.50

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	9.0	5.5	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	16.0	7.5	2.5
Denver	8.0	6.0	5.0
New Orleans	9.0	6.0	4.0
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	5.0	4.5	3.75
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
	BUTT WELD				
1 to 3	71	58½	⅜ to 1¼	44½	29½
	LAP WELD				
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
	BUTT WELD, EXTRA STRONG, PLAIN ENDS				
1 to 1¼	69	57½	⅜ to 1¼	44½	30½
2 to 3	70	58½			
	LAP WELD, EXTRA STRONG, PLAIN ENDS				
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
¼	7.15		11@12
5/16 to ½	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	13.50		
Tin, 5-ton lots, New York	29.62½		
Lead (up to carlots), St. Louis, 4.75; New York	5.10		
Zinc (up to carlots), St. Louis, 5.02½; New York	5.37½		
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire (carlots)	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	8.75	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	41.00	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.00	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.50	3.65
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.25	4.75
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.82@.83	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$3.50
Coke, prompt foundry, Connellsville	per net ton		4.75

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60-10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., East Hampton—M. H. Hill Brass Co.—one No. 1½ geared bliss straight side double action cam drawing press.

Fla., Orlando—L. D. Wylly—portable conveyor to load sand into cars, equipped with gas engine to run on tracks.

Ga., Rome—The Rome Stove & Range Co., J. M. Berry, Pres.—complete foundry equipment including tumblers, grinding wheels, lathe, cupola, etc.

Ia., Dubuque—The Adams Co., 205 6th St.—one sheet steel brake for 10 gauge.

Ill., Chicago—The Illinois Copper & Iron Mfg. Co. 1530 West Grand Ave.—spinning lathe, 26 in. swing, (used).

Ill., Chicago—The U. & J. Carburetor Co., 310 West Van Buren St.—No. 4 and No. 1 Foster hand screw machines; ¾ in. Gridley automatic screw machine; No. 2 high speed riveting hammer; punch presses equivalent in size to No. 1 Watch up to Loshbaugh Jordan No. 4; engine lathes; heavy duty type single spindle drills; No. 4 Bardons & Oliver turret lathes; Size 0 Brown & Sharpe automatic screw machines; Avery single and multiple spindle drills; heavy and high speed presses; disk grinder; wheel press; small shapers; Leland Gifford four spindle high speed drill presses; Cincinnati milling machines; 16 in. Arbor presses; Rockford single spindle heavy duty press, air compressors.

Ill., Chicago—The Vulcanizing Material Mfg. Co., 1423 West Van Buren St.—one electric knife, ac. 220 volt.

Kan., Hutchinson—E. C. White, 28 East Bigger St.—one Grays sheet metal cutter for 16 gage with deep throat for odd shaped cutting. Could use machine for heavier cutting.

Kan., Waverly—E. Hoffer—machinery for job printing shop.

Ky., Jeff—The Equitable Lumber & Supply Co., L. Picklesimer, Pres.—woodworking machinery, electric pumps, also carload lots of Southern pine lumber for stock.

Ky., Mayville—The Ohio Valley Pulley Wks., Inc., Central Ave., Main and Chester Sts., E. Gardner, Purch. Agt.—round broaches, all sizes, (used), address Box 288.

La., Baton Rouge—The Capital Feed Mfg. Co., P. O. Box 117, L. S. Doherty, Mgr.—feed mixing machinery, hay cutting machinery, coolers and other feed mill equipment.

Mass., Northampton — McCallum Silk Hosiery Co., 277 Dwight St.—new machinery for hosiery mill at Phila., Pa.

Mich., Bay City—The Garber Machine Co., 1004 North Water St., F. Garber, Mgr. —internal cylinder grinder, similar to Whitney, (new or used), also a screw arbor press about 24 in. between jaws, with a capacity of about 20 ton.

Mich., Benton Harbor—Baker-Vawter Co., D. F. Haddord, Purch. Agt.—one 4 roll angle straightener.

Minn., Deerwood—E. Groth—woodworking machinery.

Minn., Minneapolis—The Despatch Mfg. Co., 120 1st Ave., N., electric ovens, A. E. Grapp, Purch. Agt.—punch presses; angle iron shears; high speed power hack saw; serpentine slitting machine.

Minn., Minneapolis — The Minneapolis Crushed Stone Co., 529 Metropolitan Bank Bldg., A. D. Honr, Pres.—machinery for washing, drying and crushing plant.

Minn., Minneapolis—The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave. S.—power laundry equipment for proposed laundry.

Minn., Minneapolis—The Standard Material Co., Plymouth Bldg., L. L. Quist, Secy.—machinery equipment for washing and screening plant, daily capacity 1,500 ton; probably a pumping plant equipped with modern screens and belt conveyors, drag line, locomotive cranes.

Miss., Gulfport—The Daily Herald, G. L. Money, Purch. Agt.—7 column press.

Mo., Carthage—The Juvenile Shoe Corp. —shoe making machinery for proposed factory on Main St., Pierce City.

Mo., Jefferson City — The Automatic Water Pump Mfg. Co., 236 A East High St., B. A. Divers, Secy. and Asst. Treas.—receiving bids for machine tools, including lathes, drill presses, brass and aluminum furnaces, woodworking machinery, castings, etc.

Mo., Joplin—The Amer. Sign Wks., 117 North Main St., R. Barker, Purch. Agt.—power band saw.

Mo., Joplin—The Forsythe Mfg. Co., 319 East 3rd St., manufacturer of automobile bodies, A. H. Forsythe, Purch. Agt.—lathe.

Mo., Joplin—The Joplin Radio Shop, 422½ Main St., J. Graber, Mgr.—drill press.

Mo., Joplin—The Modern Trunk Factory, 115 West 5th St., E. Weeks, Mgr.—rip saw and planing machinery.

Mo., Joplin—The Moss Rowe Furniture Co., 115 West 9th St., W. L. Moss, Purch. Agt.—woodworking machinery, band saw and lathe.

Mo., Kansas City—The North Mehornay Warehouse, 1019 Charlott St.—band saw.

Mo., St. Louis—F. E. Palmer Supply Co., Ry. Exch. Bldg.—one air compressor.

Neb., Lincoln—The Capitol City Tire Co., 235 South 11th St., A. L. Brown, Purch. Agt.—Weaver tin tools.

Neb., Lincoln—A. E. Gesse, 404 South 11th St.—one 20 in. lathe.

Neb., Lincoln—S. Knisley, 508 North 19th St.—sole stitching machine, prefer a No. 12 Landis or a Champion curved awl machine.

Neb., Lincoln—The Weston Tire Co., 241 South 11th St., P. P. Weston, Purch. Agt. —electric tire mold.

Neb., Lincoln—The Wolff Cycle Co., 1933 O St., motor-cycle repair shop, W. Wolff, Purch. Agt.—small lathe and drill press, electrically driven.

N. J., Gloucester—The Gloucester Sanitary Milk Co.—conveyors and large capacity automatic bottle filling machines.

N. Y., Albany—F. A. West Co., Inc., 5 Main St., D. D. Blewer, Purch. Agt.—printing presses and book binding machinery and equipment.

N. Y., Bath—D. M. White, Savona Rd.—five or 10 gal. capacity ice cream freezing machinery and 6 tubs and cans.

N. Y., Binghamton—Broome County Supervisors, J. R. Jewell, Purch. Agt.—lathe, miller, drill press, compressor and tank for county repair shop.

N. Y., Binghamton—E. T. Gaige, State St.—machine tools for motor repair including internal grinders for cylinders.

N. Y., Binghamton—H. Monroe, 192 Water St.—one motor driven air compressor with tank also a small lathe suitable to mount wire brushes for rubber scarifying, (used).

N. Y., Buffalo—D. Calabuse, 655 Ellicott St.—sheet metal roller and folder, both 30 in., also edging machine and power punch.

N. Y., Buffalo—The Stewart Motor Corp., 93 Dewey Ave.—power punch press or bar cutter, capacity ¾ in. by 5 in.

N. Y., Canandaigua—The Tobin Sash Co. is to change its gasoline power to electrical power and is open for quotations and literature on electric power.

N. Y., Elmira—The Federal Radio Laboratories Inc., C. E. Johnson, 403 West 1st St., Purch. Agt.—machine tools and equipment for the manufacture of small metal electrical parts, also electrical testing equipment.

N. Y., Endicott—The Magic City Ice Co. —ice manufacturing machinery for new plant now in course of construction.

N. Y., Gasport—The Wickwire Limestone Co.—rock handling, crushing, screening and storing machinery and equipment also special equipment for the manufacture of agricultural lime.

N. Y., Gloversville—A. J. Bachman Co., Inc.—four or five 3½ in. knitting machines.

N. Y., Holland Patent—The Bd. Educ., D. B. Lisle, Purch. Agt.—machine tool equipment for vocational department.

N. Y., Long Island City—The Wappler Electric Co., Harris Ave., A. Verhols, Purch. Agt.—one disc grinder, 18 in.-24 in. disc.

N. Y., Nassau—Prior & Williams—adjustable iron rip saw table.

N. Y., Rochester—W. A. Gengenbach, 29 Strathallen Park—several Cleveland automatics Model A No. 1, spindle drive, ⅜-½ in.-½-¾ in.-¾-1½ in. (used but must be 95% new).

N. Y., Rochester—The Rochester Y. M. C. A., H. P. Lansdale, Genl. Secy.—machine and woodworking tools, also shop tools and equipment for vocational classes.

N. Y., Smithboro—Ockerman & Withey, B. J. Withey, Purch. Agt.—woodworking tools and equipment.

N. Y., Warsaw—G. Scott—complete small jobbers printing outfit with machinery.

N. Y., Watertown—O. B. Cornwell, 422 East Flower Ave.—one iron adjustable saw table with carrier.

N. Y., Watertown—Kops Bros. Inc., Water St., A. Fried, Purch. Agt.—shafting, hangers and special machinery for the manufacture of corsets (individually motor driven).

N. Y., Waverly—R. Perry—machine tools for motor repairing.

N. C., Asheville—The Biltmore Industries —one 36 in. Goddard Burr picker mixing machine.

N. C., Old Fort—The Old Fort Mills, D. W. Adams, Mgr. and Pres.—machinery for 8,000 spindle yarn mill, (new or used).

N. C., Pinetops—The Pinetops Milling Co., P. O. Box 65, J. H. Saunders, Mgr.—$11,000 to $12,000 worth of roller mill and meal mill machinery, also crude oil engine, (new or used).

O., Akron—H. L. Sutton, 1049 Diagonal Rd.—one 10 x 10 air compressor with tank; two moulding machines; one 10 ton crane, 20 to 30 ft. span; one electri c hoist.

O., Cincinnati—The Clifton Pratt Co., 1224 West 8th St., A. E. Clifton, Purch. Agt.—one No. 12½ or 13 Toledo punch press or No. 39 Bliss with 1½ in. stroke.

O., Cincinnati—The Economy Mchy. Co., 428-30 East Pearl St.—J. H. Flynn, Sr., Purch. Agt.—caterpillar tractor shovel with ¾ cu.yd. bucket; complete revolving 9 x 16 in. jaw crusher.

O., Columbus—The Columbus Builders Supply Co., Front and Long Sts., W. F. Kern, Secy.—sand and gravel handling machinery and coal handling equipment.

O., Toledo—J. Myers, 1958 Glendale Ave.—linotype machine for job printing plant.

O., Youngstown—The Bd. Educ., 16 West Wood St.—quantity of various machine tools and equipment for Rayen High School manual training division.

Pa., Brookville—The Bd. Educ., Boro of Corsica and Union Twp., c/o S. C. Beeman, Secy., R. D. No. 4, Brookville—equipment for vocational department and mechanical engineering shops.

Pa., Chester—The Chester Dairy Supply Co., 9th and Hyatt Sts.—equipment for metal working shop.

Pa., Corry—The Corry-Jamestown Mfg. Corp., manufacturer metal furniture—Bliss press and Stiles punching press 4 in., (used).

Pa., Monongahela—The Coshocton Iron Wks., Axleton St.—one 10 ton, one 5 ton and two 2 ton cranes.

Pa., Phila.—The Alva Carpet & Rug Co., Kinsey and Hedge Sts.—looms, throwing frames, twisters, shafting, belting, machine shop equipment, etc.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., L. Weber, Purch. Agt.—quantity of full fashion automatic hosiery machines, dryers, throwers, twisters, belting, shafting, etc.

Pa., Phila.—The Dept. Pub. Heath, Room 584. City Hall—W. S. Twining, Dir.—one milling machine, geared head high power.

Pa., Phila.—The United Tapestry Mills, Erie Ave. and Amber St.—looms and weaving machinery for new factory.

Pa., Pittsburgh—J. F. Casey Co., Union Arcade—one 5 ton and four 2 ton cranes.

Pa., Pittsburgh—H. J. Heinz Co., 1062 Main St., pickles, preserves, etc.—lathe, drill press, grinder and hack saw.

Pa., Rural Valley—The Advance Newspaper, H. C. Peters, Purch. Agt.—linograph machine.

Pa., Wellsboro—L. B. Marvin—machinery and equipment for proposed planing mill on Tioga St.

S. C., Andrews—The Andrews Mfg. Co.—machinery for the manufacture of slack barrel staves, headings, etc.

S. C., Charleston—The Woodstock Mfg. Co., Center St., J. F. Williams, Pres. and Mgr.—complete line of machinery for the manufacture of fibre cases, containers, etc.

Tenn., Chattanooga — The Davenport Hosiery Mills, 906 Georgia Ave.—hosiery winding machine, Altemus make preferred.

Tex., Beaumont—The Brooks Supply Co., 799 Franklin St.—additional machinery for machine shops.

Tex., Gainesville—C. H. Leonard—printing press and folder.

Tex., San Angelo—C. B. Metcalfe & Son—complete machinery for the manufacture of brooms.

Va., Norfolk—The Atlantic Iron Wks., Water St., F. H. Masi, Pres. and Mgr.—machine shop equipment.

W. Va., Weston—The Independent Publishing Co., R. A. Hall, Purch. Agt.—one 8 x 10 job press and mitering machine.

W. Va., Wheeling—The Construction Dept., 51 16th St.—one vertical electric blue print machine, 220 volts, 60 cycle, a.c. preferably a Pease style J. P.

W. Va., Wheeling—The Wheeling Steel Corp., Wheeling Steel Corp. Bldg.—shapers, milling machines and lathes.

Wis., Cudahy—L. Odry, 1211 Packard Ave.—gas storage tanks and pump.

Wis., Fond-du-Lac—The Hurcum Fuel Co., 35 West 1st St., will open bids about April 10 for machinery, equipment, concrete, etc., for four storage elevators, about 1,000 ton capacity.

Wis., Kenosha—The W. J. Pine Machine Co.—one 30 in. x 8 ft. and one 24 in. x 6 ft. planer; five engine lathes, one 12 in. x 4 ft., two 14 in. x 6 ft., one 16 in. x 6 ft. and one 20 in. x 8 ft.; one 24 in. power feed drill; one drill grinder; one 2 in. hard screw machine; one No. 2 milling machine; one 24 in. shaper and one Universal grinding machine.

Wis., Ladysmith—F. Zachek—blacksmith shop equipment.

Wis., Madison—G. Nelson, 117 West Johnson St.—automobile repair equipment.

Wis., Madison—The Pennsylvania Oil Co., 731 East Washington St.—tanks, pumps, vats, etc.

Wis., Madison—J. Werth, 542 State St.—shoe repair machinery.

Wis., Manitowoc—A. M. Richter Sons Co., South 8th and Madison Sts.—storage tanks, fermenting tanks, generators, presses, etc., for proposed cider vinegar plant.

Wis., Merrill—C. Kuehl—one 30 in. to 32 in. band saw; 4 in. to 6 in. planer; medium size shaper; sander; glue pots.

Wis., Milwaukee—The Blochowiak Dairy Co., 1364 4th Ave.—additional dairy equipment including separators and churns, power driven.

Wis., Milwaukee—J. J. Czaja, 901 Holton St.—ice making and refrigeration machinery.

Wis., Milwaukee—The Delta Mfg. Co., 911 5th St.—small milling machine.

Wis., Milwaukee—J. Hack, 1217 12th St.—one swedging machine for beading purposes.

Wis., Milwaukee—The Milwaukee Forge & Machine Co., 340 Oklahoma Ave., V. F. Braun, Purch. Agt.—trimming press.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St.—special dairy plant equipment.

Wis., Milwaukee—M. Thiel, 680 Russell Ave.—Universal woodworker equipped with motor.

Wis., Sparta—F. J. Domke—drill press, air compressor, jacks, gas storage tank and pump.

Wis., Spooner—The Spooner Milling Co., J. W. Sleight, Purch. Agt.—flour and feed grinding machinery, motor power.

Ont., Allenford—J. Temple—equipment for garage and auto repair shop.

Ont, Guelph—The Gilson Mfg. Ltd., R. Dawson, Purch. Agt.—punch press with capacity of from 45 to 50 ton pressure with approximately a 5 in. stroke.

Ont., London—G. Little of Robinson Little Co., 343 Richmond St.—artificial ice making equipment.

Ont., Montreal—G. Thompson, 2280 St. Hubert St.—small lathe and about $500 worth of tools and equipment for garage and repair shop.

Ont., Parry Sound—C. W. Thompson & Son—equipment for garage and auto repair shop.

Ont., Walkerville—R. H. Cunningham & Co. of Walkerville, has secured a building at 351 Glebe St., London, and will install equipment for the manufacture of electrical furnaces.

Ont., West Lorne—The Seaman Kent Co.—special woodworking machinery for the manufacture of oak and hardwood flooring.

Ont., West Toronto—A. R. Williams Machine Co., 64 Front St.—air compressors and general shop machinery.

Ont., Wiarton—The Kastner Lumber Co.—equipment for saw mills.

Metal Working Shops

Cal., Oakland—S. S. Herrick, foot of Adeline St., has awarded the contract for the construction of a 1 story machine shop on 18th and Campbell Sts. Estimated cost, $5,000.

Cal., Stockton—Cohen & Coiren, 45 South Eldorado St., will build an auto repair shop on North Sutter St. Estimated cost, $6,000.

Conn., East Hartford—(Hartford P. O.)—T. Shannon, Russell St., South Manchester, has awarded the contract for the construction of a 1 story, 80 x 100 ft. garage and service station on Connecticut Blvd. here. Estimated cost, $40,000. Noted March 9.

Conn., Georgetown—Gilbert & Bennett Mfg. Co. has awarded the contract for the construction of a 3 story, 52 x 150 ft. addition to its wire goods factory. Estimated cost, $75,000.

Ia., Des Moines—J. A. Klemm Mfg. Co., 1322 Grand Ave, manufacturers of auto supplies, will soon award the contract for the construction of a 1 story, 66 x 84 ft. factory and garage on Grand Ave. Estimated cost, $10,000. F. A. Harris, 3815 4th St., Archt.

Ill., Chicago—The Dwyer Equipment Co., 9 West Kinzie St., has awarded the contract for the construction of a 1 story, 60 x 125 ft. factory at 4534 North Ave. for the manufacture of ventilating fans. Estimated cost, $15,000.

Ill., Chicago—The Hudson Motor Car Co., 25th St. and Michigan Blvd., has awarded the contract for the construction of a 3 story, 100 x 300 ft. office, sales and service station on 22nd St. and Michigan Blvd. Estimated cost, $350,000. Noted March 2.

Ill., Chicago—R. Johnstone, c/o O. Van Gunten, Archt., 800 North Clark St., has awarded the contract for the construction of a 2 story, 42 x 82 ft. auto repair shop on Clark and Howard Sts. Estimated cost, $20,000.

Ill., Chicago—A. Mikele, 1311 Washburn Ave., has awarded the contract for the construction of a 2 story, 72 x 107 ft. garage on Taylor and Garibaldi Aves. Estimated cost, $50,000. Noted March 2.

Ill., Dixon—E. R. Watts is having plans prepared for the construction of a 1 story, 54 x 150 ft. garage. Estimated cost, $40,000. Private plans.

Ill., Glen Ellyn—O. Smiller, 520 Crescent Blvd., is having plans prepared for the construction of a 2 story, 60 x 150 ft. garage on Crescent St. Estimated cost, $40,000. Private plans.

Ill., Harrisburg—O. O. Cummins Garage & Repair Shop is having plans prepared for the construction of a 1 story, 80 x 160 ft. garage. Estimated cost, $40,000. Private plans.

Mass., Worcester—The Amer. Steel & Wire Co., Grove St., has had plans prepared for the construction of a 1 story, 60 x 100 ft. galvanizing plant. C. E. Goodrich, c/o owner, Engr.

Mo., Jefferson City—The Automatic Water Pump Mfg. Co., 236 East High St., is having plans prepared for the construction of six or seven 1 story factory buildings. Estimated cost, $100,000. B. F. Schuetz, Pres. Private plans.

Mo., St. Louis—The Famous Barr Dry Goods Co., 6th and Olive Sts., plans to build a 6 story garage on 7th and Elm Sts. Estimated cost, $400,000. W. Levy, 625 Locust St., Archt.

Mo., St. Louis—The Johnson Automobile Co., 3667 Olive St., is having plans prepared for the construction of a 2 story, 50 x 52 ft. garage at 3667 Olive St. Estimated cost, $45,000. W. L. Johnson, Pres. W. P. McMahon, Title Guaranty Bldg., Archt.

Mo., St. Louis—The Levering Investment Co., Pierce Bldg., is having plans prepared for the construction of a 3 story, 100 x 150 ft. office, warehouse and shop on 12th and Gratiot Sts. Estimated cost, $150,000. J. R. Whittshore, Pres. P. J. Bradshaw, International Life Bldg., Archt.

Mo., St. Louis—The United Ry., c/o R. Wells, receiver, 39th and Park Sts., has awarded the contract for the construction of a 2 story, 50 x 72 ft. and 1 story, 80 x 208 ft. office, repair shop and warehouse, on Taylor St. and Bway. Estimated cost, $100,000. Noted Oct. 13.

N. J., Camden—Lackey & Hettle, Archts., 5 Hudson St., will soon receive bids for the construction of a 1 story, 150 x 160 x 175 ft. sales and service station on Federal and Newton Sts. for the Studebaker Sales Co., c/o architects. Estimated cost, $65,000.

N. Y., Binghamton—E. T. Gaige, 235 Vestal Ave., has awarded the contract for the construction of a machine shop, repair and storage building on State St. Estimated cost, $40,000.

N. Y., Binghamton—M. and H. Horrowitz have purchased a site on Hawley and Collier Sts., and plan to build a 1 story, 47x75 ft. machine shop and car storage plant. Estimated cost, between $12,000 and $15,000.

N. Y., Waverly—R. Perry plans to build a 2 story machine repair and car storage plant on Elizabeth St. Estimated cost, between $15,000 and $18,000.

O., Cleveland—C. W. Fessenden, 2371 East 4th St., has awarded the contract for the construction of a 1 story, 50 x 141 ft. garage at 2892 East 116th St. Estimated cost, $50,000. Noted March 9.

O., Cleveland—McKinney Steel Co., 802 Perry Payne Bldg., has awarded the contract for the construction of a 1 story sintering plant on Dille Rd. Estimated cost, $75,000.

O., Cleveland—The Parker Electric Co., 1839 Euclid Ave., has awarded the contract for the construction of a 2 story 61x80 ft. office and factory at 4502 Prospect Ave. Estimated cost, $40,000.

Pa., Butler—The Butler Buick Co., Main St., will soon award the contract for the construction of a 3 story, 33 x 110 ft. garage and sales station on Main St. Estimated cost, $150,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts. Noted Feb. 23.

Pa., Phila.—J. J. Gilman, 1126 Girard Ave., is having plans prepared for the construction of a 2 story 25x178 ft. garage at 3634 North Broad St. Estimated cost, $12,000. J. S. Landes, 200 West Broad St., Souderstown, Pa., Archt.

Pa., Phila.—L. T. Olb, c/o H. T. Saunders, 38 South 16th St., will build a 1 story, 124x151x249 ft. garage on Watts St. and Ridge Ave. Estimated cost, $75,000.

Wis., Cudahy—J. Paulu, Archt., St. Francis, (Milwaukee P. O.), is receiving bids for the construction of a 1 story, 60x120 ft. garage on Packard Ave., for L. Odry, 1211 Packard Ave. Estimated cost, $40,000.

Wis., Madison—G. Nelson, 117 West Johnson St., is receiving bids for the construction of a 1 story, 110x152 ft. garage on Johnson St. Estimated cost, $40,000. A. E. Small, Ellsworth Bldg., Archt.

Wis., Merrill—The Merrill Buick Co. will soon award the contract for the construction of a 1 story, 50x122 ft. garage on Main St. Estimated cost, $40,000. Private plans. Noted March 7.

Ont., Leaside—The Durant Motors of Canada, 1011 Royal Bank Bldg., Toronto, plans to build a 3 story, 80x600 ft. auto factory here. Estimated cost, $400,000. Private plans.

Ont., Parry Sound—C. W. Thompson & Son plan to build garage and auto repair shop to replace the one destroyed by fire. Estimated cost, $25,000.

General Manufacturing

Cal., Benicia—G. W. Hume Co., 311 California St., San Francisco, plans to construct additional cannery buildings to its plant, here.

Cal., Colusa—The California Prune & Apricot Growers Assn., San Antonio St., San Jose, plans to build a 1½ story packing plant on Cooper's 2nd Extension here. Estimated cost, $125,000. Private plans.

Cal., Fresno—The Fresno Macaroni Mfg. Co., 450 1st St., has awarded the contract for the construction of a 1 story macaroni factory on Block 27. Estimated cost, $12,900.

Cal., Sacramento—The California Candy Co., c/o A. W. Norris, contractor, Peoples Bank Bldg., has awarded the contract for the construction of a 3 story, 40 x 160 ft. candy factory on R St. Estimated cost, $60,000.

Conn., Hartford—Buck & Sheldon, Inc., Archts. and Engrs., 60 Prospect St., will soon award the contract for the construction of a 4 story, 80 x 100 ft. and 80 x 400 ft. brush factory on Windsor Ave. for the Fuller Brush Co., Asylum St. Estimated cost, $400,000. Noted Sept. 8.

Conn., New Haven—The Natl. Filter & Cloth Weaving Co., 57 Hope St., Brooklyn, N. Y., is having plans prepared for the construction of a 1 story factory on Dixwell Ave. and Mather St., here. Estimated cost, $50,000. W. O. Tate, Bronxville, N. Y., Archt. and Engr.

Fla., Millidale (Jacksonville P. O.)—The Putnam Lumber Co. plans to build saw mill to replace the one destroyed by fire. Estimated loss, $140,000.

Ill., Chicago—Rechsteiner Embroidery Co., 4743 Bernard Ave., has awarded the contract for the construction of a 2 story, 125 x 125 ft. factory on Argyle and Crawford Sts. Estimated cost, $65,000.

Ill., East St. Louis—The Cain Hurley Lumber Co., 1406 Chemical Bldg., St. Louis, Mo., is having plans prepared for the construction of a 1 and 2 story lumber plant to replace the one destroyed by fire. Estimated cost, $45,000. E. M. Cain, Pres. Private plans.

Ill., East St. Louis—The Highland Ice Cream Co., plans to build a 1 story, 26 x 30-57 x 58-45 x 105 ft. ice cream factory on St. Clair and 20th Sts. Estimated cost, $75,000. Private plans.

Ill., Mattoon—The Mattoon Creamery Co. has awarded the contract for the construction of a 1 story, 50 x 130 ft. dairy and creamery. Estimated cost, $25,000. P. Bertram, Mgr.

Ill., Pinckneyville—The Atlas Powder Co. plans to build a 1 and 2 story powder plant. Estimated cost, $200,000. W. A. Smith, Pinckneyville, Engr.

Mass., East Douglas—The Hayward Woolen Co., North Main St., has awarded the contract for the construction of a 2 story, 48 x 126 ft. and 68 x 150 ft. dye house and picker building. Estimated cost, $100,000.

Mass., Marlboro—The Dennison Mfg. Co., Framingham, has awarded the contract for the construction of a 4 story, 70 x 300 ft. factory for the manufacture of paper products. Estimated cost, $400,000.

Mich., Detroit—The Eastern Market Sausage Co., 2472 Riopelle St., is having plans prepared for the construction of a 2 story, 26 x 48 x 105 ft. manufacturing plant on Windor St. Estimated cost, $38,000. Hazleton, Clark & Co., 1359 Book Bldg., Archts.

Mich., Detroit—The Mills Baking Co., 5165 4th St., will soon award the contract for the construction of a 3 story, 70 x 140 ft. bakery plant on Merrick Ave. Estimated cost, $40,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Archts. Noted March 2.

Minn., Minneapolis—The Fulton Bag & Cotton Mills, 643 Security Bldg., V. C. Douglas, representative, is having plans prepared for the construction of a 3 story factory and administration building on East Hennepin Ave. and Taft St. Estimated cost, $300,000. Kees & Colburn, 245 Plymouth Bldg., Archts.

Minn., Minneapolis—The Norwegian Lutheran Deaconess Hospital, 2312 15th Ave., S., is having plans prepared for the construction of a 2 story, 45 x 75 ft. power house, laundry and dormitory, on 15th Ave., S. and 24th St. Estimated cost, $45,000. F. Paulson, Supt. Magney & Tusler, 126 South 9th St., Archts.

Minn., St. Paul—The Roe-James Glass Co., 109 East 9th St., has purchased a site on 8th St. near Minnesota St. and plans to build a 4 story, 50 x 100 ft. factory and office. Estimated cost, $150,000. Will probably be built in 1923. Architect not announced.

Mo., Hannibal—The Robinson Bros. Paint Co., 201 South 5th St., has awarded the contract for the construction of a 1 story factory and warehouse. Estimated cost, $40,000. Noted Feb. 23.

Mo., Jefferson City—Ruwart Bros. Mfg. Co., 100 Monroe St., plans to build a 1 and 2 story addition to its saddling factory. Estimated cost, $25,000. Architect not selected.

Mo., Marshall — W. C. Fisher and T. Thorp plan to build a 1 story dairy and ice cream factory. Estimated cost, $25,000. Architect not selected.

Mo., St. Louis—The American Syrup & Preserving Co., Ruskin Ave., is having plans prepared for the construction of a 2 story, 60 x 225 ft. factory and warehouse at 5111 Penrose Ave. Estimated cost, $25,000. E. J. Lawler, 404 Sawyer Bldg., Archt.

Mo., St. Louis—M. Bass & Sons, 5175 Easton Ave., are having plans prepared for the construction of a 1 story, 50 x 125 ft. laundry at 5100 Easton Ave. Estimated cost, $35,000. Private plans.

Mo., Pierce City—The Juvenile Shoe Corp., Carthage, plans to build a shoe factory on Main St. here. Estimated cost, $10,000.

N. J., Blackwood—The Cambria Hosiery Mills, A and Cambria Sts., Phila., will soon receive bids for the construction of a 1 story 45 x 200 ft. hosiery mill here. Estimated cost, $35,000. M. W. Easby, 1804 Chestnut St., Phila., Engr.

N. J., Gloucester—The Gloucester Sanitary Milk Co. is having plans prepared for the construction of a 2 story, 40 x 50 ft. bottling plant. Estimated cost, $25,000. Lockey & Hettle, 5 Hudson St., Camden, Archts.

N. J., Montclair—The Montclair Rink & Ice Co., c/o G. Backhoff, Archt. and Engr., 9 Clinton St., Newark, is having sketches made for the construction of a 1 story, 125 x 250 ft ice plant and skating rink. Estimated cost, $200,000.

N. Y., Buffalo—The Westinghouse Electric & Mfg. Co., Ellicott Sq., plans to build a 1 story, 125 x 128 ft. factory and warehouse on Milton St. Estimated cost, $17,000.

N. Y., Gasport—The Wickwire Limestone Co. plans to build agricultural lime plant to replace the one which was recently destroyed by fire. Estimated loss, $50,000.

N. Y., Little Falls—The Barnet Leather Co., Inc., 598 East Mill St., plans to build a 3 story addition to its leather manufacturing plant. Estimated cost, $200,000. Address E. L. White, Genl. Mgr.

N. Y., Long Island City—The Ronzonni Macaroni Co., 612 Jackson Ave., plans to build a 5 story addition to its factory on Jackson Ave. Architect not selected.

N. Y., New York—The Gotham Silk Hosiery Co., 516 5th Ave., plans to build a factory on 33rd St. and 1st Ave. Estimated cost, $250,000.

O., Akron—The Brown Graves Co., 65 East Miller Ave., manufacturers of sash doors and interior finishing, plans to build a three story factory on Miller Ave. to replace the one destroyed by fire. Estimated cost, $200,000.

O., Cleveland—The Natl. Carpet Cleaning & Rug Mfg. Co., 1971 West 50th St., has awarded the contract for the construction of a 2 story, 40 x 123 ft. factory on West 50th St. and Lorain Ave. Estimated cost, $50,000. Noted July 7.

O., Cleveland—The Pearl State Road Market Co., c/o C. Kamp, Pres., Euclid and 46th Sts., is having plans prepared for the construction of a 3 story, 200 x 300 ft. market and commercial building, including a refrigeration plant, on Pearl and State Rds. Estimated cost, $250,000. A. E. Keller, 1298 Carlyon Rd., Archt.

O., Cleveland—The Saginaw Bay Lumber Co., c/o C. H. Prescott, 2106 West 3rd St., has purchased a site on Harvard Ave. and East 42d St., and plans to build a 1 and 2 story lumber yard, consisting of six buildings, mill sheds, office and garage. Estimated cost, $150,000. Private plans.

O., Youngstown—The Ward Baking Co., Southern Blvd. and St. Marys St., New York City, is having plans prepared for the construction of a 4 story, 71 x 168 ft. bakery on Manoning Ave., here. Estimated cost, $150,000. C. B. Comstock, 110 West 40th St., New York City, Archt. and Engr.

Pa., New Cumberland—The New Cumberland Box Co., Bridge and 2nd Sts., is having plans prepared for the construction of a 2 story, 60 x 90 ft. factory on Bridge St. Estimated cost, $50,000.

Pa., Phila.—The Bisler Box Co., 245 North 6th St., is having plans prepared for the construction of a 6 story, 112 x 190 ft. box factory on 10th and Spring Garden Sts. Estimated cost, $250,000. Private plans.

Pa., Phila.—The Cambria Silk Hosiery Co., A and Cambria Sts., has awarded the contract for the construction of a 2 story, 53 x 53 x 119 x 184 ft. hosiery mill on Louden and Mascher Sts.

Pa., Phila.—The Curtis Publishing Co., Independence Sq., has awarded the contract for the construction of a 3 story, 145 x 215 ft printing plant (1st unit), on 7th and Sansom Sts. Noted Feb. 2.

Wis., Eau Claire—E. Peterman, 312 Gibson St., has had plans prepared for the construction of a 1 story, 50 x 105 ft. dry cleaning plant on Chippewa Rd. Estimated cost, $50,000. Private plans.

Wis., Sheboygan—The Sheboygan Gas Co., 618 North 8th St., has awarded the contract for the construction of a 1 story, 42 x 146 ft. gas plant on 8th St. Estimated cost $50,000. Noted March 2.

Wis., Wausau—The Levenhagen Dairy Co., 612 3rd St., has awarded the contract for the construction of a 3 story, 75 x 95 ft. dairy on Washington St. Estimated cost, $45,000.

Wis., Mayville—The Peerless Traveling Goods Co. plans to build a 2 and 3 story, 50 x 90 ft. factory on Main St. for the manufacture of leather goods. Estimated cost, $50,000. Architect not selected.

Ont., Deer Lake—Tudhope & Ludgate, Parry Sound, plans to build a saw mill here. Estimated cost, $25,000.

Que., Hull—The Canadian Automobile Corp., 199 Sparks St., Ottawa, plans to build a rubber tire factory on Lamontagne Park, here. Estimated cost, $50,000. C. A. Fox, 394 Harvard St., Montreal, Archt.

Ont., Toronto—Barber Ellis, Ltd., 71 Wellington St., W., has awarded the contract for the construction of a 3 story, stationery plant on Adelaide St., W. Estimated cost, $150,000.

Ont., Welland—The Empire Cotton Co. plans to build an addition to its factory. Estimated cost, $250,000. Architect not selected.

Que, Wrightville—The Easton Chemical Co., Ltd., 197 Sparks St., Ottawa, Ont., plans to build a factory here. Estimated cost, $10,000. Architect not selected.

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Keeping Track of Sales and Distributors

Cards and Forms for Recording Sales and Shipping Data in Shop and Office—Records to Show Activities of Agents

By A. H. TUECHTER
President, the Cincinnati-Bickford Tool Co.

IN THESE days when sales are harder to make than they have been for years, an efficient system of sales records is a big help. This is particularly true of a company like ours where most of the sales are made through dealers. By this I don't mean that such records

SALES ORDER	CUSTOMER'S ORDER		
No.	No.	Machine No.	Charged
Date	Date	Lot No.	Shipped
Sold to			
Address			
Ship Direct			

Price			Terms			
Sales for Month			Date Promise to Ship on			
Total						
Sales to 1st Month			Shipped Via			
Total to Date			Remarks			

FIG. 1. SALES ORDER RECORD CARD

are not equally valuable to the manufacturer who sells direct, but rather that the builder who distributes his product through dealers must have adequate means of knowing exactly what each dealer is producing in the way of sales in the various territories which he may happen to represent.

Our system of sales and distribution records is not perfect, and probably would not be applicable exactly as it stands to any other company; but there are ideas and methods connected with it that may prove of some benefit to others. Some of the incongruous elements that will appear later are due to the fact that certain forms and methods have been retained from each of the two companies which were united in 1909 to form the Cincinnati-Bickford Tool Co. The differences in the two systems, in such cases, were too small to warrant the time and expense necessary to change them, and they have consequently been allowed to run along ever since the beginnings of the present company.

Upon receipt of an order, the 4 x 6-in. card form, shown in Fig. 1, is filled out. If the order is for a radial drilling machine a white card is used. Upright drilling machine orders are entered on blue cards and orders for repair parts on salmon-colored cards. Our sales order number is put in the upper left-hand box prefixed by "R" for radial or "U" for upright as the circumstances demand. The dealer's order number goes in the next box. Dates of each are, of course, put in the indicated places.

In the third box are the machine and lot numbers. We use letters to indicate the various sizes of uprights and numbers and letters for the radials, 4A indicating a 4-ft. universal machine, and 4D, a 4-ft. plain, for instance. The requisite dates are inserted in the right-hand box at the proper times.

Just below the boxes a description of the machine is entered. After "Sold to" comes the name of the dealer who placed the order and then his address. Shipping directions show the final purchaser's name and address to which the machine is to be shipped. His order number is also put down if it is known.

Opposite "Price," we put the list price, the discount and the net price to the dealer. Under the net price to the dealer goes the amount of sales in the current month. Addition gives the total sales for the month including the present sale. Below this total again is the amount of the sales for the current year up to the first of the

Date..... Order No.....

THE CINCINNATI BICKFORD TOOL CO.
Cincinnati, Ohio

MARKS

FOR.....
ORDER No.....
WEIGHTS: Gross..... Net.....

FIG. 2. SHOP TICKET

current month, and below that the total including the present sale.

The entry opposite "Terms" depends on the contract with the dealer or customer. In the main the terms are uniform, but it might be necessary to have some differ-

ence, as for example between domestic and foreign connections.

The following six rectangles for dates are to indicate the time when shipment is promised or to note the date when shipment is requested by the customer. The other two items are self-explanatory.

On the back of the card, which is unruled, we place in the upper left-hand corner the amount in dollars of the total unfilled orders on our books. From that figure we deduct any shipments or cancellations that may occur before the face of the card is filled out. When an order is received and the face of the card is filled out, the amount of the order is added to the net total on the back and we then have the new amount of unfilled orders. This amount we transfer to the back of the next unfilled card which becomes the live-card in the front of the file waiting for the next order.

As soon as shipment is made the card we have filled out completely is shifted to the back of the file, where it remains until the end of the month. Then the records are transcribed to the proper places and the card goes to the permanent file under its order number.

From the form of Fig. 1 the shop ticket shown in Fig. 2 is made out. This form is yellow for regular upright drilling machines, and is made out in triplicate, one copy going to the shop foreman, one to the cost department and the third to the shipping department. The order number is the same as the sales order number. In the upper space is a description of the machine. The lower space has the name and address of the customer and the serial number of the machine.

After "For" appears the dealer's name and below it his order number. Weights are put on in the shop.

A similar form on blue paper is made out in quadruplicate for special upright drilling machines and for accessories and attachments. The fourth copy goes to the routing department so that the special features can be controlled.

For radials and repair parts a salmon-colored form is used. This, too, is made out in quadruplicate.

The lot record of Fig. 3 is a 9½ x 12-in. form used both for temporary and permanent record. When it is decided to put a new lot of machines through the shop a pencil record is made out on this form. The lot number is put at the head of "Lot No." column and below it are entered as they come in, the sales orders under which the various machines are shipped. The machine numbers are all put down in column five and assigned to the various order numbers as the circumstances direct.

Column two is filled out by judgment based on the trend of sales as shown in the record. For instance, in a given lot of uprights, six might be built with tapping attachments, the balance without. In the next column any special requirements of the customer are entered from the sales order.

In columns six and seven are put the name and address of the dealer placing the order, except in the case of a direct sale. Shipping marks and destination are taken from Fig. 1 and the date shipped is put in when the machine leaves the factory. When the whole lot has been shipped the lot record as it finally stands is copied in ink for permanent record.

The forms described so far may be called primary records. From them various secondary records are made out to bring out more clearly certain data. For instance, the 4 x 6-in. card of Fig. 4 is made out with amounts of orders and shipments in dollars for each agency office. There is also a similar card showing the total business of the dealer in all his offices. The card shown in Fig. 5 gives the annual record of the dealer in dollars.

Annual dealer records in numbers of machines instead of in dollars are shown on the 5 x 8-in. cards of Figs. 6 and 7, Fig. 6 showing uprights and Fig. 7 showing radials.

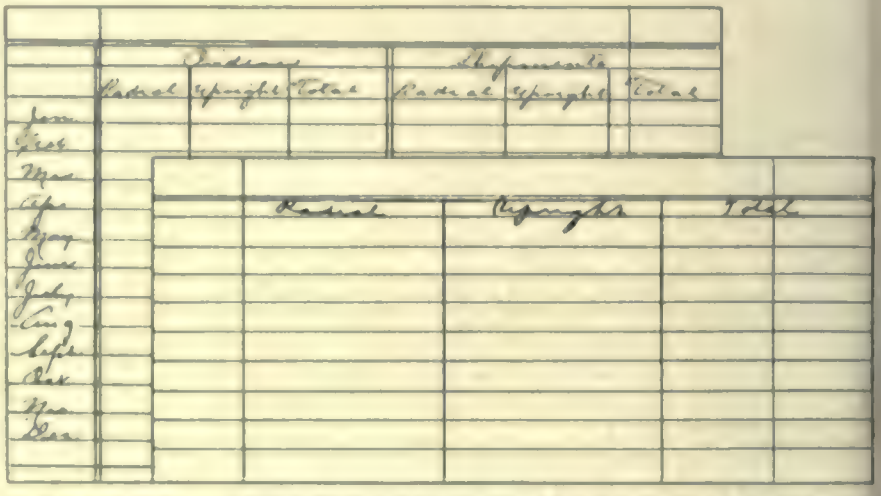


FIG. 4 (ABOVE). AGENCY RECORD IN DOLLARS BY MONTHS. FIG. 5 (BELOW). AGENCY RECORD IN DOLLARS BY YEARS

Another useful card file is made up from the primary

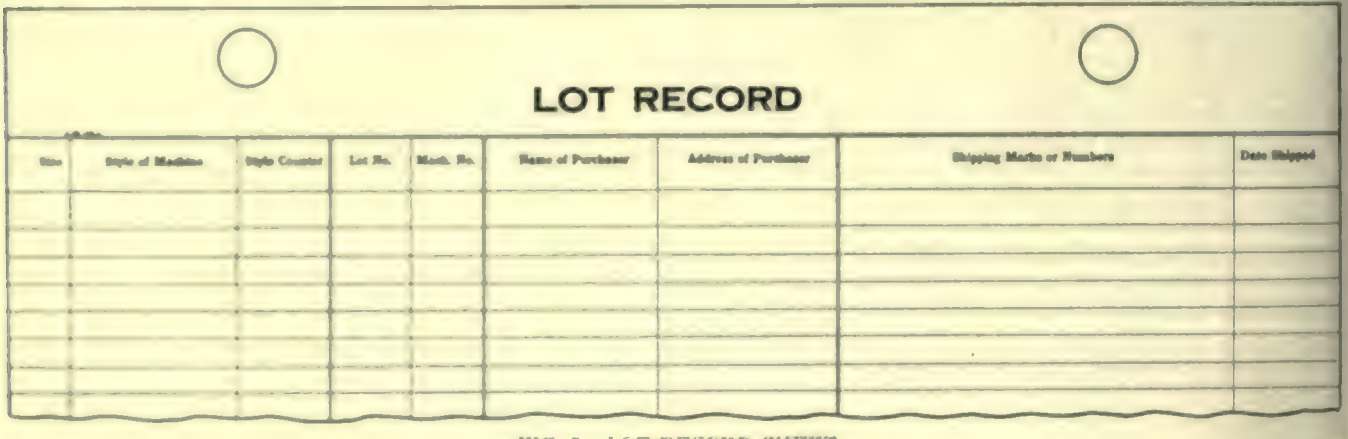


FIG. 3. LOT RECORD SHEET

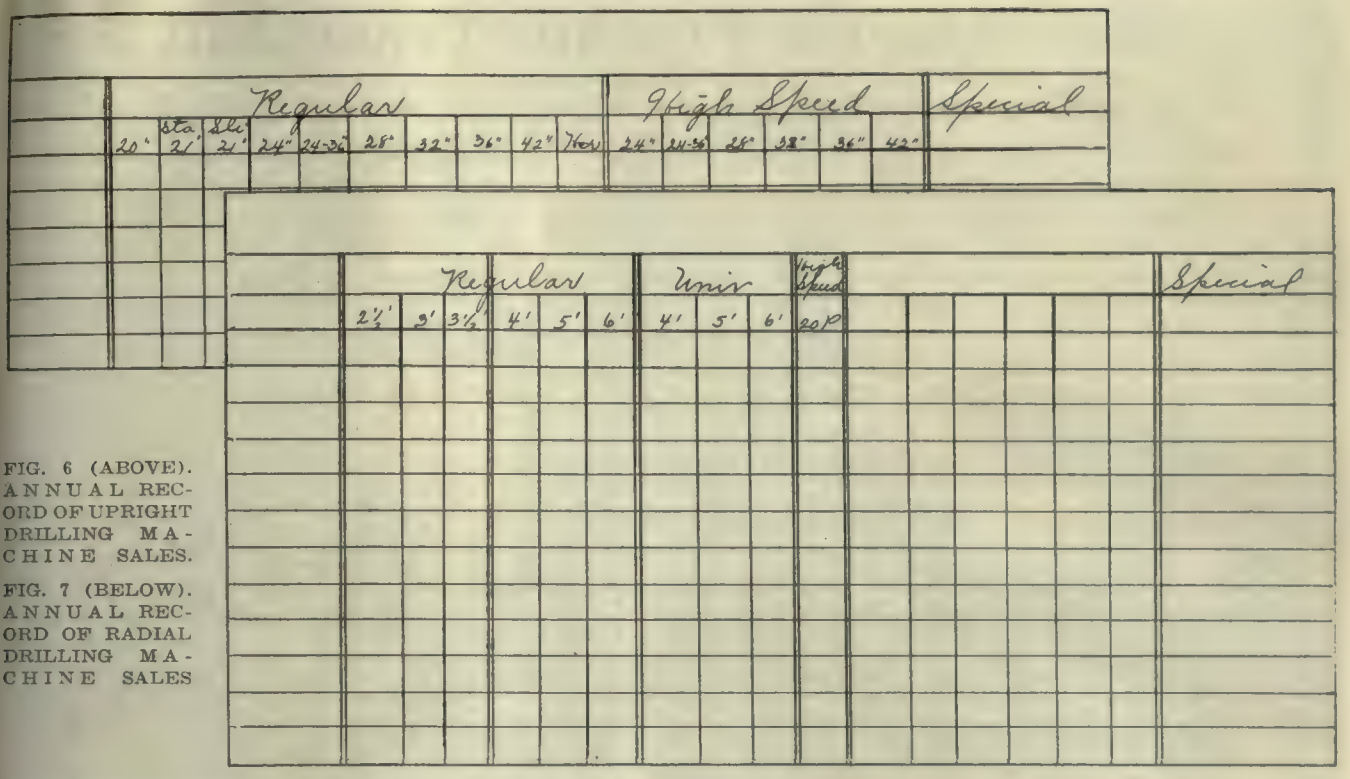


FIG. 6 (ABOVE). ANNUAL RECORD OF UPRIGHT DRILLING MACHINE SALES.

FIG. 7 (BELOW). ANNUAL RECORD OF RADIAL DRILLING MACHINE SALES

records on the tabbed 3 x 5-in. cards of the kind shown in Fig. 8. The cards are filled in at the end of each month and show the machines sold to a firm during the month. As will be seen from the illustration the

TOWN | STATE

FIRM

STYLE MACHINE	No.	BY WHOM SOLD	DATE

E 36308-T

FIG. 8. SALES RECORD FOR GEOGRAPHICAL FILING

cards are arranged to be filed geographically. They are useful in keeping a check on what the dealer is selling in any given district. They are also valuable in locating the machine number when a customer sends in for repair parts without giving the number in his correspondence.

Finally there is the agency record made out on a 12 x 19-in. sheet with the headings shown in Fig. 9. Two separate records are kept on this form, the first of which is a sort of day book in which a record of each machine sold by the agency is entered as the shipment is made. From this sheet it is easy to watch the volume of business turned in by each agency office.

A more interesting comparative record is obtained by rearranging the items on the big sheet so that the orders are grouped by cities. It is immediately evident from this record whether an agent is making good in one city or falling down in another, for his sales over a period of years are all there so that they may easily be compared. If more tools are being sold in a small city than in a big one there must be some reason, or if $100,000 worth of machines were sold in this city in 1920 and only $5,000 worth in 1921, it may be worth while to find out why.

On the whole we find these records invaluable in our business. In case of dispute over territory or results, with any agent or between two agents, we have the records at hand and can show the facts in the case at a few minutes' notice.

AGENCY RECORD

NAME LOCATION YEAR

MONTH	CUSTOMER	ADDRESS	Quantity	DESCRIPTION	UPRIGHTS	RADIALS	SPECIALS	TOTALS

FIG. 9. AGENCY SALES RECORD SHEET

Machining the Franklin Crankshaft

Machines and Methods Used in Turning the Center Bearings and Crankpins on a Seven-Bearing Crankshaft—Drilling for Lubrication—Balancing

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

AS THE Franklin motor uses a seven-bearing crankshaft, it presents somewhat more of a machining problem than some other designs of shafts. After the forging, heat-treating and straightening operations, the crankshafts are turned on Wickes lathes as seen in Figs. 1, 2 and 3. The first illustration shows the turning of the three central bearings, the shaft being driven from both ends and the three bearings turned at once, together with the facing of the cheeks on the sides. This can, perhaps, be better understood by referring to Fig. 2 which shows the lathe with the crankshaft removed and gives a good idea of the driving heads *A* and *B*, and their clamps for holding the shafts in position. The turning tools are held in the substantial holders shown at *C*, while the side or web facing tools are shown at *D*. The web facing cutters are set at a suitable angle to make adjustments for width on easy matter. The lathe is provided with a spacing bar *E*, which allows the carriage to be easily located for different bearings on the shaft. In Fig. 3 are shown the second and fifth crankpins being turned in a similar lathe, and also the holding fixture used, in considerable detail, as well as the diameter stop at *A*. Drilling the oil holes, which form such an important part of a forced feed lubrication system, is accomplished in the battery of three machines, shown in Fig. 4. These machines have special drilling heads, and fixtures which hold the crankshaft at the desired angle and in the proper position for



FIG. 1. TURNING THE THREE CENTER BEARINGS.



FIG. 2. LATHE EMPTIED TO SHOW TOOLS



FIG. 3. TURNING THE CRANKPIN



FIG. 5. DRILLING THE END FLANGE

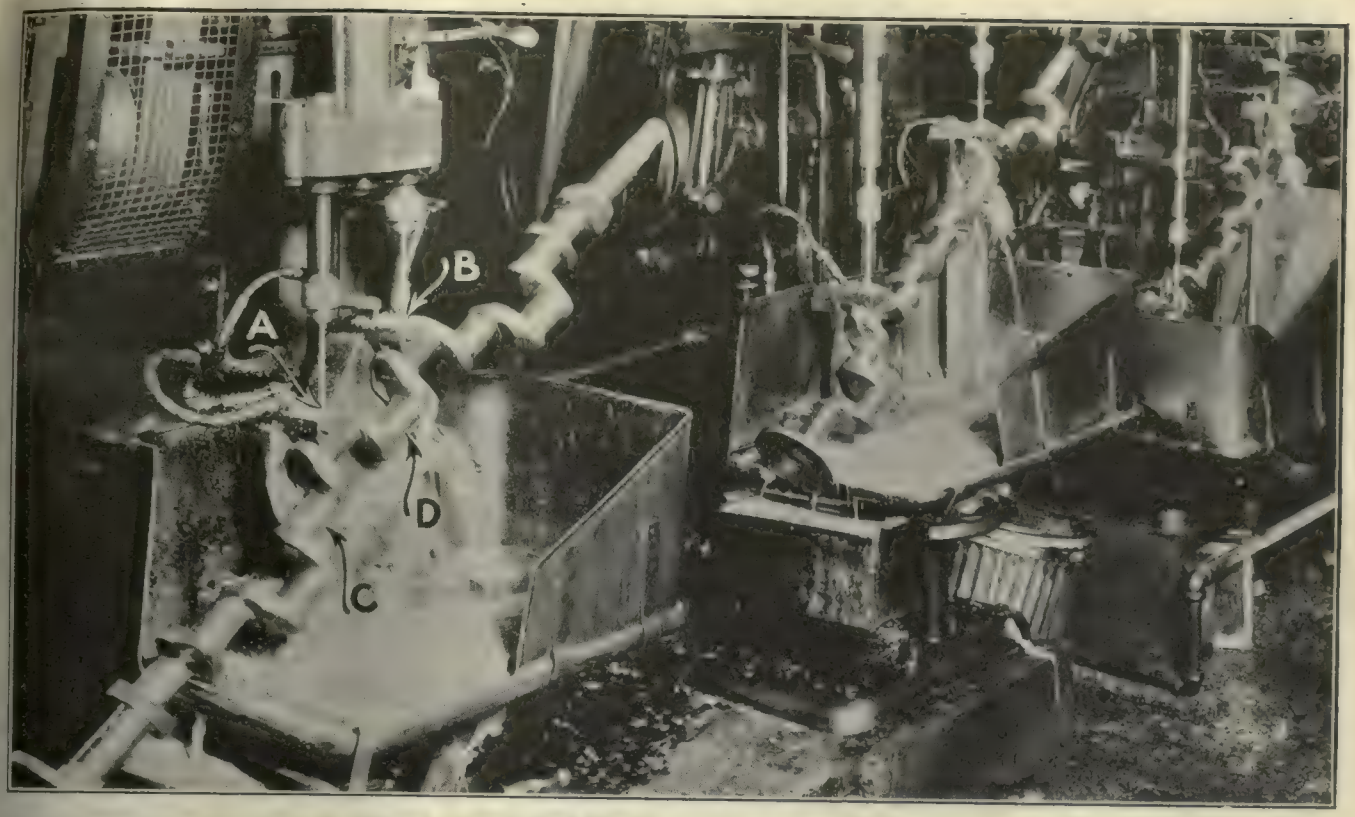


FIG. 4. DRILLING THE OIL DUCTS IN THE BEARINGS

the different holes. Referring to the machine at the left, the different lengths of drilling spindles can be seen, although both are driven from a single head. The guiding bushings *A* and *B* start the drills through the third and fourth crankpins and guide them through the crankpins, through the webs and out through the main bearings of *C* and *D*. As the oil pump forces lubricant through every main bearing, these holes must guide the oil direct to the adjoining crankpin to insure positive lubrication at all times.

In a similar way the second machine drills the holes in the second and fifth crank pins, and through the web to the adjoining bearings. In the last operation (on the third machine) the crankshaft has been reversed so that the holes are drilled in the opposite direction to that in crankpins one and six. Thus six crankpins and six of the seven main bearings are drilled. The end bearing receives oil direct from the pump, but does not feed any other bearings. This method of drilling the crankshaft is very simple and satisfactory and has facilitated production.

Drilling the flange at the end of the crankshaft is

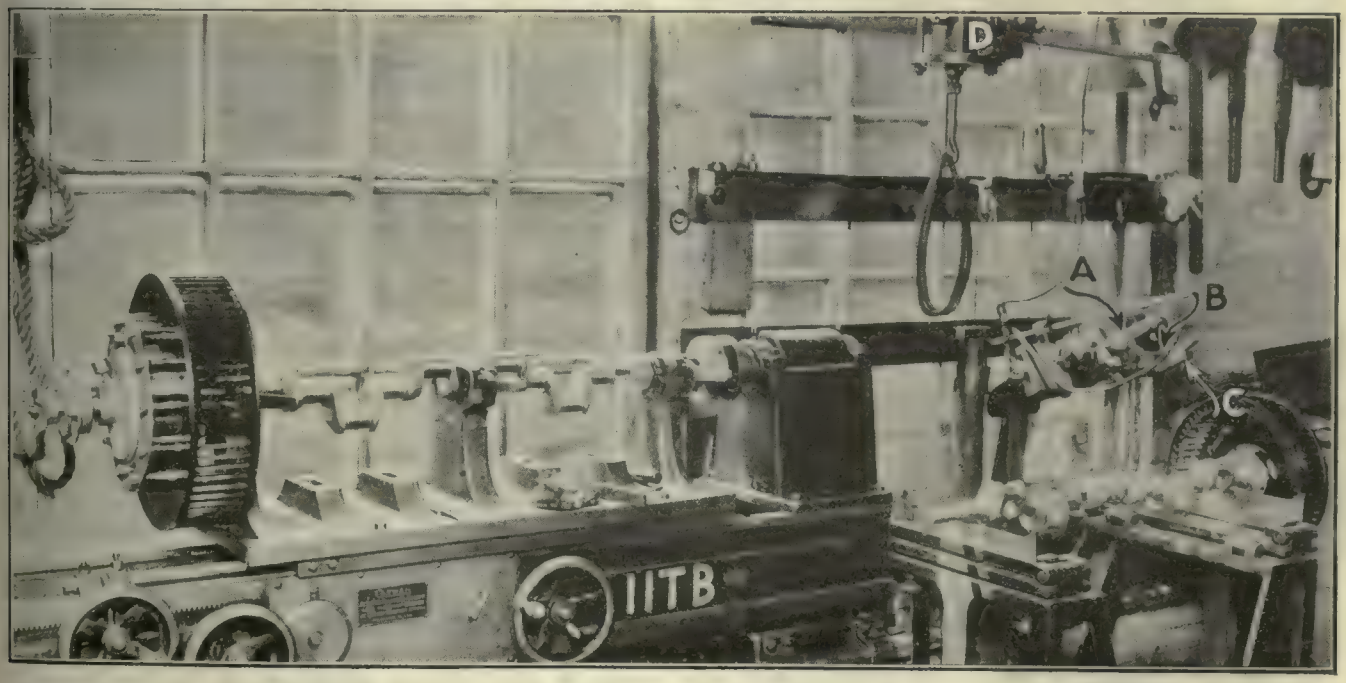


FIG. 6. STATIC AND DYNAMIC BALANCING OF COMPLETE CRANKSHAFT

accomplished with the simple fixture shown in Fig. 5, which consists of a special drilling head having six spindles and a box form of fixture with an enclosing cover. The lower end of the crankshaft rests on a center at *A*, while the upper end is positioned by a suitable centering device, as well as the steadying fork *B*. The six holes in the flange are drilled in one operation.

Balancing the Complete Crankshaft

After the crankshaft has been finish-ground, the Sirocco fan, which is one of the main features of the Franklin cooling system, is mounted on it, together with the couplings which go back to the first universal joint. The whole unit is then given both a standing and a running balance, as shown in Fig. 6. The standing balance is given on the stationary balancing ways shown at the right, these ways being adjustable in both directions so as to make it easily possible to keep them level and lined up at all times. Conveniently mounted over the balancing ways, is the portable electric drill, shown at *A*, by which excess metal can readily be drilled out from any point, should this be found necessary in the static balance. The drill itself can be seen at *B*, and the supporting arm, or "old man" at *C*.

Then the whole unit is carefully lifted by means of the hoist at *D*, and swung over into the Carwen dynamic balancing machine shown at the left. Here the running balance is carefully tested, and when satisfactory the crankshaft is ready to be assembled with the other motor parts. It will be noted that the balancing is done with the universal spider, grease cup, and other small parts in place, so as to insure satisfactory service in the completed motor.

Amortization of Plant Facilities

By Page Golsan
Ford, Bacon & Davis, Inc.

I have just read with a great deal of interest Mr. Figsby's article, "Amortization of Plant Facilities," on page 482 of American Machinist. Mr. Figsby has very clearly expressed the situation. However, I wish to call your attention to the subhead of his article reading as follows:

> "Regulations 62 of the Treasury Department Give Manufacturers Another Chance to File Claim—Substantial Relief Available Under Little-Understood Provision."

I am of the opinion that this subheading was placed over his article by your proofreader, because it is not in accordance with the facts which the author has set forth. The Treasury Department has no authority to give manufacturers any "chances" to file claims. The permission to file a claim and the dates of limitations therefor are specifically set forth in the Revenue Act quoted at length in the article. The law states that the claim shall be allowed "if claim therefor was made at the time of filing return for the taxable year 1918, 1919, 1920, or 1921." The Treasury Department has permitted the filing of 1921 returns in tentative form on March 15, 1922, subject to final revision by June 15, 1922. A literal interpretation of the law, therefore, makes it mandatory that some sort of amortization claim shall have been filed at least by March 15, 1922, and if this has not been done I cannot see how another "chance" is available.

The law specifically states that revisions of these claims may be made at any time "before March 3, 1924." This is clearly set out by Mr. Figsby in his last paragraph. However, the manufacturer is in a position to revise only if "he has come under the wire" by having filed some form of claim in accordance with the law's dates of limitation. I take this occasion to write you along these lines that your heading be not misleading.

You further state that the question of amortization is little understood. I must differ with you on this account for in our work along these lines we have found a very high understanding of the subject by the officers of companies entitled to these considerations. In general, the only question has been as to the method of determining value-in-use. This value, as Mr. Figsby outlines, is a definite engineering problem and subject to solution only from that viewpoint. You would not call in an accountant to tell you how much a power plant was worth. That is an engineer's business. On the other hand, the setting up of tax returns and the determination of the capital amounts to be amortized are the accountant's business. In preparaing the final claim for amortization both have their particular field.

Which Kind of Ton?

The American Institute of Weights and Measures has issued the following letter addressed to its members and friends:

"In the English system of weights and measures the 'ton' has two values: The 'Long ton' of 2,240 lb. and the 'Short' ton of 2,000 pounds.

"The critics of the English system make the most of this element of uncertainty as to tons. We have found, also, that there is a rather prevalent feeling among manufacturers and others that this duality of 'tons' is fairly open to criticism as objectionable.

"However, it is apparent that the real basis of the objection is not so much that we have two kinds of tons, as that they have not been easily designated or distinguished in common usage.

"In order to meet this situation in as simple a manner as possible and to minimize misunderstandings in the use of these two values of the 'ton,' the institute, subject to the majority opinion of its members, desires to advocate and work for the general adoption and use of the following definitions and designations:

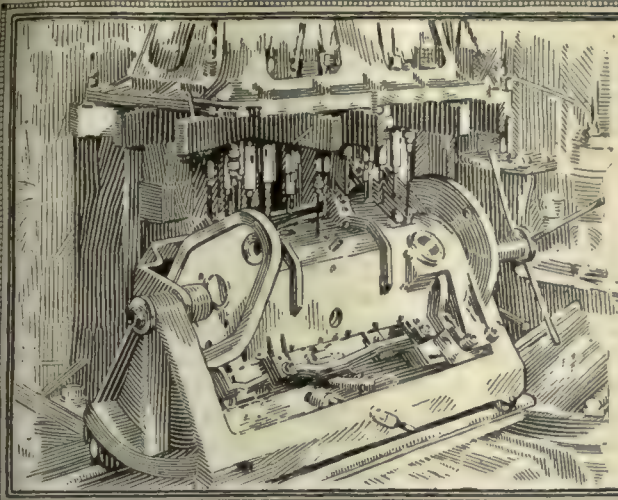
(1) A weight of 2,000 lb. shall be known without any further designation as a 'ton.'

If circumstances demand it, the ton of 2,000 lb. can be designated as 'S-ton,' this being especially recommended in trade with Great Britain and its colonies.

(2) A weight of 2,240 lb. shall ALWAYS be designated as 'L-ton' (Pronounced Ell-ton).

"If in sympathy with our aims, you or your company approve of this move, kindly return to us in the enclosed stamped envelope the lower part of this sheet signed and dated; if you do not approve kindly state your objections."

All men in the machinery industry should consider themselves as the friends of the American Institute of Weights and Measures, or at any rate should consider the institute as their friend on account of its valuable work in fighting against the compulsory adoption of the metric system. We suggest that this problem be given immediate consideration and that the approval or disapproval of those engaged in the machinery industry be sent to C. C. Stutz, secretary of the institute, 115 Broadway, New York.



Tool Engineering

By
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Attachments for Turret Lathes—Factors Influencing the Design—Duplex Attachment for Turret—Forming and Generating Tools for Taper Turning and Boring

TAPERED and curved surfaces, both external and internal, often require special attachments in order to machine them accurately. Inside forms when of small diameter are often machined by the use of tapered or formed reamers; large diameters by a flat tool of correct shape, or by means of a generating attachment so arranged as to cause a single-point tool to travel along the taper or the form of the contour. Outside contours may be produced by a formed tool on the turret or cross-slide, or by means of an attachment using a single-point tool so arranged that it will follow a specified form and reproduce this on the work. Attachments for producing angular and curved surfaces are applied in many kinds of manufacturing work to engine or turret lathes. They are often used in combination with other tools for turning, boring and facing; and they may be operated simultaneously or separately, according to the requirements of the work.

Tapered and curved surfaces do not always require a generating action to produce them within the required limits of accuracy. For small work, forming tools of various kinds or tapered reamers can often be used with success on certain kinds of materials, such as cast iron, brass and steel of low carbon content. Alloy steels containing nickel and chromium usually require a generating attachment with a single-point tool, because the "wirey" character of the material does not lend itself readily to formed cuts with wide-faced tools.

Conditions occasionally require more tools than the turret faces will permit; and in such cases it may be necessary to design a special attachment to be applied to the face of the turret, such that two or more tools can be used by indexing the attachment. This procedure is not necessary very often, but there are times when a special attachment can be used to advantage and thus avoid the necessity of an extra operation. Several important points in connection with the design of attachments are given in the following paragraphs.

1. The material to be cut determines to some extent whether a generating tool is required or whether simple forming tools can be used. This matter should, therefore, be considered first, as it is a determining factor in the design. The accuracy required is also important; and for a rough job requiring only a clearance cut, a simple forming tool can sometimes be used even if the material is unsuited to this kind of cutting.

2. The number of pieces to be machined is important, as on small production it hardly pays to design a generating attachment unless great accuracy is required. Therefore, the simple formed tool will often be found more economical on low-production work.

3. The type of machine used should be selected with care, always considering any other operations which can be performed in the same setting. When a form cut is to be made that cannot be combined with any other operations, it is often possible to adapt an old engine lathe, applying to it the necessary forming or generating attachment. Attention should always be paid to the type of machine most suitable, in order to combine operations and obtain maximum efficiency in this way. Before attempting to design any generating or forming attachment, complete data should be obtained regarding sizes of the various parts of the machine to which the attachment is to be applied.

4. The rigidity of any tool used in production is an important factor. This is a point which is often overlooked in design; and as a consequence very light cuts must be taken in order to avoid chatter, and much time is therefore lost. Sliding or moving members must be rigidly supported and of sufficient section to withstand the cutting strains. A generating or forming attachment usually has moving parts which must operate freely, yet at the same time there should be no looseness or weak members which would tend to cause vibration.

5. The convenience of the operator should be studied when designing fixtures. In connection with the setting of the tools and the adjustment of them, the setscrews should be suitably placed so that they are easy of access. If tapers are to be produced by a generating attachment, the taper bar should be easily accessible; if adjustable, suitable provision should be made so that proper measurements can be taken of the angle of the taper. Other points in connection with convenience of operation will be taken up during the treatment of taper and forming attachments.

6. The flexibility and up-keep of generating attach-

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ments should be very carefully considered when designing. There are cases when a tool must be designed to operate in a confined situation, and where there is little

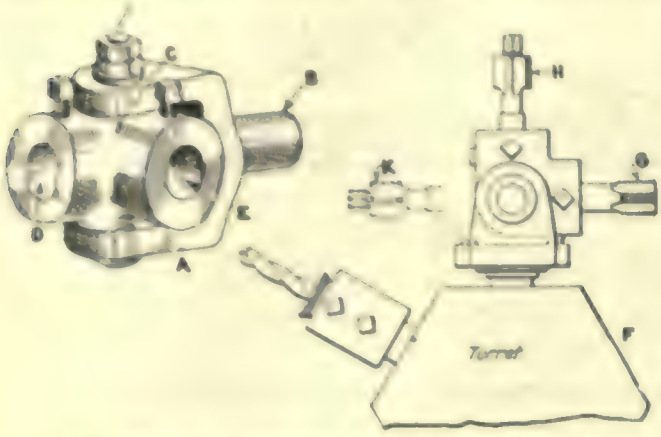


FIG. 355. ATTACHMENT TO HOLD TWO TOOLS ON ONE TURRET FACE

chance to make it adjustable so that other sizes can be handled. In many instances, however, a little forethought on the part of the designer will enable him to design the attachment so that it can be used for a considerable range of work. It is very disappointing to find that a slight change in the design of the part requires an entirely new generating fixture, particularly if it appears that the tool could originally have been designed with greater latitude and at practically no more cost.

In providing for up-keep, it is important to make sure that all surfaces subject to wear should be so arranged that replacements are possible, in order that the tools can be kept in good condition for a long period of time. Adjustable gibbing should be provided wherever necessary. The cutting tool itself should be conveniently replaceable, and a suitable gage should be furnished for setting it to the correct size if the conditions of the work require it.

Duplex Attachment

Mention has been made of the occasional necessity of using more than one tool on a single turret face. While this condition is not often found, yet it is frequent enough to deserve consideration. When the addition of one tool to a turret "set-up" will avoid the necessity for a second operation, it is obvious that a considerable saving can be effected by the use of an attachment which will permit the extra tool to be used along with the others.

In Fig. 355 is shown an attachment of this kind at *A*. The body of the tool is furnished with a shank *B* which fits the turret hole. An indexing member *C* is held in the body of the tool in such a way that it can be readily indexed. Two holes are provided at *D* and *E* to receive the tools required. The illustration at *F* shows the application of the device to a turret set-up. The tap *G* and counterbore *H* can be used progressively on a single turret face. The dotted lines at *K* indicate the position of the counterbore while the tap is being used. A 90-deg. indexing movement is used on this attachment, and suitable stops and an index pin are provided to give the correct location when indexing.

Mention has been made of the possibilities of forming certain kinds of materials with a plain forming tool. We have taken up previously the design of circular forming tools and other tools of a similar kind used on the cross-slide. It is often possible to design a tool for taper work in such a way that it can be applied to the turret of the machine. Tools of this nature are not generally adapted to alloy steels or other materials of a tough and "wirey" nature.

In Fig. 356 is illustrated the application of roughing and finishing tools for a piece of tapered work shown at *B*. The holder *C* is a casting which is fastened to the turret in some convenient manner. The forward end of this body is faced off at the rear so that the cutter *D* can be mounted upon it as shown. Adjustment for diameter is allowed by the two slots at *E*, and the cutter blade is held in place by the setscrews *F*. By mounting the cutter at the rear of the body of the tool, all of the thrust of the cut is taken by the solid member and no great strain is imposed on the setscrews. The

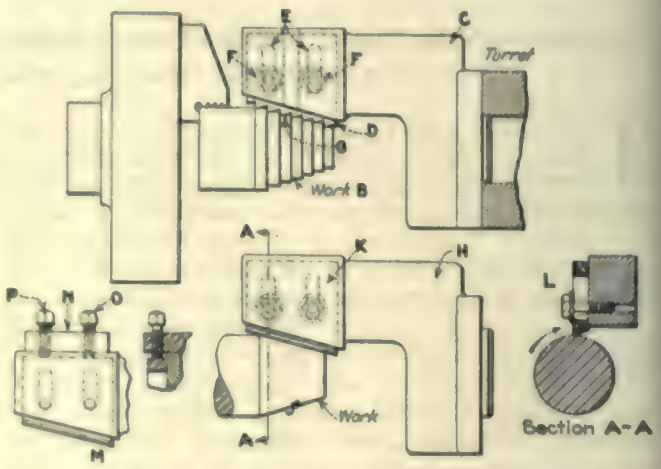


FIG. 356. TAPER-FORMING TOOLS ON TURRET

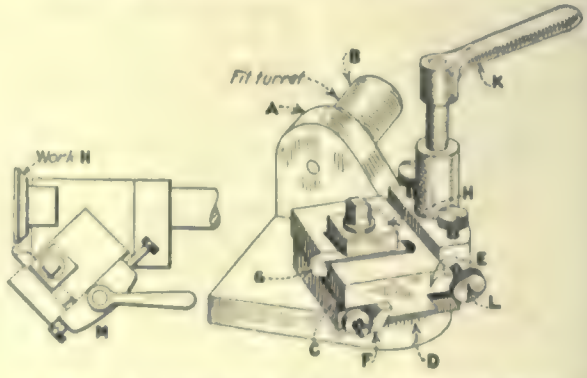


FIG. 357. ADJUSTABLE TAPER-TURNING TOOL

angular edge of the tool is serrated at *G* so as to make the cutting action easier and break up the chip.

The finish operation on the taper is done by a tool of similar form, shown at *H*. The body of this tool contains a single cutter blade *K*, which has a plain edge for finishing the work. The adjustment of the tool is made in the same manner as that previously mentioned. The sectional view at *L* illustrates the simplicity of this design, but it will be evident that no provision is made for fine adjustment, the operator being obliged to adjust the tool by the "sledge-hammer" method. Both roughing and finishing tools are tongued, so that they fit the tool body and are thus kept in alignment.

A refinement of this design which permits more accurate adjustment to be made, is shown at *M*. A plate

N is fitted to the top of the block, and contains two adjusting screws *O* and *P* by means of which the cutter can be readily adjusted to a given diameter. This type of taper forming tool is simple in design and economical in manufacture. For low-production work on suitable materials it can often be used to advantage.

Adjustable Taper-Turning Tools

For light cutting when it is not necessary to remove a great amount of stock and when the work is of small diameter, an adjustable turning tool like that shown in Fig. 357 will often be found useful. The holder *A* has a shank *B* which fits the turret hole. On the body of the tool a swiveling unit *C* is mounted so that it can be swung and clamped in different positions, according to the angle of taper required. The body of the tool is graduated at *D* to assist in setting. The member *E* is dovetailed to fit the swiveling member *C* and an adjustable gib is provided at *F* in order to take up wear. The tool *G* is conveniently mounted in the slide *E* and clamped in place by means of a strap *H*. The slide is moved by means of a rack and pinion, the latter being operated by a handle *K*. The device is furnished with an adjustable stop *L*, which can be set to control the travel of the slide.

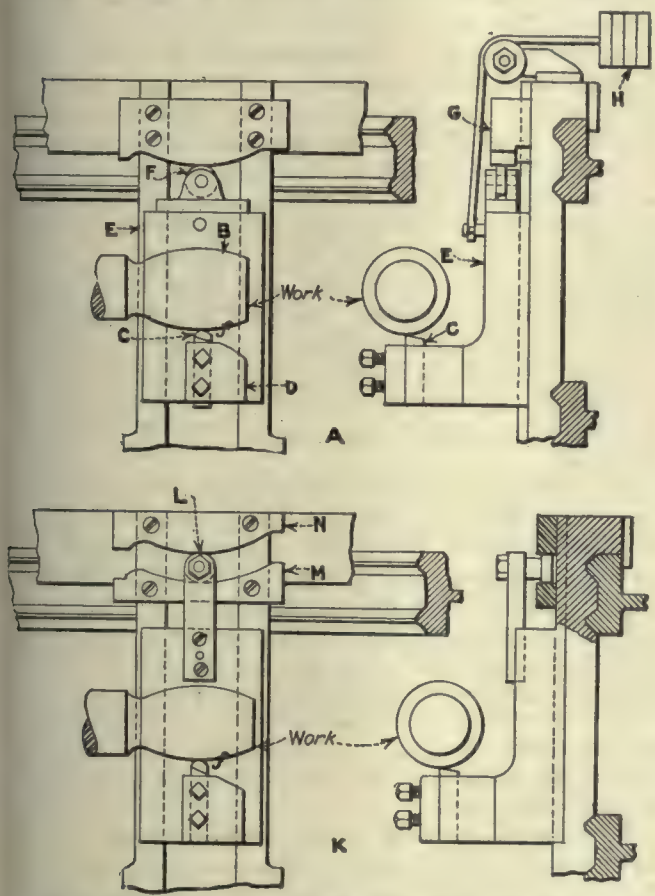


FIG. 358. FORMING BY THE GENERATING METHOD

The application of this tool is shown at *M;* the work *N* has a short and blunt taper cut on it. It is necessary only to adjust the swivel to the correct angle and operate the slide by hand when generating the taper. The advantage of this tool is in the adjustable feature, and also in the fact that it is a self-contained unit which does not interfere with any other tools. For certain kinds of work where the same taper is to be produced continually, a device of this kind can be made up without the swivel member. The taper of the slide is made to suit the work for which it is intended. This simplifies the construction slightly, but there is no chance for adjustment.

When forming or generating attachments are used, there is generally a spring or weight by means of which the roller or follower is kept in contact with the form which is to be reproduced. The direction in which the pressure is applied is important, and there are many forming attachments designed which are incorrect in principle, yet which will many times produce good work if the material being cut is not too hard. The form which controls the shape of the cut should be so placed that the follower can never lose contact with it under any circumstances.

This matter is illustrated in Fig. 358, and the principles shown there should be clearly understood before attempting to design forming attachments. In the example at *A* the work *B* has a curved contour, which is to be generated. The tool *C* is held in a block *D* mounted on a floating slide *E*. At the end of this slide there is a roller *F*, which is kept in contact with the form *G* by means of a weight *H* or a stiff spring. If this weight should not be sufficiently heavy to keep the roll in contact with the form at all times, the tool *C* might be forced out of its position due to the hardness of the material, so that a true contour would not be obtained. If the work to be machined is a casting and many hard spots are encountered, the finished work is especially likely to be inaccurate.

A method which can be depended upon to reproduce the form accurately, no matter whether the work is hard or soft, is shown at *K*. In this case the pressure is applied against the roll in the direction indicated by the arrow at *L*, so that the roll is continually against the plate *M*. There is a guard plate *N* used simply to prevent any drawing-in action of the tool into the work. This guard plate is seldom necessary, except in cases of very severe cutting or where the pressure of the cut, due to its shape, is likely to overcome the pressure of the spring or weight. The pressure of the work against the tool assists the spring or weight to keep the roll in contact with the form *M*, so that an accurate shape is produced.

In considering the use of springs or weights, it will generally be found more convenient to use springs, as they are less likely to be in the way. The springs should be proportioned so that they will give sufficient pres-

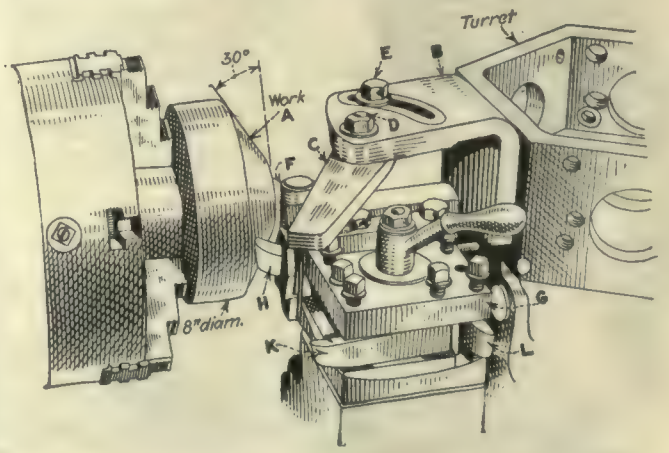


FIG. 359. SIMPLE METHOD OF GENERATING A TAPER

sure to hold the roll firmly against the form plate. The principles indicated in this illustration are fundamental in their nature and are not to be considered as hard and fast rules. For various reasons it may be found necessary to make forming attachments which are not strictly correct in principle, yet which will give good results under the conditions where they are used. The designer must be governed by the shape of the form and the amount of material to be removed.

Generating a Taper

The method used for generating any sort of a taper should avoid tying up the machine so completely that other tools cannot be used. It is possible to prevent this trouble by employing a very simple arrangement, such as that shown in Fig. 359. The work *A* has a 30-deg. angular surface, which is to be turned, but which is too wide to machine properly with a flat-blade tool.

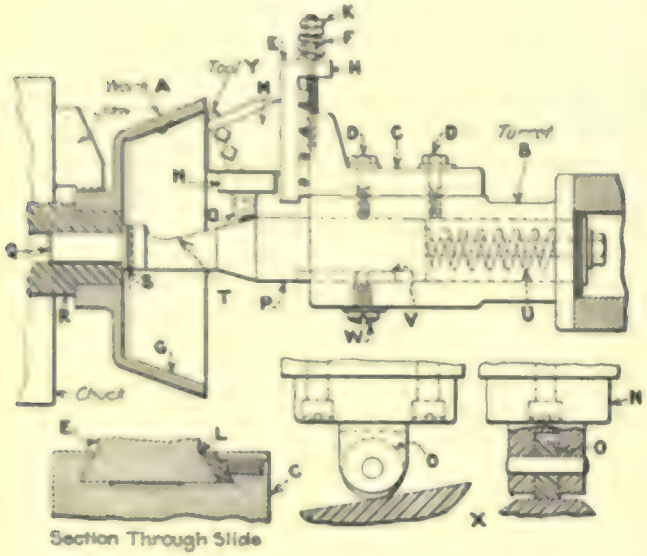


FIG. 360. GENERATING TOOL FOR BORING TAPER HOLE

As other tools are to be used in connection with the turning operation, it is desirable to leave the turret and cross-slide free, so that they can be used for other tools. A bracket *B* is mounted on one of the faces of the turret.

To the under side of this bracket a hardened steel plate C is adjustably fastened. This plate pivots on the bolt *D*, and it can be set to any angle within its capacity after loosening the nut *E*. A special holder carrying a roller *F* is located in one face of the cross-slide turret toolpost *G*, and a tool for turning the taper is provided at *H*. Other tools are used in the turret toolpost at *K* and *L* for other operations on the work. When using this attachment, the roller *F* is held firmly against the side of the plate *C* and the crossfeed of the machine is thrown into engagement, thus causing the tool to travel along the angle at which the taper plate is set. An arrangement of this sort will be found very convenient for many kinds of taper work and its simplicity and ease of adjustment make it extremely useful.

Holes of large diameter which are to be bored to a taper are most conveniently machined by means of a taper attachment. An example of this kind is shown at *A* in Fig. 360. The inside surface *G* is to be bored to an angle of 20 deg., and it would not be good practice to attempt to do this with a flat-blade tool or anything in the nature of a reamer. The holder *B* is mounted on the face of the turret, and on the upper face of it the bracket *C* is fastened, being held in place by four bolts *D*. The slide *E* is fitted to a dovetail on the face of the bracket *C*, and the spring *F* exerts pressure on the overhanging lug *H*. The amount of this pressure can be regulated by adjusting the locknuts at *K*. A sectional detail of the slide with a tapered gib is shown at *L*.

On the under side of the toolholder *M* a block *N* is fastened in such a position that it carries a hardened roller *O* that is used to control the movement of the slide. A detail of the roller and holder is shown at *X*. The body of the tool *B* carries a pilot bar *P*, the small end of which *Q* enters the bushing *R* in the chuck. A ball thrust bearing *S* is suitably mounted on the pilot bar so that it strikes the face of the bushing. The upper part of the bar is cut away at *T* to the angle which is to be generated. The bar is a sliding fit in the body of the tool, and a heavy coil spring *U* is utilized to keep the pilot in position against the face of the bushing *R*. In order to prevent the bar from turning, the keyway is cut at *V* and a special screw *W* is inserted in the slot.

In operation, the device is entirely automatic after the turret feed has been engaged. The ball thrust bearing *S* remains in position against the face of the bushing, and the body of the tool carrying the slide moves forward while the bar remains still. The pressure of the spring *F* forces the roller *O* down against the tapered portion *T*, thus causing the tool *Y* to generate the taper according to the angle on the bar. This type of taper boring tool can be applied to either a hand or automatic machine. Adjustments for diameter within the capacity of the attachment are easily made by moving the tool.

Care should be taken in the design of tools of this sort to make sure that all parts are sufficiently heavy to withstand the cutting action. Replacements of tools should be provided for, and readjustments for wear. The pilot and thrust bearing are very important, as the former assists greatly in supporting the tool, while the latter reduces friction. Bars having different tapers can be substituted for the one shown if it is desired to cut other angles.



Shall We Standardize Tapers?

The Opinions of Many Firms Making and Using Tapered Members—Nearly All Want a Standard—What Shall It Be?

THE standardization of any machine part involves numerous problems. A very few oppose all standardization; more want to standardize on the particular thing they are using and some are willing to adopt whatever the majority consider best for the purpose. Nearly everyone admits the desirability of uniform practice, not so much for interchangeability of tools as to avoid confusion and the necessity of numerous gages, and to reduce the number of tools to be carried in stock.

The question of a standard taper for machine tools was broached some time ago and a canvas of machine-tool builders and users yielded some interesting results. With three or four exceptions all believed a single standard was desirable. A number doubted that it could be secured except at a prohibitive cost, while a few considered it worth almost any price, providing its adoption could be gradual and the cost spread over a few years.

The Morse taper has by far the most advocates, particularly for drilling machine and lathe use, while the Brown & Sharpe taper holds the lead for milling machine use. Much of this preference for the Morse taper is due to its wide-spread use on drill shanks, although it was perhaps the most criticized of any on account of the varying degrees of taper used in the different sizes.

The Jarno taper has many friends but few users. Those who use it, however, find it perfectly satisfactory, except for a few criticisms as to its length; in fact the length of the Brown & Sharpe taper is also criticised in a number of cases.

The simplicity of the Jarno dimensions and the logical manner of arranging the sizes, as compared with the arbitrary selecting and numbering of the others, adds greatly to its popularity. Then there are a few other tapers such as the Sellers with its key or spline instead of a tang.

The Brown & Sharpe taper is preferred for milling machine work on account of its smaller angle, holding milling cutters more securely against loosening under a cut. This, however, loses its significance on the modern milling machine as heavy-duty cutters require more than the friction of a taper shank to drive them. Draw-in rods and key drives of various kinds are being used more and more for this work.

Extracts from some of those who are interested in the standardization of tapers are of special interest and are given herewith. As some objected to being quoted, all are given without identification. They are nearly all however from representative firms in various lines and seem to fairly represent the general feeling.

Several advocate a new or compromise taper, between the Brown & Sharpe and the Morse. They object to the Jarno taper as being nearly the same as the Morse, although having the advantage of uniformity and logical sequence. A new taper would evidently add to the confusion and it would seem better, all things considered, if a change is to be made to adopt a taper already in use. This would probably favor the Morse taper in spite of its lack of uniformity. It would cause less confusion than any other change and might be an advantage in most cases. The milling machine men would be most affected and might not consider it advisable to change, but would probably do so if it seemed best for the industry.

The opinions follow:

Morse Heads the List

No. 1. We believe that this matter will narrow itself down eventually to one uniform taper, and in the case of engine lathes and turret lathes, we are firmly of the belief that the Morse taper will be adopted as the universal standard.

The more we simplify these various standards the better it will be not only for the machine tool manufacturer, but also for the buyer.

No. 2. We are very much in favor of a standardization of the tapers used in spindles of machine tools. While we do not use any tapers in the machines we manufacture ourselves, we are nevertheless users of various types of machines and believe the standardization of tapers would be very much to our advantage. We find in our experience that the Morse taper is the taper most generally used in our works and this taper would be very satisfactory to us.

No. 3. In our opinion either the Brown & Sharpe, the Morse or the Jarno tapers would make a satisfactory standard. The proportions of the Morse taper are beyond a doubt more practical than those of the Brown & Sharpe or longer standards, for the reason that the deeper the taper hole the more difficult it is to accurately machine it, yet it must be deep enough to insure the proper alignment. The Morse taper seems to fill the bill in this respect. The chief fault to find with the Morse taper is one of engineering detail, in that the taper per foot is not the same in the different sizes and the diameters at the large and small ends are not even dimensions. From a practical standpoint, to our mind, this has no real bearing as it is just as easy to make them this way as any other.

No. 4. When the subject of standard tapers was mentioned, it immediately started an argument, and we find that different people in this organization do not agree. So we imagine you are going to have your troubles in getting a general agreement. For your information, however, we might advise that our superintendent prefers the Jarno taper. Other choices are—first, the old Pratt & Whitney $\frac{5}{8}$-in., and second—Brown & Sharpe $\frac{1}{2}$-in. to the foot. Perhaps we might say that the Jarno taper seems to be in favor, as the old Pratt & Whitney and the Jarno are practically the same.

Two More for Jarno

No. 5. The Jarno 0.600-in. taper per foot would seem about right. I have heard an occasional citicism of the Brown & Sharpe $\frac{1}{2}$-in. per foot taper on the grounds of holding in tools to the extent of rupturing the metal when released. When using steep angle end mills or undercut cutters where there is a tendency to draw into the work, it is necessary to use a threaded shank or tap the shank of the cutter for a holding rod.

At first glance, it would not appear difficult or expensive to take care of a new taper in connection with drills, small cutters, etc., by one of two methods: the use of collets with the new taper externally and old taper internally, or, the better way, by regrinding and finishing all collets that could be made over into the new standard as well as the drill shanks, cutters, etc. This, of course, would mean refinished arbors and bars of all description, as well as the bore of the machines, but once this job was done the advantage would be evident.

No. 6. We think that a suitable standard should be

adopted and a standard taper per foot should be used for all sizes of work. It is our opinion that either the Brown & Sharpe taper of ½ in. per foot, or the Jarno taper of 0.600 in. per foot should be adopted. We think for milling machine construction, that the Brown & Sharpe taper of ½ in. per foot would have a little advantage over the Jarno taper, as the Brown & Sharpe taper would have a tendency to hold better and not loosen as easily as the Jarno. However, most milling machines being built today have arrangements for drawing the taper arbor securely in place. With this in mind, we cannot see why the Jarno taper could not be used just as well in milling machine constructiou. We know that it would work out O.K. as far as lathe centers are concerned. In fact, we think it would be superior in lathe construction as a lathe center is always being forced back into the taper fit. The only place where we can see there would be any trouble at all by using the Jarno taper would be in small machines where taper arbors are used with nothing to drive them but the taper fit. Furthermore, we think that there will be less confusion if the Jarno taper is adopted, as the Morse taper is quite universally used and same is very close to 0.600 in. per foot. We cannot see where there would be any serious objection to adopting this taper.

Doubts Value of One Standard

No. 7. The value of one standard taper is questionable, because of the variety of uses to which taper shank tools are put. The Brown & Sharpe taper is unquestionably superior for milling machine work, because the greater the taper the easier it is to loosen the shank in socket, due to jarring in operation; but a greater taper is more satisfactory in drilling machines and boring machines, on account of ease of extraction.

If a standard taper is adopted, it would necessarily be a compromise, and it would seem advisable to adopt the Morse in preference to any other, for the following reasons:

It is approximately half-way between the Brown & Sharpe ½-in. and the ⅝-in. used by Sellers and a few other machine tool manufacturers, although there are rare instances where tapers greater than ⅝ in. per foot are used. The use of tapers greater than ⅝ in. or even ¾ in. per foot is very limited indeed when compared to the use of Morse or Brown & Sharpe. The Morse taper is used to a much greater extent than any other, as the more common small tools are regularly made with Morse taper, such as twist drills, machine reamers, milling machine tools and lathe centers and sockets. The Brown & Sharpe taper is used, except in few instances, on milling machine tools. While theoretically, the Jarno taper makes a strong appeal, its advantages are more or less academic, and it has certain practical disadvantages, as follows:

Its use as compared to the use of the Morse taper is very slight indeed. There are nineteen sizes covering the same range as covered by seven sizes of the Morse. This would mean the use of a corresponding number of so-called sleeves and sockets, provided it were possible to obtain small tools with Jarno taper shanks. Small tools with the Jarno taper are regularly furnished by few if any manufacturers other than Pratt & Whitney Co., and even they list a much greater number and variety of tools with Morse taper than with Jarno or any other. There is a natural disinclination to change, even when it can be shown that there is a potential profit in doing so, and, therefore, there is an added difficulty in this case when confronted with the fact that there are few regularly manufactured tools with Jarno taper shanks, because there would be problems of special prices, delays in delivery and other inconveniences such as are experienced when special tools are ordered.

Every effort would be made by us to support a single standard if one were adopted by a majority of representative machine tool manufacturers, but it is felt that no great hardship would be noticed if the Brown & Sharpe taper were continued in use for milling machines, and the Morse taper adopted for other machine tools.

No. 8. If we were all starting new, we think the Jarno taper would be the best one to adopt, as all dimensions come in eighths or tenths of an inch. This is the only reason why we prefer it. The Brown & Sharpe and Morse tapers are so well established, and there are so many manufacturers fitted with standards to produce these tapers that we would not think it advisable to change to a new standard that has not any advantages other than even figures. We agree that the Morse taper would be proper for lathe spindles, but think it is bad practice to use drills in footstock spindles.

The Morse and Jarno tapers are so nearly alike, that it might be possible to use the Morse drills in the Jarno spindle and do no more damage than if it was a Morse spindle. To be sure that Morse taper drills will not be put into spindles there would have to be more of a difference than there is betwen a Morse and a Jarno taper. Our unbiased opinion is that it would be best to continue with the Morse taper on lathe spindles.

No. 9. The drilling machine manufacturers use the Morse taper; the twist drill manufacturers use the same, and it is also used on lathes to a very great extent. Much manufacturing is based on using the Morse taper and to make a change to one of the others would certainly involve more than the happy thought that it would be good if such a change were made. Then again, there are other manufacturers who use the Brown & Sharpe taper and they would feel the same way about it.

No. 10. We use mostly Brown & Sharpe and Morse tapers but feel that one or the other should be adopted as a standard taper. In fact, we also believe that all machine tools, especially engine lathes, should be more standardized. As for instance—the swing of the lathe and the weights and dimensions, so that customers would know what size lathes they are really buying.

No. 11. All of our milling machines and gear cutters are equipped with the Brown & Sharpe taper. All of our drilling machinery, lathe spindles and floor type of boring machines have the Morse taper. In as much as it is not necessary in our plant to exchange any equipment between these two types of machines, we never experience any difficulty and it would seem to us that as these tapers are more or less of an old standard, it might be well to stick to them.

No. 12. So far as the style of taper is concerned, the leading makes of milling machines are quite well established on the Brown & Sharpe standard. There is, however, no standardization as between different sizes of milling machines, so that there can be no free interchangeability of tools and arbors on milling machines of the same make but of different size.

The adoption of a standard taper hole in the spindle is not sufficient to enable free interchangeability or arbors, unless the spindle noses are also standardized, since it is now quite common practice to provide arbors with a clutch drive, and unless the clutch drive fits the spindle nose, it of course, cannot be used no matter if the taper on the arbor is exactly the same standard as the taper in the spindle of the machine.

Opposes Standardization

No. 13. What would be gained by having the tapers of all milling machines and lathes exactly the same? Nothing except that it might be a little handier for the users of different kinds of tools. In a milling room of course they could use the arbors of one machine on another, etc., but the life of the machine tool business is the fact that it is not similar in design. The salesman has a good talking point if he has a machine that is just a little different from the other fellow's. The nearer we come to the same design in various ways the less ginger there would be in the business. The slight discommodity caused by having in any factory various designs of tools, is not worth giving consideration.

I am not in for unformity in this particular line in any way, shape or form. I believe in going ahead and thinking as you please and bringing out somthing radically different from anyone else. This applies to the depth of bed of the machine, the height from the table to the cutting tool and various other things in connection with the machine that would be just the reverse from my neighbor's product.

(To be continued in next week's issue.)

Tools and Methods in a Railroad Shop

A Grooving Tool for Locomotive Pistons—A Set of Spiral Crosshead Reamers—Scarfing and Other Tools—Washout Plugs and Taps

SPECIAL CORRESPONDENCE

THE line drawing, Fig. 1, shows a piston grooving tool of the gang type. The toolholder is made to fit the toolslide on the lathe carriage and carries three $\frac{3}{16}$-in. blades or cutters and three at the opposite end which are $\frac{3}{8}$ in. wide. These grooving tools are of high-speed steel; the filling blocks and wedges are of tool steel and all other parts are of machine steel.

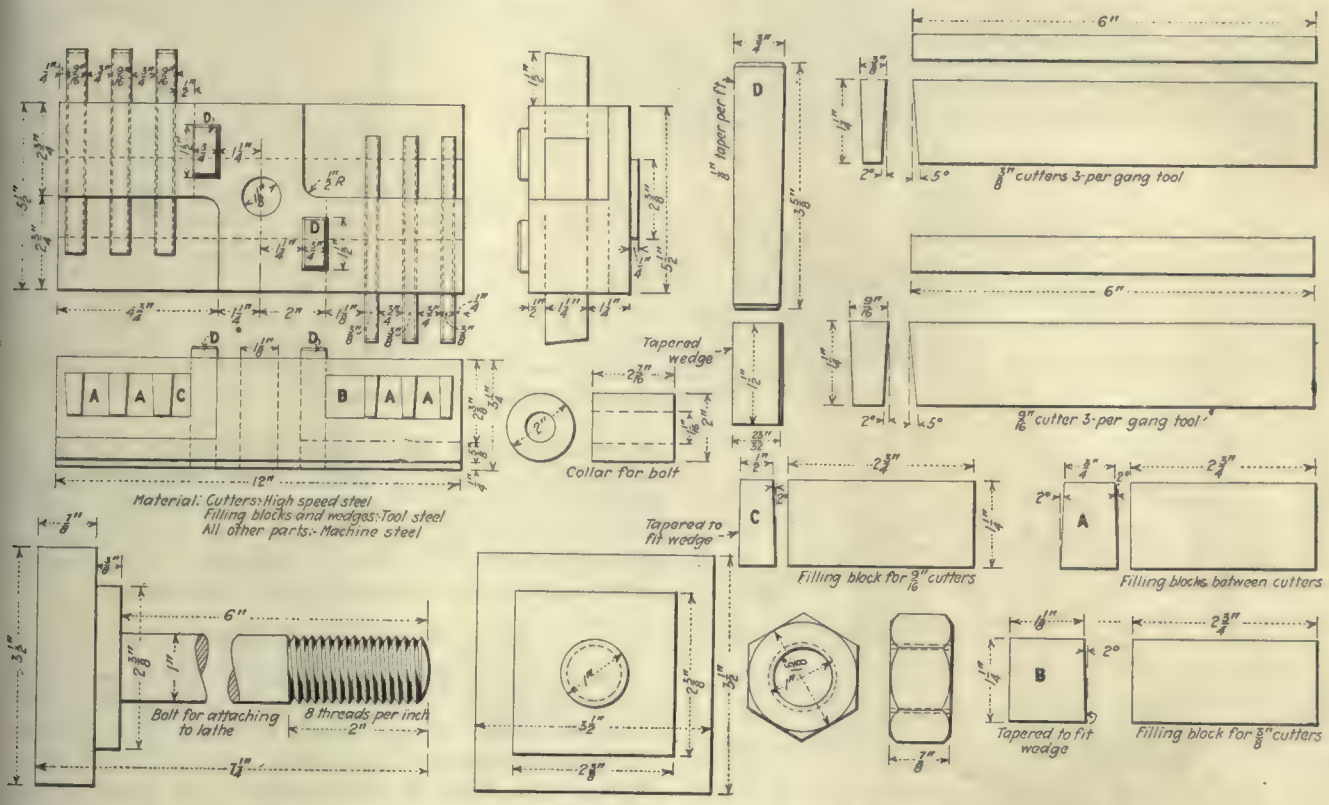


FIG. 1. GANG TOOL FOR GROOVING PISTONS

The toolblock or holder has a $1\frac{1}{8}$-in. hole bored through its center for the upright bolt by which it is attached to the lathe. The underside of the holder is made with a tongue for the regular toolpost slot in the top of the slide. The cutters are made with a 2-deg. taper on each side for side clearance and are ground at the ends to a 5-deg. front rake. The filling blocks or spacers *A* between the cutters are made with 2-deg. taper at the sides in the reverse direction from the cutter slope to fit properly between the cutters, and the inner filling blocks *B* and *C* are similarly tapered on their faces where they match the cutter sides, while their opposite or inner sides are tapered to correspond to the wedges *D*, which serve to lock each gang of blades firmly together. These two wedges *D*, as will be seen, are driven down from the top of the holder into rectangular slots cut vertically through the body of the holder. All dimensions are given on the drawing.

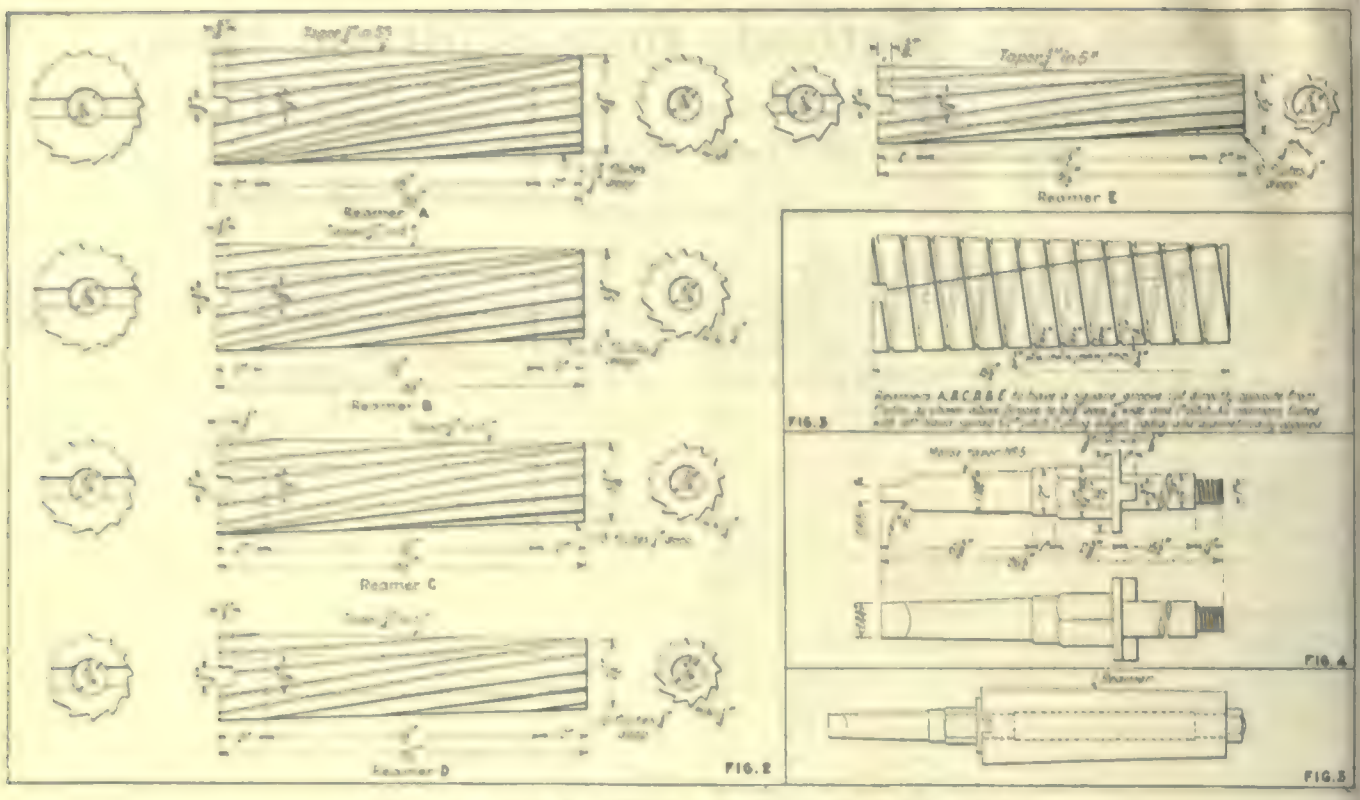
By releasing the clamping nut on the top of the bolt at the center of the block, the tool may be swung halfway around and again secured in position. This makes it possible to run in the narrow grooving tools, then swing the full width tools into position for finishing the grooves to exact width.

The line drawings, Figs. 2 to 5, give full details of a series of spiral-fluted, taper crosshead reamers, the layout covering five sizes. These range from $2\frac{1}{2}$ to $4\frac{1}{8}$ in. in diameter at the small end of the reamers. The number of flutes range from 10 in the smallest size of reamer to 17 in the largest in the series. All sizes are fluted with left-hand spiral cut to a lead of 62 in. in one turn, or as commonly expressed, to a pitch of 62 in. The flutes are cut $\frac{1}{4}$ in. deep and with their faces radial. As shown by Fig. 3, a square groove $\frac{1}{8}$ in. deep by $\frac{3}{16}$ in. wide is milled directly opposite the flutes, to break up the cut. The lead of this right-hand groove is 1 inch.

Reamers and Shanks

The reamers are made independent of the shanks, Fig. 4. The body or cylindrical portion of the shank has a diameter of $1\frac{1}{2}$ in. to receive the hollow reamers. A cross-key is formed on the face of the shoulder on the shank and this key enters a slot milled across the end of the reamer so that when the nut at the end is tightened, the shank and reamer are held securely together. The assembled reamer is shown in Fig. 5.

An interesting form of gage used for testing driver



FIGS. 2, 3, 4 AND 5. DETAILS OF CROSSHEAD REAMERS



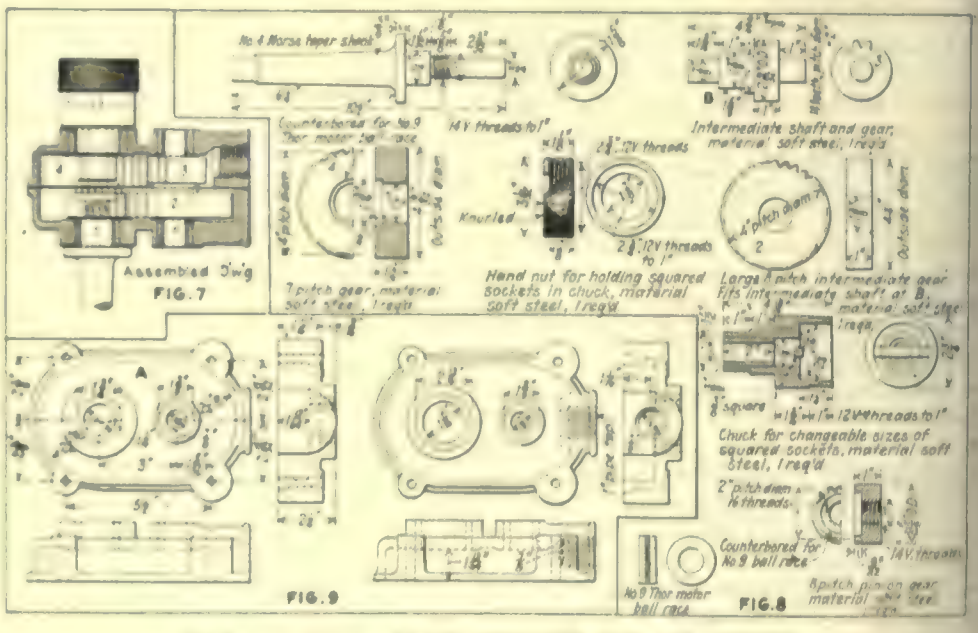
FIG. 6. GAGE FOR TESTING DRIVING AND TRAILING WHEELS

and trailer wheels is illustrated by the line drawing, Fig. 6. The gage is adapted to measure the wear on the tread and on the inside of the flange by means of two swinging points *A* and *B* which come in contact with the surfaces noted. The ends of the hooked-shaped gage points are graduated to read directly in sixteenths, but very much smaller amounts may be read by inspection.

In connection with the use of various classes of large and medium-size tools used in the way of drilling, tapping, seating and other operations, the speed reducer for motors shown in the drawings, Figs. 7 to 9, should be of interest. This device is shown as made at the Southern Pacific shops and all details are given in the drawing. The assembled mechanism is shown by Fig. 7, the various steel details in Fig. 8, and the casing details in Fig. 9. The gearing gives a four-to-one speed reduction. The method of construction will be understood without detailed explanation.

MISCELLANEOUS TOOLS

The drawings, Figs. 10, 11 and 12, illustrate certain boiler-stop tools. Fig. 10 shows scarfing tools for boiler flue-sheet flanges. These tools are made up with six inserted blades of high-speed steel which fit radial slots in the head of the appliance. A machine-steel sleeve fits over the blades or cutters from the rear and



FIGS. 7, 8 AND 9. SPEED REDUCER FOR AIR MOTORS

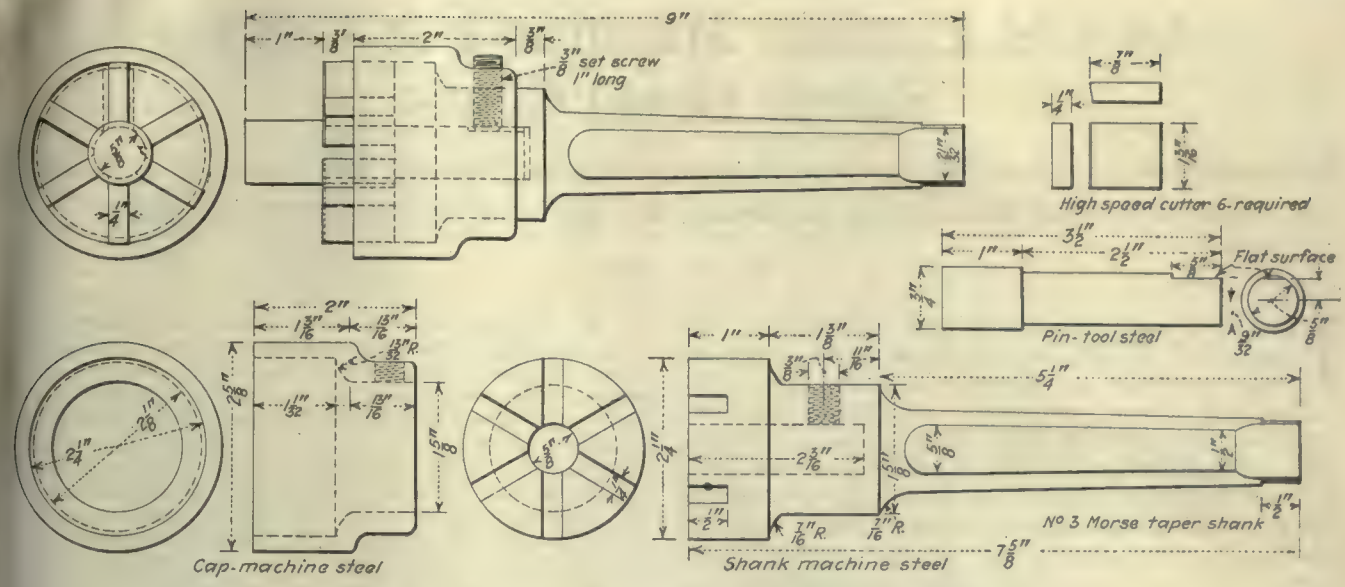


FIG. 10. SCARFING TOOLS FOR FLUE-SHEET FLANGES

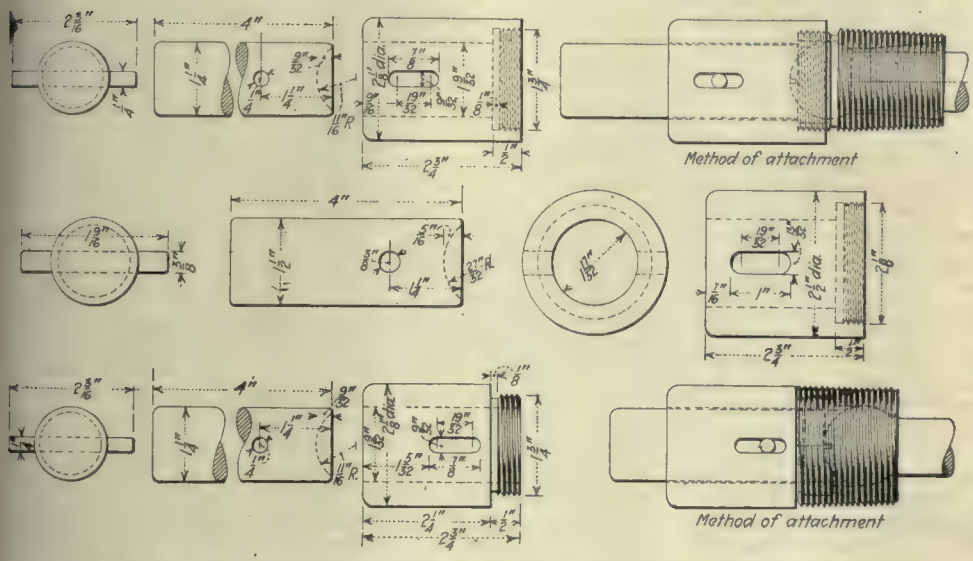


FIG. 11. HOLDING-ON TOOLS FOR RIVETING FLEXIBLE STAYBOLTS

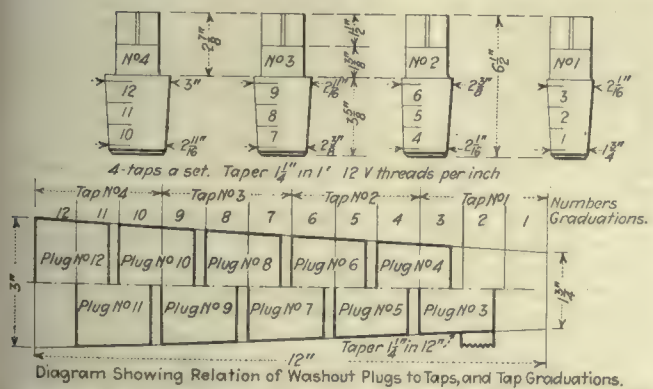


FIG. 12. DIAGRAM SHOWING RELATION OF WASHNUT PLUGS TO TAPS AND TAP GRADUATIONS

this is secured by a hollow-head screw which is tapped through the body and also serves as a holding screw for the pilot pin.

The drawing, Fig. 11, shows holding-on tools for riveting flexible staybolts. Full details are given on the drawing, and the method of application is so clearly shown as to require no explanation.

The diagram, Fig. 12, shows the relation of washout plugs to taps and tap graduations. Four taps make up the set, all cut to 12 V-threads per inch. The graduations from the small end of the smallest tap to the large end of No. 4 or the largest tap, are marked from 1 to 12, so that there are three graduations to each tap. The diagram at the bottom of the drawing shows how the taps are proportioned to overlap from one size of plug to another, each tap thus taking care of some portion or all of the three plugs in its range. The tools described in this article are shown as made and used in the shops of the Southern Pacific Company, at Sacramento, Cal.

Air-Cooled Suit Designed to Protect Welders

A brief item in the *Journal of the American Welding Society* refers to a new type of air-cooled suit that has been recently invented and which is designed to protect the oxy-acetylene welder from the heat he is exposed to in doing heavy welding in confined places. The inventor claims that the wokman equipped with this suit is protected from the heat by the circulation of the air around his body. The air passes through the mesh of the fabric of which the suit is made. The air is supplied by a pan through a flexible tube fastened to the suit.

In very hot work the helmet is used to protect the welder's head from the heat and also to supply fresh, cool air for breathing.

The suit is also supposed to be a protection against poisonous gases and can be worn for hours at a time without discomfort.

An Old English Machine For Cutting Spiral Bevel Gears

Originally Intended for Making Gear Patterns—Unique Indexing Arrangement — Formers for Controlling the Cutting Angle and the Spiral—Construction of the Spiral

By W. OWEN

I HAVE in my possession a book entitled "A New Century of Inventions," by James White, civil engineer, published in Manchester, England, in 1822. The book is most interesting, and shows many inventions which are, even today, looked upon as relatively new. Amongst these are the curved tooth bevel gear and the method of cutting the same. In view of the recent developments in this direction, particularly in your country, I enclose a copy of this portion of the book, which, as it is probably the first record of this type of gearing, may be of interest to your readers.

The article sheds a vivid light on the engineering literary style of that period, and in order not to disturb the atmosphere, I have left the wording exactly as it is given.

OF A CUTTING ENGINE

For large Bevil Wheels and Models, on the Patent Principle.

One of the most prominent subjects of this essay, if not the most important, is the System of Toothed Wheels, with which the second and third Parts were introduced, and which still claims a share of my readers' attention. As hinted a few pages backward, it seems not enough for me to exhibit and describe the System, but I must defend it against repeated objections, on pain of seeing it's utility delayed, and the public deprived of it's real and solid advantages. I am *far* from wishing to impeach the *motives* of those who still nourish or express dissent, when they deign to bring reasons for so doing; but the mere opinion—"it won't do"—expressed by a man of reputation, may impede, for a time, the progress of an useful discovery, and thus produce a public evil. This, then, is a result I am anxious to avert; as the present System *has* many points of excellence, against which no insuperable objection *can* be brought. Had I not declined, already, to name either the friends or enemies of the System, I might here appeal to persons who highly approve of it; and, indeed, who use it daily with manifest advantage. But, I forbear. If, by means of the Engines already given, and *that* I am going to offer, it is proved, that the difficulty of making these wheels is *trifling*, compared with their utility, one important point will be gained: I shall not hear it repeated, "that the System cannot succeed, *because of the difficulties of it's execution.*"

The present Cutting Engine is shown in Figs. 1, 2, 3, of Plate 32. It's immediate use is to form the teeth of *wooden models*, for casting. These are previously *built* as usual, and *lagged* with *bay-wood*, of sufficient thickness to furnish the teeth, and leave a small thickness of *that* wood behind or under them.—*A B*, in Fig. 2, represents a wheel of this kind, ready for cutting;—mounted correctly on the center pin *C D*, which latter is so formed as to be *fixable* in any position on the table or bench *E F*. Under the wheel *A B*, there is a kind of *index a b*, put upon the said center pin *C D*, which, by means of the clamp and screw *b c d*, can be occasionally connected with the wheel *A B* so as to turn it, when it is itself turned by the means hereafter to be mentioned. To proceed with the description: *G* is a slide, moving horizontally on the bench *E F*, as seen at *f e* Fig. 3; this slide being the basis of the headstock *G H*, which contains the *perpendicular slide H I*, itself the support of the cutter-frame *K L*, so constructed as to turn on it's bolt above *I*, and take any proper position over the edge of the wheel or model *A B*. This slide, then, with it's appurtenances *H I K L*, moves along the bench *E F*, as seen in Fig. 3 at *f e:* and what gives it this motion, is, the screw *g*, furnished, purposely, with a left-handed thread, working in the *half-nut* contained in the small frame *k*, which contains also a jointed *cap*, that can be lifted off in an instant, and the screw set at liberty. Moreover, the second use of this screw *g*, is to *be* thus disengaged from it's nut, and lifted up to about *i*, where it serves to push back the slide *G* toward the wheel, without that loss of time it would occasion if pushed back by the working of the screw. The letters *M N*, shew another important part of the Machine, applying to the cutting-process. It is an inclined plane, sloped to the same degree as the bottom of the teeth of the wheel. (See the line *a k*.) This inclined plane, then, is fastened, in any proper place, on the bench *E F*, by the wedge *N*, *just* like the puppet of a common turning lathe; and it passes through an opening in the slide *G I*, or rather suffers this to pass *over it*, as better seen at *M*, Fig. 3. Furthermore, the slide *I* (Fig. 2), after gliding down this inclined plane *M G*, will have to be raised between each cutting: and that is the office of the workman's hand acting on the lever *O P*, through the iron frame *Q M*, which is shewn at Fig. 3, in another direction; and marked with the letters *Q l m*. In fine, the slide *G* carries on each side of the Machine a pulling bar *n*, connected with the said slide, and with a smaller sliding piece *o*, the use of which is to hold a pin (seen in the figure, but leaving no room for a letter of indication), which *turns* the wheel *A B*, by the plate *p*, as the slide *G* recedes, and the cutter-system *I K L* descends on the inclined plane before-mentioned. Having thus adverted to all the important parts of the Machine, we turn to Fig. 1, for the purpose of shewing *what* the plate (whose edge is seen at *o p*) means; and the effect it is intended to produce.

In that figure, let *B A c* be the section of any wheel it is desired to cut on this principle. The width of the face of such wheel is shewn by the line *a b;* and *a c* is called the *projection* of that face, on the base of the cone of which the wheel *A B* is a portion; it's summit being at *C*. The line *c d*, shews *one* of the spiral teeth with which the wheel is to be furnished; and I make it by this uniform process: The pitch of the wheel, whatever it be, is set off from *c* to *f:* and that pitch is divided into *eight* parts, (shewn here as *four* on account of their smallness) while the width of the face *f d*, is divided into *nine* parts, shewn here (for the same reason) by *four and a half* divisions. This latter division is more numerous than the former, that the principle may be a little *overdone;* or that the teeth may overlap each other by 1/9 of the pitch: To which purpose, beginning the spiral line *c d* at *c*, I move in the second circular line from *c* to the second radial line *C i*, and draw *that diagonal* which forms the first part of the curved line *c d*. From this second point, I go to the third circular line, taking also the third radial line, and drawing the diagonal. This I do until arrived at the fifth circular line, when I find myself likewise at the fifth radial line *C d f*. These four spaces thus gone over, represent the eight parts into which this part of the face *a b would have been* divided, had the figure been larger: and there remains a small division near *d*, equal to one half the others, through which the curve *c d* is prolonged by a similar process: and this latter portion is what the successive teeth *overlap* each other, as before stated.

Now, it will be seen below, that the needful *circular* motion is given to this wheel, by a movement that takes place in a direction parallel to the base *a c B* of this figure. The curve *c d*, must, therefore, be transferred from the surface

of the cone, to this base *a c* B. To do this, I place a point of the compasses at *A*, and trace, with the openings *A a*, *A c*, &c., the six *quadrants* included in the space *a c g h*, which are now the projections, on the base, of the circular lines *a b f d* on the surface of the said cone. Here, a slight difficulty should be obviated: strictly speaking, this *projection* would be horiontal, and, of course, invisible in this position of the wheel. But I have supposed the figure *a c g h*, turned ninety degrees downward, round the horiontal line *a B*, so as to make one representation suffice; and also to shew the connection of the lines *a b g h*, with those *f d a b*. The curve *k l*, is thus a *copy* of that *e d*, only *shortened* in the proportion of *a b* to *a c*—that is, of the side of the cone *a C*, to the half-base *a A*.

To secure, then, the coincidence of the pitch, as set off on the circumference *a f* and *a g*, we must divide a similar portion of both into an equal number of parts, *e f;* and treat them, on the lines *a c g h*, as we did on those *a b d f;* by which means we shall get the curve *k l*, *the projection of that e d.* And this curve *k l*, must be made part of a *plate k l m n* (about 1/10 on an inch in thickness), the use of which is as follows:

This Plate *k l m n*, is no other than that marked *o p* in Fig. 2; and it is there fixed to the index *a b*, directed to the central pin *C D*, as it is in Fig. 1 to the center *A*—insomuch, that the *pin* shewn in Fig. 2 near *o*, acting on the *sloping* curve *k l*, will turn that index (and with it the wheel) by the very motion which draws back the slide *G* (Fig. 2), and lets down the slide *I* on it's inclined plane *G M*.

We may remark, lastly, that as the present Machine is adapted to *large* models, it is not, now, provided with a dividing-plate, although the means of so doing are self-evident. On the contrary, the division dots are seen on the edge of the wheel *A B*, as is likewise one dot, near *b*, on the clamp *b c*, from which a given distance is set off to each of the dots on the wheel, so as to give the pitch required. By these means, then, the wheel is divided and cut, in good, if not in exquisite divisions; and all the teeth take their shape from the Plate *o p* (or *k l m n of* Fig. 1), and are thus good, in that respect also.

To recapitulate the steps of this process—The workman stands behind the Machine, near *E;* and, working the screw with his right hand, draws back the slide *G*, (the *power* then turning the cutter *r* very swiftly) by which means, the slide *I* glides down the inclined plane *M*, and the cutter, impinging on the sloping face of the wheel, cuts it to the depth *r a;* the shape of the tooth (by the turning of the wheel) being the spiral form *e d* of Fig. 1. It may be added, that the lifting lever *O* permits this descent of the bar *Q M*, because it is suffered to fall lower than *now* represented. Thus, when the slide *G* is arrived near *h*, the tooth is finished; and the cutter leaves the wheel at *a:* after which, the cutter-frame and slide *I K L* are raised by means of the lever *O*—the screw *g* taken out of its *steps*, and the slide *G* pushed back by it, until the vertical slide *I* rests again on the inclined plane *M*, as it at first did. Nothing, now, remains to prepare for cutting a new tooth, but to change the division-dot, by the application of the gauge or compasses, from *b* to the next point on the wheel; to do which, of course, the clamp *b c* must be loosened and refastened by the thumb-screw *d*. I would just notice the 4th figure—to say, it is a sketch of one quarter of a bevil wheel: intended merely to shew the form and position of these teeth, and the general appearance of the System.

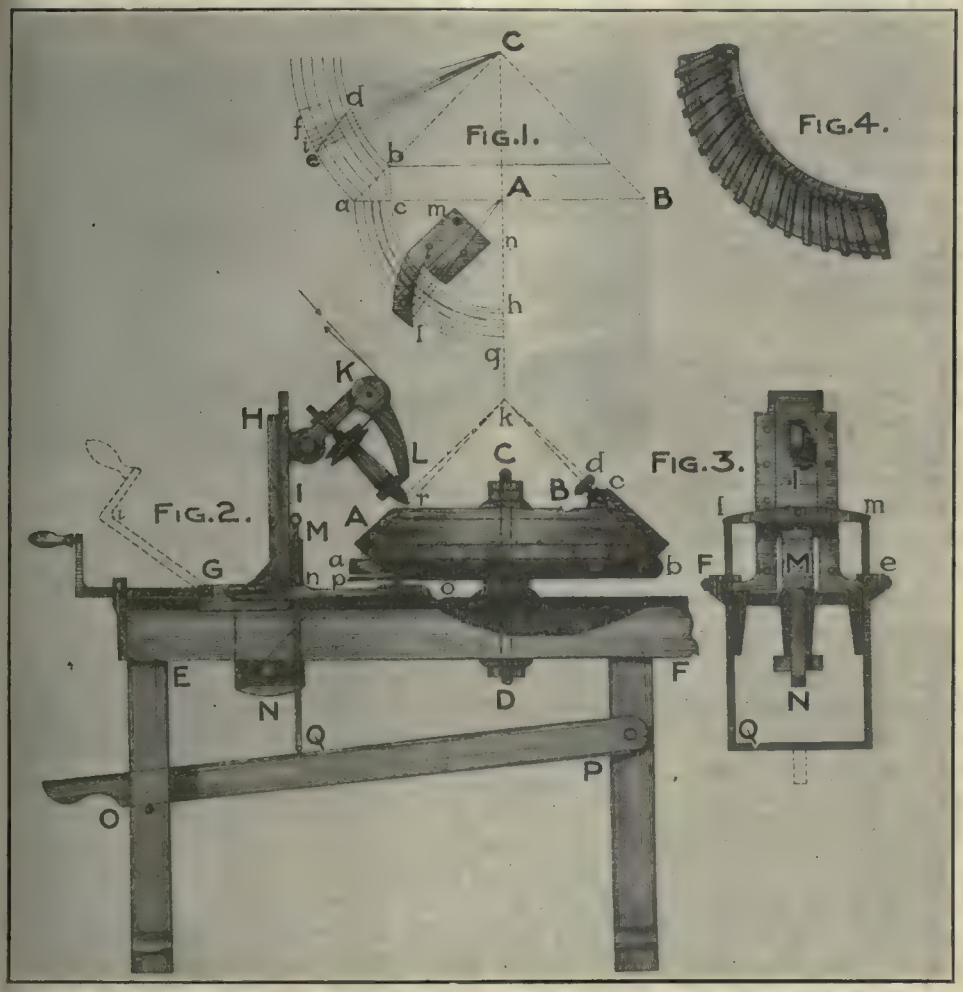


FIG. 1. CONSTRUCTION OF THE SPIRAL. FIGS. 2 AND 3. THE GEAR CUTTING MACHINE. FIG. 4. SKETCH OF PART OF A SPIRAL BEVEL-GEAR

Finally, my readers will please to advert to what has been already said on the *forms* of these teeth, and their uses: and recollect especially what was observed on the epicycloid, as applied to them. It will easily be perceived, that to *put* that form on one of these teeth would be an almost hopeless attempt! —and, happily, it is not necessary. We can, however, by using the cutter *r* with various slopes, and going several times through each *space*, cut *facets* on the teeth, quite near enough to the theoretical form to make them work *well* together; and, as before observed, nothing is wanting to make the teeth *perfect*, but to run them with the wheels placed in due position.

Safety Code for Grinding Stands

The maximum angular exposure of the grinding wheel periphery and sides for hoods used on machines known as bench and floor stands should not exceed 90 deg. or one-fourth of the periphery. This exposure shall begin at a point not more than 65 deg. above the horizontal plane of the wheel spindle.

Whenever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed 125 deg. This exposure shall begin at a point not more than 65 deg. above and extend to a point not more than 60 deg. below the horizontal plane of the wheel spindle.—(*From A.E.S.C. tentative standard safety code.*)

An Eastern Shop of Modern Design

Concluding the Description of a Machine Tool Shop—Lighting, Heating and Power Applications—Crane Service and Sanitary Arrangements

BY C. E. CLEWELL

THE crane service adopted in the new Gould & Eberhardt plant at Irvington, N. J., consists of two 10-ton Shepard cranes, one in each of the high bays, with one-ton electric hoists in the small bays. In the high bays, a number of jib cranes of special design have been installed in such a way as not to interfere with the overhead crane service, these jib cranes merely serving as a help-out to relieve the larger traveling crane over a small radius immediately around the jib crane. These jib cranes have a 12-ft. arm, have a lift capacity of one ton and can handle the needs of approximately three machine tools. A special feature is the use of a steel angle arm for supporting the horizontal crane arm, which is supported at the base of the crane, thus holding the horizontal arm by compression and not interfering in any way with the overhead crane.

The supporting run-way for the 10-ton cranes in the high bays consists of reinforced concrete and is mounted on concrete brackets as a part of the main columns. On top of these run-ways a heavy pine board is placed as a base for the crane track, this general scheme resulting in quiet operation. Direct current crane motors are used. The supporting run-way of the small one-ton cranes in the low bays is made up of eye-beams mounted on special clamp devices attached to the shop columns.

Artificial Lighting in the Shops

The artificial lighting of the plant is divided into two parts, namely, that for the shops proper and that for the offices and the drafting, production and planning departments. For the shops, the mercury vapor lamp of the Cooper-Hewitt Electric Co. has been adopted as standard in preference to the Mazda lamp, for reasons given below. In the offices and drafting rooms, Mazda lamps are used in semi-enclosing fixtures.

These shops contain a splendid example of a modern and carefully planned lighting system. A good deal of attention was given to the type of lamp to employ, the two principal forms considered being the Mazda-C or nitrogen filled lamp with some form of shop reflector, and the mercury vapor lamp. The management felt that it could not afford to use the brilliant Mazda-C lamps in the shops when it was possible to secure the restful effect of the mercury vapor lamp with its relative low brightness and consequent low degree of glare effect. As a result, the entire shops, with the exception of washrooms and stockrooms, are equipped with the mercury vapor units, the Type P lamps for direct current circuits being used in the low bays, and the double-P, or two-tube units being used in the high bays.

One mercury vapor lamp is used per bay, which is closely equivalent to one watt per square foot, a value chosen to insure highly adequate illumination for the work with no need for local lamps. The general distribution of the light from these lamps is such as to produce a low degree of shadow effect and the results of the artificial light approximate those of natural light. No difficulty has been experienced from the spectral character of this type of lamp and no effort is made to correct its greenish color by the use of special reflectors.

The lamps in the central bays are all equipped with regular angle-type porcelain enamel metal reflectors,



WASHROOM SHOWING TROUGHS AND SHOWERS

and those near the side walls have special 45-deg. angle type reflectors for throwing the light away from the walls to the working surfaces adjacent. A row of double-P lamps runs down the high bay aisle and under the crane run-way on each side while smaller units are used for the illumination of the benches below. The lamps are supported from the roof by two flexible chains for each lamp, thus keeping the lamps in one fixed angular position at all times.

For renewal or cleaning, the lamps in the high bays may conveniently be reached from the guarded walkway attached to the crane, this walkway having a railing and being safe for such work. The lamps in the low bays may be reached from an ordinary ladder.

Mazda lamps with semi-enclosing fixtures are used in the various offices and in the drafting and associated departments. Mazda lamps are also employed for the washrooms and stockrooms.

Shop Motor Applications

The application of power to the machine tools used for manufacture in this plant is either by the group motor or by individual motor drive methods. An interesting and important feature connected with the group motor drive is the use of automatic push button control for each group motor. For this purpose, a closed panel box is mounted on a column near the motor, and inside of this box fuses, a mainline switch, a circuit breaker and the contactor switches for starting are mounted. In other words, each group motor has the complete protection afforded by this equipment. On the outside of this panel box an off and on push button is located. The group motors are suspension mounted from overhead steel frame work and belted to a large pulley on the group line shaft.

These shops find considerable use for the adjustable

speed motor and quite a number of the machine tools thus have their own individual motor. For example, the large planers are driven by reversing motor planer equipments, three or four at present being operated by constant speed motors with a temporary frame work for mounting the motor overhead, although these few planers are ultimately to be equipped with reversing motors.

Heating and Ventilation

Heating is accomplished by a system of radiators mounted overhead to act as an insulator for the saw-tooth sash and to expedite the passage of the heat to the floor. Other floor radiators are used at certain locations. The heating is done by exhaust steam and makes use of the differential valve vacuum system with a vacuum pump ranging from 3 to 5 lb. pressure.

Ventilation is provided by hand operation of the sash in the saw-tooth roof, all sash in the high bays being arranged for hinged opening, and 80 of the 160 ft. of sash across the low bays being similarly arranged.

Steel shelving has been adopted for all toolroom bins and also for holding raw materials in the storage spaces. The bar stock, for example, is held in steel shelf compartments, the heavier parts being stored above for the convenience of handling by the overhead cranes, and the lighter parts below are taken care of by hand. The bins for ordinary raw material are open while those for bronze parts are equipped with doors and locks.

Portable Elevators

A valuable aid for quick repairs and also for handling parts at some height above the floor is the use of portable revolving elevators of the Revolving Portable Elevator Co., which avoid the necessity of ladders in many cases and which are of considerable help for putting up countershafting, for oiling and for the maintenance of the overhead group motors and for belt repairs.

Automatic scales are adopted as standard for the receiving and shipping ends of the plant and it may be stated that the railroad track at the receiving end of the shops is at floor level rather than being depressed, as it has been felt that the use of depressed tracks inside the shops introduces an unwarranted disadvantage in the irregularity thus imposed on the floor space. Where it is desirable to unload material with the floor of the car at the shop floor level, a track just outside and along the outer wall of the shop is depressed so as to make this possible.

Where jigs are not available and it becomes necessary to lay out the work in the usual way, a large laying out table is provided near the center of the outer high bay aisle. A small air compressor furnishes the supply for air hammers throughout the shops, the lay-out of the air compressor piping being so designed as to give the necessary flexibility to the outlet locations.

The employees' locker room contains 700 lockers, 12 x 15 x 72 in., provided with locks and keys rather than combination locks. Immediately adjoining the locker room a washroom is located. The management decided that enameled troughs were preferable to individual wash basins, these being in sets 18 ft. in length with faucets high enough to permit of washing under running water. They are shown in Fig. 7.

Washing water is furnished initially from the company's artesian well through a tank, with which a steam coil is used for tempering the water to 110 deg. at all times by thermometer control. Eight shower baths are available for the shop men, with hot and cold water.

The main shop entrance opens directly through a hallway into the washrooms and then into the locker room, from which the shop proper is reached. This sequence is considered most advantageous from the standpoint of convenience and the time involved in reaching these two rooms.

The shops contain one toilet only, centrally located, thus keeping all plumbing at one place. This toilet has a slightly depressed floor and can be completely flushed with water. Unusual care has been given to the plumbing and fittings in this toilet and to complete ventilation. Access to the closet plumbing is furnished by side doors and a passage which extends the full length of the room.

Separate toilets and washrooms are located adjacent to the offices and near the drafting rooms. An ingenious wardrobe supporting holder is found in the clothes closet of the offices, which is constructed from simple pipe and pipe fittings with a wire screen above for hats.

Drinking fountains are placed throughout the shops, furnished with water from the local well, and each one provided with a sump below the fountain pipe standard for drainage. Provision is made at each drinking fountain for a hose connection for washing the floor. Among other sanitary provisions there may be mentioned the complete exhaust system for the removal of dust and dirt in connection with the polishing machines.

Hospital Facilities

Near the main shop entrance a liberal space is enclosed for hospital purposes. This room is completely covered with white enamel including the roof trusses. It is fully equipped.

The completeness of the sanitary arrangements is merely one indication out of many which might be mentioned, to show the thorough manner in which these new shops have been planned. This particular company in moving from old quarters with years of experience under more or less limited manufacturing conditions, was in a position to give deliberate attention to many refinements in the equipment and in the general lay-out of departments, which makes these shops, as a whole, highly satisfactory for the purposes for which they were designed.



Refinishing the Bores of Internal Combustion Motors

By S. M. Ransome

As has been pointed out in recent issues of the American Machinist, an increasingly extensive line of mechanical work is opening up in refinishing the cylinder bores of the 9,000,000-odd gasoline motors now in use in this country.

A worn cylinder bore presents to the unobservant or unmechanical eye the appearance of a well polished and apparently round and true hole; but a little measuring soon discloses the fact that the bore, though smooth, is no longer round or parallel, but is enlarged toward the upper end and is somewhat oval in places. There may also be a worn spot caused by the "kick" of the piston at the extreme ends of the bore.

The next consideration is the thickness and stiffness of the metal to be machined. Here again appearances are deceptive, as to the casual observer the walls present an almost solid appearance, whereas we know that what we really have is a cast-iron pipe of uncertain thickness, usually ranging between ¼ and ½ in., unsupported in the center but stiffened at both ends by the top and bottom walls of the water-jacket.

The problem then is to re-finish a long slender cast-iron pipe, of relatively large diameter as compared with the wall thickness in which we are likely to encounter a highly glazed surface with sometimes a few scores and hard spots to further complicate matters.

Early Methods

Until recently there had been but two principal ways of doing this work. If done by the garage man the bore was usually lapped out with an old or new piston, plenty of emery, oil and elbow grease, the resultant hole being sometimes fairly true but more often not, depending on the skill, muscle and patience of the "lapper." Also, no inconsiderable portion of the lapping compound was likely to be left in the pores of the iron walls, or even in the crankcase, with the result that the lapping continued long after the garage man had reassembled the motor.

The other method was to strap the block on the carriage of an engine lathe and rebore the holes with a single point cutter held in the regular form of boring bar, usually taking out about ⅛ in. so that the cutter would not ride over the polished surface of the hole. New pistons and rings would then be fitted up in the engine lathe and the job thus be completed.

In regard to this boring method the writer has found that even when using a double-ended cutter in an expanding boring bar, considerable springing away of the cylinder walls results, so that after taking one cut of, say about 0.020 or 0.010 in. per side, another cut could be taken without altering the setting.

These older methods have been rendered practically obsolete by the new modern methods employed; mainly grinding and reaming.

Many varieties of reaming tools are in use. There is the well-known "Critchley" type of reamer, expanding by means of a conical nut at each end of the blade. This type of reamer necessitates a pilot or support to make sure that the tool enters the hole properly and consequently we find various piloting devices incorporated, or else we see the reamer held in the spindle of a drill press or boring mill. A more modern specimen of this type of reamer has a pilot ground directly on to the blades. Then there are a number of so-called reboring tools, comprising a short multi-bladed cutter holde having a pilot ahead of it usually made in some form expanding ring and supported behind by a spindle screw, held in a bracket which bolts to the top of t cylinder block. These tools can be operated by han by self-contained electric motor or by connecting to drill press or boring mill.

Such tools have the advantages of being small, por able and cheap and although probably not as rapid accurate as a more elaborate machine they have a decid advantage in that they can in many instances perfor the work on the cylinder block in place in the car, t cylinder head, pistons and connecting rods bei removed, but crankshaft, clutch, etc., being undisturbe

Still another type of tool which has entered the fie later than any of the previous tools mentioned is t expanding reamer which depends on its own blades f piloting. These reamers are usually entered into t hole, expanded to size by some device on top of t reamer and then turned by means of a solid or a ratch wrench like any other reamer. On reaching the bott of the hole the blades can be withdrawn and the rea taken out.

One reamer of this type is suspended by a rope fr above, giving the reamer preliminary alignment; t rope passing over pulleys to a counterweight so that t reamer can be left suspended at any point desir These reamers can be driven as in the case of the reb ing tools mentioned either by hand or power and c also be used in the bores in place in the car.

We would say that we have found a properly ream cylinder bore to be of quite sufficient smoothness for t purpose, as an indicator with spherical point can run up and down the bore without showing any ridg or hollows of more than 0.00025 to 0.0005 in. variatio and even these minute irregularities disappear aft the motor has been run a few hundred miles.

Fit Pistons Closely

In our practice we aim to keep piston clearanc within very close limits; thus, if the necessary clearan has been set for any given bore at say 0.003 in., ream the bore to 0.002 in. clearance and in a very sho while the friction of the rings will have taken one-ha to one-thousandth from the bore leaving it smooth.

Some fit the pistons even closer than this, leavi hardly any initial clearance but giving the motor preliminary running-in with plenty of oil and with stream of cold water flowing through the radiat This method should result in an almost perfect matin of surfaces and when worn to a fit, the requisite wor ing clearance should have been obtained.

To give one specific example, the writer has seen block reamed and pistons fitted with about 0.001 i total clearance. After running about 300 miles t head was removed and examination revealed that t clearance had increased but 0.0005 in., while the wor ing sufaces, though not as yet perfectly mated, we rapidly approaching that state and that probably in t next 300 miles would "reach bottom."

As to the different methods and their relative valu it is as with almost everything else: all good metho and tools have their proper application, there are meri and demerits to all mechanical devices, each finds a fie where its good points count and its weak points are n injurious. The working of economic law usually pu men and machines, not forgetting tools, just abo where they belong.

Industrial Schools in Springfield, Mass.

SPECIAL CORRESPONDENCE

The new building of the Springfield (Mass.) Vocational School, which opened for public inspection soon after New Year's, is gradually installing machinery and equipment to bring its operations to full scope, and will be one of the best-appointed institutions of its kind in the East. The illustration affords a view of the machine shop. Students of the machine shop and woodworking department are engaged in producing needed equipment for the school, and similar service is rendered by the drafting and patternmaking departments, thus enabling the school forces to be employed without competing to any great extent with wage-earners in a slack season for the machinery trades.

Courses have been instituted in machine work, drafting, patternmaking, cabinet making, printing and electrical work, and a course in automotive mechanics will be started soon. Each course requires three years for the average student to complete. Three-fifths of the time is devoted to shop work, one-fifth to subject matter related to that work, and the rest to general academic subjects with an emphasis on the industrial side. Every student must be over fourteen years of age and have finished work of the sixth grade. The enrollment now numbers 230. In addition there are sixty rehabilitation students placed at the school by the Federal Veterans' Bureau.

The work also includes an evening vocational school, with eighty enrolled, mostly adults, this being extension work within the scope of the Smith-Hughes Act. Every evening student is required to pursue some line kindred to his regular work and every instructor in trade subjects must have had eight years' journeyman experience.

G. A. Burridge, principal, and seventeen instructors constitute the regular staff. Department heads are: E. J. Fasser, machinery; James D. Long, drafting; Thomas L. Flynn, patternmaking; H. T. Perry, cabinetmaking; John J. Mack, printing; Clayton E. Bliss, electrical work.

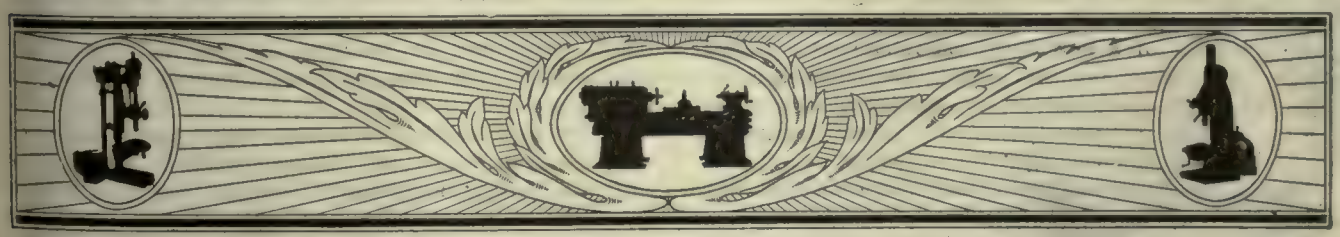
Also giving instruction in the trades in Springfield are the Evening School of Trades, at the Technical High School Building, with 500 men and 300 women students, directed by a staff of forty; and the Continuation School, having its own building, with 200 boys and the same number of girls. The Evening School of Trades has recently instituted a three-year course in engineering, with six hours of intensive work each week, in addition to courses in sheet-metal work, woodworking, electricity, automobile repair, plumbing, etc. Industries of that section supply many of the instructors. In the women's classes household arts and science are taught. The



STUDENTS AT WORK IN THE MACHINE SHOP

Continuation School, with students from fourteen to sixteen years of age, all employed in local establishments, conducts courses in machine shop practice, woodworking, printing, commercial subjects and home economics. This school has a particularly well-equipped machine shop, and original work is sought as one of the important ends in the different departments. The school, now in its first year, and having C. W. Robinson as its director, is working out a comprehensive system of production charts and is also making a detailed survey that is to include every industry in the city.

These special schools, as adjuncts to the regular grammar and high schools, which also bear extensively on the vocational and technical side, are engaged constructively in the effort to further the work of training skilled industrial workers that shall keep New England in a high place in the machinery and other trades, and because the industries of the Springfield district are so widely diversified the schools possess exceptional opportunities.



How to Compile Catalogs

Objects of Catalogs—Importance of Engineering Data in Selling and After Sale—Shortcomings of Most Catalogs—Constructive Suggestions for Improvements

By ALEX DOWEL

THE purpose of a catalog dealing with mechanical equipment such as machine tools, small tools and the like is twofold. First, to assist in advertising and selling by showing the nature of the product and giving a description. Second, to give sufficient data and prices so that machines or tools can be selected and ordered from the catalog and a check for the proper amount sent.

Attempts have been made by various manufacturers of machine tools to prepare catalogs that will answer both purposes and while such efforts are commendable as showing a realization of catalog shortcomings and while they are undoubted improvements over their predecessors, they leave a considerable amount of room for improvement.

It Is Necessary to Furnish Information

Does it not appear to be a good business principle to consider the whole subject from a broader point of view and try to find out what people who actually use catalogs think about it? After the catalogs are distributed the manufacturer will doubtless say, "Oh, these are our customers, past, present and future; we want to impress them with the value of our product; that is the purpose of the catalog." Would it not be more nearly correct to say that the prospective customer wants first of all INFORMATION? Really, that is the sum and substance of his needs. The manufacturers will say, "We don't want to tell him too much, for if we do he will not ask for more information; if he doesn't ask for more we cannot get closely in touch with him and the first thing we know the Blank Manufacturing Company will send a salesman to him and sell a machine."

If you depend upon your catalog to act as a salesman you will be disappointed no matter how it is prepared. The salesman also is only an item in marketing your product. The eventual reason why you will make the sales is because of the merits of your product. Your catalog helps, your salesman helps, but your reputation and the merit of your product should be of greater help than anything else.

Let us see what factors are most essential in selling a given mechanical product. There are the cost; durability; operation; cost of maintenance, etc. The man to whom you are selling your machine or tool is usually a mechanical man. But if he is not, he is depending upon some one to advise him. By what method does he reach his decision? Probably by the consideration of cost and relative merit. The cost can be readily determined. If the merits of the machines are backed up by a firm name well-known and of good repute, the selection may be made because of that reputation. If the machine is of a new type and made by a comparatively unknown firm, the prospective purchaser must depend largely upon description, specifications and data in the catalog together with any other information which he may receive from the salesman.

Having analyzed to some extent those matters which effect the purchase of the product let us take up a few specific instances of important items which should be included in the catalog: (1) General description, stating the purpose of the machine and the class of work to which it is most suited; (2) details of construction; (3) details of operation; (4) applications to various kinds of work; (5) specifications; (6) selling price.

In the general description considerable latitude is permissible. If the factory has been established a great number of years and is well known it may be of interest to say a few words regarding the organization, its inception and progress over a period of years. Some manufacturers take up these matters at considerable length but I do not believe that it is essential. Following a brief history, the principle uses of the product should be stated; this will make a logical introduction and lead up to matters connected with design and construction.

A general statement can be made as to important points in design and information can be given as to reasons for certain features. Factors, which in the belief of the manufacturer make it superior to other machines of a similar nature, can be explained. These points should be mentioned in a broad way but should not be taken up in great detail. Paragraphs may be included regarding the various types manufactured and the equipment that can be provided. All of these data may be considered in the nature of an introduction and it should therefore not take up much space, normally 500 to 600 words.

Details of Construction

A consistent method requires that descriptions be given, with line cuts or halftone reproductions of important details in design. The opening paragraph should state the range of the machine so that there will be no doubt in regard to its capacity and ability to handle a given class of work. The head and bed, the spindle, the feeds, the gear box, carriage, oiling system and cutting lubricant system should be mentioned briefly, yet with sufficient detail to make all points of interest clear. The customer will naturally be interested in any points that have to do with upkeep and wearing qualities. Rigidity, accuracy and power should be referred to. The wording should be convincing yet conservative.

Another matter which will always interest any one who is in the market for a machine is the method of handling and convenience of operation. The shop man for instance would wish to know how the various speeds and feeds are obtained and would doubtless decide as to whether or not the levers and handles were conveniently placed. The feed mechanism, the gear box, the various levers, can be briefly described. Great detail would not be required as the operator's hand book would give all necessary information regarding setting up.

It is always of interest to show applications of machine tools to various kinds of work for which they are particularly adapted. Often a customer will be influenced to buy machines and tools if he is shown the application to work of various kinds. Considerable

variety in the examples given will not only illustrate specific cases but will make the flexibility of the machine apparent. On certain types of machine tools that require considerable tool equipment, such as turret lathes and the like, the data presented will be of particular interest to the shop man and the engineering department. Therefore, if the examples given are selected with a view to showing the adaptability of the machine to a wide range of conditions there is much more likelihood of a sale. If the examples shown are drawn in detail with dimensions and production figures, an impression of the greatest value is made on the prospective customer as it places before him several concrete examples of machining operations together with the length of time necessary to do the work. A comparison of the production time with the time on similar work being machined in his own factory may affect the situation strongly enough to create a desire to possess one or more of the machines. Several manufacturers of machine tools have shown detail drawings of various parts giving production time on each but they have not in the majority of cases shown the methods of tooling which are applied to each case. The writer believes that it is important to show how the results were obtained. The amount of space available for these details depends upon the size of the catalog, but it is usually possible to devote three or four pages of a catalog of normal size to them.

Specifications

Machine tools are built in various sizes and with different capacities. A table can be arranged to include complete specifications regarding sizes, capacities, speeds, feeds and all other data necessary when planning production work. The present lack of information is regrettable. There is hardly a catalog that will give all the information necessary to enable a tool engineer to design fixtures or special tools for the machine described. If the preparation of the specification table should be turned over to the engineering department with a request that it confer with the tool department to make sure that all important dimensions are included, a long stride in the right direction would have been taken.

It should not be necessary for the tool designer to go out into the shop and measure up a machine, yet in the majority of cases such a procedure is required.

In addition to the actual specifications, it may be necessary when special tools are to be fitted to various parts of the machine to include a certain amount of special engineering information in diagram form with dimensions. The spindle for example should be shown in section with all necessary dimensions so that a chuck or faceplate can be properly proportioned. So also the turret and cross-slide on a turret lathe should be given in detail. On milling machines the table dimensions and distances between T-slots as well as the dimensions of the slots themselves should be specified. When standard tools, such as turning or boring tools, are furnished as a part of the equipment, their capacities should be stated in the table. One of the best ways of realizing the amount of data required in a catalog is to put yourself in the place of the man who would be required to design tools for use on the machines described.

When preparing catalogs of small tools there are several points of importance. Some have been mentioned previously but there are a few that have not been taken up. Considering a small tool catalog as a whole, if the manufacturer has specialized along a certain line for a number of years, it would be wise to include as an introduction a brief historical chapter. If several kinds of small tools are made it would seem advisable to include a statement to that effect. General instructions can also be given in the introductory chapters regarding the ordering of tools as can any other data that seem pertinent. The classification of small tools is an important factor for the preparation of a catalog and it is a good idea to group the tools according to some well defined system. If the catalog is a large one the sections can be divided by sheets of paper of a different color or they can be thumb-indexed. A complete index of all tools listed should be conveniently placed, preferably at the back of the catalog.

A great many small tools are held in bushings or by means of holders. For example a straight shank chucking reamer of small diameter is frequently held in a bushing by means of a setscrew or placed in a floating reamer holder. Whichever method is used it is necessary to know the diameter of the shank. This dimension is usually lacking in small tool catalogs so that when making up holders the reamer shank must be measured. If the reamer should happen to be in stock that might not cause difficulty, but if ordered from outside, as frequently happens, the equipment could not be completed until after the reamer had been received. The same thing applies to straight shank taps and arbors for shell reamers. In fact, it is almost invariably the case that the dimension required for fitting a tool to a holder or bushing is left out of the catalog when it could just as well be included.

There does not seem to be any consistency in the manufacturers' attitudes in respect to giving dimensions. A combination drill and countersink for example is usually held in a drill chuck and the diameter of the body is not particularly important, yet it is given.

General Information

There are frequent cases where small tools are listed and the description that goes with them is not complete enough to give a prospective purchaser sufficient information as to their use. The application of the tool to the work can often be shown by means of a line drawing or a sectional view, thus making the subject matter clearer and enabling the purchaser to analyze his own problem and decide whether a given tool is suited to it or not. I would hardly go so far as to suggest that all tools listed in a small tool catalog should be shown by line drawings but at the same time I venture to state such a procedure would meet with the approval of the entire engineering fraternity. It would be interesting to prepare a catalog of this sort and send it out with a questionnaire for comments as to its utility from both an engineering and sales point of view. It is possible that there may be a happy medium between a catalog containing all half-tones and one containing all line drawings with necessary dimensions.

Speaking broadly I believe that catalogs of mechanical equipment are decidedly in need of improvement. Many things are done year after year that simply follow a precedent established perhaps thirty or forty years ago. The illustrations used are more or less up to date and the art work may be exceptionally good. However, the man who is using a catalog to obtain information prefers finding it to looking at the art work. Appearance should not by any means be neglected though; it would seem that a judicious combination of art and needed information would result in improvement that would be much appreciated by the mechanical fraternity.

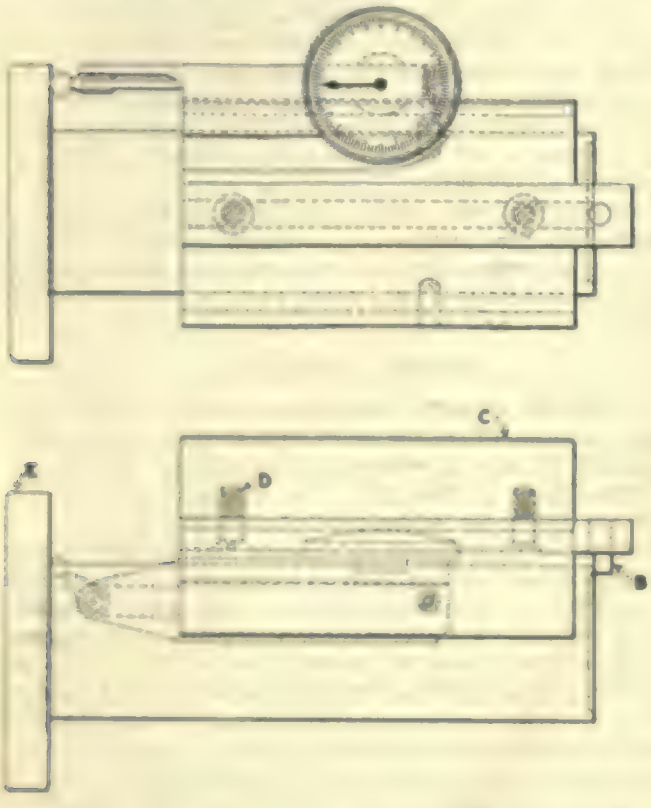
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

An Indicating Length Gage

By Osbert E. Charles

The accompanying sketch shows one of three indicating length gages that I made, and which have worked out very well for use in grinding shoulders of various shafts to a limit of 0.0005 in. The dial indicator used is a "Last Word" which is mounted on a hardened and ground V-block *A*. In the back end of block there is a hardened pin *B*, the front of which has a flat about $\frac{1}{8}$ in. wide ground on it after the pin is in position, and which comes in contact with the shoulder of the work. The dial indicator is positioned on block *A*, so that the registering point will have a movement of about 0.015 in. on the dial. A piece of cold-drawn steel *C*, $\frac{3}{4}$ x $\frac{1}{2}$ in. with finger grooves milled on each side is fastened to the top of block *A* with two flat-head screws *D*, making a convenient handle for the gage. In order to check the accuracy of the gage a set block or dummy *E* was made to the correct length, and the length marked on it to prevent any chance of error. After the indicator has been properly adjusted, a drop of solder should be put on the pivot of the adjustable contact point to guard against a possible slipping of the friction adjustment.



INDICATING LENGTH GAGE

By using this gage it is possible to gage the work without removing it from the centers and, working it in conjunction with a micrometer stop on the table of the grinding machine, we have been enabled to make considerable saving of time as the operator knows just how much he has to take off and sets his stop accordingly. It is very seldom that he takes more than two readings, one when he starts and one to check himself before removing the work from the centers to put in a new piece.

Attaching a Wire Rope to a Socket

By Martin McLauthlin

On page 309 of American Machinist, is an article headed "Attaching a Wire Rope to a Socket," in which the opening statement carries the implication that if the cable is attached to the socket in the manner described the connection may be depended upon to develop the full strength of the cable.

In my experience of over thirty years in the use of wire rope fastenings for passenger and heavy freight elevator service, I have become familiar with and have made many tests of various types of cable fastenings and I have found that the fastening described does not merit the confidence it sometimes receives, even when made by men accustomed to it, and it is less reliable when made by amateurs.

Muriatic acid is not a desirable associate for wire cable; often the wires are not properly cleansed of the acid and sometimes the cable is so dipped as to permit acid to be absorbed by the hemp core, in which case "rotting" of the cable speedily follows. Sometimes lead or low-grade babbitt is used instead of zinc and it is not unusual for this fastening to fail by the pulling out of a considerable proportion of the wires under a stress much below the ultimate strength of the cable. In the preparation of the A. S. M. E. "Safety Code for Elevators" very much consideration was given to the matter of suitable cable fastenings and the type of fastening described in your article is not recognized by that code.



I have thus far found but one fastening which insures "that the full strength of the cable may be depended upon," namely, the spliced eye; and that is so logical, simple and reliable that it seems unusual that it is not in universal use. If the simple instructions given in the A. S. M. E. Elevator Code are followed, it is more difficult to produce a spliced eye that will develop less than 100 per cent of the cable strength, than it is with equal care to produce with a "fan hitch," as

your article describes, a near approach to the cable strength; and the "fan hitch" will, if not thoroughly cleansed of acid, deteriorate rapidly with age.

Following are the A. S. M. E. Elevator Code instructions for making a spliced eye:

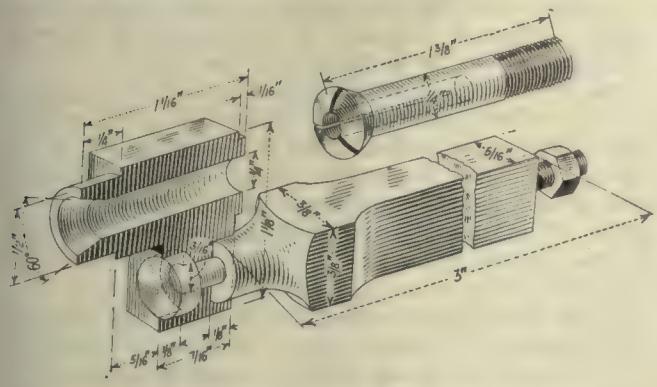
"A metal thimble shall be placed within the eye and the splice made with not less than the following number of tucks: First strand, two tucks; second strand, three tucks; third strand, four tucks; remainder of strands, five tucks. The eye shall be drawn tightly around the thimble, the strands drawn tightly after each tuck and the tuck smoothly laid. After the last tuck is made each strand shall be cut off not closer than one-fourth (¼) inch from the tuck and beaten down flush. The splice may be left bare or served with marline."

Boring-Tool Holder for the Bench Lathe

By Frank H. Baker

The accompanying sketch shows a boring-tool holder that I have found very convenient for use in the bench lathe.

In the shop where I am employed as toolmaker the product is dental tools, and my work consists principally



BORING-TOOL HOLDER FOR BENCH LATHE

in making small dies, jigs and fixtures. I find this holder to be invaluable for holding tools for boring small holes down to ⅛ in. in diameter.

The parts may all be made of machinery steel and pack hardened, except the spring collet. The swinging feature renders the tool quickly adjustable for height.

Pin Wrenches for Any Size Nut

By I. B. Rich

Nuts and screw connections which require a pin wrench are rather hard on repair men, as the holes are never alike in any two cases and none of us have a large variety of pin wrenches lying around loose. It usually happens that in the nut which you must take off or put on, the diameter of the holes and their distance between centers differ from the pins on any wrench you have.

I had such a case the other day and, as usual, the man was in a hurry. He'd just had one flivver stolen and he bought a new locking wheel to have put on his new car before someone took that one away from him. This wheel had a nut which needed a pin wrench different from any I had. I was just starting to make a wrench in the usual way when a bright idea dawned upon me.

The bright idea was to bend up a staple as shown at *A*, Fig. 1, using the right size wire to suit the holes in the nut. Then I clamped the staple in the hand vise shown

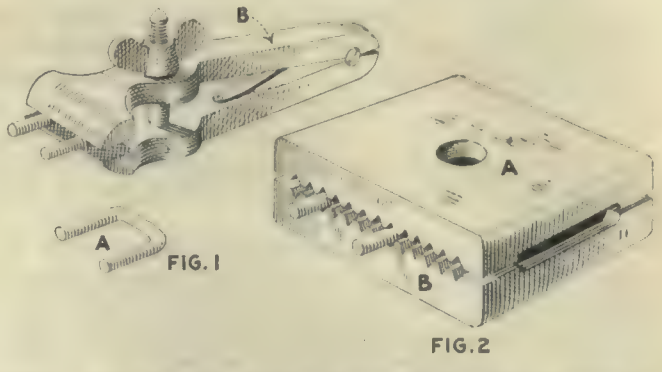


FIG. 1. AN IMPROVISED PIN WRENCH. FIG. 2. A WRENCH FOR VARIOUS SIZES

at *B* and I had a wrench which did the trick by using a wrench on the vise for the final pull. It's an easy matter to bend up a few staples and have them handy for other jobs.

When I get time I'm going to make a real, universal pin wrench as shown in Fig. 2. I'll have two plates like *A* with raised edges *B*. One edge in each plate will have V-notches, spaced as closely as convenient. Then I shall make up several sizes of pins, in sets of two from drill rods, and magnetize the pins so they will stick whenever I lay them in the holder. This will prevent the pins falling out and rolling under the bench while I am setting them for different center distances. With this combination in my tool kit, any old size of pin-wrench nut will be easy picking and there will be no delays to customers.

Enlarging Pistons by Plating Them —Discussion

By H. Clinton

Regarding enlarging pistons by plating, as told in an article on page 287 of American Machinist, I would say that about eighteen years ago I was in charge of some Lanston monotype keyboards and when overhauling a lot of these which had seen considerable service, we discovered that the fits of the pistons which actuated the perforating punches had become so loose that there was quite a loss of power, as well as considerable waste of compressed air through leakage around the pistons.

Careful inspection disclosed the fact that the holes in which the pistons fitted were both bell-mouthed and out of round. As it meant a delay of about three weeks and the expense of purchasing new parts if we relied on the factory to help us out, I decided to re-ream the holes with an expansion reamer until they were round and straight, and nickel-plate the pistons. As the pistons were of brass, copper plating was omitted. The plating was done very slowly on the theory that we would get a fine-grained and dense deposit.

In order to get a variation in size some were left in the bath longer than others, thus enabling us to make selected fits. This procedure worked out surprisingly well. We were able to get the machines in excellent running order in a short time and had no further trouble with them so far as the pistons were concerned.

Special Screw for Securing Strippers to Dies

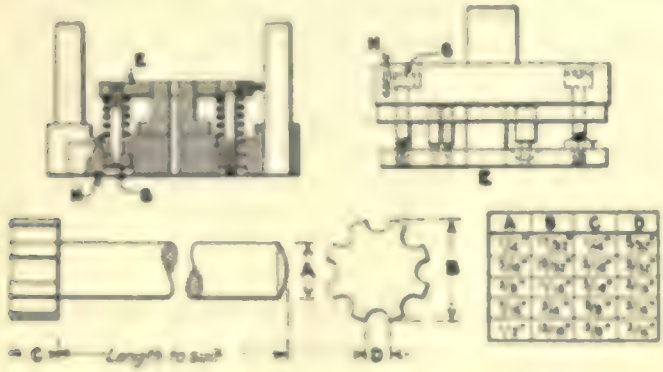
BY DONATO ZAZZARA

The method of holding strippers for sub-press and blanking dies, blankholders, etc., herewith illustrated and described, is simple in construction and satisfactory in use.

In the illustration of a sub-press die and a piercing punch the reader will note a comparison of the method with that more commonly used; the new to the left, the old to the right.

The stripper *E* is tapped for the holding screw *G*, which has a special head with eight shallow grooves equally spaced about the circumference. After the proper position of the stripper is determined, the small setscrew *H* is inserted in the die bottom, one half fitting a groove in the head of the holding screw. This keys the holding screw securely to the die bottom, with no possibility of its turning, so that the original position of the stripper is maintained regardless of how much pounding the die receives.

A distinctive feature of this construction is that it offers a means of adjusting the location of the stripper accurately and quickly. By removing each setscrew and turning each holding screw an equal number of grooves,



SIMPLE AND SATISFACTORY METHOD OF HOLDING SCREWS IN STRIPPERS

one may be certain the relative position of the stripper is correct. Practice will soon teach the proper amount of rotating to give the holding screws in order to obtain any desired adjustment of the stripper.

Comparison of this simple means with the ordinary method shows two parts against five. With the old method constant vibration often loosens the locknuts and allows the stripper to become displaced, sometimes with disastrous results.

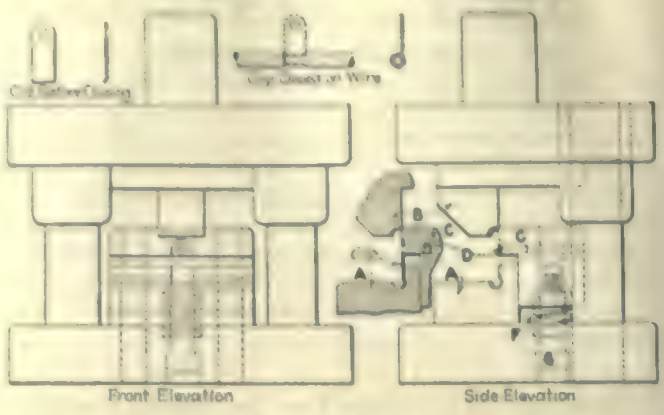
Should the reader decide to adopt this plan, details of the special screws are shown which have been proved to be well adapted to the purpose.

Unique Clip Rolling Die

BY EDWARD H. TINGLEY

The Delco-Light Co., Dayton, Ohio, has developed and is successfully using a clip rolling die to close a brass clip around a stripped electrical wire, preparatory to soldering. The clip, of 0.031-in. sheet brass, is blanked, partly formed and the end curled to a quarter circle before going to the rolling die. The wire around which the clip is rolled is first stripped of the insulation at the places where it is desired to have clips, and after assembling, the joint is soldered to make a tight electrical connection.

The sketch shows the construction of the die. The



TOOLS FOR ROLLING CLIP ON WIRE

lower forming block *A* and the upper setting block *B* are both recessed to the proper diameters to care for both the insulated wire and, at the working part of the die, the clip and bare wire. Block *A* and the sliding receiver *C* are both recessed to hold the clip, to a depth no greater than the maximum thickness of the sheet brass of which it is made. *D* is the locating and supporting pin that fits in the hole of the clip.

The clip is placed on the pin *D* and in the recess of block *C*. The wire is laid in the block *A* at the proper place. The upper setting block *B* descends, holding the clip in the recess in *C* until *B* hits the top of *C* when both *B* and *C* move downward against the tension of spring *F* and start to curl the clip around the wire. Further downward motion brings *B* in contact with *A*, when the clip receives its final set.

On the return stroke the blocks *B* and *C* and the wire and clip all rise together until the screw *G* holds the block *C* from going any higher. Block *B* continues to rise to the end of the stroke of the press. Clip and wire are then free to be removed.

This die is designed to be used on a No. 19 Bliss inclinable press. The incline serves to hold the clip on the pin until the die descends. Excellent results have been obtained with this die as the clip comes out perfectly flat.

Height-Gage Lines

BY GUSTAVE A. REMACLE

The modern height gage is a very serviceable instrument and the degree of accuracy which can be attained when working directly to lines scribed by it depends largely upon two things—the workman's skill as a mechanic and his knowledge of the form of a height gage line.

It seems to be a general habit to regard a height-gage line as merely a line, light or heavy, straight and accurately laid off. However, owing to the peculiar form of these lines, their width and lack of uniformity of width affects the accuracy with which points may be marked off in relation to certain other definite points.

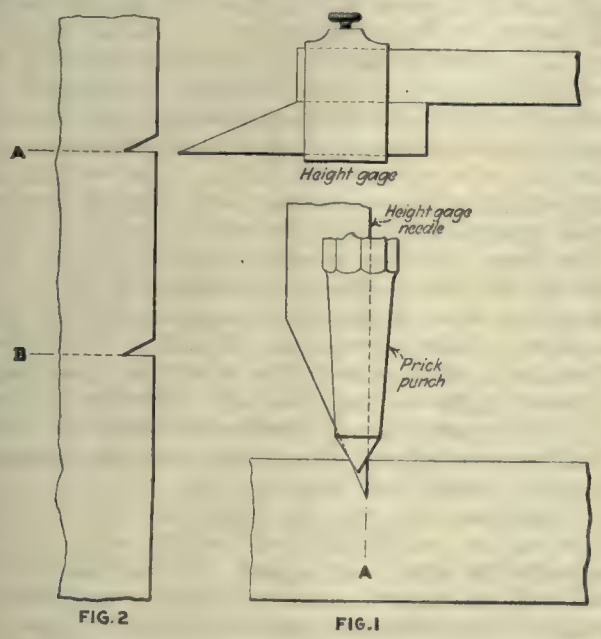
In Fig. 1, I have sketched a magnified cross-section view of a height-gage line together with a prick punch ready to strike off a center in the wrong place. Before the peculiar structure of such a line occurred to me, I had often noticed that when I had bored a number of

holes, by means of wiggling from prick punch marks, I succeeded in obtaining the desired positions of the holes in relation to each other, while a few thousandths of error existed in relation to the original striking-off point which would usually be the top or bottom of the piece, or some projection.

In the accompanying sketch, *A* represents a line which should be the center of a hole to be bored. If a line has been laid off which is 0.004 in. in width, it can be plainly seen that error is bound to result even though the greatest care is observed with other operations.

Owing to the form of a height-gage needle, this error cannot be removed entirely but it can be reduced to a minimum by having the needle sharp and by marking off light and uniform lines.

When a prick punch mark is to be made at the intersection of lines, the accurately ground prick punch should be placed gently into one of the lines and then moved along until the point rides into the intersection. A very slight click can be felt when this happens. Before striking the prick punch with a hammer, the prick punch should be held in a vertical position and pressed downward by hand. This will produce a tiny mark



FIGS. 1 AND 2. MAGNIFIED HEIGHT-GAGE LINES

which can be observed with a magnifying glass. If this mark appears to be accurately made, the punch can then be placed in position and tapped with a hammer.

Another manner in which toolmakers work directly to height-gage lines consists of making an outline with height gage, scriber, dividers and trammel points and then working to the lines. This method is much practiced in the die-casting game. Here again if these various lines are regarded merely as lines, error will occur in accordance with the width of the lines.

In Fig. 2 I have shown a magnified cross section view of lines which have been marked off from some other point of the work with a height gage. It is essential that a depression be milled between points *A* and *B*. The reader can see at a glance that if accuracy be desired, line *B* should be entirely milled away while in the case of line *A*, the cutter should be worked in until it just grazes the line, removing none of it.

Scriber, divider, and trammel points each make lines peculiar to themselves and if error is to be minimized these instruments should be kept sharp and light lines should be made. Also, when working to the line the cross section form of the scribing point should be kept in mind. When I strike off lines with the height gage, I often mark that part of the die plate which is up during this proceeding because it would be a difficult matter to determine which lines should be milled away, and vice versa, after once the work is set up.

A Simple Cylinder Grinding Rig for a Lathe

BY CHARLES BROWN

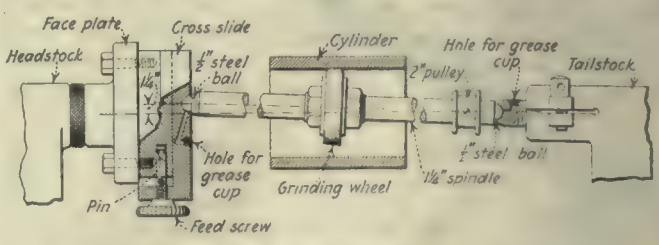
The writer has found the device, herewith illustrated and described, to be very useful in his small shop for the purpose of grinding out automobile and other cylinders. While he does not attempt to compare it with any of the standard cylinder grinding machines on the market in quantity of output, he believes it to be about the limit of simplicity and low cost of construction for such shops as cannot afford to have one of the standard machines.

An arbor of suitable diameter and length to handle the work required of the device, is cupped at each end to take a standard ½-in. bearing ball. A 2-in. flanged pulley is pinned to the arbor quite near to one end and, at the middle of the arbor, right- and left-hand collar nuts are fitted to hold a suitable grinding wheel between them.

The arbor is supported in the lathe by a cupped center at the tailstock end and at the other end by a block having a similar cup on its outer face and fitted to slide radially in a suitable piece that is bolted to the faceplate. By means of a knurled adjusting screw the bearing block can thus be moved in or out from the center and thereby change the radius of the circle described by the gyrating wheel.

As the driven pulley is so near to the fixed tail center the "drunken" motion is not sufficient to seriously affect the somewhat long driving belt, which comes from an auxiliary counter overhead. The arbor runs 6,500 r.p.m., and the maximum amount of offset obtainable at the faceplate end is 1¼ in., giving a scope of adjustment at the wheel of approximately ⅝ in. These dimensions can, of course, be made to meet expected requirements. With this device I have enlarged by 0.012 in. the bore of a cylinder 3¾ in. long in 19½ minutes.

[Though our correspondent does not say so, it would seem necessary to redress the periphery of the grinding wheel after each increment of setting, as the corner of the wheel nearest the faceplate would, of course, advance faster than the opposite corner and thus alter the



INTERNAL GRINDING RIG FOR LATHE

bearing of the wheel upon the work. Also there would seem to be need of compensating for the changing distance between centers as the adjusting block was moved along its slide.—Editor.]

EDITORIALS

Dangerous Economy

CONGRESS has succumbed to another violent attack of economy. Not content with the excellent achievements of our negotiators at the Disarmament Conference, it has threatened to undo most of the work done there by cutting the Navy personnel from Secretary Denby's conservative estimate of 90,000 men to 65,000. To maintain the 5-5-3 ratio to the full, would require 130,000 men.

No business man will find fault with a genuine effort on the part of anyone connected with the Government of the United States to effect economies in the operation of government functions. On the contrary he has used every means in his power to urge such economy. But the present movement to scuttle the Navy by reducing its personnel below the point at which it is barely possible to maintain efficiency, is neither sincere nor an economy in the long run.

Look at what happened to the Rivers and Harbors Bill—increased by $15,000,000. An increase in almost any other appropriation would not be such conclusive evidence of the workings of the politician's mind, but the manipulation of these particular funds has long been infamous. We venture to predict that the usual $350,000 for free seeds will get back into the appropriation bill before it reaches the President. No other proof of the lack of sincerity is needed. There is an election next fall.

But what of the ultimate effect of such a reduction in the Navy? Have the American people forgotten so soon how long it took and what it cost to get our unprepared Navy into action? It was not an achievement to which many of us care to "point with pride." A few millions spent before 1917 in maintaining the efficiency of the Navy would have saved many millions spent later in trying to make up the lost ground. Any machine deteriorates rapidly when maintenance is neglected.

The AMERICAN MACHINIST has supported the position taken by the United States in calling together the Disarmament Conference and in making the tremendous sacrifice which alone made the negotiations successful. That sacrifice was necessary to prove the good faith of this country in its plea for reduction of naval armament, and was only made on condition that corresponding sacrifices, even though smaller in size, were also made by England and Japan. It was a business-like compromise in which each party gave up something for the benefit of all. The reduction of the Navy personnel is nothing of the sort, it is simply a wild, regardless-of-consequence slash at appropriations so that the candidates can go before their constituencies with a record of reduced expenditures at which to point.

We feel confident that we voice the opinion of the machinery industry when we say that we fervently hope that this country will never be engaged in another war, but we are equally confident that the industry does not believe that the way to peace lies in the disarmament of the United States while other nations maintain their military establishments. We hope that this country can and will call other conferences looking to further limitations of armament, and eventually to universal peace, through universal confidence and understanding, but we do not believe that much can be accomplished by a big and wealthy nation without means to defend itself. Human nature doesn't work that way.

No doubt you will agree with what we have just said; most thoughtful Americans will, but your opinion will have little effect unless your representative knows what it is. Tell him.

How the Buyer of Machine Tools Increases the Sales Price

ANY general manager will admit that the cost factor hardest to figure is the cost of sales. He can easily get accurate figures on production costs up to the time the machine is ready to ship—but the cost of getting the order is almost an unknown quantity. It varies from almost zero, when the customer writes or wires the order without solicitation, to as much as 50 or 60 per cent of the selling price when the sale requires special treatment and much expense in travel.

The buyer, in other words, largely determines the price by the cost to which he subjects the maker in making the sale. If the buyer makes it necessary for the seller to make several long trips, if he delays him unnecessarily, if he subjects him to expense in any way, the buyer in the end pays the bill. There is no other way. Every cantankerous buyer who boasts that he is a hard man to sell, is adding to the cost of machines bought by himself and everyone else.

We must also get over the notion that the buyer is conferring an everlasting favor on the seller. It is frequently the other way around. In the case of machine tools the buyer secures a machine which he uses indefinitely to produce a profit for himself. Is not the favor on the other side, if at all?

Whatever the sale, each side should benefit. If the seller did not prefer the money to the machine he would not sell. If the buyer did not prefer the machine to the money he would not buy. And whatever adds to the cost of making the sale hurts the buyer more than the seller, for in the long run the cost must go into the price of the machine.

Use One-Way Tolerances Only

WE HAVE been thinking of plus or minus tolerances for so long that many do not seem to realize they belong to the dark ages of interchangeable manufacture.

The advantages of the one-way tolerances are many. With holes or all similar surfaces made basic, *plus* the given tolerance, and all plugs and similar mating surfaces made basic, *minus* the tolerance, much confusion is avoided and mechanical operations are made more simple.

The standard hole, with the basic size of the mating

part enough smaller to allow the necessary clearance for lubrication or for other reasons, is now the basis of most interchangeable machine manufacturing.

Both the Newall system in England and the Johansson system in Sweden are based on two-way, or plus or minus, tolerances. Ludwig Loewe & Co. in Germany also used the two-way, or bi-lateral system, for twenty years. But the advantages of the one-way system were so great that, despite the cost and other difficulties in the way, they have now adopted the one-way system.

Similar action is being taken in France and Switzerland and, with the progressive firms in the United States working along the same line, it looks as though the one-way method of tolerances would soon be standard the world over.

Get into the habit of thinking of one-way tolerances only. See that drawings and blue prints are properly marked and help along the good work.

Which Kind of Ton?

THE American Institute of Weights and Measures is now advocating that in all references to tons, short ton or long ton be specified. In America there is little reference to the long ton, frequent reference to the short ton. The obvious way to designate the short ton of 2,000 lb., is the way suggested by the institute, namely, to use nothing but the word "ton." The long ton of 2,240 lb. could then be designated by the word "L-ton."

The AMERICAN MACHINIST has approved the suggestion and will from now on, whenever referring to the long ton, use the expression "L-ton." The short ton will be designated by the word ton without any modification.

It is further suggested by the institute that if circumstances demand it, a ton of 2,000 lb. could be designated by "S-ton." This is especially recommended in trade with Great Britain and its colonies. It seems that such a recommendation is sound and should be followed in dealing with foreign countries using the ton of 2,240 pounds.

False Economy

TO a certain class of buyer the appeal of the second-hand machine is irresistible. The saving of twenty-five or thirty per cent of the cost of a new one is too much for his bargain counter mentality to resist and he falls for a purchase, the value of which is at least open to question.

These remarks are in no sense disparaging to the small shop proprietor who cannot scrape money enough together to buy new equipment, nor to the reputable concerns which render a real service to men of his type by selling re-conditioned machines of standard make with complete equipment. Such dealers are in business to stay and their dealings are entirely legitimate.

Unfortunately, there are others in the machinery business whose principles are not so praiseworthy. How they cheat the unsophisticated buyer is indicated by an article in the last issue of the organ of the British Machine Tool Makers' Association. Special shell lathes, some with but one spindle speed, others without power feed, still others equipped only for special jobs, are catalogued as standard models by shyster dealers.

Here is but one instance of dishonest methods, but it should be sufficient to show the danger for the unwary that lurks in buying from unknown dealers in "as is" equipment. Is it worth the money to pass up the service that goes with a new machine, or a guaranteed re-built one, the assurance that the machine is perfect and the unquestionably better performance it will give, for such a risk?

The Reward of the Kicker

IT IS unfortunate, but true, that many of the favors in this world go to those who make the loudest noise. The pleasant average citizen who doesn't complain if his eggs are ancient or his meat is underdone or his apple pie is forgotten and who treats the waiter as though he were a human being, usually waits for his service until the loud-voiced complainer who finds fault with everything in sight has been pacified. Of course it isn't right, but that's the way it happens.

In other words, if you want service you very often have to ask for it or even demand it, particularly if the service is to come from a municipal, state or federal organization. Some such situation is likely to face the machinery men of the country before long, as the result of the curtailment of the requested appropriation for the Bureau of Foreign and Domestic Commerce. We commented last week on the favorable significance of the fact that an increase, small though it was, had been granted to the Department of Commerce by Congress. It was a well-earned recognition of valuable service.

However, because the increased appropriation for the bureau is still too small for its requirements, there may have to be a revision of plans by the director. In case of such a revision somebody's service is going to suffer and if events follow their usual course, that somebody will be the quiet, deserving group which fails to make its needs known.

That the Bureau of Foreign and Domestic Commerce through its Industrial Machinery Division has been a valuable aid to American machinery manufacturers and merchants since its inception, has been amply proved. What it may do in the future has hardly been imagined, let alone planned, as yet. Foreign trade bids fair to be the next great line of development for the activities of the United States and the men of the machine industry should be foremost in the advance.

Under the circumstances it will do no harm and may do much good, to let the director of the bureau know that you value the work of the division assigned to you and want its work continued and expanded.

Saving the Air Mail

NOW that the Senate has restored the appropriation for a continuation of the Air Mail Service, it is up to the House of Representatives to acquiesce as they have done on several previous occasions. The amount of the appropriation, $1,900,000, is inadequate; but we will be thankful for that because so much of our future in commercial aviation depends on it.

Transportation, perhaps more than anything else, affects all business dealings. Commercial aviation will play a much more important part in future development than many realize. Anything which can legitimately be done to further it should have our unqualified support.

It is hoped that the House of Representatives will agree to this appropriation without further delay. If they do not, it behooves us all to see that our representatives are made acquainted with our belief in the need of this, in a positive manner. The Air Mail must continue and with it a development of suitable commercial planes.

Shop Equipment News

Manufacturers' Consulting Engineers Two-Way Boring Machine

The machine shown in the accompanying illustration is intended for boring simultaneously both sides of the work. It has recently been placed on the market by the Manufacturers' Consulting Engineers, McCarthy Building, Syracuse, N. Y. It is intended especially for boring, bottoming, and reaming both the exhaust and the intake ports of gas-engine cylinders, although the same type of machine is applicable to many similar operations.

The machine is motor driven, and is semi-automatic in operation. The workholder to which the cylinder blocks are clamped accommodates four cylinders, and is arranged to rotate about its central axis. The multiple heads at the two ends of the machine are fed toward the center simultaneously, where they finish the work and then return to their outer positions and come to



MANUFACTURERS' CONSULTING ENGINEERS TWO-WAY BORING MACHINE

rest. In this way, the ports on both sides of the cylinder are finished at the same setting.

The workholder is then indexed to the next position, and the feed for the heads engaged by a hand lever so that the cycle is repeated. Loading and unloading of the work is done while the machine is in operation, so that the only idle time of the machine is that required to move the workholder from one position to the other. The machine is capable of machining the castings as fast as the operator can supply them.

The cycle of operations requires 20 sec., in which time one cylinder block is completely bored, bottomed, and reamed on two sides. Two holes 1⅞ in. in diameter and 1 in. deep are held to 0.001 in. limits in diameter and plus or minus 0.005 in. in depth.

Van Norman Re-li-o No. 2 Bench Wet Grinding Machine

The Van Norman Machine Tool Co., Springfield, Mass., has recently adapted its "Re-li-o" bench grinding machine, such as described on page 776, Vol. 55, of AMERICAN MACHINIST, to wet grinding. The machine is thus suitable for the use of cylinder regrinding shops and piston distributors, where rapid production on a semi-manufacturing basis is necessary. Oversized pistons can be reduced quickly to fit the diameter of re-ground cylinders.

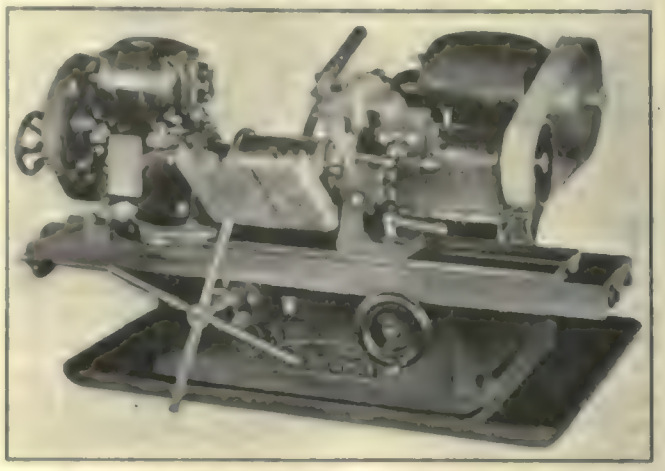


FIG. 1. RE-LI-O NO. 2 WET GRINDING MACHINE

In Fig. 1 can be seen a front view of the machine equipped with a water guard. A pump, tank, guards and piping for flood lubrication are provided. The location and the method of drive of the pump are well shown in Fig. 2. The wheelhead is equipped with a ½-hp. electric motor carrying an 8 x ¾-in. abrasive wheel. The wheel slide is made longer than in the dry type of machine, so as to insure greater rigidity.

The tool-holder mounted on the front of the wheel-

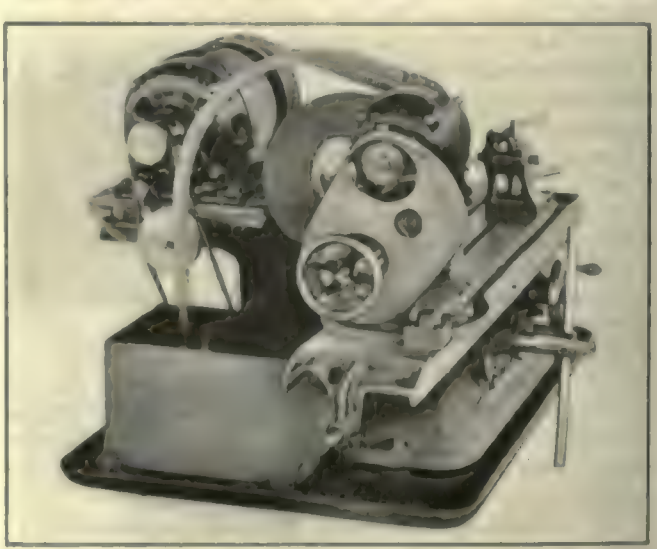


FIG. 2. WORK HEAD END OF RE-LI-O NO. 2 WET GRINDING MACHINE

slide can be swung into and out of the operating position without changing the position of the set-up or dismounting the grinding wheel. It is thus possible to remove a considerable amount of metal from the work by means of the turning tool, and then to swing the tool out of position and finish the work by means of the grinding wheel. The piston can thus be brought to size quickly without distorting it. The work is ordinarily held on a bull center or on an adapter, and the tailstock center is used as an additional support. The wheel is not rotated while the lathe tool is cutting. The toolholder can be entirely removed if it is not needed.

The machine is made heavier in some parts than the dry grinding machine. It has a more substantial locating and clamping device for use when turning the work spindle at an angle, or in securing it parallel to the ways. An adjustable stop is provided to maintain the proper position of the table.

The machine is adapted also to the grinding of wristpins, valves, reamers, and such small work requiring either cylindrical or taper turning operations. It is adaptable also to use in toolrooms and experimental shops. Its net weight is 600 pounds.

Union Portable Universal Saw Bench

In the illustration is shown a small, portable, universal saw bench that has recently been placed on the market by the Union Machine Co., Grand Rapids, Mich. The machine is adapted to use in pattern and woodworking shops, and is capable of handling stock up to 2 in. in thickness. It can be mounted on a bench, although it is ordinarily furnished on the base, as shown.

The base is provided with rollers, one of which is so controlled by the operating handle that it can be raised and the two legs of the base rested directly on the floor. The device can thus be very easily moved from one location to another. It derives current from a lighting circuit, so that it can be connected to a convenient socket. A ½-hp. motor drives the 7-in. saw.

The frame of the machine is a one-piece casting. The table is cast iron, 20 x 18 in. in size, and can be tilted to any angle up to 45 deg. and locked in place. Graduations are provided to facilitate the setting. The bolt connecting the motor and the saw is covered by a guard, and a device is provided for varying the belt tension. The saw may be furnished for either ripping, cross cutting, or combination work. The position of the guard covering it is adjustable, so as to provide room for the desired thickness of stock to be cut.

The arbor of the saw runs in ball bearings at a speed of 5,000 r.p.m. The arbor yoke is hinged, so that it can be raised and lowered to permit the saw to project above the table only the desired amount for the job being performed. Dado heads up to ⅝ in. wide and of 6-in. diameter can be carried. The metal throat plate is removable, so that hardwood throat plates may be inserted when using dado or grooving heads.

The cross-cut gage can be used on either side of the saw in the two slots in the table. It can be set and clamped at any angle. The ripping gage is machined on both sides and can be used on either side of the saw. It is locked in position and lined up with the saw automatically when the lever-head screw is tightened. A splitter guard is provided to prevent the stock from pinching the saw.

A switch for starting and stopping the machine is located on the front of the base. The machine is only 10 in. high in the bench style and 36 in. when mounted



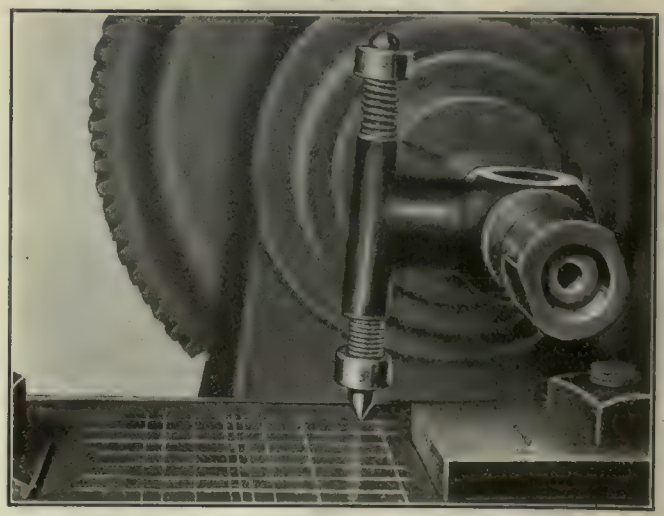
UNION PORTABLE UNIVERSAL SAW BENCH

on the base. The net weights of the two styles are 133 and 268 lb., and the weights crated 170 and 330 lb., respectively.

Johnson Center-Locating Punch

A combination prick punch and scriber for precision work in laying out centers for holes in jigs and dies has recently been placed on the market by Bernard F. Johnson, 3476 Boulevard, Jersey City, N. J. It is not necessary to employ buttons in laying out holes, as is ordinarily done. Holes can thus be placed very closely together, and the punch marks can be made in the desired positions without the possibility of interference that may occur between buttons.

The tool can be used in conjunction with a shaper, milling machine or other machine tool. Ordinarily, it is mounted on the cutter arbor of a milling machine, as



JOHNSON PRECISION CENTER-LOCATING PUNCH

shown in the illustration, with the punch either perpendicular or horizontal. The work is attached to the machine table, and is moved by means of the machine controls. The operator observes the movement by means of the graduated dials on the screws of the machine, so that the required dimensions between marks may be easily obtained. After each adjustment of position, a prick mark can be made on the work by tapping the rear end of the punch with a hammer. When all the centers have been properly located, the work may be removed from the milling machine and held on the face-plate of a lathe. The ordinary method of indicating, drilling and boring the holes can then be applied.

It will be noted that movement of the punch stem in either direction is possible, the springs normally holding the tool at rest. The device may be employed in conjunction with a dividing head, where it is desired to swing the work about a center. The center point may be used as a scriber for marking lines directly on the work. The springs in this case serve to keep a constant pressure of the point against the work. As the part is moved by means of the machine controls, continuous lines may be made, so that the die can be easily laid out. A thin line is scratched by the point, which is hardened and ground all over.

The tool is of especial use when laying out cams, as the outline can be accurately drawn on the work before cutting is started. The two collars on the ends of the punch are of equal size, so as to facilitate alignment of the tool. As shown, the holes in the arm of the device are ½ and ¼-in. in size, for mounting on the arbors of milling machines.

State Universal Saw Bench

A universal saw bench for use in pattern, cabinet and carpenter shops, and in shipping rooms and foundries has recently been developed by the State Pattern and Machine Co., 2824 West Lake St., Chicago, Ill. The machine is intended primarily for use on wood, but can be employed for such purposes as sawing carbon, asbestos, fiber and even soft metal.



STATE UNIVERSAL PORTABLE SAW BENCH

The machine can be supplied with either a tilting or stationary table. The motor is of ½ hp., either Emerson or General Electric make, 110 or 220-volt, and for either a.c. or d.c. The height is 34 in., and the diameter of the saw is 8 in. The saw can be raised or lowered, and provides a maximum depth of cut of 2¼ in. The speed is 3,500 r.p.m. A guide is furnished which can be used on either side of the saw.

A guard is supplied which consists of several thin aluminum plates so arranged as to swing easily as the work is pushed past the saw, but to prevent entrance from the side or from above the saw. The machine is equipped with S. K. F. ball bearings. The endless belt is adjusted by means of a special device. The machine can be operated from an electric light socket.

Erratum

The address of the Frank O. Wells Co., Inc., of Greenfield, Mass., was incorrectly given as Springfield, Mass., in an article entitled the "Wells Screw-Plate Set" on page 494.

Reconstruction Hospital To Have Enlarged Facilities

As a direct result of the world-wide experiments in rehabilitation of men injured in war, America has now a hospital dedicated solely to the care of industrial diseases and accidents and the restoration of industrial casualties to active useful life again. Ground was broken on April 2, for the new eleven-story addition to the Reconstruction Hospital at 100th St. and Central Park West, New York City.

It is a new idea to have a hospital where men suffering from any of the many casualties of industry may receive the benefits of an intensive study of their cases by surgeons specializing in all the newest forms of therapy, combined with the complete after-care of the patient until he is fit to earn a livelihood. Yet in the brief life of the present hospital, men have been sent from all over the country to take advantage of its unusual treatment, and many suffering from seemingly incurable physical ailments and distortions have been returned to useful industrial life again.

Besides the usual equipment the new hospital will have the most extensive and complete physio-therapy plant in existence. There will be rooms for occupation therapy, especially designed equipment embodying the latest principles in rehabilitation, electro-therapy, and mechanical apparatus, whirlpool baths, and a gymnasium where a score of mechanical devices assist the patient in recovering the fullest use of stiffened joints and weakened muscles.

The total cost of the new annex will be $1,500,000. It is hoped to complete the first two stories at once to relieve the pressure on the present hospital in which an average of 175 cases receive treatment daily, half of that number being sent by the Government.

Officers of the governing board of the hospital are: President, W. Gilman Thompson, M.D.; chairman of the board of directors, Allen Wardwell; vice-presidents, John A. Hartwell, M.D., and Giraud F. Thomson; treasurer, Edward M. Townsend; secretary, Elwyn W. Poor.



NEWS SECTION

Defendant Asks Rehearing of Open-Price Case

Rehearing of the open-price association practice in trade, or modification of the decree in the hardwood lumber case, to permit of the collection and dissemination of production, sales and stock reports, has been requested of the U. S. Supreme Court in a petition filed by the American Column and Lumber Co., defendants in the recent suit in which the court decided the practice was illegal because in violation of the anti-trust law. The lumber interests base their request on misinterpretation of certain phases of the case, and make general denial of the conclusions of the court that the purpose of the practice employed by the lumber interests was to curtail production or enhance prices.

Exhibit Road Machinery in South America

An exhibit is being planned by the Bureau of Public Roads of the United States Department of Agriculture, to be shown at the international exposition to be held at Rio de Janeiro, commencing next September, to stimulate trade in American made road machinery and motor vehicles. Models showing various steps in the construction of a road, colored transparencies and motion pictures will be used to illustrate American methods of road building. Manufacturers of road machinery and equipment are invited to exhibit.

The exhibit is also to cover highway transportation and this field will be covered by models being prepared by the National Automobile Chamber of Commerce.

Court Upholds Sugar Machinery Importers

The U. S. Court of Customs Appeals has decided the case of Cotton, Weill & Co., Ltd., involving the duty on centrifugal machines for use in the manufacture of sugar. They were assessed on importation, as dutiable by the collector of customs. The importers protested on the ground that the articles were knocked-down entireties and entitled to free entry as machinery for use in the manufacture of sugar. The Board of General Appraisers overruled their protest, but the court reversed its decision, sustaining the contention of the importers.

Annual Convention of Metal Trades

The twenty-fourth annual convention of the National Metal Trades Association will take place at the Hotel Astor, New York, on April 19 and 20. The program for this year, it is reported, is in many respects the most attractive which the association has ever been able to offer to its members and friends, subjects having been selected which it is felt everyone is vitally interested in at this time.

Among the subjects of importance to the metal trades which will be discussed at the convention, is that of training apprentices to be skilled all-round workmen. A committee on apprenticeship has been investigating the systems of various industries and will report at the convention.

Conditions in the coal mining industry and on the railroads will be discussed by speakers of national prominence; finance; the relation of the farmer to industry; the progress which the city of San Francisco and other large cities have made in emancipating themselves from labor union domination; future industrial conditions in the light of the European situation—are some of the subjects which will also be dealt with. Some of the speakers will be: Robert M. Lynch, of San Francisco; Harold G. Moulton, Chicago; Magnus W. Alexander, New York; E. L. Greever, Tazewell, Va.; James A. Emery, Washington, D. C.

The part played by the non-union coal operators of West Virginia in stabilizing conditions in that industry will be fully outlined by the Hon. E. L. Greever, of Tazewell, Va., counsel for the non-union mine operators of that district. Mr. Greever handled all legal matters arising out of the insurrection of last September. In view of the present labor difficulty in our coal mining industry, the subject is timely.

Ordnance Stores Moved

Under an appropriation of $1,642,351 made available by Congress in a deficiency bill, and approved by the President, the War Department is transporting ordnance stores to permanent storage points incident to the evacuation of ordnance depots of a temporary character heretofore maintained at South Amboy, Hammonton and Westville, N. J.; Middletown and Tullytown, Pa.; Seven Pines and Penniman, Va.; Sparta, Wis., and Toledo, Ohio.

Imports of Industrial Machinery in Egypt

A statistical study of Egyptian imports of industrial machinery in the last three years, just completed by the industrial machinery division of the Department of Commerce, shows that such imports from the United States in 1921 constituted 29.6 per cent of the total, compared with 12.3 per cent in 1920 and 15.6 per cent in 1919.

Egypt is not an industrial country, and the market for machinery is restricted. The most important Egyptian customers for such machinery are the various branches of the Egyptian government. The largest item on 1921 imports, after rail locomotives, was stationary internal combustion engines, valued at £302,762, of which the United States contributed only £4,614.

Rate Cut Not Ready

The decision of the Interstate Commerce Commission in the matter of a general reduction in rates, it now appears, will not be forthcoming before April 15. At present the case is being studied by the commissioners individually. If they should find themselves in substantial accord, the decision probably could be handed down as early as April 15, but should there be important differences between them, it obviously will extend the time required.

President Holds Up Patent Treaty

Action by the Senate authorizing the President to revive the patent convention entered into with Germany in 1909 has raised a storm of protest. As a result it seems probable that the President will withhold, pending an investigation, the notice reviving that treaty.

The 1909 patent convention with Germany provides that, in case the United States should amend its patent laws by the insertion of a working clause, this legislation would not apply to patents of German origin. The agreement is reciprocal.

There are certain American industries which are anxious to have this reciprocal safeguard, but the arrangement is regarded as being a very detrimental one to the chemical industry.

Chief sentiment for the revival of the treaty of 1909 is said to exist in the electrical industry.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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It is estimated that from 300,000 to 500,000 miners and 70,000 textile operatives are on strike, but the fact that these two great strikes have not seriously affected business attests the stolid confidence in the future that is now generally felt. The apparent unconcern of the public is due to a widespread belief that an adjustment by compromise will soon be reached and that a vacuum is being created in the supplies of cotton goods and coal that argues higher prices later on.

Concurrently the railroads are doing better, and February net earnings are substantially in excess of earlier expectations. Many other signs of increased activity are also to be noted. The Western Union Telegraph Co. reports a substantial gain in the number of messages handled, and the telephone toll business, local and long distance, is said to be at its peak.

Upon the theory that a nation wide improvement in business is impending, the financial markets have been active and buoyant. A large number of bond issues, including one for Czecho-Slovakia and another for the Republic of Santo Domingo, have been readily absorbed. The Victory war bonds have sold above par and most of the Liberty issues have crossed 99. On the advance a great many small holdings have been marketed and the money thus released is apparently being invested in other securities that promise a higher return and have greater speculative possibilities.

Speculation Rife

The many letters asking for my advice with regard to speculative investments that I have recently received indicate that the spirit of speculation is spreading, and the fact that some of my correspondents seem angered by my answers urging them to put their money in a first mortgage on improved real estate is proof that the temptation to take a chance in the hope of making something more than compound interest is again becoming irresistible.

As the contagion of speculation spreads and the public becomes excited a further advance in the stock market is quite possible, if not probable. But even if I were willing, as I am not, to take the responsibility of recommending the purchase of any particular security I should feel impelled to point out that the stock market is now in the secondary stage of a bull movement. As it advances sharp reactions that will make marginal operations more and more dangerous are to be expected.

I feel at liberty to speak this word of caution because during the dark days of the past twelve months I was persistent in predicting that the golden flood by which the country has been inundated would ultimately submerge the wreckage of the late depression, and now that the conditions that I expected have developed the prudent should be on their guard lest they become the victims of a thoughtless public enthusiasm.

Of the commercial and industrial future it is possible to speak rather more confidently than of the stock market. The steel mills are running at 70 per cent of their capacity. The indications favor a further gain. The railroads are buying more freely and the building activity is almost phenomenal. In greater New York 27,839 apartments or tenements containing 107,054 rooms are in process of construction. From many other cities a similar building boom is reported. It is reflected not only in the demand for structural steel but in the sales of brick, cement and other building material. In one forenoon last week 16,500,000 brick were sold in New York, and the price of cement has risen to $2.90 per barrel. The shortage of housing will soon be a thing of the past and landlords are rather less exigent in their demands.

An improvement in the jewelry trade is another sign of returning prosperity. The diamond cutters are busy again for the first time in two years. A further advance in coffee which has carried the May option to nearly ten cents a pound, the rapidity with which the Cuban surplus of sugar has been distributed at advancing prices and a slight improvement in the market for crude rubber, which is said to reflect an increased demand for tires and automobiles, are other straws in the current of the commodity markets which indicate a greater willingness to buy on the part of the public.

Cotton has fluctuated within comparatively narrow limits. A prominent trader says that the market is "buffaloed" by the textile strike and the premium of 50 points on the May option in New York. It is said that this position has been cornered by a group who are reputed to hold contracts for the delivery of 750,000 bales.

The dry goods market is somewhat firmer but it is to some extent paralyzed by the strike and the artificial conditions which exist in the market for the raw material. It is, however, admitted that the shelves of distributors are very bare of cotton goods and their replenishment by active buying seems to be only a question of time.

Sales of fertilizers are rather below last year's figures and current guesses are that the acreage will be increased by not more than from 3 to 10 per cent.

Waiting for Russia

The grain markets are hesitant. Their future depends upon crop development and the outcome of the Genoa conference. Some think that if Russia is accorded commercial recognition there she might again become a large producer and exporter of wheat.

Lloyd George's Parliamentary victory, following his remarkable speech, has revived the hope of early and rapid recovery in economic conditions abroad. The market for foreign exchange is in consequence generally firmer, but German marks continue "droopy" at around 30 cents a hundred. The paper circulation of Germany has been increased by nearly eight billion marks and now stands at over 130 billion.

There has been a sharp advance in Mexican bonds. Many think that it presages President Harding's recognition of the Obregon government. It seems to be generally agreed that conditions in Mexico are decidedly better.

In Washington the best political opinion is that the Senate will pass the bonus bill with an amendment for the imposition of a sales tax. The folly of this course, if it is followed, is fully appreciated, but business men realize that the first effect of the proposed legislation, if it is enacted, will be inflation and higher prices. For this, most of them are, consciously or unconsciously, preparing. After the proposed largesse to the soldiers has been distributed and spent the prostration which always succeeds artificial stimulation will no doubt follow. Prudent men should therefore be prepared to step off the train when it commences to slow down, but as it has just started it may be unwise to look too far ahead.

The weekly statement of the Federal Reserve Banks shows an increase of nearly $8,000,000 in the gold held, but the reserve ratio is practically unchanged at 77.7 as against 77.8 per cent last week.

Government Sale of Standard Airplanes

Notice has been received from the office of the Chief of the Air Service, War Department, Washington, of the sale of a lot of standard J-1 airplanes and hangars. Sealed proposals for the purchase of these airplanes will be received at the material disposal and salvage section, Office of the Chief of Air Service, Room 2624, Munitions Bldg., Washington, D. C., until 3 p.m. Tuesday, May 2.

The airplanes are stored in the Aviation General Supply Depot, Houston, Texas. The equipment consists of fourteen standard J-1 planes which have never been used. These planes are not equipped with engines. Another lot consists of fifteen standard J-1 planes, not equipped with engines, which have been used and which need minor repairs. All the planes in this section are equipped with gasoline tanks, hand pump and air gage, but do not include instruments, accessories, spare parts, or tools.

The bids for the airplane hangars will be received up to May 8. These hangars are located at the Aviation General Supply Depot, Morrison, Va. The lot consists of twenty Alban-Richards Type B portable hangars, complete with canvas covering; forty-nine Alban-Richards Type A portable hangars, minus canvas covering.

Observations at the Leipzig Fair

Rapid Growth of German Machine Tool Industry—Present Design Based on Imitation, Rather Than Originality—Foreign Influence Missed

By OUR BERLIN CORRESPONDENT

The Leipzig Fair, at which the exhibition of machinery of every description has become a standing feature during the last two years, supplies a good picture of the activity of the German machine tool building industry. Recent developments have added considerably to the utility of fairs, which now spring up like mushrooms in all parts of Central Europe. Traveling has become expensive and cumbersome, and traveling salesmen are a species which, if not entirely extinct, has greatly diminished in numbers. Instead of the salesmen, the buyers are now traveling in search of the best purchases, and for them a general meeting place with a great number of sellers is a great convenience. Moreover, this year's Leipzig Fair takes place under a luckier star than its immediate predecessors, the sinking exchange naturally acting as a stimulant to foreign and domestic buyers. To the expectations based thereupon can doubtless be attributed the greatly increased number of exhibitors of all branches of industry, and the large number of visitors, surpassing all records of previous fairs. Buying is brisk, and although the reports launched in the newspapers are no doubt exaggerated, a very satisfactory volume of business has been transacted in domestic as well as foreign orders, although the hopes in the latter respect have not been nearly realized. Even at the machine tool exhibition, where in the preceding years hardly any actual contracts were concluded, a considerable number of sales have been transacted. Several exhibitors put signs on their machines indicating the number of orders received for that particular tool.

Machine Tools Predominate

The so-called technical exhibition, taking place on the exhibition grounds, which will be remembered by the members of the A.S.M.E. who visited Leipzig in 1912 as guests of the Society of German Engineers, now unites nearly all lines of engineering. The largest and most prominent space is occupied by the German machine tool industry, which exhibits collectively. The organizer, the Association of German Machine Tool Builders, is using all its influence in producing an imposing show. This year's result, evidently helped a good deal by the favorable market conditions, far surpasses all previous exhibitions. The space contracted for by the association was insufficient to house all exhibitors, and a large building had to be erected in haste. Even so, some of the exhibitors are found outside of the exhibition grounds, in the town proper.

The interest of the observer is naturally attracted to such new firms from whom novel designs can reasonably be expected. Most of these new firms originated from dealers taking a hand in manufacturing by entering into joint business with machine builders on the lookout for specialties, contracting with them for the manufacture of certain designs. In the same way a number of employees of machine tool companies in leading positions have contributed to the increase of machine tool manufacturers. Considering these facts, the exhibits of the new machine tool builders are very disappointing. Hardly without exception, they have not ventured from the beaten track. The lines adopted seem to have been selected, not with a view to satisfying a pressing demand, but rather from personal preference for certain designs and types. Independent inventive ideas, carried out with assuredness, are peculiarly absent. It is true, only a few started upon the already overcrowded field of standard machinery, but most of them encroached upon preserves already occupied by somebody else, with the sole justification of a few new and often needless improvements. The best that can be said for a number of so-called novelties is that their originators have studied the American Machinist with great care and intelligence, patching together features picked out here or there. The copying of American designs from live machinery is now impossible owing to the absence of the latter, but new ideas developed in America are very useful as a guide and stimulant to the designers. As far as actual copying can be observed, it is based upon the types available from pre-war times, into which the designer has often incorporated his own ideas of improvement.

Lathes Most Prominent

Lathes form by far the most numerous group. The typical German gap lathe with flat bed did not put in an appearance. This type is slowly dying out, and where it is still made the makers seem to be ashamed to show it in public. It is now the ambition of every lathe manufacturer to produce lathes with V-ways, lead screw and feed rod, and change gear box. There is a strong tendency towards the single-pulley drive, not so much from actual demand but for gaining distinction. The ambition of the makers seems to end there frequently, although this does not apply to the leading manufacturers. The craze for all-geared headstocks is shown on a backing off lathe with single-pulley drive exhibited by Schütthoff & Baessler, one of the new firms, which is successfully combating the monopoly Reineckers have enjoyed for a long time in the making of backing-off lathes. Lathes with electric drive are also receiving increased attention. Several manufacturers show more or less happy solutions of this problem. In most cases the electric motor is placed on top of the headstock, the whole design bearing a rather makeshift appearance. In only one case can it be said that the problem has been attacked with the serious intent to produce a homogeneous design. This is the high-speed lathe made by Gebr-Boehringer, now probably the leading German lathe manufacturer. In this lathe the electric motor is put into the headstock casing, its axis in alignment with the spindle. So well have the designers utilized the space that the headstock is not much larger than in an ordinary all-geared lathe, and casual observers would probably pass it over as such a one. Headstock and motor form one compact unit. The latter is a reversible, variable speed motor for continuous current. Three speeds can be obtained through the gear box, giving in combination with the speeds of the motor a wide range of speed changes. As a further novelty in this lathe both lead screw and line shaft are driven through the gear box. The wiring for the motor is placed inside of the frame with the starter arranged in the cabinet foot under the headstock. When in position the power is carried to the lathe through cables in slots of the floor. The lathe is built in one size of 250 mm. height of centers, but in various lengths of bed. Gebr-Boehringer also show a heavy lathe on which tests are being made during the exhibition with stellite and Le Moyne steel in comparison with German makes. The stellite, which is now being sold in Germany through the Jaegerstahl Company, is still considered superior to all other makes where high cutting speeds are concerned, while the Le Moyne steel gave an excellent demonstration of its capacity in taking large feeds. Chips of 3½ mm. thickness and over 25.4 mm. wide, were cut from a piece of Siemens-Martins steel of 60 kg. strength, a record achievement of this lathe. Tests could not be carried out to the utmost limit of capacity, as the power supplied by the electric installation was not sufficient.

In the field of milling and drilling machines nothing essentially new is to be seen. The Wanderer Works, Germany's leading milling machine manufacturer, has evidently contented itself with improving the finish and workmanship rather than the design. It is now using hardened steel gears in the gear boxes. A milling machine with a double arm support of the spindle, a copy of the Milwaukee design, is shown. Ludwig Loewe shows a universal milling machine with a triple dividing head in combination with an automatic indexing device. In this exhibit a keyway milling machine is also to be seen; in this machine the cutter, at the end of its stroke, reverses automatically and repeats the stroke for cleaning out the cut, after which it is stopped automatically.

Electrically Driven Drills

A great variety of drilling machinery is shown, none of which presents any novelty. In several cases the machines are equipped with electric drive. Of gear cutting machinery very little is in evidence. Besides the well-known makes of hobbing machines, German copies of the Fellows gear shaper and the Gleason are most conspicuous. The Reinecker line of Bilgram machines is

about. The Lorenz Machine Tool Works, which specializes in heavy gear cutting machinery, is showing a large machine for cutting herringbone pinions such as are used for turbine drive.

Of planers only a few makes are represented. A large planer is exhibited by Gebr. Bachringer, with greatly improved electric drive, for which the A.E.G. (General Electric Company) is responsible. By using an entirely novel arrangement of rheostats, the stoppage of the platen at the end of the stroke, or at any desired moment, by pressing a button, takes place with such precision that the most accurate work up to a shoulder can be performed. The novelty in this design is the automatic electric brake which comes into action before the return of each stroke, no matter whether the latter is actuated by dogs or by electric push buttons. The manner in which the brake acts varies according to the speed or length of stroke. In short strokes it is only small, and increases in proportion to the length of the stroke. The result obtained is astonishing; the reverse is entirely free of shock, even of the slightest vibration. The cutting speed can be varied between 5 and 12 in. There is a set of three buttons for starting, stopping, and reversing the platen, arranged at either side of the housing.

The Zimmerman Works, a German firm which during the last year has moved into the front rank of machine tool manufacturers, is showing a planer with a new device for the positive relief of the tool by means of a shaft placed in the toolslide and actuated at the end of each stroke through cams.

Automatics Prominent

In automatics several makes of the Cordley design are again prominent. The Pittler Works is showing an automatic of this type of unusually large dimensions, the spindle having 6-in. bore. As a novel feature of this automatic the cutting-off tool is placed vertically above the work. This firm has just published its balance sheet of last year's business, which supplies a striking instance of the prosperity which many of the German machine tool factories enjoy. The value of the buildings has been entered at less than two million marks, which now would hardly pay for the roof. The stocks of finished machinery and material, finished and semi-finished parts, figured at one and a half million marks, or hardly more than the price of the machinery visible at the exhibition.

From the commercial point of view the small automatics have been most successful. Of the many types of machines which Loewe has on exhibition, the small automatic of 1-in. bore, which commends itself by its simple design, found largest interest amongst actual buyers. Ludwig Loewe has now re-established its foreign selling organization, and has appointed agents in all countries where it was represented before the war, including England.

A large number of makes of grinding machinery are represented, many by new firms. The only new item of interest in this field is the "Sun and Planet" system of crankpin grinding, shown by Friedrich Schmaltz. The grinding wheel, which is driven by electric motor, the two forming a compact unit, has besides its own rotation, a revolving movement around the work.

The number of single purpose machines to be seen is comparatively small. To the copy of the Lapointe broaching machine already existing, Alfred H. Schütte has added another. The Lapointe design is scrupulously followed, with only a few variations, especially in the arrangement of the driving parts. This firm is also showing a lathe for simultaneously turning, cutting-off and boring. This tool is made by the Schaerer Machine Tool Works, a lathe factory which Alfred H. Schütte bought some time ago. The machine works from bars fed through the spindle hole. It has two toolslides, one on either side, for the turning and the cutting-off tools respectively. The purpose of the machine is to manufacture rings in quantities. By the turning tool or tools the cross-section of the blank is divided into two or more rings, the center bore is performed by the boring spindle which runs in the tailstock and has a separate drive counterwise to the headstock spindle. It appears that Schütte is constantly expanding his manufacturing scope. In his double capacity of manufacturer and dealer the first seems now to be predominant, at least inside of Germany. The firm has re-established most of its pre-war time foreign branches and agencies.

In the small tools section little of interest is seen. The most prominent part of this section is occupied by Schuchardt & Schütte's exhibit of the precision measuring tools developed in connection with the well-known optical works of Carl Zeiss. While the machine tools this firm shows deserve no special mention, being designed on strictly conventional lines, the precision measuring tools represent, no doubt, the greatest progress achieved in Germany during recent years. The standard types of gages, of which various kinds are shown, are noteworthy only as specimens of the high-class work done in the Zeiss factory. However, in the combination of mechanical and optical measuring some great results have been accomplished. These optimeters, as they are called, are capable of correctly reading measurements down to 1/1000 part of a millimeter. Of special interest is the thread measuring optimeter, which is the most perfect and best of its kind known in Germany. The Zeiss instruments will probably be introduced in America as soon as their manufacture in quantities is assured.

Firms Expanding

Schuchardt & Schütte have been able to develop their organization and have increased their manufacturing lines. The latter consist of cutting tools and gages, several standard machines and a few single purpose tools. Another specialty of the firm is the manufacture of portable electric drills. The firm maintains its old established branches in Stockholm, Copenhagen, Vienna, Prague and Budapest. The branch in Milan was re-opened on a larger scale than in pre-war times, and a sales office was established in Amsterdam a short time ago.

The Fortuna Works, manufacturer of the Hirth minimeter, has added a new feature to this instrument, which increases its value in shop practice. Two small electric lamps, a red and white one, are placed close to the reading dial. They are connected with the index finger, and can be adjusted to light up at required limits. Instead of lamps, electric bells of different sounds may be used so that the instrument can be handled by blind war invalids. The firm has received numerous inquiries for minimeters from America, but find the way to this market barred. The firm placed its agency in America with a New York firm. The shipments sent to this firm have been refused entry into American territory because of an injunction obtained by the former agent, the Norma Company of America. This injunction has of course been granted on the strength of the patent rights having passed into the possession of the American Norma Company, but the impression created in Germany is that German firms have no legal standing in the United States, although nearly four years have elapsed since the end of the war. For this reason they are shy in licensing new inventions to America, and many promising negotiations in this respect have broken down on such grounds.

A Thousand Designs

There are over two hundred machine tool makers represented at the exhibition, and more than a thousand tools of various makes and designs can be counted. With the few exceptions mentioned, none present any material news interest. Specialization has not advanced any further. On the contrary, it seems that works which have thrown overboard some of their lines, evidently with a heavy heart, are now branching out again. Specialization seems to be content to remain a doctrine only. Even young firms, starting out with single-purpose machines, show an inclination to take up other lines as they go along. The old German adage that one cannot stand on one leg is evidently being followed, disclosing a certain lack of confidence of the manufacturers in their designs. German firms maintain that their market is not large enough for such minute specialization as prevails in America, but as the production of the German machine tool industry is not far behind the American, such arguments are not convincing. The truth is that the makers instinctively incline to make the nets in which to catch the buyers as large and closely meshed as possible. Standardization of parts is also progressing very slowly. Manufacturers of measuring tools state that although new firms are frequently ordering their gages according to present standards, the old established firms are exhibiting strong conservatism, opposed to any change.

The general impression received from the exhibition is that only a few of the manufacturers are keeping in mind the building up of their production with a view to future business, and that most of them are solely thinking of the business of the present. In the latter respect good results are evidently obtained, and prosperity seems to prevail almost everywhere. The ill effects of the long seclusion from the outside world upon the moving spirit of the industry are strongly visible. New blood is urgently needed, and no greater service could probably be done to the German machine tool industry than if conditions would permit the importation of foreign machinery. As it is, a marked staleness prevails, which can be remedied only by foreign competition.

Growth of American Machinery Trade in China

BY A BRITISH CORRESPONDENT

One of the great outstanding features about China's trade today, is the steady rise of American commercial influence in that country. This is evidenced by the fact that the value of United States' exports to China has risen from 25 millions of dollars before the war, to about 150 millions of dollars last year. That, in itself, is a significant fact; and before dealing with the machinery and machine tool trade, I propose examining very briefly the causes of this increase. In 1914, there were only 136 United States commercial houses in China. Today there are considerably over 400. There are many causes operating to cause a favorable environment to American enterprise. Of course, the events of the war had some influence. The United States enjoyed peculiar advantages in that part of the world during the war, some time after hostilities ended, particularly in regard to early delivery of machinery. For some years English exporters of machinery could not deliver on any terms, and when the war ended they could do so only on terms that made business very difficult. Some of these advantages have passed and others are passing away and competition in future will be on more equal terms.

This large development of American trade in the Celestial Empire is recognized by all shrewd observers in Europe as a sure sign of her growing realization of the importance of the Pacific. British manufacturers realize that in future America will be a far more serious competitor than in the past. Several influences have been at work in promoting United States trade, influences which English traders often pooh-poohed and regarded as of little importance, but when taken in the aggregate are of great value. For instance, for years past Americans in China have been working very hard in educating the Chinese, building and endowing many schools and colleges; mixing in a spirit of real comradeship with the better class of Chinese in social functions; while their sympathy with the ideas and aspirations of "young China" has brought them into close association with the more progressive elements in the country. All these influences are factors and have had a certain cumulative effect. The influence, too, of American missionaries, working in a perfectly legitimate way, must not be ignored. It is undeniable that the United States business element in China has got much nearer to the hearts of the people than the representatives of most other countries, although, of course, all this would have been useless unless the American merchant had had a good article to sell.

A Closer Friendship

The "new ways" represented by American firms in China appeal also to the younger and more democratic Chinese merchants. The new spirit has become noticeable among Chambers of Commerce where the old-time conservative element has had to recognize the power of the younger men with their more go-ahead methods. This element is inclined to ignore the old traditions and methods of trade and to follow the system that offers more chances even if at the risk of occasional loss. This bolder spurt of enterprise has brought the two races much closer together than people in Europe can imagine.

A little while ago, the Hong Kong correspondent of the *Times* quoted some local selling prices of machine tools, etc., in South China. It should be pointed out that to the Chinese mind price is the chief consideration. Many buyers of engineering products are unable to distinguish between a very good article and one that may have a good appearance, but yet be a poor article. Only a comparatively few of them are able to judge the merits of design or construction. They will buy a very cheap tool in the hope that it may be a good one and that if not then it is only the loss of a few hundred dollars. This strikes the Western mind as rather a speculative way of doing business, but it is the Chinese method in many cases.

The local selling price of an English made screw-cutting 6-in. lathe is about £267, while the price of the foreign-made machine is quoted at about £130. Local quotations for an 8-in. British lathe is in the neighborhood of £400, while the foreign-made machine is sold at £230. The British 10-in. lathe is quoted locally at £537 against its competitors' price of £325. It is not suggested here for a moment that these machines are of equal value. An experienced eye at once notices the difference in design, construction and wearing efficiency. But as already stated, the majority of Chinese buyers in the engineering section cannot be regarded as at all competent judges as to the respective merits of competing machines. All they know is that there is a very large difference in price and they are largely blind to quality. The prices of American-made machine tools are reported by Chinese firms to be rather lower than those quoted for British machine tools.

A shaping and planing machine giving a 10-in. length of stroke (hand power) is quoted at £20. A British shaping machine (stroke to 12-in.) costs £200 in China, whereas a foreign firm is selling a 10-in. machine (not hand power) at £50, and a 16-in. machine at £106. In 1920 the latter machine was quoted at £126. British 16- to 18-in. machines are quoted locally at £250, against a 22-in. machine for £150 by foreign importers, the 18-in. machine being, £120. A British planing machine 6 ft. x 30 in. x 30 in. costs locally £625; a machine of similar dimensions imported from another part of Europe cost £370. A British 25-in. drilling machine costs locally £215, while its foreign-made competitor, a 24-in. drill, costs £68, and this is seen to be typical of drilling machines of all sizes and types.

The prices speak for themselves. It is felt by everyone handling British machinery and machine-tools in the Chinese market that unless very substantial reductions are made in price it will be well nigh impossible to compete in the open market against American and Japanese competition.

To illustrate further the seriousness of the present condition of affairs, I need only recall the instance of the contracts for supplying railroad material to certain lines in China six months ago. The value of the contracts was half a million pounds sterling for the supply of locomotives and wagons. There were 176 tenders from British, French, American, German, Japanese, Chinese and Belgian makers. As will be seen below the British prices were not even in the running, the Belgians carrying off all the business except for five engines of special U. S. A. manufacture.

Goods Required	Successful Manufacturers	Price	Lowest and Highest British Tender
30 Prairie Type Locomotives	Forges Usines et Foundries of Haine St. Pierre	£10,000 (approx.)	£13,075 to £18,732
6 English Type Locomotives	Forges Usines et Foundries of Haine St. Pierre	£10,050 (approx.)	£13,500 to £17,280
2 Mikado Type Locomotives	American Locomotive Co.	£12,500 $52,000	£14,904 to £17,000
3 Pacific Type Locomotives	American Locomotive Co.	£12,500 $52,000	£14,310 to £16,500
100 Steel Open Wagons	Compagne Central de Construction a Haine St. Pierre	£680 (approx.)	£1,016 to £1,340
100 Steel Covered Wagons	Compagne Central de Construction a Haine St. Pierre	£738 (approx.)	£1,160 to £1,470
40 Steel Covered Wagons	Compagne Central de Construction a Haine St. Pierre	£738 (approx.)	£1,160 to £1,510

In this case, little, if any, financial aid would have been required because the goods would be paid for within six months. The whole contract turned on the question of manufacturing costs, which were then and are still to a rather less degree, so high in the United Kingdom that British firms had absolutely no chance of competition with those of foreign nationalities. Failing the Belgian success, the work would have gone to America or to Germany. On some of the items in the table the highest among the British tenders were nearly double those of the Belgians.

The newly issued government report on China deals with this very question of contracting for railroad rolling stock and the general conditions relating thereto. It is pointed out that the conditions on which such orders are obtainable generally involve extended terms of credit, payment usually being spread over three or even five years and that this condition does not commend such business to English manufacturers, the report adds these words:

"It is evident, however, that so long as the Chinese railroads can find merchants or manufacturers of other countries willing to do business on these terms the market offers few opportunities to those who pursue a more conservative policy." Later on reference is made to offers said to have been made by American firms to allow payments for locomotives over a period of seven years. "It is obvious (it says) that no British manufacturer or mer-

chant house could afford to grant such liberal terms without some strong financial backing, and the question arises whether the time has not come to consider the establishment of an Anglo-Chinese Industrial Bank which would assist our manufacturers in financing large contracts involving deferred payments."

STATEMENT SHOWING THE EXPORTS OF MACHINERY FROM THE UNITED STATES TO CHINA DURING THE YEAR ENDING JUNE 30, 1924, AND THE CALENDAR YEAR 1920

	1924	1920
Machinery: Machines and Parts Thereof	Dollars	Dollars
Adding and calculating machines	1,770	42,372
Air-compressing machinery	7,659	51,210
Pumps and parts		19,330
Cash registers and parts	1,705	19,410
Cement mixers	N.s.d.	42,111
Cotton gins	940	26,645
Dairy separators	641	2,660
Elevating and conveying machinery	10,560	28,102
Electric locomotives and parts		90,150
Internal combustion engines:		
Stationary gas and parts	2,914	20,104
Gasoline gasoline parts		1,671
Marine gasoline parts	19,530	66,567
Stationary gasoline parts	11,630	133,474
Tractor gasoline parts		22,514
Kerosene engines	N.s.d.	9,143
All other	N.s.d.	51,317
Steam locomotives and parts	320,679	3,320,130
Steam marine engines and parts		36,636
Steam engines, stationary and parts	134,907	564,791
Steam engines, traction and parts:		
All other engines	4,662	158,817
Engine parts and elsewhere specified		
Pumps		565,950
Roller bearings	60,771	162,211
Other parts		1,106,001
Laundry machinery: Power		
Washers	1,420	10,644
All other	600	4,936
Lawn mowers	224	1,212
Metal working machinery:		
Lathes		241,433
Other machine tools	17,668	411,039
Sharpening and grinding		53,317
All other		222,562
Motors, gas and water	N.s.d.	11,907
Milling machinery—flour and grist	152,635	599,942
Mining machinery—all sorts		32,505
All other	4,004	46,970
Paper-milling machinery	1,782	69,418
Printing presses	5,192	324,646
Pumps and pumping machinery	14,131	447,626
Refrigerating machinery	504	93,421
Road-building machinery	N.s.d.	15,135
Sewing machines	20,055	268,931
Shoe machinery		2,679
Sugar-making machinery		28,279
Textile machinery	3,149	1,703,673
Typewriting machines, including parts and other	542	12,503
Weighing machines	809	1,634
Wood-working machinery	46,822	246,611
Miscellaneous machinery:		
Agricultural machinery	505	27,665
All other	975	71,580
All other machinery and parts	175,266	3,163,720

Note: N.s.d. Not separately distinguished.

The Trend of Business Improvement—Plants Resuming

The Western Electric Co., Hawthorne, Ill., has adopted a production schedule calling for 900,000 complete telephone instruments during the present year, in addition to 9,000 switchboard sections and other electrical equipment.

The Grand Trunk Railroad Co. has resumed operations at its repair shops at Battle Creek, Mich., following a few weeks' shut down. A force of 550 men will be employed.

The Carnegie Steel Co., Pittsburgh, Pa., has resumed operations at the 10-in. rolling mill at its Mingo Junction, Ohio, plant, following a shut down of about a year. The mill will give employment to about 100 men.

Thomas A. Edison, Inc., West Orange, N. J., is resuming production on an increased capacity basis in all departments at its local plant, with greatest advance in the storage battery branch of the business. Employment is being given to about 3,000 operatives, and this working force will be increased by about 100 employees a month.

The Wilson Foundry and Machine Co., Pontiac, Mich., a subsidiary of the Willys-Overland Co., Toledo, Ohio, has increased production from 50 to 100 Knight motors per day, and during the present month plans to advance the output to 125 motors per day, reaching full capacity. The company is now giving employment to about 1,500 men at the plant.

The Norfolk & Western Railway Co. is developing capacity operations at its machine and repair shops at Shenandoah, Va., and a large number of men are being added to the working force.

The Baldwin Locomotive Works, Philadelphia, Pa., has contracted for locomotives to an amount of more than $1,000,000 during the past fortnight, including twenty-five engines for the Chicago, Milwaukee & St. Paul Railroad Co., and three locomotives for the Alabama & Vicksburg Railroad Co. The company now has unfilled orders on hand totaling in excess of $10,000,000.

The American Car and Foundry Co. has received a contract from the Norfolk & Western Railway Co., for 1,000 steel hopper cars, and will handle the work at its Berwick, Pa., plant. The working force is gradually being increased, and it is expected that a quota of 3,500 men will be on the payroll early in May.

The Bethlehem Shipbuilding Corporation, Wilmington, Del., will soon add 100 additional men to the working force in the car shops at its local Harlan works, making a total of 700 men in this department. The company has contracted for 140 all-steel cars for different railroads, in addition to an order for 250 such cars for the Pennsylvania lines.

The General Electric Co. is increasing the working schedule at its Pittsfield, Mass., plant, and taking on a number of new employees. Operations have been increased more than 20 per cent since the first of the year.

The Davies & Thomas Co., Catasauqua, Pa., manufacturer of iron and steel castings, will resume operations at once on a full capacity basis, following the securing of a contract from Booth & Flinn, Inc., New York, contractor for the New York-New Jersey vehicular tunnel under the Hudson River, for 48,000 tons of cast-iron segments, to be used in connection with the project. The company is making inquiries for 50,000 tons of pig iron to be used for the work.

The Dort Motor Car Co., Flint, Mich., is increasing production at its plant and rapidly reaching capacity output. Manufacture of completed cars during March was 229 per cent in excess of production in February, while the figures for the last noted month were 150 per cent over those of January.

The American Steel and Wire Co., Allentown, Pa., has adopted a capacity schedule at its local plant, increasing operations from two to three shifts a day, giving employment to more than 1,000 men. Orders on hand insure this basis of output for an indefinite period.

The axle plant of the Olds Motor Works, division of the General Motors Corporation, Lansing, Mich., has adopted a full time operating schedule, giving employment to close to 1,400 men. The plant will produce 15,000 sets of axles for the Oakland Motor Car division of the corporation, on a basis of 125 sets a day. In addition the plant will produce 90 sets a day for the Oldsmobile car, making a total output of 215 sets of axles daily. It is planned to increase the present working force by about 100 men within the next few weeks.

The Ford Motor Car Co., Detroit, Mich., is operating its Canadian plant on a production basis of 4,000 automobiles a month. The Manchester, Eng., plant of the company is running on a production schedule of 2,000 cars a month, while the Buenos Aires, Argentina, works are producing on an average of 1,250 cars and trucks monthly.

The Chevrolet Motor Co., Bay City, Mich., is running on a daily production schedule of 800 motors and 900 axles in these departments, at its local plant.

The Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa., has adopted an increased operating schedule at its plant. An order for car bolsters has been received from the Philadelphia & Reading Railroad.

The Vulcanite Roofing Co., Anderson, Ind., manufacturers of composition roofing products, is increasing operations at its local plant, and has added 80 employees to the working force during the past fortnight.

The Philadelphia & Reading Railroad Co. has placed orders with the Bethlehem Steel Co., Bethlehem, Pa., for 10,000 tons of 100-pound rails, and 3,000 tons of 130-pound rails; and with the Carnegie Steel Co., Pittsburgh, Pa., and the Midvale Steel Co., Philadelphia, Pa., for 5,000 and 2,000 tons, respectively, of 130-pound rails.

The Crescent Washing Machine Co., New Rochelle, N. Y., has been running at practically normal for some time and finds business conditions improving. The production at the present time, which is chiefly of dish-washing machines, is stated to be 80 per cent of the maximum production that the company has ever had.

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has received orders for five large booster converters with transformer equipment. The orders aggregate about $250,000 and will take six months to complete.

The Van Norman Machine Tool Co., Springfield, Mass., is increasing its output of its new grinding machine, the Re-li-o, and has developed a new machine, embodying the same general ideas, but suited to wet grinding, which is now being put in production.

New York Central Railroad has ordered 19,000 freight cars from the Standard Steel Car, American Car and Foundry, Pressed Steel, Pullman, General American Tank Car Co. and Rolston Steel Car Co.

During the month of March this year the National Cash Register Co., of Dayton, Ohio, did four times as much business as compared with the same month last year.

Cincinnati Letter

Machine tool builders in this city report that they are receiving few orders from widely scattered sources, which seems to indicate that business is picking up in this line, but is still far from normal. Dealers in used equipment report increased sales, and in some instances have been unable to supply the machines wanted. One purchasing agent who wanted a certain kind of lathe, found two dealers who could supply this machine, but before he had made up his mind which one to purchase from, both machines were sold to out-of-town customers. This is mentioned as an instance of how sales are being made today.

Several machine tool manufacturers are doing work for builders of radio apparatus. The Crossley Manufacturing Co., manufacturer of radio outfits, has taken over the plant of the Greaves-Klusman Tool Co., and will employ about 300 men in this growing industry. The plant will be operated by the American Automobile Accessories Co., which is a subsidiary of the Crossley concern. The main factory of the Crossley company will continue at Northside.

A great many of the machine tool men in Cincinnati will attend the meeting of the National Machine Tool Builders' Association in Atlantic City, N. J., on April 25 and 26.

James C. Smith has resigned from the Eastern Machinery Co., and has opened salesrooms at 6 East Third St., where he will deal in machine tools and equipment under the name of the Smith Machinery Co.

Chicago Letter

Although there are conflicting reports concerning business during the month of March, all dealers seemed to be pleased and feel that the first week in April has brightened the outlook by the increase in prospects and the amount of buying. There has not been the slightest decrease in the amount of inquiries since the first of the year.

It is understood that the John-Manville Co. has purchased part or all of the tools listed in the recent inquiry for the Waukegan plant. The report that the Universal Portland Cement Co. had purchased against its outstanding list has been denied on the grounds that the appropriation to cover the purchase of the machines has not yet been secured. One of the largest orders received by a local concern was for twenty-two nail machines.

A slight development is noted in railroad activities. The Santa Fe system has issued the following additions to its outstanding list: One No. 4 milling machine, one 40-in. turret lathe, one 24-in. lathe, flue testing machines, one Morton 36-in. shaper, four 20-in. lathes, one emery wheel stand and a boilermaker's flange clamp. The Burlington recently inquired for a 1¼-in. triple head bolt cutter and a heavy-duty drill. The Illinois Central, which it is reported, recently purchased a 24-in. x 12-ft. engine lathe, has not issued any inquiries recently and the engine lathe is evidently something inquired for some time ago.

A number of shop-owners who have found their present equipment more than adequate for their needs, are disposing of many of their machines to other manufacturers at prices far below their worth, seemingly unaware of the fact that fair prices could be obtained for these machines in the regular used-machinery markets.

Business Outlook in Foreign Markets

Cable reports to the Department of Commerce show an increased activity in foreign markets. The improvement reported in February in the demand for American products continues.

The demand for machinery in the Dutch East Indies is of exceptional interest to American manufacturers, because this market was practically neglected until circumstances connected with the war brought about an increased demand for American machinery. Since that time the United States has shared to a considerable extent in this trade. In 1900 it represented a total value of over $4,000,000 per year; by 1911 it had increased to $8,000,000; in 1914 it was $10,000,000, the trade being handicapped due to the war, but in 1919 it rose to about $22,000,000.

Since Chinese import trade has recently revived and the building of business houses, roads, railways and factories has been resumed, it is interesting to know what part Germany is taking in this. The *Deutsche Handelsdienst* states that German firms are doing a large business in electrical machinery. A German company is competing with an American firm for the contract of putting in a telephone system in the principal city of Shantung. Also in Shantung a sugar refinery is to be established, which will have a working capital of £2,500,000 and which will require a complete new outfit of machinery.

A considerable amount of new government construction work which would involve the use of steel is contemplated in Quebec, Canada. During the period July 1, 1920, to June 30, 1921, fifty-eight steel bridges were built in the Province and fifty-five (thirty-two all-steel and twenty-three reinforced-concrete) are under construction.

During 1921 the United States shipped to Alaska seventy passenger cars, valued at $75,242, and fifteen motor trucks valued at $10,279. The registration of motor vehicles in Alaska shows a total of 384 passenger cars and 153 motor trucks.

Cost of Castings Over the Country

Although machinery casting work is essentially a labor proposition, requiring separate detail and an individual price on each casting, a certain uniformity in rates per pound is noticeable throughout the various important industrial centers.

Prices vary, depending upon quantity, weight of casting, and on the nature of the work. The type of pattern or the shape of a given piece of work may also materially affect the price. However, certain minimum and maximum rates apply to most castings, based upon the cost of the metal used and the difficulty of the operation.

In the accompanying table current rates are shown in twelve large cities. These prices, which represent average conditions, fluctuate but slightly from week to week, being governed by conditions in the metals market and the cost of labor, as well as by the size, weight and specific details of the job. For instance, few foundries can compete at a rate under 3c. per lb. for gray iron, regardless of the size of the casting, while a rate exceeding 16c.@20c. per lb. would seldom be charged on gray iron castings even of light weight and in small lots. Minimum and maximum rates on all types of jobs taken into consideration, it appears that in most instances a price of 5½c.@6c. per pound is fairly representative of the cost of medium weight gray iron machinery castings on the present market.

MACHINERY CASTINGS — IN CENTS PER POUND:

		Gray Iron	Steel	Brass	Bronze	Aluminum Alloy
Pittsburgh	—Light	9.0	16.0	30.0	34.0	65.0
	Medium	6.0	10.0	27.5	30.5	52.5
	Heavy	3.0	6.0	25.0	29.0	40.0
Philadelphia	—Light	9.0	14.5	14.5	15.0	25.0
	Medium	5.5	12.0	....	....	....
	Heavy	2.65	12.0	5.0	....	....
Atlanta	—Light	5.5	22.5	25.0	25.0	65.0
	Medium	4.5	20.5	22.0	22.0	60.0
	Heavy	4.0	18.5	20.0	20.0	50.0
Detroit	—Light	7.0	17.0	35.0	....	....
	Medium	4.5	12.0	30.0	....	....
	Heavy	3.0	7.0	22.0	....	....
Birmingham	—Light	16.0	....	33.0	33.0	70.0
	Medium	7.5	....	30.0	30.0	59.0
	Heavy	2.5	....	28.0	28.0	48.0
Denver	—Light	8.0	30.0	30.0	40.0	60.0
	Medium	6.0	15.0	24.0	31.0	50.0
	Heavy	5.0	7.0	19.0	27.5	40.0
New Orleans	—Light	9.0	12.0	25.0	36.0	50.0
	Medium	6.0	10.0	19.0	26.0	45.0
	Heavy	4.0	9.5	....	22.0	35.0
Minneapolis	—Light	9.0	17.0	28.0	30.0	70.0
	Medium	8.0	11.0	25.0	28.0	60.0
	Heavy	4.5	7.5	22.0	25.0	50.0
New York	—Light	9.0	22.5	30.0	34.0	65.0
	Medium	6.0	16.0	27.0	31.0	57.5
	Heavy	3.0	10.0	25.0	29.0	50.0
Cincinnati	—Light	5.0	15.0	20.0	20.0	50.0
	Medium	4.5	11.25	16.0	16.0	45.0
	Heavy	3.75	7.5	12.0	12.0	40.0
Cleveland	—Light	6.75	18.0	30.0	32.0	75.0
	Medium	4.5	13.0	25.0	27.0	60.0
	Heavy	2.6	9.0	20.0	24.0	45.0
Montreal	—Light	...	....	....	....	....
	Medium	...	....	....	....	....
	Heavy	...	....	22.0	30.0	35.0

Business Items

The Cleveland office of William K. Stamets has been moved to 974 and 976 Kirby Bldg. George D. Miller is manager of the Cleveland Office. The Stamets organization recently concluded agency arrangements with a group of Hartford manufacturers, including Billings & Spencer Co., Hanson-Whitney Machine Co., Hartford Tap and Gauge Co., Taylor & Fenn Co., and the Whitney Manufacturing Co.

James, MacNeal & Camp, manufacturers of "Power King" electric drills, have moved from Chicago to a new plant at Warsaw, Ind.

The Wiederhoildt Construction Co., of St. Louis, Mo., has opened offices at 30 Church St., New York City. J. D. Martin is in charge. The company builds a patented chimney for smelters and steel plants.

The Western Radio Manufacturing Co., 11 South La Salle St., was recently incorporated by Sidney Saldinger, H. E. Wilmore and Charles Gollay, with a capital stock of $20,000, to manufacture and deal in radio apparatus.

The Combustion Engineering Corporation has opened a branch office at 1137 Guardian Bldg., Cleveland, Ohio. Frank Henderson has been placed in charge.

The Wright-Hibbard Electric Truck Co., of Buffalo, N. Y., has purchased the Collins Iron Co. building in Phelps, N. Y., and will convert it into a factory for the manufacture of electric industrial trucks.

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., has received a contract from the Southern California Edison Co., for electrical equipment for a powerhouse at Big Creek. The aggregate consideration is said to be $1,500,000.

The Electric Furnace Co., Alliance, Ohio., has moved its general sales offices from Alliance to Salem, Ohio. All departments will be consolidated at the works on Wilson Street.

The Hibbard Manufacturing Co., Joplin, Mo., is building an addition to its plant in that city. This new building will take care of the manufacture of sludge tables, and when completed will afford employment to several machinists.

The Domex Co., of Buffalo, N. Y., manufacturers of small metal parts, has secured lease on a factory building at Akron, N. Y., and will remove from Buffalo. The Domex Co. is now negotiating for the plans and patents of the Kaman Auto Radiator Co., of Akron, and will install machinery and equipment for the manufacture of radiators and tubular specialties.

The interests of H. H. Hall in the Draper & Hall Co., Middletown, Conn., have been purchased by G. E. Quinn, who now becomes general manager of the concern. The business will be continued under the old name, expanding later into the manufacture of automatic grinding machines and twist drills.

The Garlock-Walker Machinery, Ltd., of Toronto, Canada, has been changed to the Garlock Machinery, Ltd.

The American Bosch Magneto Corporation reports, for the year ended Dec. 31, 1921, a deficit of $2,049,992, after an inventory adjustment of $1,813,815. After deducting dividends of $120,000, there was a deficit for the year of $2,169,992. That result compares with a net income of $945,700 in 1920.

Announcement has been made in Baltimore that the Richmond, Va., plant of the Chicago Nipple Manufacturing Co. has acquired a plant in Baltimore and will move to that city. It is expected that the new plant will be ready for operation in May.

The Andrews Iron and Steel Corporation recently started operations in its new plant at Utica, N. Y. The company has remodelled the plant formerly occupied by the pipe foundry of the International Heater Co., and with new machinery will manufacture structural steel and bridge shapes. Officials of the company are: President and general manager, George W. Andrews; vice-president, O. J. McKeown; treasurer, F. J. McMackin; secretary, C. A. Schmidt.

The Universal Tool Co. has been organized at Garwood, N. J., with a capital stock of $125,000. Directors are W. H. Osborne, Jr., D. B. Smith and Blair Reily, of Newark, N. J.

The locomotive department of the Beech Grove, Ind., shops of the Big Four Railway Company, which has been closed since Feb. 15, was reopened under the contract plan by the Railway Service and Supply Corporation, which is also operating three other departments in the shops. E. S. Pearce, general manager for the contracting corporation, said the success with which his corporation had operated the three other departments in the shops had been responsible in a measure for the decision of the Big Four Railway officials to adopt the contract plan for the locomotive department and he said it was gratifying to know that the men themselves preferred it to the old system of dealing direct with the railroad company because they could earn more money.

Personals

JAMES L. O'NEILL, formerly inspector in charge of tools and gages at Frankfort Arsenal, is now with the Budd Wheel Corporation, Philadelphia, Pa.

GUY CUNNINGHAM has been appointed receiver of the Rivett Lathe and Grinder Co., of Boston, Mass.

PATRICK J. FOY has resigned his position as safety engineer at the Willys-Morrow plant at Elmira, N. Y., and will engage in private business.

M. W. TABER is now special representative for the Motor Wheel Corporation of Lansing, Mich., with offices in Detroit.

CHARLES E. FOUHY, of Boston, Mass., has been secured by the Willys-Morrow Co. to head the employment bureau at the Elmira plant.

R. P. RAYMOND, formerly chief draftsman for the Columbia Graphaphone Manufacturing Co., of Bridgeport, Conn., has been appointed superintendent of manufacture for that company in the plant at Toronto, Canada.

PROF. SIMON T. HART, of the College of Applied Science, Syracuse University, Syracuse, N. Y., addressed the Technology Club of Syracuse at a recent meeting. His subject was "Cams, their Design, Construction and Uses."

RICHARD G. PLUMLEY has been appointed manager of the order department of the Yale & Towne Manufacturing Co., Stamford, Conn. He will be assisted in this position by George L. Hodges.

WILLIAM H. WOODLIN, president of the American Car and Foundry Co., sailed last week for Rome, where he will attend the International Railroad Congress to be held in that city on April 15.

GINJIRO FUJIHARA, president of the Oji Paper Manufacturing Co., of Tokyo, Japan, with his purchasing manager, Yasunosuke Fukukita, and three departmental heads who are touring United States and Canada, investigating paper-making machinery and mechanical equipment, recently spent some time at the plant of Bagley & Sewall Co., in Watertown, N. Y.

NORMAN L. SNOW has resigned his position as vice-president and active head of the Terry Steam Turbine Co. of Hartford, Conn., to become president and treasurer of the Diamond Power Specialty Corporation, of Detroit, Mich., a new company which has purchased the business and plant of the Diamond Power Specialty Co.

F. S. HICKLING has been appointed manager of the railway division of the Westinghouse Electric and Manufacturing Co., Pittsburgh office. Barton Stevenson is now in charge of the power division and S. R. Shave of the price section.

WILLIAM E. DOUGHERTY has joined the sales force of the Independent Pneumatic Tool Co., of Chicago. Mr. Dougherty will make his headquarters at the Philadelphia office.

G. F. SHERRATT has been appointed manager of the Pittsburgh office of the Chain Belt Co., of Milwaukee. The Ward Equipment Co., of Pittsburgh, will continue to handle the complete line of "Rex" products, made by the Chain Belt Co.

GEORGE S. BARTON, president and treasurer of the Rice, Barton & Fales Machine and Iron Co., Worcester, Mass., paper and pulp machinery manufacturers, will leave on a business trip to Europe about the middle of April.

L. D. MOWERY has been appointed general manager in charge of production of the Mills Company, Cleveland, Ohio. Mr. Mowery has been a designer and manufacturer of steel factory equipment for more than twenty years, and was the founder of the Metal Crafts Company. More recently he was consulting engineer for the E. F. Hauserman Co., Cleveland. The Mills Company produces steel shelving, sash, skylight frames, partitions, cabinets, tables and the like.

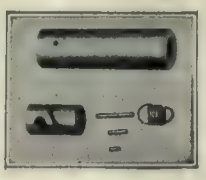
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Oiler, Cone-Pulley, "Flush"

Sexton Machine Co., 308 Pearl St., Hartford, Conn

"American Machinist," December 15, 1921.



The oiler is adapted for use in cone pulleys especially, but also for pulleys running on shafts or studs. The body of the oiler is a steel tube of sufficient length to reach from the surface of the pulley to the bore, and is ground on the outside diameter to a drive fit in a standard reamed hole. When filled with oil the plug is snapped back to place, flush with the surface of the pulley, preventing the escape of oil. The tube and hollow body of the plug constitute the reservoir. The oiler is made in ¼, ⅜, ½ and ¾ in. sizes, and with any length of tube desired.

Threading and Cutting Machine, Pipe, Motor-Driven, Forbes, No. 450

Curtis & Curtis Co., Railroad Ave. and Garden St., Bridgeport, Conn.

"American Machinist," December 22, 1921.



The head of the machine is mounted in a supporting shell, is rotated by a direct-connected electric motor and has an automatic release and cam lock. Longitudinal travel is provided for the head, to feed the dies on the pipe. An automatic feed is provided for the cut-off device. The machine is intended for mounting on a bench, but can be equipped with a floor stand and a high adjustable pipe rest. Three sets of dies each are furnished with the machine, as well as three cut-off tools. The machine has a range of ⅛ to 2-in. right-hand threads, and requires a 1-hp. motor running at a speed of 1,800 r.p.m. Height, 20 in. Bench space, 24 x 16 in. Weight, 350 lb.

Grinding and Sanding Machine, Spindle-type, "Little Wonder"

Wonder Grinder Co., 612 West 12th Street, Erie, Pa.

"American Machinist," December 22, 1921.



The machine is intended for internal circular grinding on both wood and metal. The table is circular, and can be tilted 45 deg. to either side. It automatically locks at right-angles to the spindle, or may be locked in any desired position. The abrasive spindle is mounted on a vertical shaft, and driven directly from a ¼-hp. removable electric motor mounted vertically in the base. The spindle has an adjustable top bearing and runs at a speed of 1,725 r.p.m. It is 9 in. in length and is provided in diameters of 1½, 2⅜ and 4½ in. with an oscillation of ⅞ in. The motor can be furnished for direct or alternating current of 25, 40 or 60 cycles. The controlling switch is on the front of the column. Table, 20½ in. in diameter. Height, 37 in.

Stand, Garage, "Champion"

Western Tool and Manufacturing Co., Springfield, Ohio.

"American Machinist," December 22, 1921.

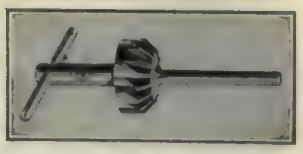


The stand is made of steel throughout, the trays being of pressed steel and the supporting frame of heavy pipe. A plain-jaw "Champion" vise No. 13 is mounted on the table. A drawer is provided for tools. A brake can be easily operated by the lever underneath the vise, and when locked it prevents movement of two of the casters. Height, 39 in. Length: top shelf, 42 in.; middle and bottom shelf, 43 in. Width: top shelf, 14 in.; middle and bottom shelf, 26 in. Drawer, 14 x 14 x 4½ in.

Valve Reseating Tool, Automotive

New Britain Tool and Manufacturing Co., New Britain, Conn.

"American Machinist," December 15, 1921.

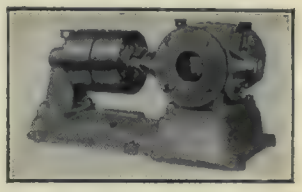


In this tool for resurfacing the valve seats of automobile engines, the cutter is made like a shell reamer and is a slip fit for the shank, upon which it is held against turning by a short spline or pin fitting into a notch in the shell. It is of high-carbon steel and may be furnished in any required angle, though it is stocked in angles of 30 and 45 deg. The pilot portion of the shank is furnished in any diameter to fit standard sizes of valve-stem guides, or it can be made to fit oversizes. Cutters and shanks are interchangeable, so that any combination may be quickly secured.

Pump, Rotary

Exeter Machine Works, Inc., West Pittston, Pa.

"American Machinist," December 22, 1921.

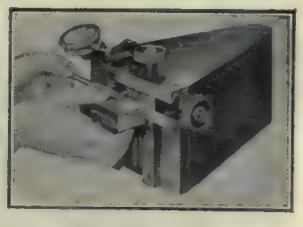


This pump handles liquid of any specific gravity and is adaptable to machine shop use for circulating lubricating oil and coolant. The inner rotor is keyed to the driving shaft. The outer rotor has four ports which open into the chambers of both the suction and the discharge side of the pump during rotation. The pump has no reciprocating parts, operates at comparatively slow speed and delivers a continuous flow of liquid. It is stated that under normal barometric conditions it gives 28 in. of vacuum. Small pumps tested are said to have shown a volumetric efficiency of 98.67 per cent, and a pumping efficiency between 70 and 82 per cent. The pump can be furnished with the body strengthened to operate against a pressure of 600 lb. per square inch.

Gage, Thread-Lead

Toledo Tap and Die Co., Clinton St., Toledo, Ohio.

"American Machinist," December 22, 1921.



The device gages the lead of threads and was originally developed to check the lead on the taps and precision studs made by the concern. The gage consists of an arm 8 in. long pivoted on an adjustable bearing. A hardened and ground point engages the thread tested, and is connected with the dial gage to register the accuracy of the work. One of the measuring points is movable, and can be set within a range of from ½ to 2 in. An elevating table holds work up to 2 in. in diameter. The adjustable point is set to the zero position from a master thread gage and the threads of the work are pressed against the measuring points. Any difference in lead from the master setting is registered on the dial gage.

Grinding Machine, Hole, Double-Head, No. 2

Bryant Chucking Grinder Co., Springfield, Vt.

"American Machinist," December 29, 1921.



The machine grinds such internal surfaces as the pin holes in gas engine pistons. Two sliding and swinging heads are suspended from the heavy bar at the top of the machine. Both wheels are in the cut together, each grinding an end of the hole. All the movements are controlled by the capstan wheel and traversing mechanism at the right. The wheels are fed to the work in grinding, or to the diamond in redressing, by a handwheel on the front of the machine. Standard Bryant internal grinding spindles are used, running at 20,000 r.p.m. The spindle driving pulleys run upon independent ball bearings, as also does the chuck or work holder. The chuck will take pistons up to 4½ in. in diameter and 4½ in. long. Floor space, 3 x 6 ft. Weight, 2,300 lb., including countershaft.

Obituary

HENRY HESS, founder of the Hess-Bright Manufacturing Co., Philadelphia, Pa., died in Atlantic City, N. J., on March 23. Mr. Hess was also the founder of the Hess Steel Corporation, of Baltimore, and was at one time president of the Engineers Club of Philadelphia, the Society of Automobile Engineers and vice-president of the American Society of Mechanical Engineers. He was also interested in many other engineering societies and held active membership in the following: American Institute of Mining Engineers, Society of Automotive Engineers, Franklin Institute and the Institute of Engineers of Great Britain.

JOHN MCDONALD, proprietor of the old Belpe-McDonald Foundry at Lawrenceville, Pa., and later organizer of the Pittsburgh Foundry and Machine Co., died at his home in Pittsburgh on March 21. He was 70 years old.

SAMUEL MCCLURE, vice-president and general manager of the Stewart Furnace Co., Sharon, Pa., died at his home in Sharon on March 24. He was 63 years old.

LOUIS A. DUNME, of Lawrenceburg, Ind., a member of the firm of George H. Bishop Saw and Edge Tool Manufacturing Co., died recently at his home. He was 69 years old.

LAWRENCE B. JENCKES, a director of the Crompton & Knowles Loom Works, Worcester, Mass., died on March 29. He was 55 years old.

WILLIAM F. MCNABB, secretary and treasurer of the Vanadium Metals Co., died suddenly in Pittsburgh on Mar. 28.

KNOX TAYLOR, president of the Taylor-Wharton Iron and Steel Co., died at his home in High Bridge, N. J., on April 4.

FRANK H. UNDERWOOD, retired manufacturer of machinery and belting, died at his home in Auburndale, near Boston, Mass., on April 3. He was 74 years old.

Trade Catalogs

"Cocm Process" Metallic: Henry Wells Ltd., 11 Haymarket, London, S. W. 1, England. Pamphlet containing information of value to those interested in the lubrication of plant and machinery.

Sprague Dynamometer: The Sprague Electric Works, New York City, N. Y. Bulletin No. 46,716 describing the Sprague recording dynamometer used in research work in various plants and laboratories.

Air Compressors: Curtis Pneumatic Machinery Co., St. Louis, Mo. A thirty-six page catalog describing a line of air compressors. Particular attention is given to the Model B, single stage, two stage and truck tire air compressors.

The Spindle Book: Jacobs Manufacturing Co., Hartford, Conn. A sixty-page bound reference book containing the complete specifications of various types of drilling equipment. The book is made up of the names of sixteen firms using taper shank drills, taper or drill chucks, with the kind of equipment used. The book is compiled for free distribution among dealers in machine tools and supplies.

Commutator Troubles: The Martindale Electric Co., Cleveland, Ohio. A four-page circular covering commutators, grinding and undercutting. A separate card gives a list of commutator troubles, their causes and remedies.

Flexible Shaft Equipment: The Hergt Manufacturing Co., Bridgeport, Conn. A catalog describing and illustrating several tools adapted for grinding, chipping and screwdriving. The equipment is of the portable type featuring flexible shafts and couplings.

Johnson Tools: Johnson Tool Co., Providence, R. I. Circular illustrating and describing the Johnson cutter plate and die milling machine. Specifications and working data are inclosed.

Whiting Cranes: The Whiting Corporation, Harvey, Ill. A four-page circular describing in a general way the Whiting line of electric and hand-power travelers, bucket handling and gantry jib, pillar and bracket cranes.

Electric Grinders: Columbia Manufacturing Co., Belleville, Ill. Supplement A to Grinder Book No. 26 describing a line of electric grinders and buffers, also the self-contained type of grinder. List prices are included.

Deschanel Cableway. Deschanel Engineering Corporation, New York, N. Y. The Deschanel cableway bulletin describing a single line cableway for use in handling materials in railroad yards, docks, power houses and other plants. The bulletin contains much useful information and interesting reading matter.

Torchweld Instructions. Torchweld Equipment Co., Chicago, Ill. A very valuable instruction book for oxy-acetylene welding, cutting, lead burning and carbon burning. The information is presented in an easy reading manner and would be valuable to shop men or executives.

Locomotive Repairs. The Cincinnati Milling Machine Co., Cincinnati, Ohio. A large thirty-two page booklet of data and experimental matter in milling operations in railroad repair work. The booklet is intended to show the variety of work that can be done in railroad shops by Cincinnati milling machines, and gives some interesting data compiled from experiments.

Book Reviews

Milling Cutters and Milling. A treatise based on the results of experiments conducted by Prof. Airey of the University of Michigan and Carl J. Oxford, chief engineer of the National Twist Drill and Tool Co., 69 pp., 5 x 7½ in. Illustrated. Published by the National Twist Drill and Tool Co., Detroit, U. S. A. Price, $1.

A recent paper presented before the American Society of Mechanical Engineers gave the results of experimental research on milling cutters carried on by Prof. Airey and Mr. Oxford at laboratories of the University of Michigan. In this book the data gathered during the course of the experiments and previously are treated in a somewhat less technical manner for those interested in the art of milling.

The authors point out that the discovery, made some years ago, that a given amount of material could be removed with less power if a cutter with few teeth were used than if the cutter had more teeth, "would have been very important if the proper deductions had been made and incorporated in the design of milling cutters. However, it was simply concluded that the coarse-tooth cutter in itself was a more efficient tool. • • • A careful analysis of the discovery mentioned shows us, not the efficiency of coarse-tooth cutters, but the efficiency of taking heavy instead of thin chips." They contend that sufficient chip space is the important factor in determining the tooth spacing.

The book is easy reading and is a worth while contribution to our knowledge of cutting metals.

Materials of Construction. By the late Prof. Adelbert P. Mills of Cornell University. Second edition, edited by Harrison W. Hayward, professor of materials of engineering, Massachusetts Institute of Technology. Cloth board covers, 476 pp., 6 x 9 in., 192 figures. Published by John Wiley & Sons, Inc., 432 Fourth Ave., New York, N. Y. Price, $4.

In this second edition, the book has not been changed fundamentally from the original work published in 1915. However, certain of the chapters have been condensed and parts of others have been rewritten, while several new chapters have been added. In addition, the book has been divided into sections, each treating of a different material employed in construction.

The volume treats of the manufacture, properties and uses of various materials employed by the engineer, the subjects being covered in considerable detail. However, intricate problems in chemistry and metallurgy are not handled. Although the treatment is more comprehensive than ordinarily required for classroom purposes, the incorporation of valuable material in the volume increases the usefulness of the book as a reference work.

The subjects treated in the various sections are: Plaster, lime and natural cement; portland cement and concrete; stone; bricks and other clay products; the ferrous metals; the non-ferrous metals and alloys; timber; rope; and mechanical fabrics. The most extended treatment is, of course, given on the subject of the ferrous metals.

Forthcoming Meetings

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 13. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

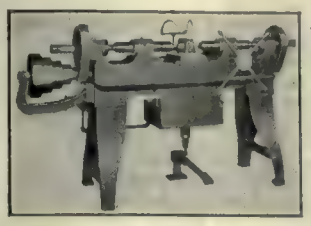
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

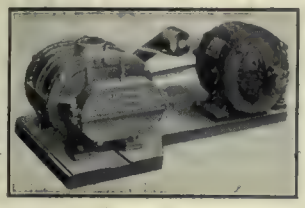
Patented Aug. 20, 1918

Reaming and Chamfering Machine, Opposed Spindle
Murchey Machine and Tool Co., Detroit, Mich.
"American Machinist," December 29, 1921.



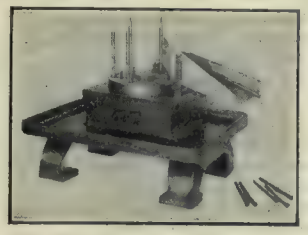
The machine is intended for reaming and chamfering nipples, but can be equipped with dies for threading nipples from ⅛ to ¾-in. pipe size, or can be arranged for threading tees, valves, studs and other work threaded on both ends. The nipple is held in a central vice opened and closed by a treadle. The spindles carrying the tools are fed to the work by the pilot wheel. The countershaft has two drive pulleys for different speeds, and together with a 4-step cone pulley, provides for eight changes of speed. The capacity is for nipples for ⅛ to 2-in. pipe, and 12 in. in length. Floor space, 8 x 2 ft. Weight, 1,200 lb.

Blower Unit, Motor-Driven, Positive-pressure, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," December 29, 1921.



This blower unit supplies the pressure for a heat-treating furnace independent of the main power plant; and obviates the expense of running the large plant motor when only enough power is required to operate the blower. It is adaptable for small installations, and is made in four sizes accommodating blowers Nos. 3 to 6 with motors of from 1 to 2½ hp.

Marking Machine, Tubing, Rotary
Noble & Westbrook Manufacturing Co., Hartford, Conn.
"American Machinist," December 29, 1921.



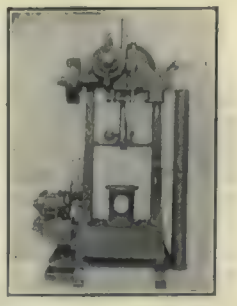
The machine is used for stamping names and patent marks on small tubing, and is power driven through a three-step cone pulley. Power is transmitted to the table through worm gearing. The table of the machine revolves, passing the work over the die and making the mark. It is divided into six equal parts, each having a mandrel upon which the work is fed by hand. A cam, raising a lever, ejects the work automatically. The machine can be furnished for marking any size tubing of short length. It weighs about 90 lb.

Speed Transformer, Combined Worm and Spur Gear
Natisch Gear Works, 451 Hudson Ave., Brooklyn, N. Y.
"American Machinist," December 29, 1921.



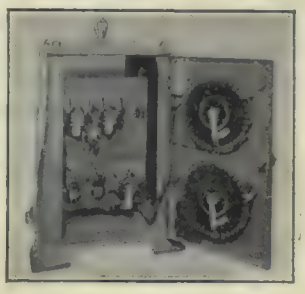
The transformer can be furnished for speed reductions ranging from 75:1 to 600:1 by using different gear ratios. The illustration shows a transformer for delivering ½ hp. at a speed reduction of 600:1. The case is cast iron, oil tight and rust proof.

Broaching Press, Vertical, Power
Lucas Machine Tool Co., Cleveland, Ohio.
"American Machinist," December 29, 1921.



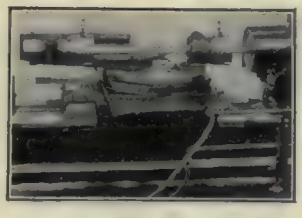
The machine is intended for the operation of push-broaches. It requires only short broaches, and allows the work to rest on a horizontal surface. Motion is transmitted to the ram through gearing controlled by a lever at the front. A gage mounted on the ram registers pressure exerted. The motor runs at 1,200 r.p.m., and is of either 7½ or 10 hp. The machine is made in two sizes, with capacities of 15 and 30 tons, respectively. The speed of the ram on the cutting stroke is 9 ft. and 6 ft. per minute respectively, and on the return stroke, 21 and 15 ft. per minute. The maximum distance from base to ram is ordinarily 48 in., but may be either 60 or 72 in. Weights, 2,900 and 3,800 lb. respectively. Export box, 125 and 150 cubic feet.

Control, Planer, Electric, G.E.
General Electric Co., Schenectady, N. Y.
"American Machinist," December 29, 1921.



The apparatus prevents tables of electrically controlled planers from overtraveling, employing the dynamic system of braking. The equipment consists of a control panel on which are mounted rheostats and contactors, resistance, master switch or push button, which is used in connection with a standard direct-current, reversible adjustable-speed motor. The control is furnished in two types, one with and one without a resistance-selecting contactor. The selective resistance contactor enables the machine to operate with small tool clearance, and also where the duty varies from no load to full load, and where cuts are made to the end of the travel.

Staybolt Attachment, Threading
Acme Machine Tool Co., Cincinnati, Ohio.
"American Machinist," December 29, 1921.



The attachment is intended for use on turret machines. Two dieheads are used, and when set by a master or staybolt tap, their simultaneous cutting insures that both threaded portions on the staybolt will have the same lead as a continuous thread. The diehead at the rear is adjustably mounted, so that any length of staybolt within range of the adjustment can be cut. The attachment is made to fit the 2½ x 26-in., 3½ x 36-in., and No. 3 universal machines. By its use staybolts can be made from forging or from a bar.

Gear Shaper, High-Speed, No. 7
Fellows Gear Shaper Co., Springfield, Vt.
"American Machinist," January 5, 1922



The shaper is intended to handle any form of gear in a standard automobile transmission, and can also be adapted to the cutting of helical and herringbone gears. It performs roughing and finishing cuts automatically at the same setting and with the same cutter. A gear-type cutter is used to generate the teeth. The light weight cutter spindle is held in a straight path by guides, and is reciprocated by a connecting rod and crank arm. The work spindle carries a reverse-taper arbor. Gears are provided for securing seven feeds. The coarsest feed is 435 strokes for one revolution of the cutter; the finest feed is 1,735. Roughing and finishing cuts are taken at the same feed and speed.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Pig iron, No. 2 foundry, up $1 per gross ton in Philadelphia and Chicago; foundry, basic and bessemer up $2.46 in Pittsburgh. Basic in better demand in the Eastern states. Steel sheets up $3 per ton at Pittsburgh mills; quoted at $3.90 as against $3.75@$3.90 per 100 lb. in New York warehouses.

Tin quoted in New York at 30½c. as against 29½c.; lead at 5½c. advanced from 5¼c. and zinc at 5½c. as compared with 5¼c. per lb. one week ago. Brass rods up 1c. and brass wire 1½c. per lb. in Cleveland.

Declines—Nickel ingots and shot quoted at 36c. as against 41c; electrolytic at 38c. as compared with 44c. per lb. formerly. Monel metal products down 2c.@8c. per lb. f.o.b. Bayonne.

The official Pittsburgh mill price of $1.50 for structural shapes and soft steel bars continues to gain in firmness. Plates, however, are quoted at $1.40@$1.50 per 100 lb.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21 00
Northern Basic	21 02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22 26
Virginia No. 2	28 74
Basic	20 25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.0	5.0	2.63
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	16.0	7.5	2.5
Denver	8.0	6.0	5.0
New Orleans	6.0	5.0	4.0
Minneapolis	9.0	6.0	4.5
New York	9.0	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21	2.85	3.80	3.55	3.95
Nos. 22 and 24	2.90	3.85	3.60	4.00
Nos. 25 and 26	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized steel sheets:				
Nos. 10 and 11	3.00	3.90	3.75	4.15
Nos. 12 and 14	3.10	4.00	3.85	4.25
Nos. 17 and 21	3.40	4.30	4.15	4.55
Nos. 22 and 24	3.55	4.45	4.30	4.70
No. 26	3.70	4.60	4.55	4.85
No. 28	4.00	4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.61
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.50		12@13
3/16	7.15		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.50
Tin, 5-ton lots, New York	30.50
Lead (up to carlots), St. Louis, 4.90; New York	5.25
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.00	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.00	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.50	3.65
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.25	4.75
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	12.00	14.50
IC, 112 sheets	12.80	12.30	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.82@.83	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½ c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machinery wants published without charge

Machine Tools

Conn., Bridgeport—The Fabric Machine Co., 187 Cedar St., manufacturer fabric cutting machinery—one 12 in. or 13 in. x 16 ft. lathe (used).

Del., Claymont—The Worth Steel Co.—motor driven plate shear, with knife 80-110 in. long, 1 in. cutting capacity.

D. C., Wash.—The Southern Ry., 1100 Pennsylvania Ave., C. E. Craig, Gen. Purch. Agt.—valve seat planer.

Ia., Dubuque—Adams Co., 295 6th St.—sheet metal brake for 10 gauge material, power preferred.

Ia., Muscatine—The Roach & Musser Co.—Model B Mattison turning lathe.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt.—one 500 ton double end hydraulic wheel press, one 90 in. motor driven driving wheel lathe, one heavy duty double end car axel lathe with motor drive, one 200 lb. Beaudry hammer, one 52 in. car wheel lathe; one 4 ft. radial drill and one 15 ton crane.

Ill., Chicago—The Nash Stamping & Bending Wks., 424 South Clinton St.—two Brown & Sharpe No. 2½ hand screw machines.

Ill., Chicago — The Paidar Co., 1129 North Wells St.—one No 2 Universal milling machine; one 4 spindle back geared drill press, one 2 spindle small drill press.

Ill., Chicago—W. A. Spinks & Co., 362 West Erie St., A. Hoskin, Purch. Agt.—one small engine lathe. Star preferred or similar make.

Ill., Chicago—The Underwriters Laboratories, 207 East Ohio St., W. H. Merrill, Purch.—one 20 or 24 in. Barnes Drill Co., self oiling, 4 geared drill and tapper, geared motor drive. Also a 24 in. Potter & Johnston universal shaping machine, geared motor drive. (both used).

Ill., Englewood—The Englewood Optical Co., 1151 Eggleston Ave., E. E. Hilbern, Mgr.—small screw cutting lathe, bench or engine type with draw in spindle and collets, milling attachment and metal equipment. Want to use latter for experimental tool and instrument work. 6 in. to 9 in. swing, 15 to 18 in. between centers, weight between 75 and 150 lbs. small bench drill press of screwdriver type and small shaper 4 to 6 in. stroke if possible with shaping attachment or milling machine that would answer same purpose as shaper.

Ky., Central City—The Triangle Machine Wks., Inc., W. B. Mix, Secy., Treas. and Gen. Mgr.—one 26 ft. and one 8 ft. lathe, cutting machine; 40 in. radio drill press; 60 ton hydraulic press; cylinder grinder; back saw and other small tools. (used).

Mich., Detroit — The Central Machine Products Co., 1052 Merrill St.—one 20 in. to 24 in. back geared drill press (used).

Mo., Joplin—Pillels & Jones, 2220 Anna Avenue (machine shop and planing mill), O. E. Jones, Mgr.—planing machinery and lathe.

Mo., Joplin—The Ozark Motors Co., 832 Joplin St., A. McClaren, Purch. Agt.—boring machine for automobile cylinders.

N. J., Plainfield—The Natl. Vitaphone Corp., 112 North Ave., (phonographs), C. E. Rapp, Pres.—punch presses, screw machines and other automatic machinery.

N. Y., Brownville—F. Page—threading and tapping machine for Water Bd.

N. Y., Lowville—G. A. Smith Co., State and Jackson St., G. A. Smith, Purch. Agt.—small back geared engine lathe; miller and upright post drill; air compressor and tank.

N. Y., Ogdensburg—E. and H. Burns Co., 22 Lake St.—sheet metal punch press and one forming roll.

N. Y., Ogdensburg—Starter, Ignition & Battery Service Co., 23 Washington St., G. P. Haven, Purch. Agt.—light lathe to carry polishing mandrel also complete battery recharging machinery and equipment.

N. Y., Utica—A. Becker, 513 William St.—one 16 in. black geared engine lathe and bench miller also high speed twist drills.

N. Y., Waverly—The James Taylor Co., Fulton St., (battery repair and charging)—complete battery charging plant and machinery and equipment for repairs.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., A. Jones, Purch. Agt.—one 48 in. x 20 ft. lathe; 72 in. boring mill; 60 in. open side planer, 12 ft. table; 24 in. shaper.

O., Cincinnati—W. Powell Co., 2233 Colerain Ave., manufacturer of valves—double spindle milling machine for milling tapered squares on valve stems.

O., Cincinnati—The Randle Mchy. Co., 1735 Powers St., G. Bierbaum, Purch. Agt.—angle iron shear to cut and punch 6 in. angles; 8 in. Bignall & Keeler pipe threading machine, motor driven, 250 volt, D. C. motor; hydraulic wheel press 200 to 300 ton; car wheel boring mill for wheels 33 in. diameter, on thread, and to bore 4½ in. hole.

O., Cincinnati—The Smith Mchy. Co., 6 East 3rd St., J. G. Smith, Purch. Agt.—one No. 60 Heald cylinder grinder; 20 in. drill press and a No. 13 Toledo or No. 19 Bliss press with 3 in. stroke.

O., Cleveland—Chandler & Price Co., 6500 Carnegie Ave.—heavy duty drilling machine.

O., Cleveland—The Cooper Spring Co., 2220 Center St.—Brinnell-Hardin testing machine.

O., Cleveland—The Rail Welding & Bonding Co., 1615 Collamer St.—one 80 to 100 ton geared press, (used).

O., Marion—The Murdock Dishwashing Machine Co., P. H. Ryder, Pres.—several kinds of metal working machinery.

Pa., Carry—The United States Chair Co., J. B. Patterson, Pres. and Treas.—one back knive lathe.

Pa., Pittsburgh—C. L. Flaccus Glass Co., 1107 Empire Bldg.—one 16 in. and one 18 in. lathe suitable for glass mould work.

Wis., Madison—W. F. Clark, 2105 Keyes Ave.—equipment for garage, including pumps, oil storage tank, etc.

Wis., Milwaukee—A. Graunke & Son, 431 29th St. (sheet metal workers)—sheet metal brake and gutter former.

Wis., Milwaukee—The Wisconsin Auto Exchange, 115 Sycamore St.—one gear press.

Wis., Milwaukee—C. Zawatski, 851 Sobieski St.—lathe, drill press and gasoline storage tank and pump.

Wis., Sparta — F. J. Domke — equipment and auto repair machinery for proposed garage on South Water St.

Wis., Stockbridge — The Stockbridge Sheet Metal & Plumbing Co., c/o N. Karls—sheet metal working machinery.

Ont., Delhi — M. C. Beecroft — complete equipment for modern garage and auto repair shop. Estimated cost, $10,000.

Ont., Sarnia—The Dominion Alloy Steel Corp., Sarnia, C. H. Wills, Marysville, Mich., interested — equipment and electrically operated furnaces for steel plant on St. Clair St.

Ont., St. Thomas—The City Council, A. Stokes, Chn.—equipment for repair shop and gasoline station.

Machinery

Fla., Bradentown—J. L. Waterbury Co.—complete narrow gauge railroad equipment, including locomotives, cars, tracks etc.

Ga., Thomasville — The Dawes Constr. Supply Co., P. O. Box 314, J. P. Dawes, Mgr.—complete line of machinery for the manufacture of sand paper.

Ia., Des Moines—The Des Moines Printers Exchange, 310 2nd St.—printing press and stereotype machine.

Ill., Chicago—G. A. Deveneau, 652 South State St.—filter press, 2 ft. square, 8 to 12 leaves, with or without pump, electrical or steam driven (used).

Mass., Boston—W. H. Field Co., 39 Washington St., N.—woodworking machinery.

Mass., Whitinsville—The Whitin Machine Wks., Main St.—one 20 ton hand power crane, 45 ft. 8 in. span.

Mich., Detroit—A. W. Fellers, 6035 14th Ave.—planer and matcher, (used).

Mich., Detroit—E. R. Sloat, 5382 Woodward Ave.—complete plating outfit, (used).

Minn., Baudette—V. H. Ricci, P. O. Box 101—type setting machine.

Minn., Minneapolis—H. C. Johnson, 2730 Lyndale Ave., S. (creamery products)—power machinery, churns, mixers, etc.

Minn., Minneapolis — The Strutwear Knitting Co., 731 East 14th St. — W. A. Struthers, Secy.—knitting machinery, full fashion, for proposed factory.

Minn., Minneapolis—The Western Newspaper Union, 200 North 3rd St.—cylinder cutter.

Minn., St. Louis Park—The Minneapolis Concrete Co., J. C. Melville, 818 Builders Exchange Bldg., Minneapolis, Secy.—belt elevators, mixers, block machine, gravity conveyors, lift truck, and two electric motors.

Minn., Wells—The Mirror, J. E. Schofield, Purch. Agt.—four page press.

Mo., Dodson—L. Stewart—one 6 x 9 circular printing press and type.

Mo., Joplin—W. F. Barnett, 1607 Main St.—electric paper cutter for job printing plant.

Mo., Joplin—D. W. Gahagan & Son, 107 West 9th St., E. M. Gahagan, Purch. Agt.—printing press.

Mo., Joplin—The Joplin Machinery Exchange, 211 East 4th St., R. M. Clark, Mgr. —two or three 2, 3, 4 or 5 ton 24 or 36 in. gage electric locomotives for mine work, either storage battery or trolley type (used).

Mo., Kansas City — Brown-Preuss Stationery Co., 918 Grand Ave., J. Brown, Purch. Agt.—multi-color printing press.

Mo., Kansas City—The Drovers Telegram Co., Inc., 1505 Genesee St., W. P. Neff, Purch. Agt.—folding machine for newspaper plant.

Mo., Kansas City—The Lion Oil & Refining Co., 622 Finance Bldg., V. H. Smith, Secy.—one 1,200 bbl. agitator; 4 miles of 4 in. pipe line; couplings; 15,000 bbl. steel water top tank; 8 miles of 2 in. extra heavy pipe; miscellaneous valves and fittings.

Mo., Kansas City—The Lowell Press, 3017 Main St.—printing press and supplies for job printing plant.

Mo., Maplewood — H. E. Lousche, 7208 Anna St.—woodworking machinery for saw mill.

Mo., Springfield—W. E. Green, 719 Boonville Ave.—small tools including hammers, anvils, chisels, wrenches and automatic bellows.

Mo., Valley Park—The Barbour Boat and Pattern Co.—straightening machine and rolls.

Neb., Lincoln—The Nebraska Material & Supply Co., 117 North 9th St., W. H. Bixby, Purch. Agt.—belt driven air compressor, capacity 50 cu.ft., 60 to 70 lb. pressure, (used).

N. J., Newark—W. H. Hall, 563 18th Ave. power feed rod and Dowel machine, Hawker No. 2 (used).

N. Y., Binghamton—The Binghamton Limestone Co.—rock crushing, conveying and grinding machinery for agricultural lime plant.

N. Y., Binghamton—W. S. Jennings, 91 Carroll St.—pneumatic marble cutting, polishing and marking machinery and tools.

N. Y., Brooklyn—Berman Bros. & Lindeman Co., Inc., 2384-2392 Atlantic Ave., manufacturers of knit goods—knitting machines, 7 and 9 in. Sniker top, 2 or 4 feed, 285 and 365 needles to the cylinder.

N. Y., Brooklyn—A. Starke, 50 Columbia St.—electric hoist, ½ ton, a.c.

N. Y., Buffalo—Bd. Educ., 1401 Telephone Bldg., D. J. Sweeney, Purch. Agt.—receive bids until April 19 for woodworking tools.

N. Y., Caledonia—The New York Alfalfa Mills, H. R. McKay, Purch. Agt.—grinding, sieving, elevating and conveying machinery and equipment for feed mill.

N. Y., Canandaigua—The Central Sash & Door Mfg. Co., R. E. Pool, Purch. Agt.—double surface planer; rip saw and table; sander.

N. Y., Cattaraugus—F. E. Cobane, Jefferson St.—air compressor and tank 200 lb. pressure; hydraulic rim press and 2 ton triplex chain hoist.

N. Y., Corning—Allen & Andrews Chocolate Co., 67-71 West Market St.—W. W. Allen, Purch. Agt.—candy making machinery and equipment.

N. Y., Corning—The Corning Brush & Sponge Co., Hart St., A. Anderson, Fuller Ave., Purch. Agt.—special woodworking machinery for the manufacture of brush backs and handles.

N. Y., Deansboro—The Deansboro Feed & Lumber Co.—woodworking tools and equipment.

N. Y., Forestville—A. E. Dye Milling Co., H. A. Dye, Purch. Agt.—flour and feed grinding, grading, elevating and conveying equipment.

N. Y., Gainesville—The Gainesville Dairymen's League — machinery and equipment also cold storage system for proposed milk pasteurization and bottling plant.

N. Y., Gouverneur—The Gouverneur Limestone Co.—crushing and grinding equipment for the manufacture of agricultural lime.

N. Y., Gouverneur—The International Pulp Co.—talc grinding machinery.

N. Y., Henderson Harbor—The Snow Garage Co., G. Snow, Purch. Agt.—one 2½ ton capacity triplex chain hoist with 300 ft. track and traveler.

N. Y., Jamestown—C. F. Carlson, 19 Norwood Ave.—small blue printing machine.

N. Y., Lackawanna—W. J. Lohr Co., Lehigh Ave. and Ridge Rd.—machinery and equipment for 50 ton daily capacity ice plant.

N. Y., LaSalle—A. LeBar & Sons Co., Belden Ave. and River Rd., A. LeBar, Purch Agt.—machinery and equipment for artificial ice plant, 25 ton per day capacity.

N. Y., Lockport—A. W. Jack Corp.—machinery and equipment for the manufacture of asbestos paper.

N. Y., Lowville—The Bordner Cap Co., manufacturer of pasteboard bottle caps, C. W. Bordner, Purch. Agt.—special automatic machinery for cutting card board discs.

N. Y., Mohawk—The Elizabeth Street Garage—complete battery charging outfit with converter and panel; cylinder grinder (Heald or similar); two ton hoist.

N. Y., Naples—M. J. Maney—machinery for the manufacture of wire handles for grape baskets.

N. Y., Portchester—M. Di Leo, Westchester Ave.—conveying machinery for 300 ton coal bunker.

N. Y., Rochester—A. W. Hopeman & Son, 569 Lyell Ave.—woodworking machinery for proposed furniture factory on Hague St.

N. Y., Rome—The Rome Milk Corp., Inc., W. Murphy, Purch. Agt.—milk handling, pasteurizing and bottle capping machinery and equipment.

N. Y., Watertown—A. M. Osborne, 741 Davidson St.—bread and pastry mixing machinery and baking ovens.

N. Y., Wayland—J. E. Barber—printing press and job equipment.

N. C., Garner—N. L. Broughton Cotton Seed Co.—cotton seed culler.

N. C., Mt. Airy—Jones & Wilson, A. Jones, Purch. Agt.—hand rock crusher to handle about 5 yd. per hr.

N. C., Reidsville—The Amer. Products Corp., B. R. Stone, Mgr.—complete line of bottling machinery and equipment for small plant, including filling, corking and labeling machines, conveyors, etc.

N. C., Rutherfordton—The Taylor Lumber Co., W. C. Taylor, Mgr.—complete line of hand planing mill machinery.

N. C., Thomasville—J. P. Long—machinery and equipment for laundry.

N. C., Waynesville—The Natural Abrasive Mining Co. of America, F. R. Hewitt, Treas.—machinery for proposed grinding mill at Willets.

O., Akron—Brown Graves Co., 85 East Miller Ave.—one veneer jointer to point 86 in. veneers.

O., Cincinnati—The Economy Mchy. Co., 428 East Pearl St., J. Flynn, Sr., Purch. Agt.—double drum double cylinder hoisting engine, 7 in. x 10 in. cylinders.

O., Cincinnati—The Ohio Mchy. Co., 24 West 2nd St.—band saw; saw table; pony planer; jointer; planer and matcher; swing saw.

Pa., Corry—The Corry Jamestown Mfg. Co. (manufacturer of furniture)—several presses, smaller than 30 ton.

Pa., Pittsburgh—The Enterprise Fdry. Co., 1400 Nixon St.—foundry equipment to replace that which was damaged in recent fire.

Pa., Pittsburgh — T. A. North, 825 Maginn Ave., N. S.—woodworking machinery.

Pa., Pittsburgh—The Standard Sanitary Mfg. Co., Preble Ave.—one 60 in. open side planer.

Pa., Pittsburgh—The Pittsburgh Supply Co., Ross St.—two 20 ton overhead cranes.

Pa., Westfield—The Pennsylvania Potash & Fertilizer Co.—machinery for the manufacture of potash-fertilizer. Exclusive rights to the Kreiss process.

S. C., Saluda—R. H. Etheridge, woodworking—knife grinder for planer bits, hand feed, also power feed ripsaw, (used).

S. C., Williston—L. M. Pearson—modern machinery and equipment for creamery.

Tex., Houston—The Worsham Bros. Motor Co., J. H. Worsham, Purch. Agt.—air compressor, 10 hp., power motor, air tank.

Va., Emporia—W. W. Rich—log saw mill complete, (used).

Va., Hopewell—The Hopewell Ice & Cold Storage Co., W. C. Ellis, Mgr.—electrically operated machinery for ice plant.

Va., Lodge—B. B. Dawson—canning machinery and equipment for small plant, (new or used).

Va., Lynchburg—The Texas Arkansas Petroleum Corp., P. O. Box 592, W. W. Hancock, Pres.—well drilling machinery and equipment.

Va., Norfolk—J. B. Porter, P. O. Box 255 —various small tools for tinning work, such as shears, cutters, cornice brakes, etc., also about 40 hp. tubular boiler, (used).

Va., Norfolk—The Tidewater Paper Co., Newcastle and Water Sts., R. A. Barrett, Purch. Agt.—one 10 x 15 job printing press, Chandler and Price preferred (used).

Va., Richmond—The Richmond Housing Co., P. O. Box 131—portable saw outfits.

Va., Williamsburg — The Peninsular Dairies, W. Gilley, Secy.—dairy machinery and equipment.

Va., Wytheville—R. P. Johnson, Lumber mill—locomotive dinky engine; conveyor loader for coal, sand, etc., also four side planer and matcher, (used).

Wis., Appleton—H. C. Kattke, 695 Appleton St.—blacksmith shop machinery and equipment.

Wis., Black River Falls—The Vaudreul Wood Products Co., R. Koehler, Purch. Agt. —power saws.

Wis., Eau Claire—The Northwestern Steel & Iron Wks., Spring and Ball Sts.—chain hoist for machine shop.

Wis., Junction City—The Cera Mfg. Co. —planer and saws.

Wis., Marshfield—Blum Bros. Co., 135 West 9th St. — woodworking machinery, power machine, motors, craters, etc., for proposed butter tub factory.

Wis., Marshfield—J. Froelich, Route 1—cheese making machinery, including vats and separator, line shaft drive.

Wis., Mayville—The Peerless Traveling Goods Co.—special machinery for proposed factory on Main St.

Wis., Merrill—Smith Bros. & Kuehl (woodworking), C. Kuehl, Pres.—planers, shapers, band saws and sawing machine.

Wis., Milwaukee—The Ackerman Oil Co., 221 Grand Ave. — gasoline storage tanks and pumps for proposed filling station at Cudahy.

Wis., Milwaukee — The Interior Woodwork Co., 521 Fark St.—additional equipment including a motor generator set.

Wis., Milwaukee—The Plymouth Mfg. Co., address M. Mann, Plymouth, Wis.—machinery for the manufacture of dress goods, etc.

Wis., Milwaukee — W. J. Raley, 711 Chestnut St.—gas storage tank and pump.

Wis., Watertown—J. J. Locklin, 630 West Main St.—milk handling, pasteurizing and bottling equipment.

Wis., Waupon—C. A. Shaler Co.—special machinery and power machinery for vulcanizing plant.

Ont., St. Thomas—The St. Thomas Packing Co., W. H. Moody, Mgr.—materials and equipment for proposed cold storage plant.

Ont., Strathroy — The Butler Woolen Mills—woolen mill equipment.

Metal Working Shops

Conn., Bridgeport—The Bridgeport Auto Co., Inc., 386 Fairfield Ave., plans to build a 2 story service station on Courtland St. Estimated cost, $40,000. Architect not selected.

Cal., Los Angeles—E. A. Gray Co., 510 South San Pedro St., has awarded the contract for the construction of a 1 story machine shop. Estimated cost, $40,000.

Cal., Oakland — The Walnut Grove Creamery, 41st and Market Sts., has awarded the contract for the construction of a 2 story blacksmith shop on 41st and Market Sts. Estimated cost, $5,000.

Cal., San Pedro—The Regan Forge Co. has awarded the contract for the construction of a 1 story, 80 x 200 ft. foundry and machine shop. Estimated cost, $60,000.

Cal., Tranquility — The Tranquility Union High School Dist. is having plans prepared for the construction of various school buildings, including machine shop, farm mechanics building, etc. E. J. Kump, Rowell Bldg., Fresno, Archt.

Ill., Chicago—Z. E. Smith, Archt., 305 East 55th St., is receiving bids for the construction of a 2 story, 50 x 50 ft. factory at 414 East 34th St., for the Chicago Wheel & Spring Co. Estimated cost, $25,000.

Ill., Highland Park — Holmes & Flinn, Archts., 8 South Dearborn St., Chicago, are receiving bids for the construction of a 1 story, 50 x 140 ft. garage and auto repair shop on Laurel and 1st Sts., for G. H. Koon, 47 South St. John St. Estimated cost, $40,000.

Ill., Joliet—The Lundgaard Bros. Auto Co. plans to build a 1 story, 40 x 140 ft. garage. Estimated cost, $40,000. Architect not selected.

Ky., Central City—The Triangle Machine Wks., Owensboro, Ky., will build a 1 story, 70 x 150 ft. machine shop. Estimated cost, $10,000.

Mass., South Boston (Boston P. O.)—The National Can Co., Lincoln St., has had plans prepared for the construction of a 2 story, 52 x 160 ft. manufacturing building, 1 story, 20 x 40 ft. garage and a 3 story, 20 x 40 ft. storage building. Estimated cost, $125,000. A. A. Browne, 7 State St., Boston, Archt.

N. J., Atlantic City—The Union Transfer Co., 1004 Spring Garden St., Phila., has awarded the contract for the construction of a 1 story, 45 x 115 ft. and 181 x 165 ft. garage at 1114 North Virginia Ave. Estimated cost $100,000. Noted Sept. 28.

N. J., Trenton—The Crescent Insulated Wire & Cable Co., Taylor and Olden Sts., has awarded the contract for the construction of a 2 story, 75 x 240 ft. and a 3 story, 60 x 120 ft. factory on Taylor St. Estimated cost, $150,000.

N. Y., Baldwinsville—C. L. Cadle, Supt. Pub. Wks., Albany, plans to build a barge canal repair plant, here. Estimated cost, $100,000. L. F. Pilcher, Albany, State Archt.

N. Y., Rochester—R. G. Costich, 251 Hayward Ave., plans to build a 50 x 146 ft. garage on Hayward Ave. Estimated cost, $40,000.

N. Y., Syracuse—The Franklin Automobile Co., 302 South Geddes St., plans to build an automobile factory. H. H. Franklin, Pres.

O., Cleveland—**The Dille Mfg. Co.**, 664 Bank St., manufacturer of hardware, has awarded the contract for the construction of a 1 story, 45 x 75 ft. addition to its factory. Estimated cost, $40,000.

Ore., Portland — The Oregon Coal Co. plans to build 1 story blast furnaces. Estimated cost, $500,000. A. G. McKee Co., 2422 Euclid Ave., Cleveland, O., Archt. and Engr.

Pa., Derry—**The Pittsburgh High Voltage Insulator Co.** has awarded the contract for the construction of a 1 story, 95 x 160 ft. factory. Estimated cost, $50,000.

Pa., Kane—The McKean Chemical Co., Duhoga, plans to build a 2 story, 80 x 250 ft. chemical plant here. Estimated cost, $40,000. N. B. Bubb, Williamsport, Secy., Treas. and Mgr.

Pa., Phila.—The International Harvester Co. of America, 21 North 23rd St., is receiving bids for the construction of a 5 story, 100 x 130 ft. warehouse and a 1 story, 64 x 100 x 140 ft. service station on 16th St. and Indiana Ave. Estimated cost, $500,000. W. D. Price, 5405 North Central Ave., Chicago, Engr.

Wis., Beloit—J. T. Hetherington & Son, Archts., 25 South Dearborn St., Chicago, will soon receive bids for the construction of a 2 story, 100 x 120 ft. factory on Broad St., for J. H. Sarls, 412 Broad St. (manufacturer of automobiles). Estimated cost, $75,000.

Wis., Madison—W. F. Clark, 2105 Keyes Ave., is having plans prepared for the construction of a 1 story, 60 x 166 ft. garage and filling station on University St. Estimated cost, $45,000. A. E. Small, Ellsworth Bldg., Archt.

Wis., Milwaukee — W. J. Raley, 711 Chestnut St., is having plans prepared for the construction of a 2 story, 30 x 150 ft. garage on Chestnut St. Estimated cost, $40,000. Private plans.

Wis., Sparta—F. J. Domke plans to build a 2 story, 32 x 100 ft. garage on South Water St. Estimated cost, $50,000. Architect not selected.

Wis., Waupun — C. A. Khaler Co. has awarded the contract for the construction of a 2 story, 75 x 110 ft. vulcanizing plant. Estimated cost, $35,000.

Ont., Sarnia—The Dominion Alloy Steel Corp., Sarnia, plans to build a steel plant on St. Clair St. Estimated cost, $3,000,000. C. H. Wills, Marysville, Mich., interested. J. J. Mahon, c/o owner, Engr.

Ont., St. Thomas—The City Council is having plans prepared for the construction of a repair shop and gasoline station in connection with the new civic auto bus line. Estimated cost, $15,000. A. Miller, City Engr.

Ont., Welland—The Highway Crossings, Ltd., manufacturer of steel railway crossing signs, has purchased a 100 x 300 ft. site in Maple Leaf Park and plans to build a factory.

General Manufacturing

N. Y., Gainesville—The Gainesville Dairymen's League plans to build and equip a milk pasteurization and bottling plant. Estimated cost, between $40,000 and $50,000.

N. Y., Lackawanna (Buffalo P. O.)—W. J. Lehr, 511 Ridge Ave., plans to build a 25 ton ice plant on Lehigh Ave. Estimated cost, $40,000.

N. Y., Rochester—**The Bartholomay Co., Inc.**, 555 St. Paul St., manufacturer of ice cream, plans to build a 4 story, 50 x 80 ft. addition to its factory. Estimated cost, $15,000.

N. Y., Rochester—A. W. Hopeman & Son, 869 Lyell Ave., plans to build a 67 x 154 ft. furniture factory on Hague St. Estimated cost, $30,000.

N. Y., Rochester—C. W. Oster, 346 East Main St., plans to build a printshop at 807 Lake Ave. Estimated cost, $8,000.

N. Y., Rochester—**The Rochester Printing Co.**, 61 Main St., E., plans to remodel and build an addition to its plant. Estimated cost, $50,000.

N. Y., Rochester — **Sampson-Wohlrab Packing Co.**, Buffalo Rd., plans to build a 3 story, 44 x 108 ft. refrigerator plant on Kerr St. and Field Rd. Estimated cost, $18,000.

N. C., Willets—**The Natural Abrasive Mining Co. of America**, Waynesville, plans to build a grinding mill, here. Estimated cost, $250,000. Address F. R. Hewitt, Waynesville, Treas.

O., Cleveland—**The Euclid Ave. Lumber Co.**, 11715 Euclid Ave., has had plans prepared for the construction of a 1 story lumber yard, including a garage, at 11615 Mayfield Rd. Estimated cost, $40,000. Private plans.

O., Cleveland — **The Penton Publishing Co.**, East 12th St. and Chestnut Ave., is having plans prepared for the construction of a 9 story, 135 x 135 ft. publishing plant on West 3rd St. and Lakeside Ave. Estimated cost, $500,000. R. E. Power, Treas. F. Chase, 645 North Michigan Ave., Chicago, Archt.

Pa., Bethlehem—R. K. Laros Silk Co., 9th and Linden Sts., has awarded the contract for the construction of a 3 story, 60 x 240 ft. silk factory. Estimated cost, $130,000.

Pa., McKeesport — **The Peters Packing Co., Inc.**, has awarded the contract for altering and building an addition to its plant. Estimated cost, $100,000.

Pa., New Castle—**The Wear Well Tire Co.** is having plans prepared for the construction of a 1 story, 50 x 150 ft. tire factory and a 14 x 50 ft. office. Estimated cost, $50,000. Earl & Altschuler, Dean Bldg., Archts.

Pa., Phila.—**The Alva Carpet & Rug Co.** has awarded the contract for the construction of a 3 story, 50 x 150 ft. carpet mill on Kinsey and Hedge Aves. Estimated cost, $100,000.

Pa., Phila.—**The McCallum Silk Hosiery Co.**, 377 Dwight St., Northampton, Mass., has awarded the contract for the construction of a 3 story, 85 x 174 ft. hosiery mill on Roosevelt Blvd. and 2nd St. here. Estimated cost, $90,000.

Pa., Phila. — Montgomery Bros., Inc., have awarded the contract for the construction of a 2 story, 27 x 70 ft. addition to packing and rubber goods factory on Penrose and Parker Sts. Estimated cost, $7,500.

Pa., Phila. — The N. E. Ice Mfg. Co., Front and Luray Sts., has awarded the contract for the construction of a 1 story, 72 x 115 ft. and 1 story, 43 x 105 ft. ice manufacturing plant on Front and Luray Sts.

Pa., Pittsburgh—The Hardie Bros., 1601 Liberty Ave., are having preliminary sketches made for a 5 story, 135 x 350 ft. candy factory on Pike and 13th Sts. Estimated cost, $150,000. J. L. Beatty, Jackson Bldg., Archt.

Pa., Shamokin—The Croninger Packing Co. plans to build a 5 story, 40 x 75 ft. packing plant. Estimated cost, $150,000. W. H. Lee, 32 South 17th St., Phila., Archt.

Pa., Watsontown—The Watsontown Sash & Door Co. plans to build a factory to replace the one destroyed by fire. Estimated cost, $150,000.

R. I., Providence—The Colwell Worsted Mills, 204 Hartford Ave., has awarded the contract for the construction of additions to its plant, including a 2 story, 55 x 200 ft. mill; a 1 story, 46 x 80 ft. dye house; 1 story, 45 x 60 ft. boiler house; 1 story, 25 x 45 ft. machine shop, and 1 story, 35 x 45 ft. shipping building. Estimated cost, $150,000.

R. I., Westerly—The Westerly Textile Co., 41 Main St., has awarded the contract for the construction of a 5 story, 32 x 50 ft. addition to its mill. Estimated cost, $50,000.

Tex., Hoskins Mound — The Freeport Sulphur Co. of Freeport, Tex., has awarded the contract for the construction of a complete sulphur mining plant here.

Va., Hopewell — The Hopewell Ice & Cold Storage Co. is having preliminary plans prepared for the construction of a 1 story, 25 x 100 ft. ice plant. Estimated cost between $40,000 and $50,000. W. C. Ellis, Mgr.

W. Va., Richwood—J. L. Horner Ice Co., Clarkesburg, plans to build a 10 ton ice plant here.

Wis., Cudahy—The Ackerman Oil Co., 321 Grand Ave., Milwaukee, has awarded the contract for the construction of a 2 story, 40 x 60 ft. warehouse and a 1 story, 12 x 20 ft. filling station, here. Estimated cost, $40,000.

Wis., Elkhorn—F. J. Schmidt plans to build a 2 story, 50 x 75 ft. ice cream factory. Estimated cost, $35,000. Architect not selected.

Wis., Madison—The Pennsylvania Oil Co., 731 East Washington St., has purchased a site on Dayton St. and plans to build a 2 story, 50 x 95 ft. oil warehouse, etc. Estimated cost, between $40,000 and $50,000. Architect not selected.

Wis., Manitowoc—A. M. Richter Sons Co., South 8th and Madison Sts., is having plans prepared for the construction of a 3 story, 70 x 82 ft. cider vinegar plant on South 9th and Grand Sts. Estimated cost, $65,000. L. I. Pentzien, Savings Bank Bldg., Archt.

Wis., Marshfield—Blum Bros. Co., 135 West 9th St., will open bids about May 1 for the construction of a 1 and 2 story, 96 x 120 ft. buttertub factory. Estimated cost, $100,000. G. A. Krasin, Marshfield, Archt.

Wis., Mayville—J. E. Hennen, Archt., 74 South Main St., Fond-du-Lac, will receive bids until April 20 for the construction of a 2 story, 50 x 90 ft. factory on Main St., for the Peerless Traveling Goods Co. Estimated cost, $50,000.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St., is having plans prepared for the construction of a 2 story, 46 x 80 ft. addition to its dairy on Burleigh St. Estimated cost, $20,000. H. W. Voelz, 86 Michigan St., Archt.

Wis., Oshkosh—The Mercy Hospital, 185 Hazel St., is having revised plans prepared for the construction of a 2 story, 40 x 70 ft. boiler house and laundry and a 3 story, 42 x 100 ft. convent. Estimated cost, $175,000. E. Brielmaier & Sons, 432 Bway., Milwaukee, Archts.

Wis., Park Falls—The Flambeau Paper Co. is having plans prepared for the construction of a 2 story, 75 x150 ft. wood mill. Estimated cost, $100,000. T. W. Orbison, 812 College Ave., Appelton, Archt.

Ont., Barry's Bay—Murray & Omunique plan to build a pulp grinding plant. Estimated cost, $150,000. Architect not selected.

Ont., Bridgeburg—**The St. Thomas Packing Co.** plans to build a cold storage packing plant in Crowland Sect. Estimated cost, $50,000. Private plans.

Ont., Ottawa—**Swifts Canadian Packing Co.**, Ward Market, has awarded the contract for the construction of a 1 story, 50 x 100 ft. cooling plant. Estimated cost, $18,000.

Ont., Strathroy—The Butler Woolen Mills plans to rebuild plant which was partially destroyed by fire. Estimated cost, $25,000.

Ont., St. Thomas—**The St. Thomas Packing Co.** is having plans prepared for the construction of a cold storage plant. Estimated cost, $50,000. W. H. Moody, Mgr.

Ont., Toronto—The Lawrason Doughty Co., 42 Church St., plans to build a 2 story, 45 x 110 ft. printing plant on Hamilton St. Estimated cost, $25,000. Architect not selected.

Ont., Welland—The Universal Casket Co. plans to build a factory in Maple Leaf Park. Estimated cost, $40,000. B. A. Basque, Pres. Architect not announced.

Ont., Wiarton—The Kastner Lumber Co. plans to build saw mills to replace the ones destroyed by fire. Estimated cost, $35,000.

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Methods of Machine Tool Design

Usual Machine Design Methods Do Not Always Apply in Designing Machine Tools—Definition, Classification and Requirements of a Machine Tool

By A. L. DeLEEUW

THERE are many books in existence dealing with the design of machinery in general. As a rule such books treat mostly, if not exclusively, of the design of machine elements, such as bearings, shafts, keys and clutches, connecting rods and valves, or gears and cams and pulleys. Others again deal with the complete design of certain classes of machinery, such as generators, or steam engines, or turbines, or hydraulic machinery.

Having thoroughly absorbed the substance of one of this latter class of books the reader would be able to design some such machine himself and, though that machine might not be the best ever designed, yet it would contain all that is necessary to give it a certain amount of success. There are also books which deal exclusively with the design of machine tools, but they differ from the second class which was mentioned above in so far that the student, after thoroughly absorbing the contents of such a work would yet not be able himself to design a machine tool.

BOOKS TELLING in detail how to design engines, generators, hydraulic machinery, etc., are ready to the hand of the designer. When he tackles a machine tool, however, there is nothing of the sort available and the problem is a much more difficult one, besides.

Each design has its own peculiar difficulties and in addition the difficulties inherent in its type, whether it be a standard or single-purpose machine.

Nevertheless, it is quite possible to employ systematic methods in tackling each individual case. The development of such methods by one of our best machine tool engineers is the purpose of this and succeeding articles.

In the following pages an attempt will be made to describe the processes through which the designer should go when designing a machine tool. It will be taken for granted that he has the necessary knowledge of the design of machine elements or, at least, that he knows how and where to get it.

It might appear that the rules which hold good for the design of any other kind of machine should also be applicable to machine tool design; but as a matter of fact there is a great difference in the processes involved when designing a steam engine or generator or boiler, and those used when designing a machine tool. One of the main reasons is that there are no well-established data from which to start.

Designing a steam engine we start with the amount of power to be developed and we know which well-known elements we should use to obtain the desired result. We have a general picture of the machine we are going to develop and we know the order in which the details must be taken up. All the problems which come up in the design of a steam engine have been studied separately and the results have been placed on record. To design a steam engine of given horsepower our first question is: What is the pressure of the steam? We then decide what cut-off we shall use and from this we determine the mean effective pressure. We select the length of stroke and we will be guided by considerations which the problem has brought before us. Having mean effective pressure and length of stroke, we can at once determine the diameter of the cylinder. We can now check up diameter and length of stroke in relation to each other and, if necessary, modify our first choice. Knowing the cut-off at which we wish to operate, we can lay out the valve motion. In this manner the various elements of the steam engine are brought together and put into concrete form step by step. The same general method holds good for many other classes of machinery, but not for machine tools. As was said before, there are no well established data available.

Besides, there are other reasons. A number of elements which do not enter into the design of most classes of machinery are of great importance in the design of a machine tool, and even such elements as are common to the machine tool and other classes of machines are of different relative importance in machine tool design. To illustrate this latter statement: One of the great elements in the design of a steam engine—economy of power—is a minor consideration in the design of machine tools. We are perfectly willing to spend a few extra horsepower if, on the other hand, we can obtain economy of production—a factor which does not exist in the steam engine. Such elements as handiness, accessibility, freedom from vibration, provision for taking up wear, etc., are of the greatest importance in machine tool design, though of secondary importance only in the design of most other classes of machines.

Not only do we lack fundamental data, but our requirements are never definitely stated. In designing

a steam engine we know exactly what strains the various parts of the engine must resist and we can build accordingly. The strains in the engine never exceed a well-known maximum and depend entirely on horsepower and speed. In a machine tool the strains to which the machine is subjected depend, it is true, on the nature of the material to be cut and on the size of cut, but they depend also on a number of other things such as the shape of the tool and the degree of sharpness to which it is ground. A machine tool may from day to day or, for that matter, from hour to hour, take entirely different cuts with entirely different tools and in entirely different materials. There is no positive limit as to the amount of power which must be transmitted by the mechanism of the machine. If the machine is designed for a 6-in. belt and the user finds that he does not have enough power to take the cut he wants to take, he tightens the belt; or, if he has a motor drive, he substitutes a larger motor. Neither the designer nor the builder is consulted in this matter. After the machine tool leaves the hands of the manufacturer it gets into the hands of somebody who is concerned with one consideration only, and that is how to get the greatest amount of production out of that machine. The user of a steam engine would not dare to double its speed, for the flywheel might burst; the user of a boiler does not dare to increase the steam pressure, for the boiler might blow up; the user of a dynamo or motor does not dare to increase the wattage, for the insulation would burn out; but the user of a machine tool is not limited in any sense and may keep on imposing heavier and heavier duty on the machine until it breaks down, and then he blames either the manufacturer or the designer or both.

As a result of this lack of definite information and definite aim, machine tool design has depended almost exclusively on slow evolution. It has been almost entirely in the hands of men who were familiar more with the art of running the machine than with the art of originating it. During a period of many years a certain amount of knowledge has been accumulated and has been transmitted more or less by word of mouth from one generation to another. Most designers when dealing with the design of machine tools have a fairly clear idea as to the requirements of the machine they are to design, but it is doubtful if many have considered the order of importance of these requirements.

Classification of Machine Tools

Machine tools might be divided into two classes, special machines and commercial machines. Though there is little difference in mechanical requirements of these two classes there is a great difference in the relative importance of these requirements. For example, the chief requirement of any special machine is that it shall do properly the work it is intended to do. Though this also is one of the main requirements of a commercial machine, it is not the chief one. The chief requirement of a commercial machine is that it shall be marketable at a profit and as, of course, it cannot be marketable unless it fulfills its duty, it must also be suitable to the purpose for which it is built. As a result, it is not so essential that one should carefully consider the cost of manufacture of every detail of a special machine. On the other hand, as a special machine is made for one purpose only, and as that purpose is definitely known, it *is* of the greatest importance that it shall be as economical—that is, as productive—in its operation as it is possible to make it. Though this same thing is desirable, again, for a commercial machine, it is absolutely impossible to make it the main feature for all the kinds of work that might be done on it. It stands to reason that a 36-in. lathe can never be so productive for the turning of a ½-in. shaft as a 10-in. lathe can be; nor can the 10-in. lathe ever be so productive for a 7-in. shaft as the 36-in. lathe can be.

There is a class of commercial machine tools which is built for one purpose only—the single purpose machines. We might, therefore, divide machine tools as follows:

1—Special machines; 2—Commercial machines:



2a—Single purpose machines; 2b—General utility machines.

The class 2a does not offer as many difficulties to the designer as 2b, but he has still to reckon with the requirements of economy of manufacture, which is one of great importance in all commercial machines.

Requirements of Machine Tools

The chief requirements of any machine tool whether special or commercial, are the following:

(1) It must function properly.

(2) It must have the necessary strength.

(3) It must have the necessary rigidity.

(4) It must have the necessary power for the cuts intended.

(5) It must have the necessary feeds and speeds for the range of work and cutting speeds which might be handled on a machine of this type.

(6) Parts must be so proportioned as to hold wear down to a minimum.

(7) Provision must be made for the taking-up of wear which may affect the accuracy of the product.

(8) All take-ups, adjustments and parts liable to breakage must be easily accessible.

(9) The machine must be so constructed as to allow of ready repair. In other words, it must be easily assembled and disassembled.

(10) Parts should be so designed as to allow of economical manufacture.

(11) The machine must be easy to operate.

(12) The machine should have a pleasing appearance.

(13) It should be possible to handle and ship the machine by proper means without danger of breakage or distortion.

Many other minor requirements might be mentioned, but the requirements given above will give sufficient material for the following articles, and will bring up naturally those requirements not mentioned here.

As to the order of their importance, there might be some discussion in regard to some of them, but this much is sure: that number one will have to stay in its place, as meeting all the other requirements is of no benefit unless the first requirement is met—that is, unless the machine functions properly.

For the purpose of the subsequent discussions we will give the following definition of a machine tool:

A Machine Tool is a Metal Working Machine for the Removal of Material from a Piece of Work and Containing Means for Holding, Guiding and Controlling the Work, or Tool, or Both.

A machine tool is therefore an organization composed of a number of elements which in themselves may be organizations, and of which each element has to be capable of performing a certain function. There must be a mechanism, there must be means for holding the work, means for holding the tool, means for guiding either or both, and means for controlling the various movements and conditions. It may be that the same parts are used for more than one function; in fact, this is almost always so. But for the purpose of design we should keep the functions apart. The table of a milling machine guides the work and it also has means for holding it—the T slots. Similarly, the carriage and slides of a lathe or saddles of a planer are the elements for guiding and holding the tool. However, for the purpose of design we consider *one function* at a time.

Designing a Machine

When starting the design of a machine we have nothing before us but a drawing board and some instruments, or perhaps a sketch pad and a pencil. Of course there are cases when a manufacturer takes an existing machine and modifies it and calls the result a new design; and so it is, as far as the trade is concerned. But to the designer it is merely an alteration; or, in other words, the problem of designing a part of a machine. We are concerned here with designing "from the ground up."

To try to build up from this zero condition to the complete machine is very much like trying to build up a pyramid standing on its apex. We should start in with the finished machine, and we should imagine that this machine has been completely designed and will do the work for which it is intended. We then analyze this imaginary machine and find what main units are required to build it.

We should follow very much the same method as we employ when looking up railroad connections if we wish to be at a given place and at a definite time. The man in Philadelphia who has to meet an appointment in Milwaukee at a given day and hour does not start looking up the various trains he can take out of Philadelphia. Rather he looks up the various trains which would bring him in Milwaukee at the proper hour, and he finds that in order to meet his demands he must take a train from Chicago at a certain time. Then he works back, finding a train which will bring him to Chicago at such a time as will enable him to make connections for Milwaukee. There may be various combinations which will fill his requirements. He compares these combinations and selects the simplest, or quickest, or cheapest, or the one with the most agreeable scenery, or possibly the one which gives the best sleeping- and dining-car service—all according to what he wishes to accomplish on his trip. After he has determined in a general way which road he will take, he goes into details.

Analogies are never quite correct and this is a case in point. When we look up railroad trains we merely make a selection of existing conditions; but when we design an entirely new machine we have, as a rule, no existing functional units to choose from. On the other hand, this is not necessary for our first plans. We simply take for granted that in some way we will provide the functional units on which we have based our general plan.

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Romances of Metal Working—The Story of Hal of the Wind

By H. H. Manchester

Hal of the Wind, as the legend ran, was a smith and armorer of Perth, Scotland, about 1400 A. D. in the reign of Robert III of Scotland.

On the morning of St. Valentine's day, he was kissed in his sleep by the beautiful Catherine Glover, who thus chose him to be her valentine for the ensuing year. Not long after this, however, Prince James placed Louise, the French glee maiden in his charge, which caused an



HAL OF THE WIND AT WORK

estrangement between him and Catherine, and greatly increased the chances of Eachin, a young chieftain of the clan Quhele.

In the meantime, Hal, who was also known as Henry Smith from his occupation, and Henry Gow from his personal characteristics, was busily making armor for the courtiers and the clansmen. In fact, it was said that no smith in Scotland could duplicate a piece of Italian armor but him.

The feud between the clan Quhele and the clan Chattan finally became so bitter that the king authorized a tournament to the death on the plain at North Inch, near Perth, between the two clans. When the clans assembled, it was discovered that one of the representatives of the clan Chattan was not present, and although Henry Smith was a member of neither clan, he offered to fight in place of the missing warrior.

In the fight which followed, Hal of the Wind did prodigies of strength and valor, while the armor which he himself wrought stood up against every assault. The outcome of the fight was that the clan Quhele was practically wiped out by the death of some thirty of its strongest men, while Eachin alone escaped to either exile or suicide.

Smith was offered a knighthood but refused. Soon afterward he married Catherine, and many families are proud to trace their ancestry to him, while his story is enlarged upon in Walter Scott's "Fair Maid of Perth." The prevalence of the modern name Smith is good proof of the number and importance of the Smiths in Mediaeval times. As run the old verses:

"From whence came Smith,
Albe he knight or squire,
But from the smith
That forgeth at the fire?"

The Assembling of Bevel Gears

Adjustment of Pinion and Adjustment of Gear Produce Different Results—Gears Should Be Cut with Allowance for Backlash—Bottoming of Teeth

BY CHARLES H. LOGUE

THE present object is to furnish simple comprehensive instructions for the proper assembly of bevel drive gears for automobiles. A special endeavor has been made to avoid technicalities and to present the entire matter as simply as possible.

It is impossible to assemble a pair of spur gears incorrectly providing the shafts are parallel, but unfortunately this is not the case as regards bevel gears. With spur gears it is simply a matter of securing the engagement of cylindrical pitch surfaces, which automatically adjust themselves to any position in which the gears are placed. So long as spur gears may be freely operated their action will be correct, providing, of course, that they are correctly cut.

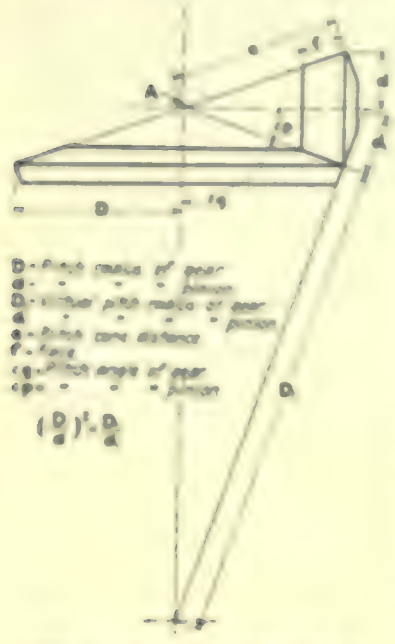


FIG. 1 PITCH SURFACES OF BEVEL GEARS

In bevel gears the pitch surfaces are conical and it is necessary that the apex of each cone coincide with the intersection of the gear and pinion axis. (See point *A*, Fig. 1.) Adjusting facilities are simply for the purpose of securing this intersection, the correction of which is evidenced by the bearing on the length and profile of the teeth, as will be explained. Gears do not require adjustment to compensate for wear, so a correct position once attained should never be altered.

It is apparent that the pitch of a bevel gear varies throughout the entire length of the face; we have, say—four pitch at the large end and five pitch at the small end of the tooth. Quiet, efficient operation requires, first of all, the engagement of equal pitches. Flush engagement at the large ends of the tooth does not necessarily mean the engagement of equal pitches on account of variations in machining of the gear blanks and to varying amounts of distortions in hardening; engagements at small ends are still less dependable on account of variation in length of face. An approximation of the correct position, so far as the relation of ends of teeth are concerned, may be found by rolling the pinion in the gear by hand.

The only real determination of this requisite engagement is by means of the tooth bearing, which may be seen by painting the teeth with a mixture of red lead and oil and running the gears under load. This bearing will occur across certain prescribed portions of the teeth of both gear and pinion and when found as described is positive evidence of proper tooth engagement. For instance, in case the bearing falls too low on the profile of the *gear* teeth it is evident that the pitch of the gear, as engaged, is less than the pitch of the pinion, therefore, the pinion is too far in towards the gear. Should the bearing on the gear teeth run high, the pinion is too far out, away from the gear. A movement of the gear toward or away from the pinion has the opposite effect, but to a decidedly less extent. By referring to Figs. 2 and 3 the relative change in pitch engagement will be apparent. Moving the pinion changes the backlash and consequent bearing along the teeth but slowly as compared to a gear movement, as will be apparent from a study of Fig. 3 so that for all practical purposes we may say that *the position of the gear controls the bearing along the length of the teeth and that the pinion position controls the bearing on the profile or height of the teeth.* Of course, in case the pinion is moved any great distance the bearing along the teeth will also change and must be corrected by re-adjusting the gear. Also any decided change in length of bearing necessitates a new pinion position. The pinion for a ratio of 5 to 1 for instance, may be moved five times as far as the gear for a given change in backlash and the gear moved five times as far as the pinion to bring about a corresponding change in profile bearing.

Equal pitches are engaged when the bearing on the profile of *pinion teeth* extends across its entire working

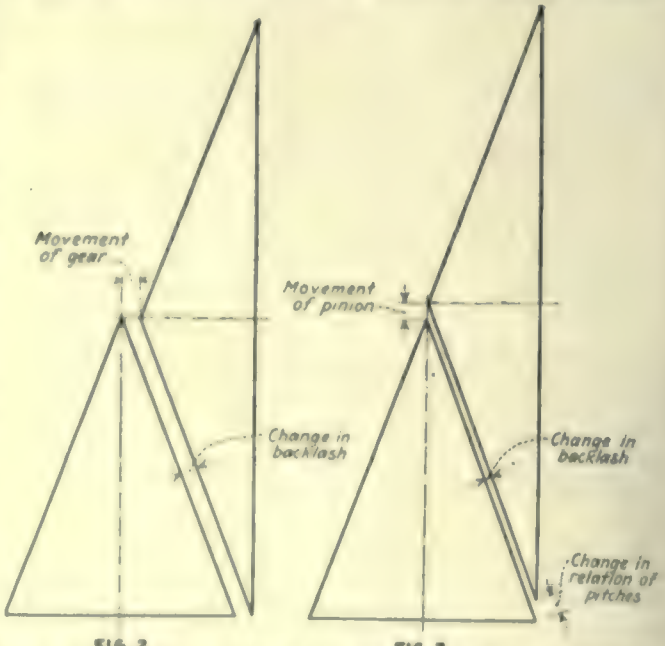


FIG. 2 FIG. 3

FIG. 2. EFFECT OF GEAR ADJUSTMENT. FIG. 3. EFFECT OF PINION ADJUSTMENT

height from the base line, where the involute curve stops, to the top of the tooth as illustrated by Fig. 4. A bearing heavy on the top (Fig. 5) means that the

pinion is too far forward, toward the gear. A bearing, heavy in flank (Fig. 6) means that the pinion is too far out, away from the gear. Do not attempt to correct bearing along the *length* of tooth by moving the pinion, although in case the bearing is low as shown (Fig. 6) at the same time slightly heavy at the large end of tooth, as in Fig. 7, a forward movement of the pinion might correct both conditions.

Unfortunately, however, it is usually difficult to see the pinion bearing owing to axle construction, so our main dependence must be placed on the bearing which appears on the teeth of the gear. The position of the bearing on the profile of the gear tooth does not extend its full depth and in many cases does not reach the tops

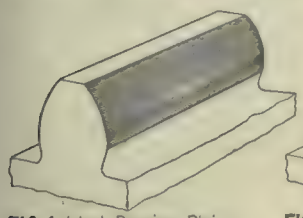


FIG. 4 Ideal Bearing Pinion

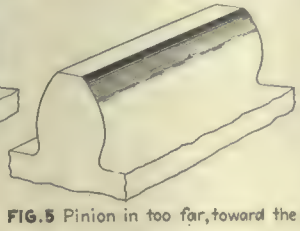


FIG. 5 Pinion in too far, toward the Gear

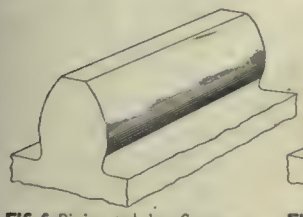


FIG. 6 Pinion out too far, away from Gear

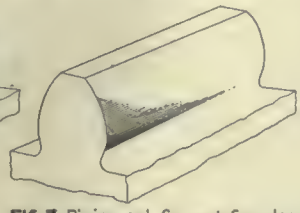


FIG. 7 Pinion out far and Gear too far away from Pinion. Might be corrected by a forward movement of Pinion only

FIGS. 4 TO 7. BEARING ON PINION TEETH

of the teeth so that its proper position is more difficult to explain than that for the pinion.

The introduction states that technicalities are avoided, but in order to offer a satisfactory explanation of general statements as to gear tooth contact as will be outlined, it is necessary to enter a little into the theory of tooth action for the benefit of those interested. Others may skip this portion and take statements made for granted. Fig. 8 illustrates the engagement of bevel gear and pinion, as developed upon their virtual pitch radii. This engagement is shown at three periods—that is, *e* at the point where gear tooth first engages that of the pinion, *g* at the pitch point and *n* as the gear tooth is about to leave pinion tooth at the end of the arc of contact.

Contact cannot occur on the profile of the gear tooth beyond the intersection of the pinion base circle and the line of action, or point *e*. Any portion of the gear tooth extending beyond this point will not show contact, as is in this case evidenced by the distance *f*. That is, the contact on profile will fall this distance below the tops of the gear teeth.

The theoretical height of bearing, above the pitch line, is equal to the pitch radius times sec² of the pitch angle times sin² of the angle of virtual obliquity. The difference between the addendum, as employed, and the bearing height found as above, represents the distance which bearings will fall below the tops of the teeth. In case the addendum is equal or is less than this amount the bearings should extend clear to the tops of the gear teeth. Contact at *g* being reached the path of the contact on the gear tooth now extends from the point *e* to the pitch line, or the distance *h*. At the end of the engagement the pinion tooth breaks contact with the gear tooth at *n* and the entire path of this contact will be found in the distance *k*. This path of contact should show on the painted surface of the gear tooth.

It is necessary to explain, in this connection, that the contact between gear and pinion tooth is constantly along the line of action. The angle of approach cannot be greater than the angle of virtual obliquity as shown in Fig. 8, so that the bearing above the pitch line of the gear can not extend beyond the point *e* as stated. The angle of recess and consequent depth of gear tooth engagement, below pitch line, is dependent upon pinion addendum. The pinion diameter and obliquity of action affect both of these dimensions.

The point to be derived from this explanation is that the position of bearing is dependable measurement of the accuracy of tooth action—therefore, a proper guide for gear and pinion location. When the bearing is correct the gears are at their best, it is only necessary to know where the bearing should come.

Usual Position of Bearing on Gear Tooth

According to ordinary practice in all straight tooth bevel gears the bearing will fall about ⅛ in. below tops of the gear teeth. In spiral bevels the bearings will usually extend clear to the tops of the teeth. This is on account of the proportionate gear addendum usually employed for these types. The depth of bearing below pitch line may be readily determined by moving the pinion a little forward, toward the gear, and noting its position. This bearing never goes the full working depth. A study of Fig. 8 will explain this.

A bearing extending from the lowest point (as may be found by moving the pinion slightly forward) to the tops of the gear teeth means a perfect form in both gear and pinion. It is only reasonable to assume therefore that the bearing will often come narrower on some gears than on others as perfection in tooth form is not to be expected. In cases where it is impossible to show

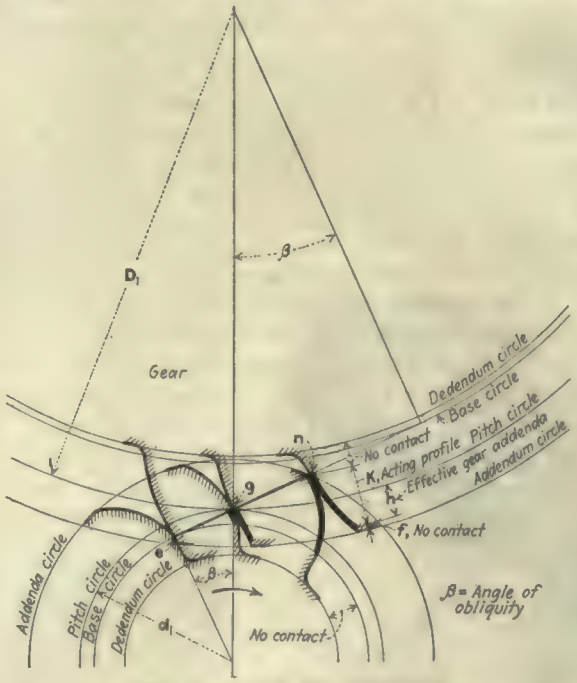


FIG. 8. PATH OF CONTACT

a bearing from the low point (found by a forward pinion movement) to the tops of the teeth, the best plan is to place this bearing in spiral gears so that it will

extend from the tops of the gears to the lowest possible point, that is—let the bearing tend to run high rather than low.

In straight tooth gears let the bearing begin about ⅛ in. from the tops of the teeth and extend down the tooth as far from this as is possible. In other words for both spiral and straight tooth gears, be sure that the main section of bearing falls across the pitch line.

Bevel gears are properly generated upon the principle that whatever backlash is to be allowed in their operation must be provided for in cutting the teeth and that this backlash cannot be altered unless a change

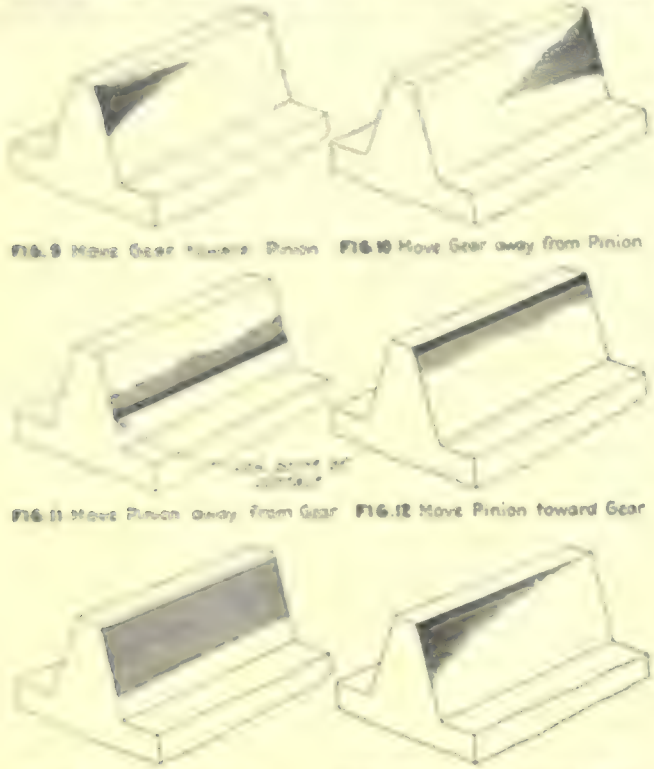


FIG. 9 Move Gear toward Pinion FIG. 10 Move Gear away from Pinion

FIG. 11 Move Pinion away from Gear FIG. 12 Move Pinion toward Gear

FIG. 13 A Correct Bearing FIG. 14 Move Pinion toward Gear, and move Gear toward Pinion

FIGS. 9 TO 14. BEARING ON GEAR TEETH

is made in the angle of shafts upon which they are mounted. Gears cut without backlash cannot be operated at 90 degrees.

A mean allowance of 0.008 in. has been adopted; gear and pinion each being cut 0.004 in. under the calculated tooth thickness. However, owing to necessary working limits, also to changes due to hardening, this allowance cannot be strictly maintained and will vary in the finished product from 0.005 in. to 0.020 inch.

General Procedure

Backlash cut in bevel gears cannot render them noisy if they are assembled to a proper *bearing*. Gears operating with too much backlash are usually noisy—not on account of their excessive backlash, but by reason of their being out of their proper position. Gears cut with 0.100 in. backlash and operating with 0.100 in. backlash will be satisfactory. The gear should be placed according to bearing—not to backlash. Under full load the ideal bearing is the full length of the tooth. On account of a slight distortion common to all automobile axles, gears should be set with this bearing somewhat toward the small end of tooth, the amount depending upon stiffness of axle construction. As previously explained, this condition is obtained mainly by the adjustment of the gear.

Note bearing along gear tooth. If the bearing is heavy on the large ends of teeth (Fig. 9), move gear toward the pinion. If the bearing is too heavy on the small ends of the teeth (Fig. 10), move gear away from pinion. Under the same load as will be applied to the axle in service, the bearing should be even the entire length of the teeth, and if this load is applied, gear should be so adjusted that this contact exists.

If a lighter load is applied in test, the bearing must be heaviest on the small ends of the teeth to allow for spring in the axle or for lift of pinion. This allowance depends upon the relation of the loads applied, and upon the construction of the axle. The position of the gear practically controls the bearing along the teeth. Moving the pinion to or from the gear has the same effect, but to a less extent.

After a proper bearing is secured along the tooth, the next problem is to bring the pinion into a position that will insure the engagement of equal pitches. After this again adjust the gear, if necessary, to restore the proper contact *along* the tooth if the pinion has been moved far enough to alter this. The proper position of the pinion is evidenced by the position of the contact on the profile of the gear tooth as follows: When the engaging pitch of the pinion is greater than the pitch of the gear, the bearing along the gear tooth runs toward the bottom of the gear tooth (Fig. 11). If the gears are operated for any length of time, extreme wear will take place at this point, due to the interference of the tops of the pinion teeth, which will show a heavy bearing (Fig. 5). This condition indicates that the pinion must be moved from the gear until the contact just begins to leave its lowest point. Contact should, under ideal conditions, just reach this low point on the gear tooth, *but should not be concentrated there.*

When the engaged pitch of the pinion is less than the pitch of the gear, the bearing along the tooth runs toward the top of the gear tooth as illustrated by Fig. 12, and is concentrated at the flank of the pinion teeth (Fig. 6), causing interference at this point. To correct this, move pinion toward gear until the contact just reaches the lowest point of contact on gear tooth.

If gears are cut theoretically correct, the contact will extend from near the top of gear tooth to the lowest point of contact (See Fig. 13); that is, to its effective bearing above pitch line. The location of the low points of contact on the gear teeth depends upon the diameter of the pinion, the proportion of the teeth and angle of obliquity, and must be found by experiment for each particular ratio. The contact on gear tooth should begin at this point and should be made to extend up to the tooth as far as possible without drawing it away from its lowest point.

With an undertsanding of the foregoing points, no special explanation is necessary regarding Figs. 2 and 3. For ratios such as shown, the position of the gear practically controls the bearing along the tooth, and the position of the pinion, the bearing on the profile of the tooth. A movement of the gear affects the profile bearing to a less extent, as does a movement of the pinion affect the bearing along the tooth. For miter gears (ratio 1 to 1) the effect of a movement of either is equal in each respect.

It is often possible to properly locate a pair of gears by one movement of either gear or pinion. Suppose, for example, that when the gear is first painted, the bearing shows slightly heavy on large ends of teeth, indicating too much backlash, and the bearing is out

toward the points of the teeth, indicating pinion too far away from gear. (See Fig. 14.) See also Fig. 7, in which case drawing the pinion away from the gear may drop bearing to its proper place and bring it across the full length of its tooth.

By simply moving the pinion toward the gear, the contact is brought farther down the profile of the gear tooth, and at the same time owing to the amount of backlash being reduced somewhat by this movement, the bearing will travel farther down toward the small end of the tooth. However, if this pinion movement has not changed the bearing *along* the tooth a sufficient amount, the gear must be moved toward the pinion.

The Block Test

The usual practice of mounting the axle on a block and adjusting the gears to their quietest position, under load, will not give the satisfactory results. Noise cannot be used as a basis for gear adjustment under these conditions. Aside from this, the operator is working entirely in the dark as regards the relative position of the gears and after testing a few axles, becomes tone deaf.

After assembling, the axle may be mounted on a block or if pressed steel construction is used, the best plan is to mount the carrier in a saddle or any convenient arrangement to run gears under load. The proper load to apply should be at least one-third the maximum power to be applied to the axle when under the car, at a speed corresponding to twenty miles per hour.

After attaining the desired bearing, the pinion may be readjusted to the quietest point at which it will operate *without disturbing the bearing attained.*

Exceptional care is ordinarily taken in the manufacture of the straight tooth gears to avoid cross bearing, so when cross bearing is found to any extent detrimental to their operation, it may be safely assumed that the trouble is due either to the machining or to the distortion of the axle or carrier.

It is difficult and generally impossible to quiet a pair of gears (straight tooth) if the axis of pinion is not on a plane with that of the gear. This is especially so when the bearing is heavy on the large end of the tooth on the drive and on the small end of the back-up or reverse drive. This bearing indicates that the axis of pinion is higher than the axis of the gear. A slight indication in the opposite direction is usually beneficial. For satisfactory results, the pinion axis should not be more than 0.001 in. above or 0.004 in. below the axis of the gear although 0.000 in. above and 0.005 in. below is better practice.

With spiral bevel gears it is impracticable, for the present at least, to furnish gears which will show a full length bearing on each side of the tooth. This is due to the nature of the spiral tooth which changes the position of its bearing, due to conditions of hardening. The nearest approach to a full bearing which can be maintained is a two-third length from opposite ends of the tooth. In this connection, care must be taken not to cramp the action of the gears in an attempt to secure a front end bearing in case this cross bearing is found heavy toward the large end of the tooth on the drive side. *At least 0.004 in. backlash should be obtained.*

On left-hand spiral gears the tendency is for the bearing to be found, when crossed, heavy on the large end of the drive and for right-hand gears heavy on the small end of the drive. The drive side of the tooth should always be favored in adjusting for bearing; the reverse side is usually of relatively small importance. When the gears show an acute cross bearing in either direction, there is little chance of getting them quiet, and continued re-adjustment under the car is usually a mere waste of time. This is one error that cannot be compensated for by any position of the gears.

When we have gears of an even ratio such as 48 to 12, 52 to 13, 56 to 14, 45 to 15, etc., the bearing along the gear teeth will be uneven if the pinion runs out the slightest amount. Under such conditions the bearing will begin, say at the large end of the tooth and track across the face until it is at the small end of the tooth, then back across the face until it is again heavy at the large end. This will occur three times around the gear for a ratio of exactly 3 to 1, four times for a ratio of 4 to 1, etc.

A full even bearing all around the gear cannot be produced commercially *for any even ratio.* Each tooth in the gear engages the same tooth in the pinion at each revoltuion, and any unevenness, particularly in the pinion, will show an uneven bearing. Therefore, when adjusting the gear for any even ratio, an average bearing must be taken for position. Uneven bearing should not be confused with cross bearing.

After hardening, it is not to be supposed that the ring gear can be made to run as true as when soft, therefore some allowance must be made. Provision has been made in cutting the teeth for a reasonable amount of out-of-round, and when making final inspection test of assembled differential and pinion, no particular attention is paid to the running of the gear unless an out-of-round is in evidence. In this event the ring gear should be removed and brought within 0.008 in. on face and diameter. It is evident that gears may be found which run out in excess of these limits without being detrimental to their quiet operation; the arc through which any such runout occurs must be considered.

Bottoming of Teeth

The fact of the teeth bottoming when set together by hand or when gears are operated without backlash is no indication of incorrect cutting. All six-pitch, many five-pitch, and in some cases even four-pitch will show this apparent defect. There is no danger of this bottoming action when gears are properly assembled, that is, with a proper amount of backlash, or more properly expressed—with a full face bearing.

Reducing the thickness of the teeth for backlash allows the pinion to drop deeper into mesh with the gear, which drop in many cases amounts to the total bottom clearance of tooth. In operation, however, the pinion should be held out of this engagement. A properly assembled pair of gears cannot bottom, no matter how thin the teeth may have been cut.

Bevel gears are cut to operate at a shaft angle of 90 deg. The axle should be machined in accordance with this. If the axle is less than 90 deg. the amount of backlash in the gears is necessarily reduced; if greater than 90 deg. the backlash is increased, that is, when maintaining an even bearing along the teeth.

For 14½ deg. teeth, 3.8 min. change in shaft angle affects the backlash 0.001 in. For 20 deg. teeth, 2.7 min. makes the same change. For satisfactory results the proper shaft angle should be maintained within 5 min. plus or minus for the 14½ deg. teeth and within 3 min. for the 20 degrees.

Although the foregoing plan of gear adjustment may

appear extremely simple, it requires a little practice before an operator becomes proficient in its use. For this reason a record of setting made should be kept until operator can definitely foretell the result of a given position for the gear. As each axle is adjusted, make a record of axle number, position of bearing along the teeth on both drive and reverse, profile bearing on each side of teeth and amount of backlash. Opposite these data should be noted the performance of the axle under the car.

In a short time the operator will begin to see what is required to produce quiet axles, and will detect axle distortion if it exists and know how to counteract or to allow for it. The desired bearing for each particular type of axle must be found in this manner.

The Road Test

It is quite possible that the position of pinion will sometimes require a slight adjustment after the axle is under the car, as it is not always possible to locate it with sufficient accuracy according to the bearing. This is generally due to spring in the axle or to looseness in construction, or both. Also, it should be understood that a pinion movement of 0.005 in. in either direction often secures results. This adjustment is usually readily made and should be considered a part of the regular road test. If the axle is noisy after the best position of pinion has been secured, it should never be necessary to move the gear. However, if the gears have been set as directed, and the drive is noisy under car, the best general rule for this is as follows:

If the axle construction is such that the differential bearing supports are weak and have a tendency to spread, move the gear up towards the pinion, reducing the amount of backlash. If the principal weakness is in the third member, or in the pinion sleeve, or is in fact anything which will allow the pinion to lift, change its axial position or whip, move the gear away from the pinion, increasing the amount of backlash, or have the gear cut specially to meet this condition. Adjusting the *gear* under car is poor practice.

To adjust gears under the car, remove oil and clean gears with gasoline. Paint the gear all around with a mixture of red lead and oil and leave off rear cover so that gears are exposed. A short run, say five or six miles without lubricant, will not injure the gears, although bearings should be lubricated. As a preliminary test, the rear end of the car may be jacked up in the garage and show bearing on teeth by applying brakes.

Adjusting gears at random in an endeavor to locate their quiet operating position is poor practice, particularly with spiral gears, as rapid wear in both gears and bearings is very liable to result. *Get the bearings.*

In gears operating with 0.008 in. backlash, a pinion lift of 0.005 in. should not be exceeded, as this barely leaves operating clearance. If the lift of pinion exceeds this amount, the error may be taken care of to a certain extent in the cutting of the gear up to about 0.015 in. If beyond this point, there is little hope of securing quiet gears. For spiral bevel gears it is especially necessary to check for changes in the axial position of pinion, particularly between the drive and the reverse.

Before a new design of axle or carrier is manufactured in quantities, a sample should be assembled and subjected to a static test, in order to locate any weakness which may exist in its construction. The principal parts to be checked are the end movement of differential and of pinion, the lift of pinion and the spread of differential bearings. The latter is of special importance if cup and cone or taper roller bearings are used.

In long third member construction the distortion of drive shaft and torque tube is of importance. The load applied to the pinion shaft should represent the maximum power of motor at 1,000 r.p.m., carrying this power through the lowest transmission gear, usually 3½ to 1. This means calculating the torque load from the full power of motor at 300 r.p.m. of the pinion.

Using 36-in. lever on pinion shaft the proper load may be found as follows:

Weight equals 5.833 × horsepower.

In any other length of lever we have—

$$\text{Weight} = \frac{210}{\text{Length of lever in inches}} \times \text{horsepower}$$

From this may be deducted one-half the weight of lever.

The possible effect of a change in the gear ratio must not be ignored when conducting a static test or in the event of any trouble being experienced with the axle. An axle perfectly satisfactory with a ratio of 3 to 1 will possibly give an enormous amount of trouble if a 4 to 1 gear is applied. The difference between a 3 to 1 and a 3½ to 1 reduction is very noticeable from a noise standpoint. Axles should be designed to meet the requirements of the lowest reduction to be employed, and upon general principles have the least reduction possible.

General Precautions

Never allow gears to be assembled in a cramped position. The gear should revolve freely after all bolts and adjustments are set. Be sure that the thrust end of the differential is seated against the thrust bearings, otherwise the gear may change its position in service. A partial turn of the adjusting nut opposite the thrust bearing is generally advisable, so as to avoid any possibility of cramping the bearing. This, of course, does not apply to cases when conical or radial bearings are employed.

Profile bearing should, if anything, be placed a little high, rather than low, especially for left-hand spiral gears and right-hand pinions, owing to the tendency of the pinion to crowd a little forward on service. When replacing gears for service, examine bearings carefully; worn, chipped or pitted bearings should be replaced. Outer ball races must be a snug fit in the bearing holes, and inner races must be a snug fit on shafts or differential hubs.

Make sure that all parts which go on the inside of housing are thoroughly clean. Any chips, grit or other hard substances grind out the bearings and gears very quickly. A lost nut or lockwasher may necessitate a new set of gears. All studs and nuts to be a good fit in threads so as to hold gears and bearings in place. If these are loose the gears will vibrate.

The plan of adjusting bevel gears herein outlined is not an experiment. It is a proper method, based upon the true nature of tooth contact. Some trouble in its application is to be expected. The operator must become familiar with the causes underlying changes in tooth contact and apply this knowledge to the particular axle under consideration. When mastered, uniform satisfactory results can be guaranteed.

A complete understanding of the principles given in this article will enable the operator to either locate the gears in a satisfactory position or to determine why they cannot be so located.

Machining a Case Hardened Mack Crankshaft

Hard and Long-Wearing Surfaces Secured by Case Hardening—Straightening, Turning and Grinding Operations—Balancing, Final Straightening and Inspection

By FRED H. COLVIN
Editor, American Machinist

THE engineers of the Mack motor found it advisable to use case hardened carbon steel crankshafts in place of special alloys, on account of the extremely hard surface produced on the pins and bearings.

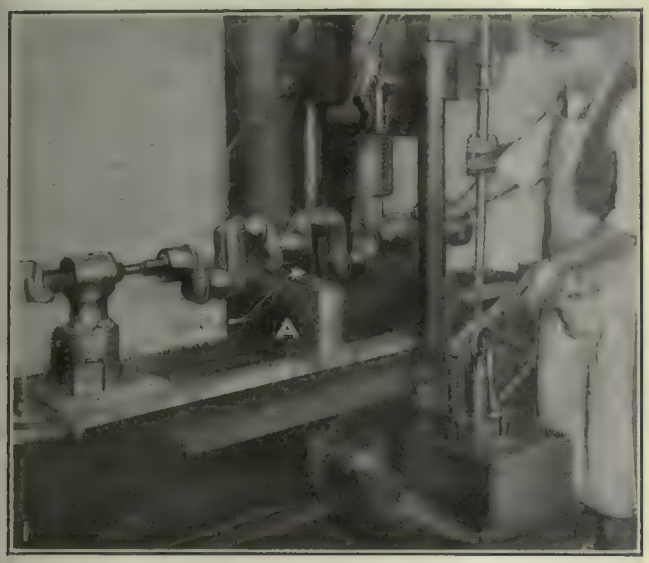


FIG. 1. STRAIGHTENING A CRANKSHAFT FORGING.

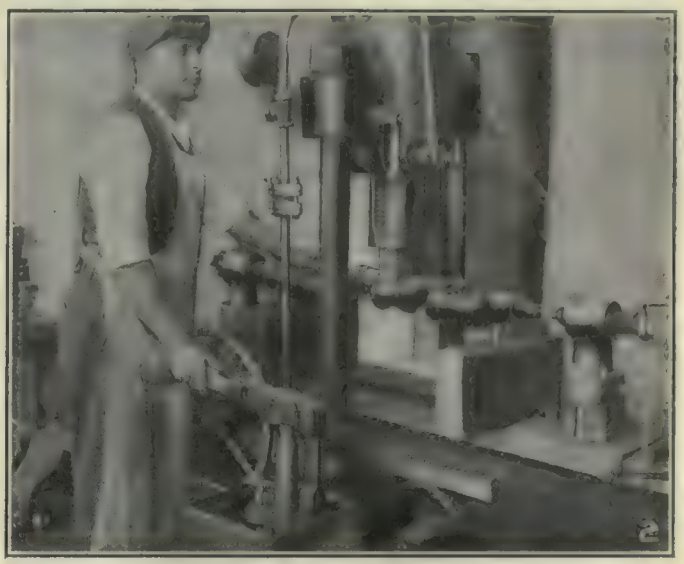


FIG. 2. SPRINGING IT SIDEWAYS



FIG. 3. ROUGH-TURNING THE BEARINGS.



FIG. 4. ROUGH-TURNING THE CRANKPIN

These shafts have given excellent results as the case-hardened surfaces seem to resist wear remarkably well and there has been no trouble from breakage, owing to the size of shaft used. It is interesting to note that at least one of the builders of high-grade passenger cars is adopting this same method with extremely satisfactory results.

The forgings are very carefully inspected, after which both ends are centered and the crankshaft straightened. Ample provisions are made for straightening, as can be seen in Figs. 1 and 2. The crankshaft is revolved on the centers shown but the centers do not, of course, bear the brunt of the straightening pressures. Blocks are provided as at *A*, Fig. 1, and wedges such as *B* are slipped in place between the blocks and the crankshaft, so as to take the stresses due to the application of hydraulic pressure by the pump shown. Fig. 2 shows the shaft being sprung in the center while in Fig. 1 the end web is under pressure.

Then comes the turning of the main bearings and the crankpins, as can be seen in Figs. 3 and 4, both American and LeBlond lathes being used for this purpose. After the bearings have been turned, the crankshaft is carburized and straightened again, should the latter be



FIG. 5. TURNING AND FACING FLANGE.

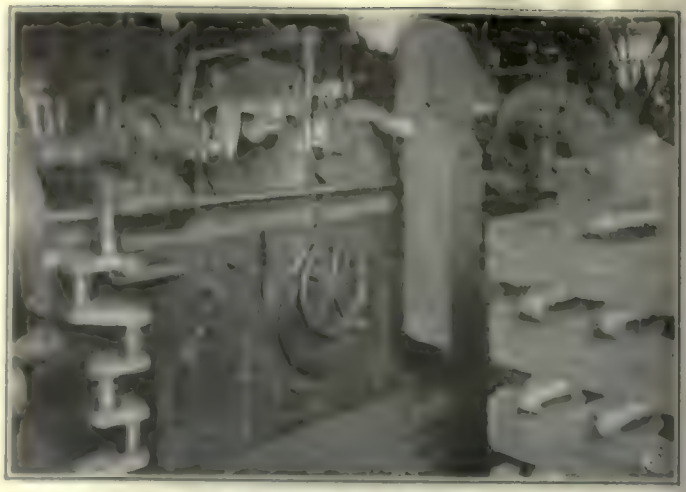


FIG. 6. ROUGH GRINDING THE PINS

found necessary when it comes from the carburizing furnaces. Then the flanges are rough-turned and faced as shown in Fig. 5 and the thread end and gear seat are roughed out as is the ball race. The thread end is



FIG. 7. MEASURING THE PIN DIAMETER

then cut off and recentered and the shaft is ready for hardening.

This means heating to 1,600 deg. F. and quenching. Then comes the inspection for hardness and the annealing of the flange of the thread end. Sand blasting is now in order to remove the scale and the shaft is then straightened very carefully, the tolerance being 0.007 inch.

The flange end which has been previously annealed is now finish-turned as is the gear seat and the end to be threaded, after which the threads are cut. The shaft is then recentered for grinding and the rough-grinding of the main and crankpin bearings now takes place.

In Figs. 6 and 7 are shown two of the grinding operations on different shafts. Different types of grinders are employed, as can be seen. The rack at the right in Fig. 6 shows a convenient way of stacking crankshafts in a compact manner and at the same time, in such a way that they will be perfectly safe against damage to the round surfaces. Stacking is accomplished by the use of wooden frames with notches cut in the proper positions so as to keep the crankshafts from rolling in either direction. As can be seen in Fig. 7, the micrometer is used for measuring the crankshaft diameters.

The crankshafts are then balanced and straightened as shown in Fig. 8, substantial balancing ways and a convenient screw press being used for this purpose. The large grinding stand at the rear enables sufficient metal to be ground off the heavy portion of the shaft to secure the desired balance.

All the finish-grinding of pins and bearings now takes



FIG. 8. BALANCING AND STRAIGHTENING THE SHAFT

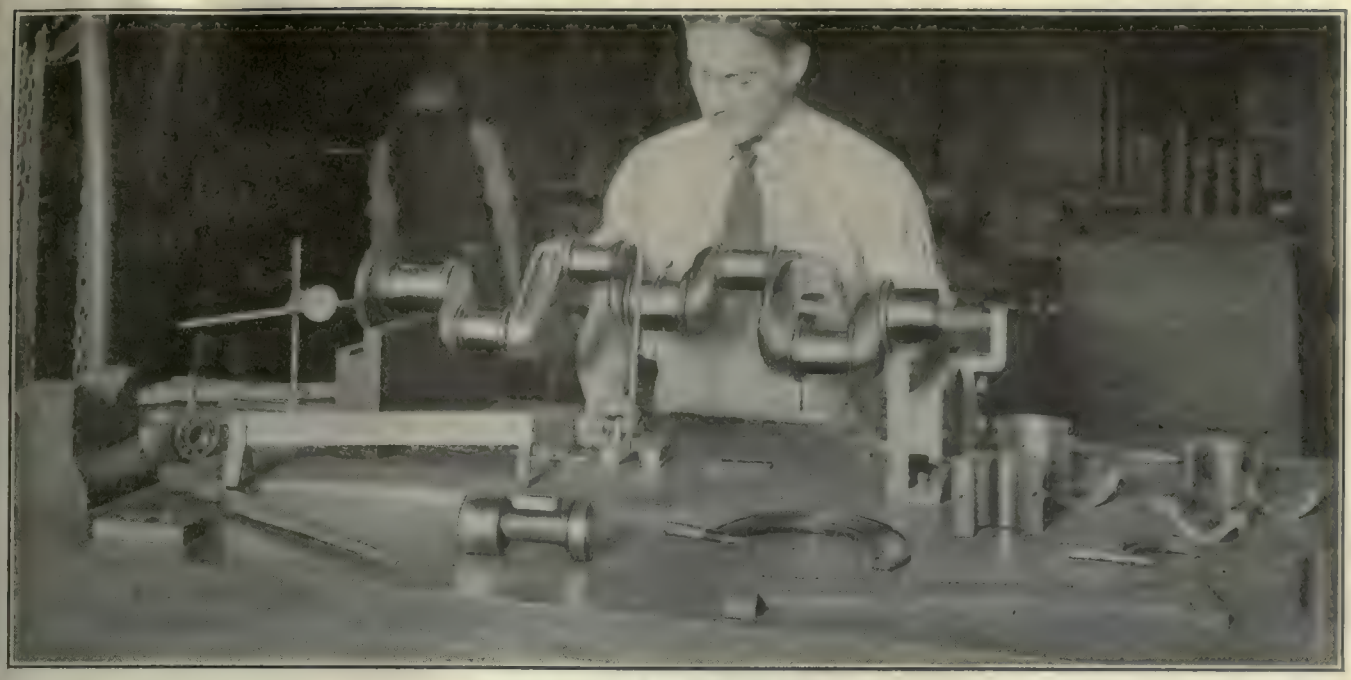


FIG. 9. THE INSPECTION BENCH

place together with the drilling and reaming of the flange holes and the milling of the keyway. The ball race is finish-bored and the sides of the flange are then faced so as to insure a true-running flywheel.

Then comes the final inspection of all machining operations, as shown on the bench in Fig. 9. The inspector is provided with suitable supporting stands and all kinds of testing instruments for inspecting not only diameters, but alignment of the shaft, shoulder distances, length of bearings, and the truth of the flange at the end. Care in crankshaft work has much to do with the successful operation of a motor and every precaution is taken to insure satisfaction at this point.

Selling the Salesman

BY DWIGHT DONALD

An editorial on page 228 of AMERICAN MACHINIST, entitled "For Your Own Good, Listen to the Salesman," demanded a second reading. I agreed with it on the first reading and I was still in accord with it after the re-reading—for it held arguments based on conditions that cannot be denied by any broad-minded business man.

Withal it was a strong plea in the interest of "selling the salesman," who today, during this time of extreme business depression, is needed more than ever by the producer of goods. The manufacturer does need the visiting salesman as a source of information as to where he can purchase equipment capable of turning out a product of high quality at the lowest possible cost. On the other hand, the salesmen in his own organization are indispensable in disposing of the material which he produces.

Nevertheless, the editorial title persists in coming before me in the form, "Salesman, for Your Own Good, Listen." By this transposition I would not seem to recommend that the salesman listen interminably to the general gossip of some purchasing agent or particularly sociable clerk whose time is hanging heavily on his hands. Admitting that sociability necessarily enters in the selling game, the interviewer has an hourly value to his employer and an hour spent in idle gossip is sixty minutes added to the cost of buying and selling.

Of course, the salesman must listen to sideplays and endeavor to learn and remember the hobbies of his prospect, so that he may cultivate as close a friendship as possible, for acquaintance is rated as a high percentage in successful dealing with the buyer. However, as the salesman listens let him decide whether he is talking with one who is in a position to make or recommend purchases, and in any instance to judge when he has reached the peak in his effort to sell. Don't let the interview reach an anticlimax each time, so that the prospect comes to regard the salesman as an unprofitable pest. If the buyer is affected with an unusual degree of sociability (some salesmen will be dubious about the existence of such a species), he invariably enjoys a relation of his own experiences, rather than having to listen to the life history of the salesman or a discourse on how he put over the last big sale.

Today there are many salesmen, be they on straight commission or salary, who appear to have the spirit, "The world is not buying, anyway"—and therefore consider each stop as a place to rest and spin a few yarns, with the excuse that they are doing missionary work.

Oh, by the way, I too have been of that honorable profession of those who travel from town to town and from desk to desk. Now that I am stationed back at the plant, and have occasion to meet many of the boys at my own desk, I am decidedly not the type of "gentleman" (by courtesy only) who tries to get back at the world for some unpleasant experience he may have suffered at the hands of some sixth assistant purchasing agent, recently promoted from office boy.

With this explanation I am sure my remarks will be accepted by our salesmen friends as suggestions rather than harsh criticism.

But, salesmen, keep on dispensing your optimism which we all admire and need; continue to spread the telling story of your product; know when you are through, and don't outwear your welcome—and come again! We need such "ambassadors of commerce."

Selling on Quality

Price Concessions Easier for the Salesman but Dangerous to the Builder—Foreign Competition Stronger Since War—Early Action on Standards Essential

By J. B. DOAN
President, American Tool Works Co

SELLING on a declining market is a hard job no matter what policy is adopted by the seller. Most buyers of machine tools are just as familiar with the business situation as are the sellers, and they are not slow to press their advantage. As a result the seller may be led or forced to price concessions, particularly if his financial condition is weak. Such a course is too often the first step to practical business suicide.

When a purchaser discovers that he can beat down a salesman's price, the salesman's position becomes an unenviable one. A shrewd buyer will go at him with statements or hints of a more or less veiled character, to the effect that his competitor has shaded his price or offered certain extra equipment. The final price in such a situation is largely dependent on the ability of the buyer to play on the credulity of the salesman and his anxiety to make the sale no matter what the cost.

> A SALE MADE on a quality basis at list price is well worth many times the effort expended in making one on a cut-price basis.
>
> The customer is satisfied and will be easier to sell the next time, instead of harder. The salesman has gained confidence from his success in selling on a straightforward business basis and will tackle his next prospect with added vigor. The manufacturer has made a fair profit on the sale and can afford to maintain and improve the high quality expected of his product.

Aside from any consideration of the ethics of price cutting, the salesman's knowledge that his house will permit him to make concessions never fails to extract some of the drive from his efforts to land orders at list price. Under fire both from his competitors and from his customer, it takes a man with considerable backbone to resist the combined pressure and sell his product solely on its merits.

Buying Productive Capacity

On the other hand, if he has no discretion in the matter of price, but must sell at list or lose the sale, the salesman can concentrate on impressing his customer with the fact that he is buying productive capacity which will make profits, rather than so many pounds of manufactured iron and steel. In these times even the best salesman needs every bit of concentration he can muster to convince a prospect on this basis. His chances of success are much reduced if the distracting thought is present in the back of his mind that if he fails to sell on quality and service ability he can fall back on price concessions.

A good many years ago we had a convincing demonstration of the truth of the assertions just made. One of our best salesmen was working the southern territory during a period not unlike the present, and price-cutting was going on everywhere. Our man, whom we may call Williams because that wasn't his name, was not getting results. We knew he was up against a tough proposition but he had been in the same fix before and had made good. His reports were pessimistic, business was rotten and nobody would even listen to sales talk at list prices.

Finally an order came in from a customer to whom Williams had quoted our dealer's price. This was contrary to custom, but not to orders, as Williams was a big enough man to have the privilege of using his own judgment about prices in emergency cases. But this was not an emergency case. His action was decidedly unjustified by conditions, and so fifteen minutes after the order came in this telegram was on its way to Mr. Williams. "Absolutely maintain prices. Judgment removed from you."

The telegram had the desired effect. Without the price concession crutch to lean on Williams pulled himself together, put his old enthusiasm into his work and commenced sending in list price orders again. That one incident was enough for us. It established a sound principle which has been maintained ever since.

While we are talking about maintaining prices I want to bring out one more point—the customer's attitude after he has succeeded in beating down a salesman or a manufacturer. At first he is very well pleased with his own sagacity and business acumen, but before long he can't help wondering whether he really beat the other fellow down as far as he might have. He begins to have doubts as to whether he was actually so very smart after all, and he usually winds up by coming to a hard and fast decision to be sure to reach the bottom the next time he has to buy anything from that company. He knows their weakness and he can be trusted to make the most of it. Having once forced a price concession his confidence is shaken and he will never be quite satisfied in a future deal no matter how favorable the terms he gets.

But there is another side to the picture. Everyone knows that comfortable, soul-satisfying feeling which comes with the possession of anything of first quality. It makes no difference what it is, an automobile, a fine house, a good coat, a high-grade machine tool, the feeling is there just the same. Even though part of the feeling may be due to the complacency of owning a better article than the other fellow, there is at the same time the solid conviction that quality goods are cheapest in the long run and produce the best results.

Another phase of the same psychological phenomenon is the almost universal desire to improve one's condition of living, keenest perhaps in Americans. Take your own experience with motor cars or perhaps your neighbor's. The chances are that you begin with

a second-hand car or the cheapest one now available. It is ten to one that when you reached the point of getting another one you selected as much more expensive and inferentially better a make as your pocketbook would stand. If you stuck to the same make the odds are just as good that the manufacturer had improved his product sufficiently in the time between your two purchases so that the same effect was attained.

The desire for something better is a moving factor in American ambition and success and can well be played upon by the wise salesman. If he has the right stuff in him he can hammer away at this side of the customer's stronghold and while it may not be so vulnerable as the price side it can be scaled.

A sale made on a quality basis at list price is well worth many times the effort expended in making one on a cut-price basis.

The customer is satisfied and will be easier to sell the next time, instead of harder. The salesman has gained confidence from his success in selling on a straightforward business basis and will tackle his next prospect with added vigor. The manufacturer has made a fair profit on the sale and can afford to maintain and improve the high quality expected of his product.

It should be obvious that selling on quality is utterly impossible unless the quality actually exists. The builder must make certain that his machine is at least as good as any other of the same type on the market, and better than the great majority of others. He must keep constantly at work to improve the quality and it is well to keep the field informed of improvements as they are made. His salesmen must know that the quality is there, and where and why and how, and must be so proud of it that their enthusiasm is contagious.

As I stated above, quality can only be maintained if a fair price is secured for the product. The two are mutually dependent and it is a hopeless job to try to build quality tools if they are to be sold at a loss. It simply can't be done very long. Either the quality suffers or the builder goes broke.

We feel that not only must the shop be manned by the very best machinists but the equipment must be thoroughly up-to-date. In our own plant we have taken advantage of dull times to go over every machine and either repair or replace it. In our radial drilling department, for instance, we sold the twenty-four machines of different sizes that had been there for several years and replaced them with seventeen new ones from stock. The new machines take up much less room and consequently cut down the departmental overhead, but in addition they are so much more efficient that the seventeen will turn out more work than twenty-four did before.

While we are talking about shops and equipment it might be well to say that this country no longer has the monopoly of methods and tools that it had before the war. Then we could build a quality tool here as cheaply as an ordinary one could be built in Europe. We understood production methods and interchangeable manufacture; they did not. But the war has changed all that. The British and French inspectors learned a lot in our munition plants and they are turning their knowledge to account. Then, too, there are many plants, both in England and on the continent, which are thoroughly equipped with the most modern machinery. We certainly sold a lot of it abroad during the war and our Army left a whole lot more behind them. It will take all of our famous ingenuity to keep ahead and even then we will be hard pressed if we don't get started on standardization of minor parts.

There is no reason on earth why every manufacturer of machine tools should insist on having his own pet systems of standards for such things as T-slots, spindle noses, handwheels, ball cranks, etc. The differences are so small as to be insignificant, but they add tremendously to production costs.

There is keen interest in these matters abroad. England, France, Germany, Holland, Belgium and others are studying standardization, and Germany and Holland have already issued accepted standards for certain parts. We can't afford to let them beat us at this game. If they do we shall soon have to face cheaper imported tools in our own markets than are coming in now.

Suggestion for Herringbone Gear Standards

By N. Leerberg

The action of the American Gear Manufacturers' Association in standardizing herringbone gears is a very commendable move. But standardization should in all cases take simplicity into consideration, especially when such standardization is based on arbitrary or empirical data. The table of "Enlargements for Pinions with 17 Teeth or Less," published on page 330 of American Machinist, is such a case. This table is calculated from the well known interference formula for 20 deg. standard addendum teeth:

$$x = \frac{1 - 0.05849\,N}{P}, \text{ or}$$

$$\text{Enlargement} = \frac{2(1 - 0.05849\,N)}{P}.$$

The herringbone gear has a stub tooth, however, and does not need this amount of enlargement to avoid interference. The object of the enlargement is mainly to give a free cutting action to the hob. There is, therefore, no need of the rather complex dimensions given in the table. The writer has, consequently, rearranged the table as given above, and strongly recommends its consideration.

In this table the last column is changed to multiples of 0.120. The dimensions in the remaining columns are in inverse ratio to the diametral pitch. It will be noticed that the values in each vertical column are multiples of 0.012, 0.015, 0.020, 0.024, 0.030, 0.034, 0.040, 0.048, 0.060, 0.068, 0.080, 0.096 and 0.120 respectively. All dimensions are even so that the addendum may be dimensioned without running into four decimal places. The table agrees closely with the original table and is more commendable for practical use.

ENLARGEMENTS FOR PINIONS WITH 17 TEETH AND LESS

No. of Teeth	Diametral Pitch												
	10	8	6	5	4	3.5	3	2.5	2	1.75	1.5	1.25	1
7	0.120	0.150	0.200	0.240	0.300	0.340	0.400	0.480	0.600	0.680	0.800	0.960	1.200
8	0.108	0.136	0.180	0.216	0.270	0.306	0.360	0.432	0.540	0.612	0.720	0.864	1.080
9	0.096	0.120	0.160	0.192	0.240	0.272	0.320	0.384	0.480	0.544	0.640	0.768	0.960
10	0.084	0.104	0.140	0.168	0.210	0.238	0.280	0.336	0.420	0.476	0.560	0.672	0.840
11	0.072	0.090	0.120	0.144	0.180	0.204	0.240	0.288	0.360	0.408	0.480	0.576	0.720
12	0.060	0.076	0.100	0.120	0.150	0.170	0.200	0.240	0.300	0.340	0.400	0.480	0.600
13	0.048	0.060	0.080	0.096	0.120	0.136	0.160	0.192	0.240	0.272	0.320	0.384	0.480
14	0.036	0.046	0.060	0.072	0.090	0.102	0.120	0.144	0.180	0.204	0.240	0.288	0.360
15	0.024	0.030	0.040	0.048	0.060	0.070	0.080	0.096	0.120	0.136	0.160	0.192	0.240
16	0.012	0.016	0.020	0.024	0.030	0.034	0.040	0.048	0.060	0.068	0.080	0.096	0.120
17	0.002	0.002	0.002	0.002	0.002	0.004	0.004	0.004	0.006	0.006	0.008	0.010	0.012

Calite—A New Heat-Resisting Alloy

By G. R. Brophy

Metallurgical Engineer, Industrial Furnace Department, General Electric Company

A freshly cut surface of aluminum, like all metals, will show a bright lustrous surface, but after a very short time in the atmosphere becomes dull. On longer exposure little change takes place in this strongly adherent coating. This is recognized as a protective coating of oxide. Aluminum when alloyed in solid solution with other metals, still retains this property of oxidizing readily and lends it to the alloy.

Advantage was taken of this property a few years ago when calorizing was developed. This process consists of coating metals with aluminum at high temperature, actually forming a surface alloy which is highly resistant to oxidation at high temperature, and to many forms of corrosion. Calorizing is not suited for work above 1,832 deg. F., due to the rapid diffusion of aluminum and the consequent lowering of the surface aluminum content to the point where breakdown under oxidation occurs.

Properties of Iron and Aluminum Alloy

A homogeneous alloy made by melting aluminum with iron naturally will show no such diffusion on subsequent heating, and provided the aluminum content is sufficiently high, the alloy will resist oxidation at temperatures nearly up to its melting point. Unfortunately, on repeated heating and rapid cooling, or uneven heating, these alloys crack badly and no homeopathic doses of any third metal tried—and nearly all were tried—helped this condition. The hot metal when the least moisture touched it acted like hot glass, flying to pieces.

The low expansion of high nickel steels, together with the fact that aluminum and nickel form a high melting compound, led to investigating the promising ternary alloys of aluminum, nickel and iron. Therefore, keeping aluminum at a minimum and substituting nickel for iron in various percentages, a series of alloys was obtained which showed increasingly good properties. However, when nickel reached 15 per cent the alloy was soft and lost nearly all its resistance to oxidation. This was probably due to the formation of the high melting compound corresponding to the formula $NiAl_3$ which, while highly resistant to oxidation itself, robbed the iron of its protection and allowed the iron to scale badly. Further additions of aluminum and nickel in proportions other than that of the above compound, finally gave an alloy which was strong, would stand shock, hot or cold; could be quenched repeatedly; and was highly resistant to oxidation. A few further refinements gave the alloy which was finally adapted and which we call calite.

Manganese and silicon above 0.75 per cent both tend to decrease resistance to oxidation, but with care in melting no trouble is experienced. Carbon increases brittleness and should be kept as low as possible and easily runs under 0.05 per cent. On account of the ease with which SiO_2 slags with aluminum, the melting must be done in a basic furnace. Also the ladle must have a basic lining.

Basic Heroult-type furnaces are used with good success. Steel scrap is first melted down and decarburized; slag is removed and nickel is added and new slag made. When all is thoroughly deoxidized, the final slag is removed and scrap calite added to the extent of 25 per cent of the melt and dissolved. The melt is then poured into a preheated ladle containing the required amount of molten aluminum. As this alloying takes place, an exothermic reaction occurs of sufficient intensity to dissolve additional scrap, and up to the present scrap amounting to 15 per cent of the melt has been dissolved with sufficient residual heat to necessitate holding in the ladle several minutes. The ladle is bottom poured so that the time of holding allows all oxide to float and nothing but clean metal to be poured.

Calite resists oxidation up to 1,300 deg. C. (2,372 deg. F.), but 1,200 deg. C. (2,200 deg. F.) is recommended for indefinite service. The protective oxide formed is tight and does not snap off even on quenching from high temperatures. Quenching after 100 hr. at 1,200 deg. C., calite lost but 0.03 g. per square centimeter exposed, while the best heat-resisting base metal alloy other than calite lost 0.56 g. under the same conditions. The same samples were run at 1,300 deg. C. for an additional 25 hr. Calite lost 0.003 g., the other 0.09 g. per square centimeter exposed. From these figures it appears that calite is twenty times as resistant at 1,200 deg. C. and the only base metal alloy to stand at temperatures higher. At 900 deg. C., or ordinary operating temperatures, the loss per square centimeter was measured in $\frac{1}{10}$ mg., or for all practical purposes, no loss.

Calite is practically noncorrosive. Samples have been polished and run in a spray of saturated sea salt solution at 100 deg. F. for 200 hr., and at the end of this time still retained the perfect polish.

Twenty-five per cent sulphuric acid dissolves calite rapidly; hydrochloric acid slowly and nitric hardly at all. Forty-eight hours in 25 per cent nitric acid, the metal lost 0.0004 g. per square centimeter exposed. Acetic acid has no effect. Molten carbonates, chlorides, nitrates, cyanides, Pb, Zn, Sn, type metal, sulphur and sulphur vapor do not attack calite. SO_2 gas at 900 deg. C. has no attack. Fluxes such as cryolite, borates and silicates attack calite rapidly.

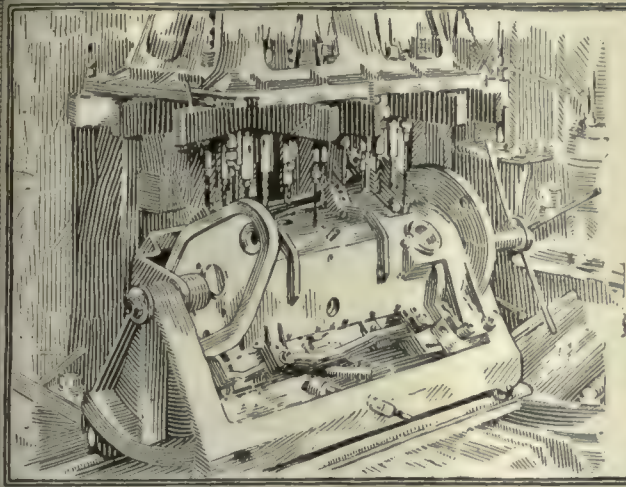
Physical Properties of Calite

In general, the physical properties are as follows:

Melting point, deg. F.	2,777
Softening temperature, deg. F.	2,500
Working temperature, deg. F.	2,200 to 2,370
Specific gravity	7.03
Weight per cubic inch, pounds	0.25
Brinell hardness, annealed	286
Scleroscope hardness, annealed.	40
Thermal conductivity, per cent of iron	25
Transverse stress, 1-in. square bar, pounds per square inch	4,250
Tensile stress, pounds per square inch	36,800

Calite cannot be machined in the cast condition, nor cut with oxyacetylene. Any change of dimension or finish must be done by grinding. It is more resistant to oxidation at high temperatures and will stand higher temperatures than any base-metal alloy tested. Its first cost is low and its operating cost lower than other non-oxidizing alloys. Boxes have been run for 1,500 heat-hours and remained in the best condition and measurements showed no warpage or growth. The oxide coating was no heavier than after the first heat.

Abstract of paper read before American Society for Steel Treating.



Tool Engineering

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Taper Turning Tools Continued — Engine Lathe and Turret Lathe Tooling—Cross-Slide and Turret Taper Tools—Plain and Adjustable Attachments

A SPECIAL taper attachment, useful when a number of different tapers are to be turned, is shown in Fig. 361. This tool is not of the adjustable type, but the taper bar is readily removable so that it can be replaced by another of a different taper. The body of the tool *A* is in the form of a bracket which is attached to the face of the turret. On this bracket a dove-tailed slide *B* provided with a taper gib is mounted. The upper part of the bracket is also dove-tailed and a taper bar *C* is fitted to it. An adjustable gib *D* is provided for this dove-tailed member also.

The angle of the taper is determined by the angularity of the slot *E* which is cut in the taper bar. The back of the slide *B* has a roller in it at *F*, traveling in the slot *E* and thus controlling the angle of the taper. In some convenient place on the headstock of the machine a bracket *G* is fastened, with an adjustable stop *H* projecting from it a distance sufficient to strike the end of the taper bar as shown. The tool *K* is carried in the block *L* mounted on the vertical sliding member *B*. In operation, the turret is brought forward until the bar *C* strikes the end of the stop *H*, at which time the feed is engaged and the tool moves ahead controlled as to its angle by the position of the roller in the slot *E*.

There are some points in this design which can doubtless be improved; for example, the projection of the tool *K* is excessive and the cutting action would be likely to cause it to dig in and chatter. It would be possible to build the entire mechanism in such a way that the tool would not overhang so much, so that there would be less danger of vibration. For light cutting, however, when a number of different angles are to be machined, a tool of this kind would produce good work.

The principle here shown can be applied to other varieties of taper turning tools. It would be possible, also, to make a similar arrangement for boring, although the toolholder and slide might be somewhat changed from the form shown. Another improvement on the same tool would be fitting the toolblock *L* in such a way that it could be adjusted up and down to take different positions on the slide, thus increasing the capacity of the attachment.

When work is long and slender it is difficult to turn it without support; hence a taper turning tool designed for a purpose of this sort should provide the necessary rest for the work. In the work shown at *A* in Fig. 362 a taper is to be cut on the end *B*, as shown by the dotted lines. On account of the length of the bar and the lack of center support, the tool itself must be so arranged that the work cannot vibrate during the cutting action. The body of the tool *C* consists of a bracket fastened to the turret face as shown. At the forward end of this bracket an angular block *D* is located, in order to carry the supporting bushing *E* in which the work is piloted.

The tool *F* is mounted in a block *G* which is fastened to a dove-tailed slide *H*. On the under side of this slide the stud *L* is fixed; and the spring *K* thrusts against this stud and causes the roller *M* to remain in contact with the taper blade *N* along which it travels. The roller is supported in a holder *O* fastened to the top of the slide. The illustration at *P* shows this construction clearly. The taper blade *N* is fastened to a substantial bracket *Q* at the rear of the cross-slide. The latter is firmly clamped in position longitudinally while the work is being done. It would be possible to attach one or more tools to the front of the cross-slide and use them for other operations on the work if necessary. In the present case, however, these tools are not needed as the cross-slide is not in use.

An additional refinement which would probably improve this design somewhat would be to make the bracket *Q* shorter, and provide the cross-slide with a hardened block over which the bracket *C* can slide, thus giving additional support. Changes would need to be made in the design of the bracket in order to provide for a condition such as this. Vibration is eliminated by the support which the work receives in the bushing. For shallow taper work an attachment of this sort is very useful, and if provided with suitable adjustments a number of tapers could be easily turned, and different diameters of work could be supported

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by using different sizes of bushings. An oil cup *R* is used to lubricate the bushings.

Many engine lathes are provided with a taper attachment placed at the rear of the machine and usually adjustable within a limited range. All engine lathes, however, are not provided with an attachment of this kind, although it may be desirable to use one of the machines occasionally for taper work. A simple attachment which can be used for this purpose is shown in Fig. 363.

The work *A* is held in a collet in the usual manner. The regular cross-slide of the lathe is removed and replaced by a special slide *B*. This slide is fitted to the dovetail on the carriage and a block *C* is so fastened that it supports a heavy coil spring *D*. The tool *E* is held at one end of the slide *B* in the proper position with respect to the center of the work. The tapered bar *F* is fastened to the headstock of the lathe, and is machined at *G* to an angle corresponding to the taper required. A block *H* is fastened to the carriage to act as a support for the taper bar and to prevent

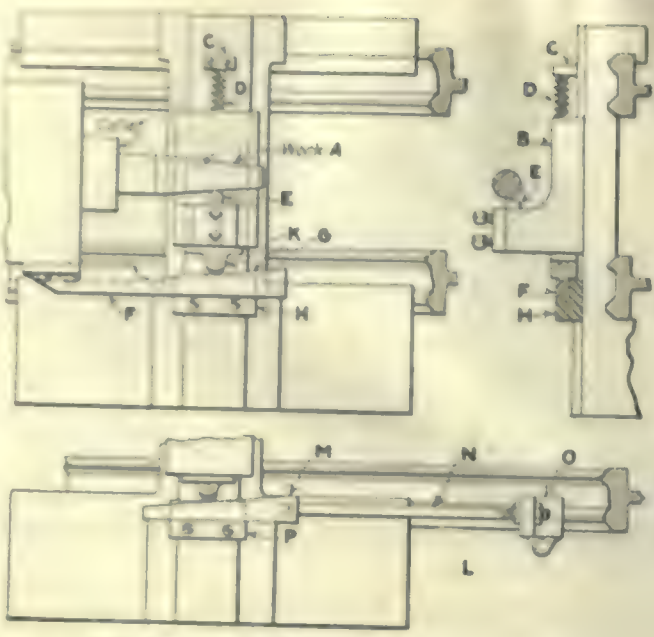


FIG. 363. SIMPLE TAPER ATTACHMENT FOR ENGINE LATHE

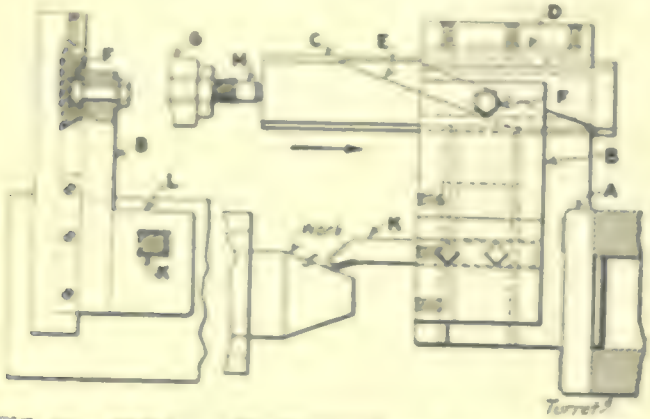


FIG. 361. SPECIAL ATTACHMENT FOR TURNING TAPERS

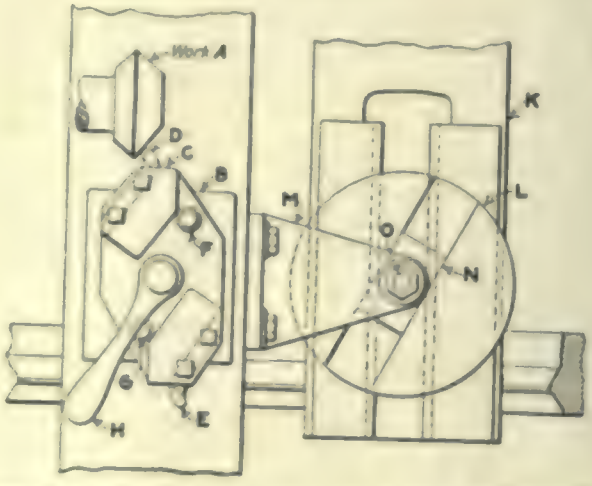
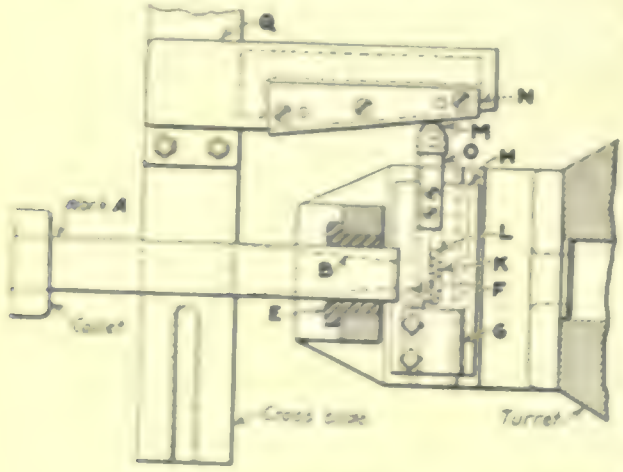


FIG. 364. TAPER TURNING WITH THE CROSS-SLIDE



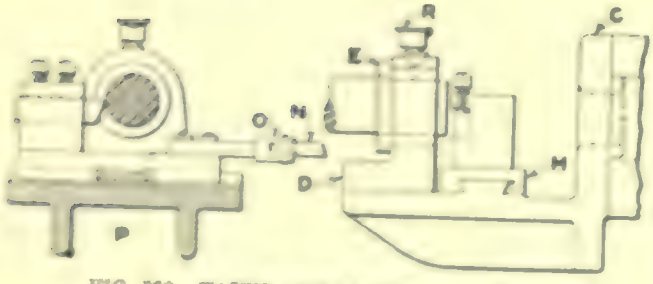


FIG. 362. TAPER GENERATING TOOL WITH [illegible] FOR WORK

it from being distorted by the pressure of the roll *K*, which is fastened to the slide.

In order to produce the taper it is only necessary to engage the longitudinal carriage feed, after which the roll travels along the taper bar and thus generates the taper. If for any reason it is inconvenient to attach the taper bar to the headstock of the machine, it may be applied as shown at *L*. The bar *M* is here attached to a rod *N* carried by the bracket *O*, which is fastened to the ways of the machine. The taper bar in this case is supported by a block *P* arranged in the same manner as that previously mentioned.

Taper work can be done by using the compound rest swung to the proper angle on an engine lathe, but when this is done it is necessary to feed the tool by hand. A turret lathe has no compound rest, and yet it is often desirable to use the cross-slide for turning a taper. The attachment shown in Fig. 364 can be used on either an engine lathe or turret lathe; the details of its application are slightly different in each case, but the principle remains the same. The work shown at *A* is to be beveled to an angle of 30 deg. and other work is to be done on it in the same operation. It is therefore desir-

able to do the work with the cross-slide and thus leave the turret free for other tooling.

A special block *B* is mounted on the cross-slide of the machine, and to it is fitted an indexing toolholder *C* somewhat similar in general construction to that described in a previous article. The tool *D* is used for roughing the angle, while that at *E* does the finishing. These tools are of the ordinary forged variety, so that they can be easily reground or replaced when worn. This turret toolpost indexes into only two positions, and these locations are controlled by a plunger in the bushings shown at *F* and *G*. A binder handle *H* locks the toolpost in either position.

The bracket *K* is fastened across the ways of the machine, and on this bracket is mounted a swivel plate *L* which is so arranged that it can be adjusted in a transverse direction. The angle can be changed by simply turning the disk around to the required position. Graduations for various angles can be conveniently placed on the base of the swivel, in order to make the setting easier. The cross-slide is provided with a bracket *M*, at the end of which is a block *N* pivoted on a stud at *O*. This block travels back and forth in the slot in the plate, thus controlling the angle of the taper. It is evident that the cross-slide must be left free longitudinally, so that it can adjust itself to allow the tool to follow the angle of the taper. After the cross-slide feed is engaged, the action of the device is automatic.

If a number of pieces of work are to be machined to various tapers and if the pieces are similar in their general shape, it is quite possible to design a taper-turning attachment with removable taper bars so that all of the work can be handled with the same attachment. When a designer is called upon to develop something along these lines, it is necessary first to determine the largest and smallest diameters which are to be machined. With this as a starting point, the range or capacity of the tool is predetermined; and it is only necessary to make sure that the methods of holding are uniform, in order that the method of machining will be similar in each case.

An excellent example of a progressive design of taper-turning attachment suitable for turret lathes is shown in Fig. 365. This attachment was designed particularly for handling a number of sizes of beveled pinions similar to the one shown at *A*. These pinions were of different diameters and tapers, and it was necessary to make the attachment in such a way that the angular surfaces would be generated accurately and without the necessity for making adjustments to take care of the different angles. The only way in which this could be done with certainty was to use separate taper bars for each angle, thus avoiding any chance of error which might otherwise be caused by a faulty setting.

The tools were designed for both roughing and finishing operations, two attachments being used on opposite sides of the turret. Only one of these attachments is shown in the illustration. The work *A* is held on a special expanding arbor *B* in the nosepiece *C* screwed to the end of the spindle. The body of the tool D is fastened to the turret face. Another tool body of exactly the same shape is on the opposite face of the turret; and a tie member *E* extends entirely across the turret and holds the tool bodies together, thus making a very rigid construction.

The slide *F* is held in place on the body by two flat straps *G* and *H*, and a taper gib *K* is provided on the side opposite to that taking the thrust of the cut, as shown at *K*. A separate toolblock *L* is fastened to the

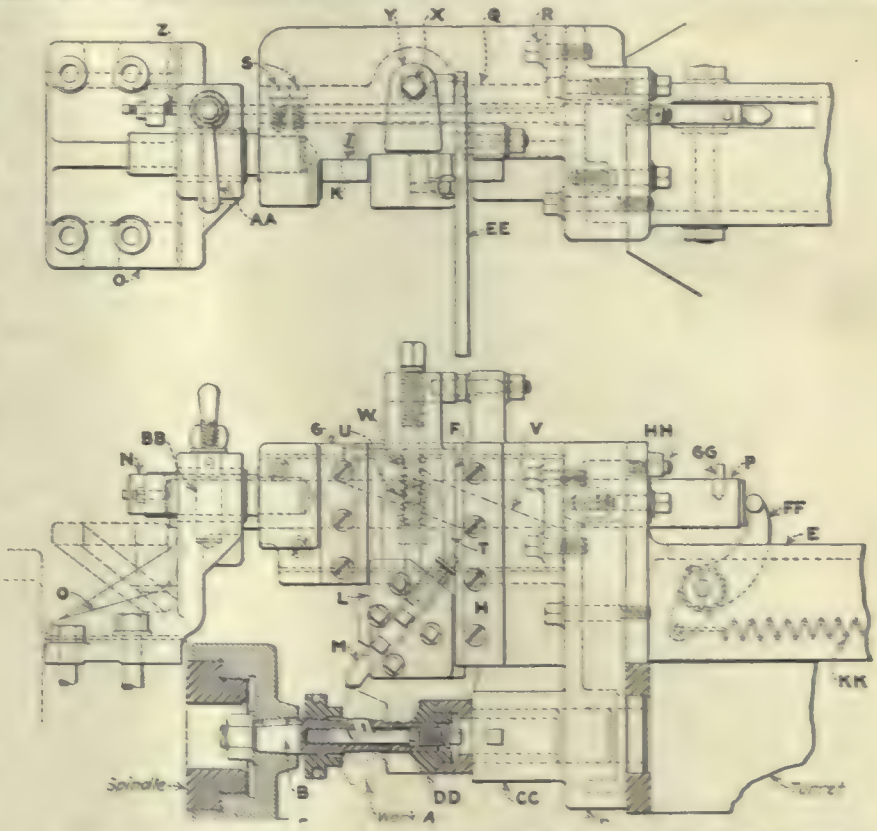


FIG. 365. SPECIAL TAPER-TURNING ATTACHMENT FOR TURRET LATHE

slide by means of suitable screws. This toolblock carries a turning tool *M* which generates the taper. The forward end of the tool body is fitted with a pilot *N* which enters a bushing in the bracket *O* on the headstock of the machine. This construction tends to stabilize the whole attachment when in operation. It also assists in obtaining accurate work, as it preserves the alignment so that there is no chance for variation.

Removable Taper Bar

The taper bar *P* lies in a slot machined at the back of the body of the tool. For convenience in machining the body is entirely open, but ribs on the top and bottom extend out and give greater rigidity. A reinforcing member *Q* is fitted between the ribs mentioned and bolted to the body of the tool at *R* and *S*, thus tying the units together and making them still stronger. There is a cored opening *T* at the rear of the slide; and the swivel block *U* projects through this opening, thus entering and being guided by the angular slot *V* in the taper bar. This construction is shown by the dotted lines. A heavy coil spring *W* is used to keep the block in contact with the slot in the taper bar. Adjustment for pressure is obtained by moving the

special screw *X* up or down as may be required. This screw is threaded into the overhanging lug *Y* on the slide.

The bracket *O* is slotted at one side to hold the taper bar. An end stop *Z* makes it possible to obtain fine adjustments for the bar, so that the angular portion will be in the right relation to the slide. The binder handle *AA* is threaded to the top of a cylindrical plug *BB* through a slot in which the taper bar passes. The various members of this attachment are cored out wherever possible in order to reduce the weight, but there is no sacrifice in rigidity.

Method of Operation

In operation the turret is brought forward until the pilot on the attachment enters the bushing in the spindle cap bracket *O*. It is carried forward sufficiently so that the end of the taper bar strikes the stop at *Z*, after which the binder handle *AA* is tightened. The feed is then thrown into engagement, and the tool moves forward while the taper bar remains still. The slide is controlled by the swivel block *U* which rides in the taper slot *V*, thus causing the tool *M* to generate the taper on the work. The hub *CC* on the body of the tool contains an angular face mill *DD* which is used to remove the stock from the cupped surface at the end of the gear blank.

After the taper has been generated, the binder handle is loosened and the entire mechanism drawn back away from the work. When this has been done the operator pulls down on the handle *EE*, thus relieving the pressure on the spring which controls the slide. This allows the kicker *FF* to act against the end of the taper bar, moving it forward until it is restrained by the pin *GG* coming in contact with the spring bumper *HH*. The coil spring *KK* exerts the pressure on the kicker. The turret can now be indexed and other tools brought into use on the work. The final cut is made by another taper turning tool exactly like this one.

The possibilities of this tool cover a wide range. The device was so designed that the toolblock *L* could be removed and a boring toolholder substituted for it, so that tapers could not only be turned but could also be bored to any size within the range of the attachment. Taper bars of various angles can be easily substituted to handle different pieces of work. The accuracy obtained on taper work with a device of this sort is fully equal to that which can be obtained on an engine lathe with a taper attachment. Attention is called, however, to the provisions made for adjustment and for handling various diameters of work. Naturally, as tools of this sort are somewhat expensive, it would not be economical to make anything of the kind unless the production were great enough to warrant the expenditure.

Nickel Plating Gas Engine Pistons

By Chester Lynndelle

The article by David Tyke, on page 287 of American Machinist, entitled "Nickel Plating Engine Pistons," is the first word the writer has ever seen in print on this subject.

Some five years ago a somewhat similar experiment was tried by the writer on the pistons of a twin-cylinder car of ancient vintage. Being of the horizontal-opposed type, it seemed that the pistons and rings wore more rapidly than those in a vertical-cylinder engine, as pistons were replaced at intervals of five to six thousand miles. Finally the cylinders wore so large that stock replacement pistons were unobtainable, when through the suggestion of a plater friend a coat of nickel was applied much as Mr. Tyke describes—except that there were some half dozen trials made before the nickel could be persuaded to "stick" properly.

After buffing the pistons to smooth out the irregularities of plating, the engine was reassembled and the nickel-plated pistons given a try-out. For about a month they gave fine service, and then, when the crankcase oil had become slightly diluted with kerosene, they cut out in just a few miles' running, knocking vigorously and setting up a series of groans that could be heard for blocks.

The Effect of Kerosene

Upon examination it proved that the kerosene had loosened up the glaze in the cylinder wall, and that the pistons had literally had strips of the nickel peeled off; fine, tightly coiled shavings, as though turned off with a diamond point, were found in the crankcase and in the combustion chamber.

After much tinkering and theorizing it was decided that the expansion of the copper facing used to bind the nickel to the iron was so much greater than the iron beneath that it had "crawled" sufficiently to start the trouble, and that the diluted lubricant had merely aided in the stripping process.

A further trial was made with a Schoop metal spraying gun, after the piston had been thoroughly cleaned of the old copper and nickel coat and roughened in a lathe. With the gun a coating of nickel was built up as a basis, after which electroplating was carried on as before.

The pistons enlarged by this method were still in service when the car was finally scrapped after some ten thousand miles of service as a delivery truck. To restore the cylinder wall gloss, graphite was fed in at intervals through a "gas-saver" opening in the intake manifold, and this in all probability was largely responsible for the excellent service secured.



Shall We Standardize Tapers?

THIS is a continuation of a general discussion on the merits of various tapers with a view to crystallizing sentiment in favor of one particular type. The first part of the article, published April 13, gave the opinion of some thirteen manufacturers. Other opinions on the subject are as follows:

No. 14. Years ago—how many, I am afraid to say—a contributor to AMERICAN MACHINIST wrote under the name of "Jarno," and among the good things offered by him was the Jarno taper. It always seemed to me to be the most consistent system in the way of tapers for a standard that has ever been proposed. I cannot help but think that if the mechanical world at that time had recognized the value of standardization as it does today, the Jarno taper would now be the standard, and in universal use. If a good mechanic, foreign born and educated to the best standardization ideals, were to suddenly find himself transplanted to the United States, he would certainly be amazed at our adherence to odd ideas concerning so-called standards that never were right. He would wonder at our sentiment, selfishness, and general shortsightedness in not moving straight ahead toward an economy always followed by proper standardization.

In my experience, I have found that anything for which any of the commonly used tapers is satisfactory would be equally satisfactory if the Jarno taper had been substituted. Standardizing tapers would, however, be a much more difficult problem today than at the time the Jarno taper was proposed, although the same or more proportionate advantages would be obtained. The cost to manufacturers would be many times greater at the present time if we consider the increase in tapers in use.

If the Jarno taper were considered at the present time as the standard, there would be more opposition from the general public because it is little known, and this would require replacing the two well-known tapers, Brown & Sharpe and Morse.

Twenty-five years ago, there were many more tapers in use than at present, and the need for standardization was more apparent. Today the Brown & Sharpe and Morse tapers greatly predominate, so that the choice of a standard in the part of the mechanical world with which I come in contact would be from among the three mentioned.

The records of our factory show that we have 721 machines with the Morse taper, 327 machines with the Brown & Sharpe, and 23 with the Jarno. A great many of these are ordered with Morse tapers regardless of the makers standard. We have a great many so-called adapters which transform one system to the other, and we can thoroughly appreciate the economy and convenience of one standard. We could standardize on the Morse taper at a less cost than any of the others, and it would suit our particular business better, if, of course, the drill shanks remained as they are. If, however, the shanks of drills conformed to a new standard, this feature could be neglected.

The cost of standardizing on Brown & Sharpe would be greater than for the Morse, merely because of the number of machines. If the Jarno were to be standardized, the cost would probably be more than for the other two on account of the greater number to change. This change, in some of our machines, would not be very serious, because the Jarno taper is so near the Morse, and in many cases the diameter at the point is not so essential for the interchange of fixtures as the diameter of the hole at the nose of the spindles and the taper.

If the majority of the manufacturing public of the United States should vote to adopt the Jarno taper as standard as fast as possible and use their influence wherever possible to get it into use, I believe that the cost of the change would be offset in a few years, and we would wonder why we ever questioned the advisability of it.

TWO FAVOR MORSE, ONE JARNO

No. 15. We are advocates of the Morse taper, basing our opinion entirely on the production machines in our plant. We believe that this is the most common taper in use and see no reason why it should not be adopted as the standard.

No. 16. As the Morse taper is more generally used and almost exclusively adopted for all sizes and styles of drill presses, lathes, and turret lathes, we advocate this taper.

No. 17. We have adopted the Morse taper and are equipping all of our machines with it unless otherwise specified. We have been requested to furnish machines with Brown & Sharpe and Jarno tapers, but it is certainly more or less confusing to make these changes, and we would heartily endorse the adoption of a single standard, preferably the Jarno.

No. 18. There seems to be no question but that a single standard would be of great advantage. The writer's preference would be the Brown & Sharpe taper; this on account of its uniformity and also having been standard in so many tools. We might add that we are using the Brown & Sharpe taper in our automatic gear cutting machine and Morse taper in our lathes, conforming to the usual practice.

No. 19. We believe that there should be a fixed standard for tapers. In order to obtain as near this result as possible, we are limiting our purchases of machine tools to those using standard Brown & Sharpe tapers, which we believe to be sufficiently satisfactory for all mechanical purposes. On account of our greater experience with Brown & Sharpe tapers, we are not in position to state the advantages of the Jarno standard. We do, of course, use Morse tapers for all of our drilling machine work, but do not believe they are as well adapted to other machine tool spindles as the Brown & Sharpe.

ECONOMY FOLLOWS STANDARDIZATION

No. 20. If there is any advantage in the different tapers it is very slight. To pick out the taper which should be adopted as a standard would be an easy matter. There are a great many machine tool builders who still believe that they could control the market in their particular type of tool, simply because they are using a certain taper in the spindles, and it surely would be to great advantage, not only to the consumer but to the manufacturer, to have a standard taper adopted for all spindles. This is followed out to some extent in milling machines, lathes and drill presses. We believe economy always follows standardization.

No. 21. Our own practice is somewhat varied as we use Brown & Sharpe tapers up to No. 14 in our small and moderate size machines, and in the larger sizes we use tapers that are standard in our own shop only and which were the original tapers before our adoption of the Brown & Sharpe. In our particular line of manufacture we do not see that there would be any great advantage in changing now to one standard, as the arbors made for our machines are seldom if ever used on any other makes of machines. We are thoroughly in sympathy with the standardizing program, however, and are finding it to our advantage in other features of our design to study this point much more closely than ever before.

No. 22. Modern milling machines are equipped with Brown & Sharpe tapers; drill presses, radial drills and boring mills with Morse tapers. Brown & Sharpe tapers are more consistent in their design than the Morse, being 0.500 in. to the foot, disregarding the number of the taper, whereas the Morse varies from 0.602 to 0.625 in. without apparent reason.

The Brown & Sharpe taper having a smaller included angle is better suited for milling machines, gear cutters or any other type of machine, where a great side thrust is exerted. This side thrust has the tendency to cause the tapered end of the cutter arbor to work loose. The Brown & Sharpe taper has a greater frictional driving power than the Morse. In modern milling practice for heavy duty, this condition is not taken advantage of as the driving is done through a flange located at the front end of the taper. The

practice of driving through a tongue at the small end of the taper should be discontinued except in the case of small end mills and small arbors for light duty.

All our gear-cutting machines for the trade are equipped with Brown & Sharpe tapers. In our milling machine department we have adopted No. 11 and No. 14 Brown & Sharpe tapers as our standard; in both cases the driving is done by a flange located at the base of the taper fitting directly into the spindle of the machine. Everybody has trouble with tangs of drills breaking, due, we believe, to having Morse taper shanks. It is our belief that drills with Brown & Sharpe tapers would eliminate that condition to a great extent.

Uses Many Tapers

No. 23. With regard to the merits of the Brown & Sharpe, Morse or Jarno taper, the writer has the impression that it would be a blessing to the country if any one of them had been adopted ten or twenty years ago and the others forgotten. In the design of our machines we use a number of different tapers. For instance, we are using a taper of 1½ in. per foot (more than twice that of the Morse) for the spindle bearings in our wheelheads, as this allows us to take up wear in a most satisfactory manner without making too much end-wise adjustment.

On the other hand, in the case of some of the smaller wheelheads where we wish to mount quills of small sizes, we have used one of the small Brown & Sharpe tapers because they have quite a wide variety of sizes as compared with the Morse, or, as I remember it, with the Jarno. There we are limited with regard to the size of the hole which we will drill in the end of the spindle and the designer has more of a choice of tapers by using the Brown & Sharpe where the large diameter is in the neighborhood of ⅞ or 1 inches.

No. 24. It is our impression that the Morse taper is in more general use than any other and we believe its adoption as a standard by all machine tool builders would be a good move.

No. 25. We are very much set on the Morse taper as far as our shop equipment and the machine tools we are building are concerned. In fact we specify nothing else but Morse tapers. We believe that the Morse taper is in more general use than any of the others. There is no question as to the economy as well as the convenience of having a single standard among machine tool builders, but it would mean a very great expense to use to use anything else but the Morse taper. In fact we would like to change over to anything else from the Morse taper about as well as we would like to change from our present system of measurement to the metric system.

No. 26. Ever since we have been in business we have used tapers which were current at the time we started out. We have never, except in one instance, adopted any of the standard tapers as a regular thing. In one line of machines which we started to build, we adopted the Brown & Sharpe taper, as probably representing more nearly the standard practice of machines of the general type that we were building. We did not change the taper in our older established lines. The experience that we had with the Brown & Sharpe taper in that one line of machines did not give use sufficient data to work from to determine whether or not it would be advisable to attempt to adopt such tapers for all machines. We expected, in adopting this taper, to be able to buy standard shanks and collets that we could use on our machines, but we found that the proportion of the standard items we would buy was so small as to be almost negligible. In nearly every instance, owing to the special nature of the tools to be used, they had to be made, so that really the taper had very little to do with cutting down the possible expense.

Likes the Jarno

No. 27. If it were a question of starting all over again and disregarding all existing tools, etc., we should prefer the Jarno taper as it seems to be ideal on account of its simple formula and uniform taper. However, this condition does not exist, and the next best standard is the Morse taper. For drill presses and lathe centers it seems there can be no objection to the Morse taper, but for milling machines, we would prefer the Brown & Sharpe half-inch taper per foot. As most shops have Morse taper reamers and gages, it would be less expensive and more satisfactory to adopt the Morse taper as standard.

No. 28. Although our product does not require taper sockets of any kind, still we would be only too glad to see some taper adopted as a standard for lathes, drills, millers, etc. We have about four different tapers in our plant and they cause very much confusion and an added expense in carrying so many drills etc., to fit them. All three tapers you mention have their merits and defects. The Brown & Sharpe is very good but being so much longer than any of the others, it requires that much more material for all bars, cutters, drills etc. This item alone would condemn it in many cases.

The Morse taper we find is too abrupt as the sockets have a tendency to fall apart; and then every Morse taper has a different degree of taper, making it hard to remember when turning bars, drills, etc.

The Jarno, while it has the faults of the Morse to some extent, has the advantage of being dimensioned in a very simple manner and the number of the taper can always be told by measuring the ends or length. While we do not think Jarno is the best, we think it is a step forward and if a happy medium between a Jarno and Brown & Sharpe could be found, we think it would fill the bill.

No. 29. We agree that a lack of uniformity on tapers leads to confusion and the multiplication of tools and arbors. We also agree that because of this there is an unnecessary waste which could be avoided by having a single standard.

Our experience shows that the Brown & Sharpe taper is satisfactory for milling machines. We believe manufacturers have in the past been using too small sizes or numbers of tapers in the different sizes of machines and which did not allow enough area in the surface contact.

We feel that the Brown & Sharpe taper holds somewhat better than the Morse on account of its small taper per foot. This same argument would hold good against the Jarno, which is almost the same taper per foot as the Morse.

Wonders at Morse Variations

No. 30. Not being familiar with the history of the development of the Morse taper my deductions may be wrong but it seems to me that the original tapers, because of the lack of proper facilities, were turned and the error in them standardized. I cannot conceive why the tapers should have varied from 0.600 to 0.630 in. Surely this cannot have been the result of an attempt to make the tapers vary with the idea that it would be better suited to the diameters involved.

The Brown & Sharpe taper would, in general, be satisfactory were it not for the fact that the No. 10 taper varies from all the rest, and I cannot understand why this is so. The nearest approach to a sensible system is reached in the Jarno tapers.

A uniform taper per foot should be established for drill shanks, lathe centers, milling machine arbors, etc., and the sooner this is done, the better. I dare say that drills with taper shanks would not have their tangs twisted off so frequently if a taper of ½ in. per foot were standardized. This subject really deserves very careful thought, but whether a taper of 0.50 or 0.60 in. per foot is finally adopted, it should be made uniform throughout for all sizes. I have always looked upon the Morse taper as a perpetuation of an error.

No. 31. We use the Brown & Sharpe taper because it is a straighter taper and hence better adapted to the use of end mills. It has been our experience that in using a Morse taper with end mills that the strain on the side of the cutter tends to loosen it in the spindle and the straighter taper of the Brown & Sharpe overcomes this difficulty.

No. 32. We believe that the taper to adopt would be the Jarno, owing to its being based on a formula easily retained in one's mind. We believe the adoption of a single standard an excellent idea, and even if plants would adopt

the slow process of having their new tools and replacements carry the taper adopted as standard, it would only be a matter of a few years until the standard taper would become generally adopted.

No. 33. From our standpoint, the Morse taper seems to be best, although we admit that its start was on a wrong basis, with reference to uniformity. However, it has been so widely adopted throughout the world for certain classes of machinery we do not see how it can be changed. The same thing may possibly be true of the Brown & Sharpe taper, but not to such a degree. The Jarno is based on a uniform basis, but is only a little known and not much used. We do not believe that you can ever reconcile users and manufacturers at this stage of the game to a uniform taper. You will meet such tremendous opposition from well-known sources, and from unexpected sources, that it will be impossible to bring this about. Something like trying to change from English to metric system, only not so bad.

Three More Jarno Advocates

No. 34. We are inclined to favor the Jarno taper because it is constant instead of changing. In this we feel it is superior to the Morse, and it has a somewhat greater included angle than the Brown & Sharpe. We think this better since it has been our experience that the Brown & Sharpe taper seats in too binding a manner at times.

No. 35. Our opinion is that the Jarno taper would be the best to adopt as a standard, the reason being that the Jarno formula is simple and uniform. We firmly believe that one standard taper would be a great convenience, as well as an economy.

No. 36. It seems as though when we are designing fixtures for our various lathes, we find that no two of them have the same taper in the spindle nose, a feature which limits the use of tools and increases the number of tools necessary. In our own manufacture of machines and tools we use only the Morse taper, and have found but one instance in which this taper could not be adhered to. That was a case where we wanted a size that came between the No. 4 and No. 5 Morse.

Personally, I believe that the Jarno taper would be the best to adopt for universal use, but it would mean a great expense to everyone like ourselves who have already standardized on the Morse or other tapers. However, we realize that it costs real money to make improvements and we would be glad to do our part along this line in co-operation with other manufacturers, if a suitable taper is decided on to cover all conditions.

No. 37. Our work is coming more and more to be in the drilling and boring lines only, so that we rarely furnish anything but Morse tapers. It seems to us that a standard taper for drilling, boring and milling machines, lathes, etc., would be desirable, but whether the cost of changing over would more than overcome the advantages, I am not prepared to say. We would be willing to abide by the decision of the majority and adapt ourselves to whatever seemed to be the most advantageous.

No. 38. We now use standard Morse tapers in the spindles of all our lathes and prefer to hold to this taper. As we understand it, most of the machine tool builders, or rather a large majority, use the Morse standard taper.

No. 39. As the situation stands now it is quite a nuisance to worry about three different standards, and personally I think it unnecessary, as all three standards are good and any one of them could be adopted. For simplicity sake, we are in favor of Jarno tapers, as it is simple to remember and the taper per foot is the same on all sizes.

The writer has also been advocating the standardizing of such parts of machine tools that hold the work and the tools. For instance, in the lathe a standard taper in head and tailstock spindle and standard size toolpost. On a radial drill, a standard diameter of spindle nose, as well as taper, standard T-slots for the table, etc. Of course, there would be a standard for each different size. We are very much in favor of standardizing and would adopt anything within reason along these lines.

(*To be continued in next week's issue.*)

Core Plugs and How to Make Them

By A. J. Langhammer

"Core plug" is the name by which the peculiar type of expansion plug described in this article is known to mechanics and engineers. The title has become a

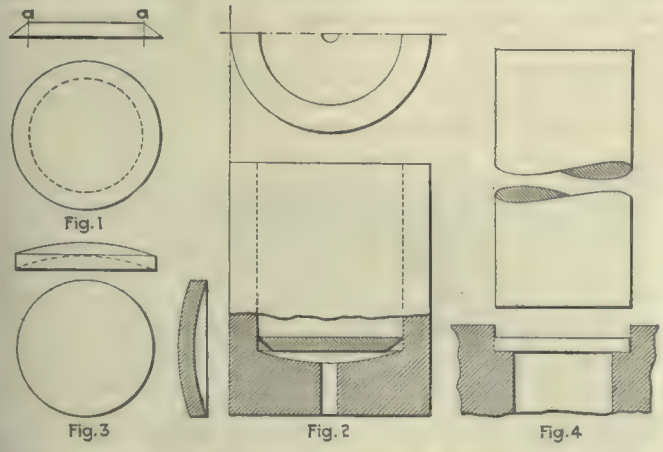


FIG. 1. THE CORE PLUG. FIG. 2. FORMING DIE WITH CORE PLUG IN POSITION FOR FORMING. FIG. 3. CORE PLUG AFTER FORMING. FIG. 4. PASSAGE SEALED BY A CORE PLUG

fixture with this plug, because of its almost universal adoption for plugging core holes in the water jackets of automobile cylinders.

A core plug for a 1-in. hole is shown in Fig. 1, which pictures at a glance the small amount of metal used. The labor cost of manufacturing is very low as is the cost of application. The writer has used core plugs on cast iron, carbon and alloy steels and for these materials cold-rolled steel in bar stock or low carbon steel in sheet stock has proved the most satisfactory. For a limited quantity it is best to make the plugs on an engine lathe to the shape shown in Fig. 1 and care should be exercised to make the base or largest diameter with a sharp edge so that it will "bite" in. Fig. 2 shows a die with a core-plug in position for forming. In Fig. 3 is shown a finished core plug, which with the sectional view in elevation is very clear.

In Fig. 4 is shown a plugged oil passage in a section of a crankcase with a core plug driven home. Immediately above is shown the "set" which is merely a short piece of cold-rolled stock with squared ends, and which with a machinist's hammer comprises the only tools necessary for assembling. At the first glance the strength of such a joint is not apparent. It is therefore necessary to again refer to Fig. 1. Here it will be observed that the metal shown in the small triangles *a*, *a* which, in the plain view, is the area between the dotted and the full circle, really forms a caulking medium. This is obviously a huge amount of metal and when driven in place, as shown in Fig. 4, forms a very strong and durable joint.

The writer has used core plugs on machine tools, fixtures and automobile parts and in diameters up to 2¾ inches.

Machine Operations in a California Pump Shop

Adaptable Shaping Fixture for Pump Brackets—Operations on the Vertical Turret Lathe—An Interesting Milling Operation—Turret Lathe Work

SPECIAL CORRESPONDENCE

THE illustrations shown herewith represent methods of manufacturing centrifugal pump parts in a factory in the Sacramento Valley.

The halftone, Fig. 1, shows a shaping operation on the base of a pump bracket. The work is here shown mounted in a special fixture in a Gould & Eberhardt 28-in. shaper. This fixture is adapted for holding all sizes of brackets, and to make the change from one size of bracket to another it is merely necessary to change the adapter plugs at the ends upon which the bracket is hung up for the shaping operation. This is brought out clearly by the detail photograph, Fig. 2, which shows the fixture and the bracket on the shop floor with several adapter plugs and collars in the foreground.

The bracket casting is bored out on a horizontal



FIG. 1. PUMP BRACKET IN THE SHAPER.

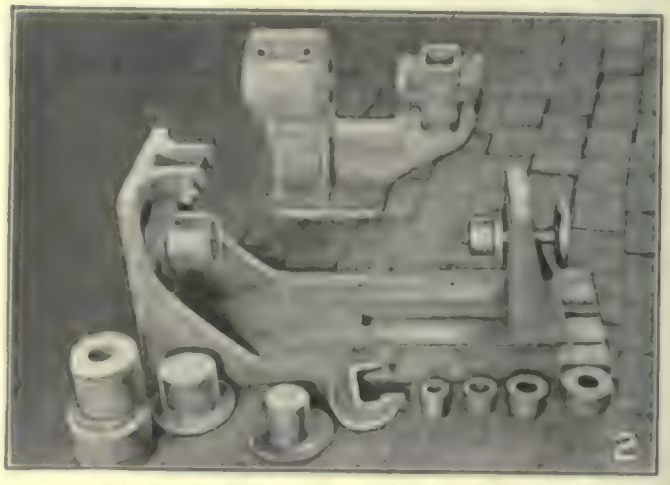


FIG. 2. SHAPER FIXTURE FOR PUMP BRACKETS

machine, and when it comes to the shaping operation, the proper head plug is inserted in the upper end of the fixture where it is secured by three hexagon head capscrews tapped into the flange around the base of the plug. The adapter rings for the handwheel screw at the right-hand side of the fixture are slipped over a sleeve which is tapped out to receive the screw for the handwheel. A washer and screw hold the adapter collars in place. For general adjustment to length to suit different widths of brackets, the outboard support for the work is adjustable longitudinally on the base and secured at any point desired by a square-head bolt sliding in the T-slot in the casting.

The two lugs at the top of the left-hand upright on the fixture carry setscrews which bear against the walls of the bracket to bring it into level position crosswise for the planing operation.

The drilling of the bolt holes in the base of this type of bracket is accomplished, as shown in Fig. 3, with the aid of a jig which is also arranged for taking care of various sizes of brackets. Details of this jig are clearly brought out in Fig. 4. The jig consists of an angle casting, in the upright of which is fixed a horizontal post, over which are fitted adapter sleeves to suit all sizes of brackets. In the rear wall of the upright leg of the jig casting there is a guide slot to receive the guide at the end of the different jig plates. A clamp screw and stud provided at this point secure in place whichever jig plate is used on the job. Referring again to Fig. 3, the bracket to be drilled is slipped over the locating sleeve in the jig and tightened upon this holding sleeve by means of a C-clamp, which is gripped upon the bosses at either side of the slot cut through the main bearing. This binds the work upon the sleeve, and the outer end of the casting is supported at the same time by a short jackscrew placed as represented in Fig. 3. The work is handled under a radial drill as shown in Figs. 3 and 4.

The casings or bowls for centrifugal pumps are bored through the wall and faced at the side for the joint surface in the manner illustrated in Fig. 5, where the job is shown on a Bullard vertical turret lathe, with the casting resting on and gripped in the four jaws on the table. With the work in this position the various turret tools are brought into action one after another to bore out the casing, rough and finish the large opening in the top of the casing, and to rough and finish the joint face on the outer surface. With the surface referred to finished as indicated, the bowl casting is ready to be machined across the face of the flange. This latter operation is attended to on a big milling machine, with the work placed over a locating ring which is mounted upon the table of the miller. This locating ring is another form of adapter which fits over a central plate secured to the milling machine table. The plate carries a vertical stud with suitable clamps and quick acting nuts to hold the work down in place. For the different sizes of pump casings, the adapter rings referred to above are changed by merely slipping them off from the central plate and replacing them by the ones required, so that the simple arrangement of very few parts takes care of all sizes of casings.

The actual milling of the flange face is accomplished with a large inserted tooth milling cutter, carried on the nose of the spindle.

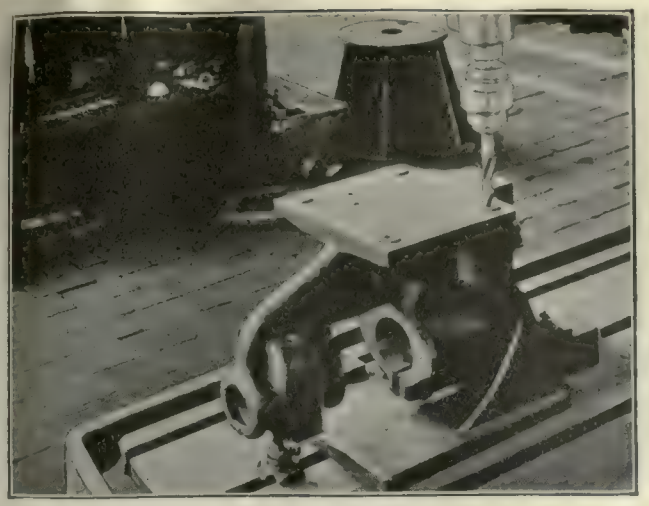


FIG. 3. DRILL JIG FOR PUMP BRACKETS.

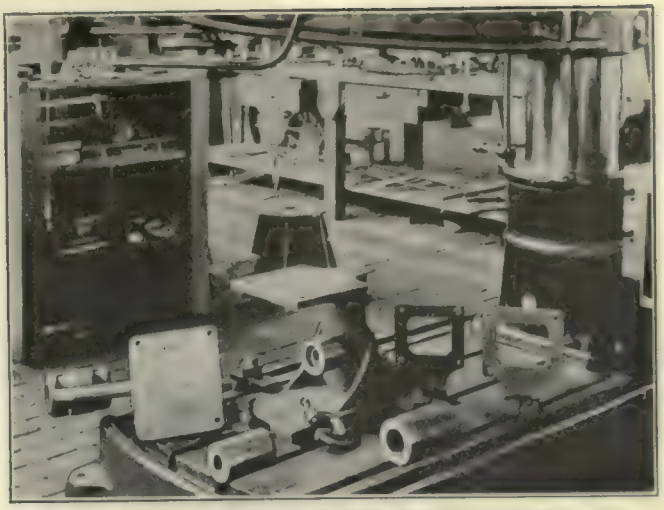


FIG. 4. SET OF AUXILIARY JIG PLATES FOR BRACKETS

On this make of pump there is used a combined elbow check valve which has a cast body with three faces at different angles to one another, as shown in Fig. 6, where two of these castings are seen in place in a special fixture on the table of a horizontal boring machine. The method of facing the round flanges at the ends of the elbow proper is to mount the work upon the angular fixture, as illustrated, and accomplish the surfacing by means of a milling cutter on the horizontal spindle. The fixture itself has two sloping faces at the proper angle to suit the elbow to be machined. While one casting is undergoing facing operations, another casting can be clamped in place on the opposite face of the fixture. Thus little time is lost in the process of removing finished work and replacing it with rough castings, as the handling of the job into place is going on at the time the cut is being taken on the opposite piece of work. The method of securing the baseplate of the fixture to the boring mill table and the means for clamping the upper or movable part of the fixture are easily seen in the illustration. The milling cutter on this machine has a 10-in. body in which are inserted blades of high-speed steel, these blades measuring 2 in. long, 1 in. wide, and ⅝ in. thick. The cutter is one of many sizes made at the plant and used for a variety of purposes in the production of pump members.

The combined elbow check valve is seen undergoing another operation in Fig. 7. Here it is shown set up on the shaper for the surfacing of the end flange. The fixture upon which the work is mounted for this operation is a peculiar form of angle iron, the wings of which are finished at the necessary angle with the base to locate the check valve elbow with the top surface in the horizontal plane. Thus without adjustment of the work upon the fixture or of the fixture upon the shaper knee, the top of the casting is in proper position for finishing, as soon as a couple of C-clamps have been applied to grip it securely in place.

Turret Lathe Work

A good deal of the work at this plant is accomplished in the turret lathe and a view of a Steinle machine in operation on spiral covers is shown in Fig. 8. These covers for different sizes of pumps are handled by boring out the hub and finishing to size and then slipping over a locating plug which is carried in the spindle of the lathe. Through this plug extends a draw-in bolt which has a nut at the outer end and an open washer as shown in the illustration, so that the removal of the work is accomplished very quickly and new work is rapidly put into place. The tools and the turrets are shown distinctly and their general character will be appreciated without detailed description.

Many classes of jobs are handled on this type of machine, including among other items the impellers or runners for the pumps which are chucked and machined in practically the same way as the spiral covers illustrated. In connection with the runners just referred



FIG. 5. BORING OUT A PUMP CASING.

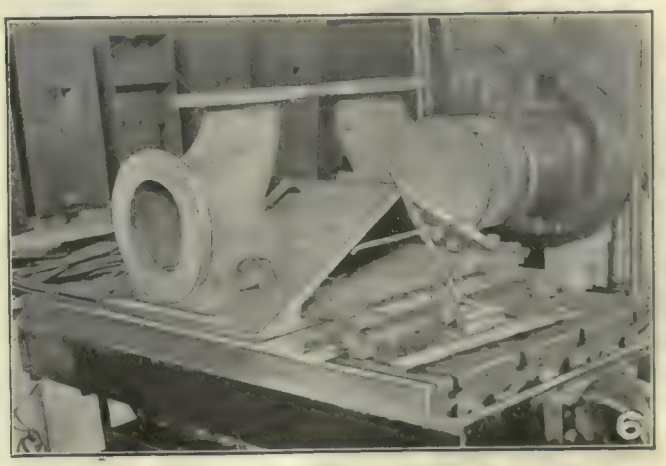


FIG. 6. MILLING COMBINED ELBOW CHECK VALVES



FIG. 7. SHAPING COMBINED ELBOW CHECK VALVES

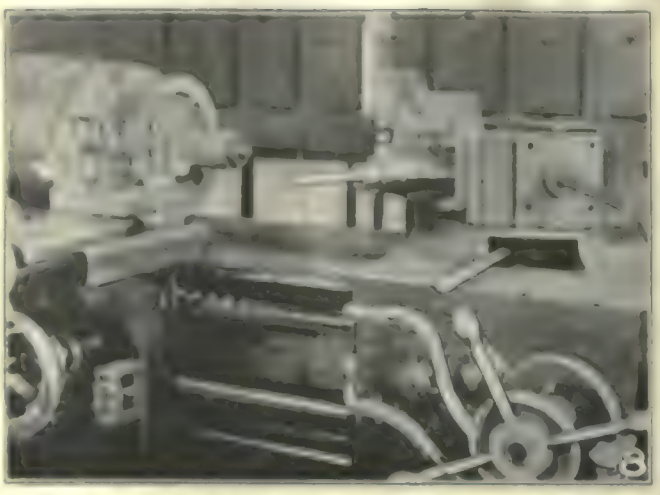


FIG. 8. PUMP COVER OPERATIONS IN THE TURRET LATHE

to, one interesting process which is carried out under a radial drill is the facing of the inner end of the hub. The other surfaces are machined after the job is set up in the turret lathe, and for the squaring off and finishing of the inner end of the hub, the casting as it comes from the lathe, is placed over a fixture under the radial drill, this fixture consisting of a circular plate with an upright post over which the work slips freely. A cutter bar is brought down with the spindle of the drill, and a flat cutter carried by the bar faces off the end of the hub to the desired dimension.

The illustrations presented in the foregoing article are selected from the many interesting features of practice at the shops of the Superior Manufacturing Co., Lodi, California.

Railroads Need Business Methods

BY C. J. MORRISON

The article by Herbert Hoover, Secretary of Commerce, on page 262 of AMERICAN MACHINIST, is very important and instructive. But one point should not be lost sight of, overlooked, hidden, or forgotten—and this is that the railroads are inefficiently operated in practically every department. This is not because the officials are incompetent or indifferent; nor is it because they are not working hard and conscientiously, but it is because they are terribly handicapped. There is probably no body of men in the world more able or hard working than our railroad officials, but they are handicapped, not only by numerous laws and regulations, but also far more seriously by the fact that railroading has been conducted as a business within itself.

In other industries there is a continuous exchange of employees and executives from one industry to another with a consequent exchange of ideas and methods, but the railroads seldom receive an employee and practically never get an executive from another industry, while the exchanges from one railroad to another are not very great. Even though there was a considerable interchange among the railroads, little good would be accomplished as the methods are similar on all railroads. The result is that the employees and officials are in a rut and are so steeped in tradition and prejudice that it is almost impossible to affect improvements.

To illustrate the point, consider an example familiar to every one. Many years ago in the days of the link and pin couplers, single track operation, no air brakes and no block signals, it was necessary to place on the rear ends of trains flags by day and lanterns at night. Today hundreds of thousands of dollars are spent by the railroads every year to maintain these things which, in all but a very few instances, are utterly useless. Incidentally, the railroads would not adopt the automatic couplers and air brakes until they were forced by law to do so, and they tried in every possible way to prevent the passage of these laws.

Henry Ford showed what can be done with a railroad by someone who, with no railroad experience, managed a railroad like any other business. Not only has he made his little road pay, but he has increased wages.

A railroad is a hard business to supervise and is so full of trials and tribulations that officials are too everlastingly busy with their daily problems to think much about economies. Each railroad needs an executive who could devote his entire time to the various problems to affect economies, and he should be a man with a broad experience outside of railroad work. There is no need for the Taylor or any other particular system, but rather the application of good common sense and outside business experience is required.

Probably the greatest money waster is the mechanical department, due partly to the fact that it is an expense department and therefore neglected, and partly to the lack of other than railroad experience by the employees and officials. It is so hard to get an appropriation for the mechanical department that the shops are full of antiquated machines and devices. The employees from this department are so notoriously slow that few outside concerns will hire them if others can be obtained. Let some courageous railroad official secure for one of his shops a high-grade superintendent from outside the railroad, give him the equipment he asks for and see what he will do to the repair bill for locomotives and cars.

In this connection it may not be out of place to say that such a superintendent will demand 50 to 75 per cent more salary than is usually paid for the position. Railroad officials are notoriously underpaid and this is another handicap. Railroads train many men only to have them leave just as they are becoming valuable.

The railroads certainly should be run as other business enterprises are, and this criticism is written with the hope that it will not add to the handicap, but that it may arouse some thought on the subject and may accomplish some good.

Selling Engineering Service

By Alex Dowel

The salesmanship required in selling any form of engineering service is of a highly specialized nature and it cannot be classed with the selling of a concrete article. The salesman must be more than a canvasser who introduces a certain kind of goods, and should be considered as a combination of salesman and engineer.

In the salesman for engineering service—consulting, industrial, or production—two important points are required: First, a full knowledge of the service he is selling and second, implicit confidence in the firm for which he is working and its ability to render adequate service to the client. It is vitally necessary that the feeling of confidence be inspired in the salesman as otherwise he cannot influence a client in the right direction and imbue him with the necessary confidence in his firm.

Let us suppose that a consulting mechanical engineering firm specializing in production methods requires the services of a salesman to introduce its engineering service to various manufacturers of mechanical products. The man selected for this job should be one who has some knowledge of general shop practice so that he may be able to talk intelligently about it. At the same time the salesman need not be a strictly first-class engineer who has specialized in the particular line with which he is associated. The ability to sell and to impress the customer is more important by far than a knowledge of engineering. Past experience which enables the man to talk intelligently about the general conditions governing the work is a valuable asset and should generally be considered as an important factor in his selection.

If a reamer, tap, die or other small tool is to be sold the salesman usually has a sample, but in selling engineering service he is selling the service of a professional man and may be classed as a salesman of "brains." It is easy to show a man a suit of clothes and land his order but to sell "brains" to him is not so easy. Yet a competent sales engineer with the right qualifications can do it—can, at any rate, influence the sale and bring the client to the point where he is willing to talk with the consulting engineer regarding his problems.

In the writer's opinion the salesman's principal business is to get in touch with firms requiring the kind of service his company is able to furnish and *to make the client eager* to have a talk with the engineers in charge of the work.

Qualifications

The sales engineer who attempts to sell engineering service must have qualifications that resemble those of an ordinary salesman, yet different because it is necessary in this class of work to be more familiar with important details. The following list notes briefly the various qualifications: (1) Ability to sell service; (2) knowledge of the service that he is selling; (3) personality; (4) knowledge of character; (5) diplomacy; (6) honesty and conscientiousness; (7) understanding to enable him to meet competitors; (8) understanding to enable him to adjust losses and generally to render satisfaction to the customer; (9) ability to market the service at a substantial profit.

I have mentioned the ability to sell service first. A salesman may be a competent engineer and yet may not have a sufficient flow of language to express himself properly and inspire confidence in the client. The ability to talk is therefore a valuable asset in a salesman but he should not by any means acquire a reputation for "gab." The experienced man will gradually lead his client up to the various points with which he wishes to impress him and he will do it in such a diplomatic way that it will not appear on the surface.

A great deal of harm can be done to an engineering firm by a salesman who creates an unfavorable impression, who makes statements as to current practice which are not in accordance with good engineering ideas. The man who understands his business will answer questions up to the point where there is some uncertainty in his own mind and at that time he will state that this phase of the situation is out of his line but he will be glad to refer it to one of the firm's engineers. Technical questions can usually be disposed of in this way to the advantage of all concerned, as they will then be brought up before the right man and accurate statements made which will be of assistance to the client. No salesman should be afraid to say that he *does not know* just how a certain matter would be handled, as he is not supposed to be a consulting engineer but rather a salesman. Neither is he supposed to go about the country and give out valuable information without charge, although it is perfectly legitimate for him to do all he can to assist a client when there is a prospect of making a friend.

Aggressive Diplomacy

The personality of the salesman enables him to obtain an interview with executives so that a statement of service can be presented to the parties most interested and most influential in turning the business in the right direction. Men with the qualifications of intelligence, energy and honesty and having good address will make a success in salesmanship while the quiet and unassuming man will often lose by a lack of assertiveness, so that he will miss a great many interviews which a more energetic salesman would obtain. Dignity should not be sacrificed and the aim should not be to obtain a reputation as "hail fellow, well met" because this attitude is likely to result in the impression that the firm represented cares more for the frivolous things of life than those which are serious. The ability to judge of the character of the executive with whom he is talking and to use diplomacy in his talk with him is a decided advantage to the salesman. A straightforward manner of talking, which is at the same time not too abrupt, gives the impression of honesty and will oftentimes enable a man to obtain a long interview, when any tendency toward concealment would leave a different impression unfavorable to the firm.

Another point of importance is the ability which a salesman should have in giving satisfaction by the adjustment of any losses that may have occurred during the progress of the work. This matter calls for the use of considerable care, yet at the same time it must be combined with business judgment in order to place the fault where it belongs without giving offence. It may be a matter of hundreds or even thousands of dollars, or it may be only a few dollars; but in either case the justice of the claim should receive first consideration. The honesty of the firm will be judged by the attitude of the salesman and there should be no hint at any time of any tricks or shady transactions which would reflect on the integrity of both salesman and firm. The straightforward plain business policy must always be followed and when this is done the results will be convincing.

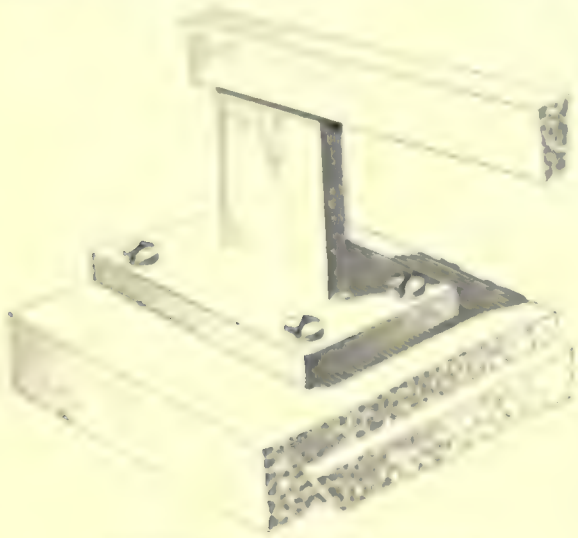
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Cutting-Off Tools That Do Not Chatter

By F. M. A'Hearn

The sketch shows an arrangement of cutting-off tool and support that is used in many shops building heavy machinery, and will cut off work of large diameter without noticeable chatter. The writer has seen it used upon a lathe for cutting off rolls 24 in. in diameter.



CUTTING-OFF TOOL AND SUPPORT

The tool used is of ½ by 2 in. beveled section, slightly wider at the cutting end and concaved on the top surface to narrow the chip. The steady cutting of a parting tool with the cutting edge extending 12 in. or more from the toolpost clamps and going through the entire diameter of the work at one setting without the usually attendant chatter, was remarkable. The chips passed back over the tool without displaying any tendency to wad or pack in the cut.

The height of the tool in relation to the center of the work, which affects conditions when cutting off work of small diameter where the tool is fed in to the center of the piece, does not seem to make so much difference on larger work as does the shape of the tool. The same applies to turning tools. The writer has observed that lathe men in turning work from 2 to 6 ft. in diameter rarely pay much attention to the height of the point of the tool, but they usually take care to keep the clearance as small as possible.

Some Repair Shop Uses for Babbitt

By H. Beard

Having to repair a large bevel gear from which several teeth had been broken out, we built up the teeth by adding metal with the acetylene torch. We then built a mold around six consecutive teeth that were in good shape and poured it full of babbitt. Before the cast was entirely cooled we pounded it on the back to make certain that it fitted the teeth and then, removing it, we had a templet to which the new teeth were fitted by chipping and filing.

At another time we had occasion to grind the bore in a number of manganese pinions. We took a pipe flange into which we screwed a short nipple of an internal diameter somewhat larger than the outside diameter of the pinions, slipped it over the tail spindle of a lathe, set one of the pinions against the faceplate and indicated it true; brought up the flange and nipple and secured it to the faceplate, stopped up all the openings except a pour hole and filled the annular space thus formed full of babbitt. This gave us a chuck into which the pinions could be slipped successively and ground, with the assurance that they would run true.

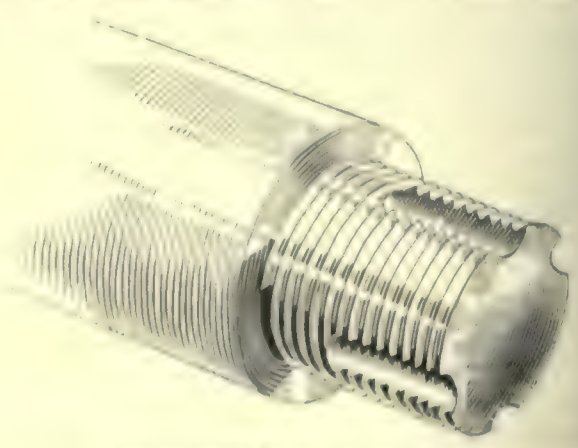
We also had trouble with a gear that persisted in slipping endwise upon its shaft and we could not afford to shut down long enough to take down the shaft and refit the key. There was a solid bearing with a smooth face several inches away from the gear hub and into this space we laid several rods, cut to the proper length to fill the space, and bound them in with twine. Wrapping a piece of sheet iron around the whole and stopping up the small openings with clay, we had a mold that we filled with babbitt. When the mold was removed there was a babbitt thrust collar between the gear hub and bearing with no dangerous screws or bolts protruding.

Fluting Screw Studs to Clean Out the Dirt

By Charles Mathias

When using screw studs for cleaning internally threaded parts, I find it desirable to cut one or more flutes in the end, as shown in the sketch, for the purpose of removing the small particles that are liable to lodge in the threads after tapping.

The flutes can readily be cut with a small radius



FLUTING THE ENDS OF SCREWS

cutter and need extend only to the length of three or four turns of thread. They do not weaken the stud to any extent because they are cut only to a depth that is just below the root diameter.

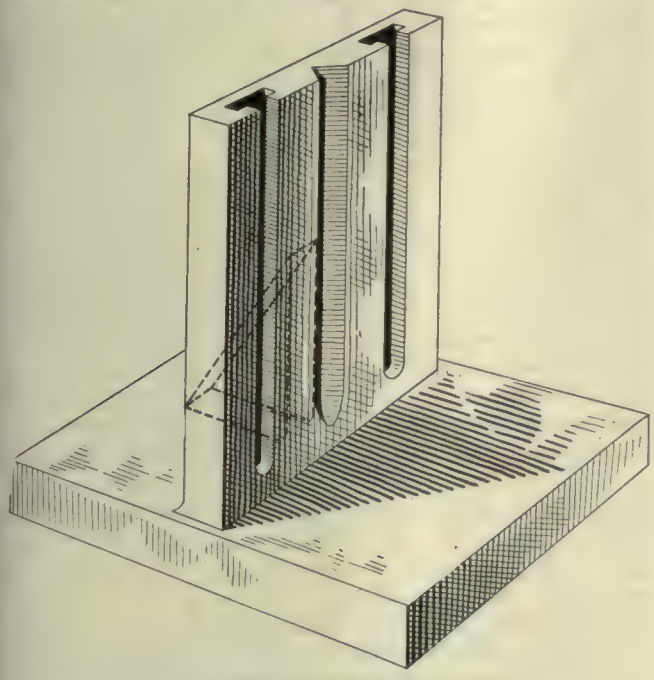
The same scheme can be used to advantage upon screws that are to be used as clamp screws on drilling or milling jigs, fixtures, and the like, and will save a deal of trouble caused by the holes becoming clogged.

Toolmaker's T, or Set-up Block

By J. A. Raught

The accompanying sketch shows a toolmaker's T, or set-up block, of the kind that the toolmaker finds very useful in laying out or setting up work that must be measured or machined at a definite distance from some fixed surface, as a bench plate or the table of a machine.

Instead of being drilled full of holes, as is usually the case, the T-slots are provided so that work may readily be clamped anywhere on its surface. The



TOOLMAKER'S SETTING BLOCK

vertical V-groove in the face facilitates the setting up of pieces having round shanks or parts. The extension base gives the tool a good firm bearing upon whatever surface it may be resting and it is not, therefore easily knocked over, to the detriment of the work clamped upon it.

Hardening Sense

By R. McHenry

There is no mystery or magic about the proper hardening of tool steel. A knowledge of the material and method is of course essential, but when warped or cracked work results, it is not without some definite reason, however hidden. The frequent howl concerning spoiled work is—"it was in the steel." I also believe this to be the correct reason in a majority of cases, but it does not necessarily place any blame on the steel maker. For "it" was probably not in the steel when he shipped it. "It" was put in during the machining operations of that particular piece of work. The "it" in this case applies to the change of structure, or strains set up, incidental to the removal of surplus stock. Normalizing or simple annealing will return the stock to a state of repose. Annealing after heavy machine work, hammering, etc., is not a new scheme, it has been recommended by steel manufacturers for years. But many at the hardening tank steadily disregard it to their own detriment.

I have found that a habit of relieving the tension on *all* tool steel to be hardened, pays and pays well. The normalizing process need not be carried out as thoroughly as in the annealing of hardened work. Heating barely to a low red and allowing the piece to cool fairly slowly until it can be handled is usually satisfactory.

The better brands of steel are pretty reliable these days, but many times they are unjustly knocked.

The hardening operation must be done just as intelligently as the designing and machine work. No die ever cracked or warped without some cause somewhere and this can usually be overcome if the right system is followed.

Here are a few "Don'ts" in regard to the hardening end which many of us know but do not pay sufficient attention to: Don't rush the heating. In annealing, hardening or tempering, heat thoroughly and evenly all over. It is a well-known fact that the heating of alloy steel quickly will prevent it from hardening properly; slow heating is not detrimental to carbon steel either.

Don't overheat: The metal will not be so hard and fine grained if quenched when above its critical point. If overheated slightly put aside until cool; then reheat correctly. If greatly overheated (burnt), scrap it at once.

Don't allow the steel to soak after it has reached a red heat; the soaking should be done first, not last.

Don't quench at a falling temperature. Dipping should be done immediately the correct rising heat is obtained.

Don't harden all sort of tools exactly the same. Take into account the shape, location of sharp corners, steam pockets (which perhaps should be packed with fireclay) and thin sections. When frail pieces are to be water-hardened, a film of oil on the bath or the use of warm water, greatly lessens the danger of springing and cracking.

Don't use dirty water or dip many pieces in a small stagnant bath, expecting the last piece to be hardened like the first. The tank should be of sufficient capacity to maintain a fairly even temperature, or else have fresh liquid running in.

Don't throw work into the bath and trust to luck. Usually the heavier portions of the piece should be chilled first. Work must not lie on the bottom of the tank, but must be held near the center and continually agitated, if fresh water is not coming in.

Don't put heavy cold tongs on light pieces before dipping. The tongs will take away the heat quickly at point of contact.

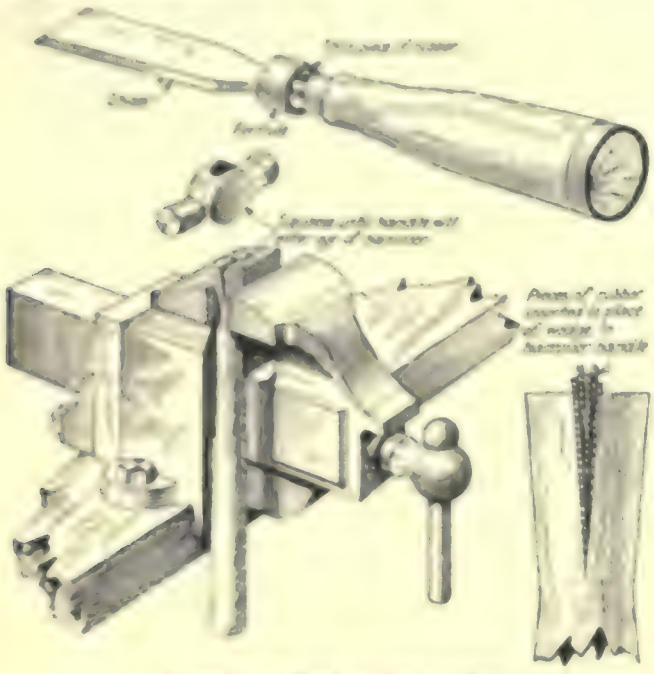
Don't leave a large die or tool in bath until the outside is cold; then toss it on the bench and be surprised if it should fly in pieces. The center may still be quite hot and exerting enormous pressure. It is a good plan to reheat the outside slightly, immediately after quenching. Many quench first in water and then in oil. I believe the less strains put in tool steel before heat-treating the better, and that normalizing does much to favor both steel and hardener.

Rubber "Wedges" to Hold Handles in Hammers

By G. L. Henderson

After experiencing considerable annoyance from having the ferrules of my chisels, gages, etc., come loose, I tried packing under them with stiff paper, but found that little relief was obtained with this means.

One day, spying an old tube from an automobile tire lying upon the floor, I cut off a piece of the thin



A NEW USE FOR INNER TUBES

rubber and, wrapping it around the shoulder portion of the chisel handle, drove the ferrule over it. Since discovering this effective remedy I have not been bothered with loose ferrules.

As it worked so well in this instance I devised another application of the same method. In putting a new handle in a hammer head I first inserted several thicknesses of the rubber in the notch where the wedge is supposed to go; then squeezing the handle in a vise with about half an inch protruding I drove the hammer head over it. The rubber expands the split end of the handle and prevents the head coming off.

Brake Device Applied to a Running-Balance Machine

By Charles Kotersall

The accompanying drawings show a device used for braking or stopping a flywheel or object that is being balanced. The device was attached to a Defiance running balance machine, without changing or effecting the machine proper to any great extent.

Most manufacturers have no way to stop or brake the object that is being balanced on a running balance machine, and without braking, a flywheel or other object being balanced will sometimes run as long as fifteen minutes before coming to a dead stop. This, of course, is a lot of time wasted. With the device shown in Fig. 1 the flywheel or object to be balanced can be brought to a dead stop in less than fifteen seconds.

The only necessary changes made on the machine were on the driving disk *A*, which was turned to a diameter to accommodate the housing *B*, and the upper bearing flange *C*, which was milled off to get a square bearing surface for the housing *B* where the bolting surface rests at *D*.

The center flange *E* is bolted to the flywheel by bolts and nuts *F* with the two driven collars *G*. The female center plug *H* is hardened and ground and fits snugly into the center flange *E*. The adjusting screw *I* butts against the female center plug *H*. As the plug *H* and the male center *K* wear to an uneven or irregular surface they should be re-ground and lapped to a smooth finish. The screw *I* also adjusts for the space between the thermoid ring and work. Both centers *H* and *K* should be hard.

Before the operator places the work on the machine he must have the fingers *L* and *M* set upright, as shown in Fig. 2. The work is then placed on the male and female centers *K* and *H*. The operator must see to it that in placing the work he does not disturb or knock down the fingers *L* and *M*. The operator then brings the work against the driving fingers *L* and *M* which drive against the collars *G* thus putting the work into motion. The finger-supports *M* and *O* hold the fingers *L* and *M* which are pivoted on the pin *P*. After the work is at the proper speed, the fingers *L* and *M* will automatically kick off or release themselves by falling to the position as shown in Fig. 2.

While the flywheel is in motion the operator is chalking the wheel to get the high point or the out of balance part of the wheel. After this is done it is required to stop the flywheel. The stationary cam *Q* slides in an upward and downward movement on the four keys *U* which are seated and held in place by means of fillister head screws. The brake lining attached to the cam *Q* is thermoid and must be attached very rigidly by means of

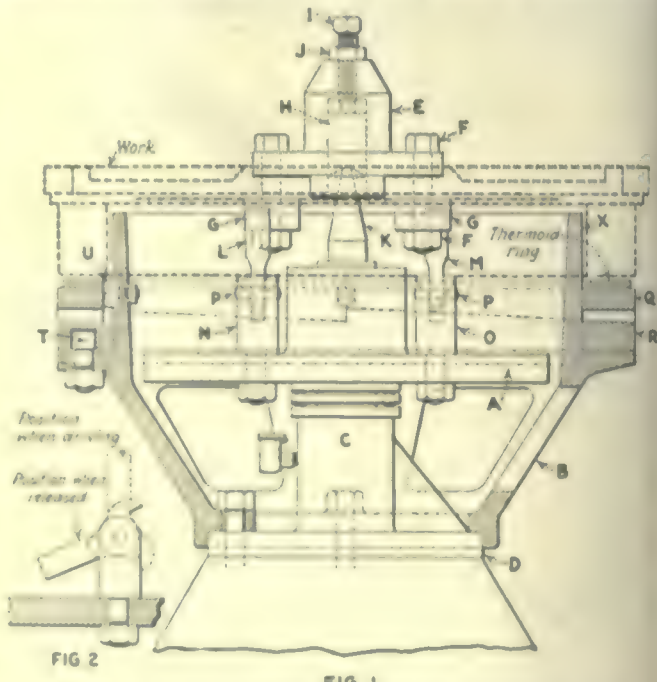


FIG. 1. BRAKING DEVICE ON THE MACHINE. FIG. 2 DRIVING AND RELEASED POSITIONS OF FINGERS

copper rivets. The lower cam *R* is operated by means of a lever in the direction in which the machine revolves, thus advancing the cam *Q*, with the thermoid

lining, upward against the flywheel rim and braking the momentum of the work, and also lifting the female center *H* off the machine center and thus bringing the work to a standstill. The housing *B* has a rim projecting up into the work at *X* acting as a pilot to prevent the work from sliding off when in motion or braking the momentum. The stop pin *T* is fastened to the housing frame *B* to prevent the cam *R* from passing beyond the four high points of the cam *Q*.

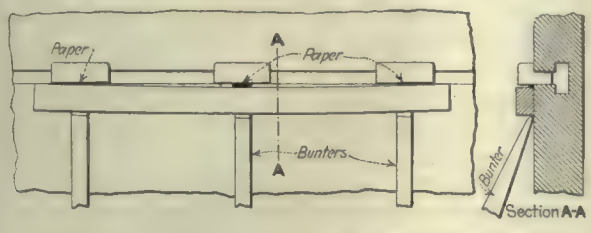
It is also understood that all revolving parts are to be perfectly balanced.

Planing Gibs Flat

BY JOHN E. HOAGLUND

On page 219 of AMERICAN MACHINIST, Tell Berna describes a way of planing gibs flat that I think is deserving of comment.

When I first learned the rudiments of planing I had as a teacher an old foreman who had spent most of his



METHOD OF CLAMPING TO PLANE WORK FLAT

life in working upon planers. The first thing he told me was: "Clamp and support your work right and you will not have to do much straightening. Avoid having to straighten the work as much as possible, for it is very difficult to straighten a piece correctly, and even if you succeed in getting it straight it probably will not remain so."

Almost any piece, especially if it is long and narrow, will not only bend but it will twist as well, so that opposite corners will be "high." On the second setting when the planed surface is in contact with the planer bed these corners, and perhaps also the middle of the piece, must be supported by packing with paper or other suitable material so that when the pressure of the clamps is applied the work will not be sprung or distorted.

Old time cards or cigarette papers make excellent packing material. Incidentally, this is the best use I have yet discovered for cigarette papers, as they are uniform and measure only about 0.001 in. in thickness.

Assuming that one of the wide sides of the gib has been planed and that it has been turned over to plane the opposite side: If now the narrow side is not straight and square (and it can not very well be so, as it has yet to be planed), it will be necessary to pack between it and the surface against which it bears, else the pressure of the clamps will distort the work not only in a sidewise direction but the under face as well, and it will be impossible to get a straight job.

My way of doing this job would be to paper up the under surface first and test it by rapping with a wrench or hammer to determine when it is properly supported, then to pack between the work and the abutting surface against which it is held at points opposite to each bunter, as shown in the cut. The bunters should be narrowed to a thickness of about $\frac{1}{16}$ in. at the end and slightly rounded.

A roughing cut should be taken over both wide sides, packing up the piece as described for each cut, and then the two narrow sides should be roughed with one of the wide planed surfaces bearing against the abutting pieces; assuming, of course, that these latter are square with the planer bed.

The same sequence of operation should then be repeated for the finishing cuts, using extreme care to see that all "high points" are properly supported in each direction before applying the pressure. To the experienced planer operator an improperly supported place in the work is instantly detected by the sound of the piece when struck lightly with the hammer.

Clamping pressure should be applied very lightly upon the finishing cuts.

Tube End Closing Tools

BY S. A. MCDONALD

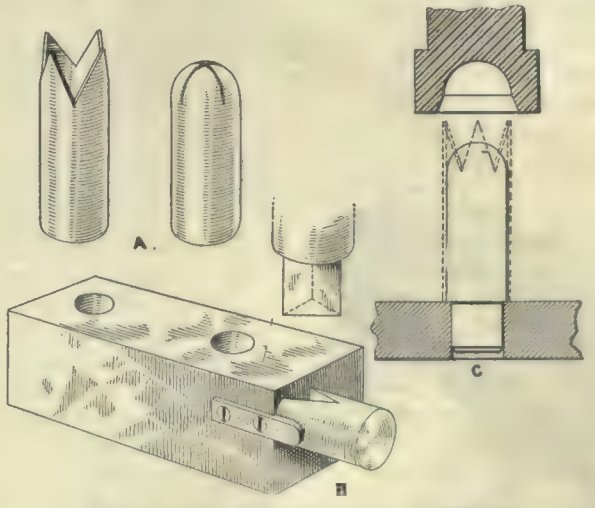
A small jobbing shop got an order to manufacture 10,000 pieces, as shown at *A* in the accompanying illustration, and made a profit because of the low tool cost.

The stock used was $\frac{3}{4}$-in. tubing with a $\frac{1}{32}$-in. wall, cut off to $2\frac{1}{4}$ in. long by a $\frac{1}{16}$-in. abrasive wheel. This left the ends with a good finish. The notching die was made from a bar of $1\frac{1}{2}$-in. tool steel planed on two sides and one end turned to fit the inside of the tube, as shown at *B*.

Before the die opening was made in the turned end of the bar, it was necessary to make the closing die to determine the shape of notch that would close perfectly. This was done by filing a tube experimentally and trying it in the closing die *C*.

The shape of the notch having been settled the opening in the die was made to correspond. A locating gage was made and secured to the side of the die, and the bolt holes drilled to secure the die to the bolster. The punch was made from a piece of tool steel, turned and milled to fit the die.

The first operation was as follows: The locating gage being removed the operator held the tube on the die against the square section, and sheared one notch in



TOOLS FOR CLOSING ENDS OF TUBES

each tube. The locating gage was then put on and the other notches cut. In the second operation the tube was placed over the plug and when the punch came down it curled the prongs in and hit the stock hard enough to spread it slightly so that the end of the tube was nearly water tight.

EDITORIALS

The Truth About the Coal Strike

THE domestic consumer of coal has evinced complete indifference to the big strike which is now three weeks old. He has little love for the coal operator whom he strongly suspects of profiteering and less sympathy for the union miners who are endeavoring to maintain their more than war-time wage rates while nearly every one else has had to accept more or less stiff reductions.

The manufacturer, on the other hand, who is apt to look farther ahead, is beginning to be somewhat apprehensive of the effect of a protracted strike on our slowly recovering business. He is interested in the merits of the case as having some bearing on the final decision and as offering some indication of the duration of the struggle.

But what are the merits of the case? In the bituminous coal industry, which should not be confused with the anthracite industry because there is no connection between them, the operators of the unionized mines, producing about two-thirds of the bituminous coal mined, are determined to force a reduction in wages sufficient to allow them to compete with the operators of non-union mines. The miners are equally determined to hold on to the gains they have made. They are entirely willing to enter an interstate conference because a national agreement is what they want as a step toward nationalization of the industry. They have made a lot of capital and gained a certain amount of undiscriminating sympathy from the daily press and in Congress by their claim that the operators have broken their contract by refusing to enter the conference which the miners were willing to take part in.

The operators on their side, claim that the miners broke their contract five months after it was signed and that the operators are no longer subject to its terms. There is little profit in the argument which is based on technicalities. However, the operators have another point to consider: more than a hundred of them are under indictment for conspiracy under the Sherman law for signing the agreement which has just expired. The operators have also offered repeatedly to meet their men in separate state wage conferences.

The operators also object to a continuation of the "check-off," a practice originally useful which has degenerated into an abuse. By it the mine unions force the operators to hold back the union dues of the miners and pay them to the union treasury, thus contributing material assistance to an organization which is fighting them in every way, even to the extent of using funds so collected in attempts to organize non-union fields.

Much has been said and done before and during the early stages of the strike to confuse the issue. The immediate problem is to deflate the coal industry to a degree somewhat commensurate with the deflation of other industries. The greater problem is to place the industry on an economic basis. On the production side there are too many high cost mines and too many miners. On the distribution side there is too great a spread between the price at the mine and the cost to the consumer. The distribution problem, of course, has nothing to do with the strike, but it must be settled before the coal situation can be called satisfactory.

In the meantime the consumer pays the bill and will be the greatest sufferer if the strike lasts very long.

Businesses Which Do Not Survive

BUSINESS depressions like the one we are now fortunately beginning to leave behind are not the only causes of business decadence. Perhaps the most deplorable cause of all is what is commonly called "dry rot"—the failure to keep abreast of the times either in machine equipment, in methods or in the handling of employees.

There are many concerns in the country which date back to the early days of centralized industry, when the relations between employer and employee closely resembled feudalism. Paternalism, the considering of employees as "my people," is still with us in too many instances.

Concerns which want to survive, which desire to keep their place in their respective industries, will do well to study carefully the question of personnel, of harmonious relations with their employees, not only today, but in the future. Those who are carefully studying industry as a whole see unmistakable signs of decay in some of the largest concerns. This frequently comes in cases of one-man management where the one man, with the greatest sincerity, believes that it is his duty to act *for* his men, instead of *with* them.

We have in mind one well-known concern of excellent repute, outside the machine industry, to which this applies. There is no question as to the honesty or sincerity of the man who directs its destiny. He is a hard working, courageous manager who honestly believes that he is ordained to act and to think for his men—that they should be perfectly willing to have him the sole arbiter of their destinies. No one else has any real authority and he refuses to see that the industrial world has advanced beyond the feudal period.

Young and ambitious men with a capacity for management in the modern way find no opportunity with him and drift away to other careers. The young blood which all concerns need, is either forced out or is congealed by repression until it is as reactionary as those in command.

We have had numerous examples of large concerns, once leaders in their line, gradually dropping by the wayside and becoming only a memory. It is perhaps the greatest danger facing a large and powerful organization. Power, backed by years of success, forgets that it became powerful by striking out with new methods, and instead, hugs the delusion that no changes are necessary.

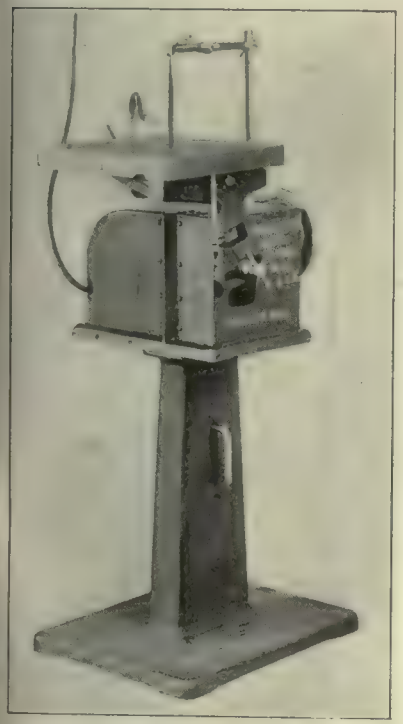
Consideration shown where it could easily be dispensed with helps to build up confidence worth much in busy times, and may well turn the balance from failure to success.

Shop Equipment News

Rearwin Nos. 3 and 4 Enclosed Die-Filing Machines

W. D. Rearwin, 716 Monroe Ave., Grand Rapids, Mich., has recently placed on the market Nos. 3 and 4 sizes of his die-filing machine, the operating mechanism of which is enclosed in a metal case. The machine is similar in principle, although smaller in size, to the No. 6 machine described on page 246, Vol. 54, of AMERICAN MACHINIST. It can be mounted on a bench or on a short column equipped with disappearing casters, the latter mounting being shown in the accompanying illustration.

The No. 4 machine is provided with a 12-in. square table arranged to tilt to all four sides, and having the swiveling mechanism graduated to 7 deg. on each side. An adjustable hold-down clamp for the work moves with the table. The position of the slide carrying the file is adjustable; also the length of stroke is adjustable from nothing up to 3 in. Speeds of 200, 300 and 400 r.p.m. are provided.



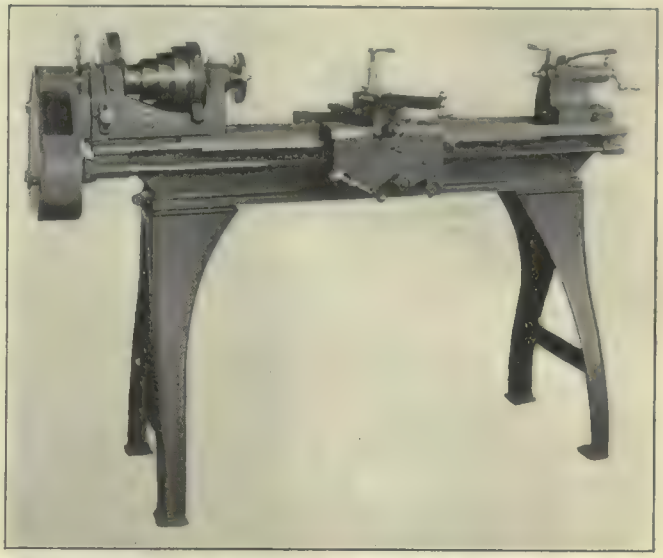
REARWIN DIE-FILING MACHINE

Both special and standard files can be used, as the upper arm has a wide range of adjustment in all directions and the machine holds securely different shapes of files. The weight of the machine separate from the motor and column does not exceed 60 lb. The No. 3 machine is the same as the No. 4 except that it is smaller, and has a 1½-in. stroke and an 8-in. square table.

Seneca Falls "Handy" Lathes

The Seneca Falls Manufacturing Co., Inc., Seneca Falls, N. Y., has recently placed on the market a screw-cutting engine lathe ranging in size from 9- to 13-in. swing and having the usual bed lengths. This machine, shown in the accompanying illustration, is known as the "Handy" lathe. It is a general-purpose machine, designed especially for the radio industry, and for starter and magneto service stations. It can be arranged for either motor or belt drive, and all the regular "Star" lathe attachments may be used in connection with it.

The bed is of heavy ribbed construction and equipped with either bench or floor legs. The headstock has back gears and a large hollow spindle adapted to draw-in chucks. Power longitudinal and cross feeds, graduated crossfeed screw, and a set-over tailstock are provided.



SENECA FALLS "HANDY" SCREW-CUTTING LATHE

A plain or compound rest, and a double friction countershaft having a cone belt shifter and self-oiling bearings can be furnished.

This company is also placing on the market a plain turning lathe having a 10⅜-in. swing and 3-ft. bed, and taking 12 in. between centers. The machine is equipped with a plain rest, feeds from 0.002 to 0.040 in. per revolution of the spindle, set-over tailstock, three-step cone and self-oiling spindle. The countershaft is of the tight-and-loose pulley type with roller bearings in the loose pulley. This machine is intended for plain turning where screw-cutting is not necessary, and it is especially adapted to use in the making of small parts for electrical apparatus.

Plimpton Industrial Hand Trucks

The Plimpton Truck Co., Elm Court, Stamford, Conn., has recently placed on the market the Model-E elevating transfer truck shown in Fig. 1. The construction of the truck itself can be seen in the lowest view, while a wooden platform in position on the truck is shown in the central view. The front end plate of the truck is a combined step and thrust bracket, against which the operator may press the handle to force the truck backward. Due to the radius on the end plate, the wheels can be swung while the handle is pressed against the plate. The stop for the platform extends across the entire width of the truck, so that wear on the ends of the wooden platforms is not excessive.

The loaded platforms are released by pressing the pedal only. It is not necessary to bring up the handle in order to start the action of the cams. The hook and link mechanism consists of a single connecting link pivoted on a cam section, which is depressed over an



FIG. 1. PLIMPTON MODEL E ELEVATING TRANSFER TRUCK AND PLATFORMS

offset hook on the elevating lever when the load is to be raised. When the elevation is complete, the handle is disengaged.

The handle is automatically retained in the vertical position when not in use; the mechanism for doing this is a spring-loaded plunger operating in a tongue on the heel of the lever. The truck is made in capacities of 3,000 and 4,000 lb., with platform sizes of 7 x 18 x 36 to 7 x 18 x 52 in. for the former and 7 x 20 x 36 to 9 x 20 x 52 in. for the latter.

The platform can be made of wood, with four metal feet secured by means of screws. Detachable steel platforms, such as shown at the top of the illustration, can be employed. The top plate of the steel platforms may be from ⅛ to ¼ in. in thickness. The side channels may be employed in the size and weight necessary for the work. The feet are of steel and bolted in place. The channels are spaced so as to allow 2 in. side clearance for the truck. The platform may be easily dismounted. It can be furnished for any truck length in standard widths of 24, 30, 36, 42 and 48 inches.

The truck shown in Fig. 2 is a heavy-duty, non-elevating platform style for use especially in foundries and machine shops where heavy, compact loads are handled. The truck has a wide wheel base and steering knuckles of the automobile type, so that it is practically impossible to upset the truck by too heavy loading on one side.

The wheels can be provided with either ball or roller bearings. The top is made of heavy oak planks and bound by angle iron at the edge, the corners being rounded. The handle is normally held in a vertical position by a spring-loaded plunger. The truck may be furnished to steer on either two or four wheels.

The truck is made with load capacities of 2,000, 3,500 and 5,000 lb. In the smallest size, platforms 18 in. wide and from 36 to 52 in. in length are provided, with a height of 8 in. In the medium size, the truck can be furnished in heights of either 8 or 10 in.; the platform is 20 in. wide and varies from 36 to 52 in. in length. In the largest size, the platform is 24 in. wide and varies from 44 to 72 in. in length. The height is 10 in. The net weights range from 161 to 352 pounds.

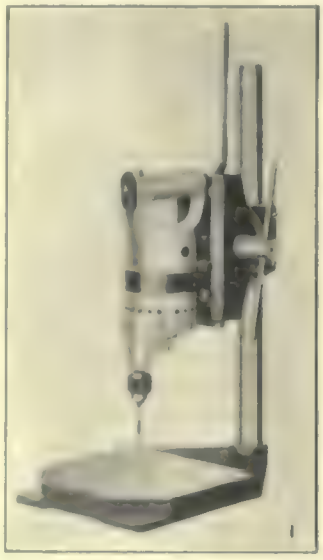
Both styles of trucks just described can be equipped with wide flanged wheels, so that they can be used either on rails or directly on the pavement or ground of the yard or building. In this way, the flexibility is increased, as the trucks are adapted to both indoor and outdoor work.

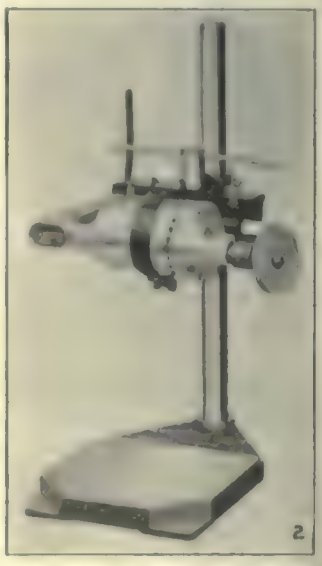


FIG. 2. PLIMPTON HEAVY-DUTY PLATFORM TRUCK

Petersen "Hole Shooter" Portable Drill Stand

The A. H. Petersen Manufacturing Co., Milwaukee, Wis., has recently placed on the market a portable drill stand for use with the "Hole Shooter" electric drill.





FIGS. 1 AND 2. "HOLE SHOOTER" PORTABLE DRILL STAND

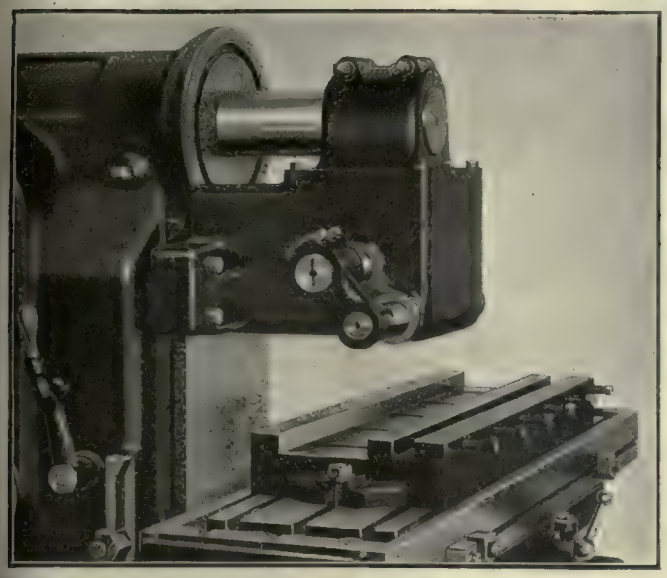
With the drill vertical, as shown in Fig. 1, the combination serves as a bench drill. With the motor swung to the horizontal position, Fig. 2, the device can be used as an electric grinding machine, or for buffing or polishing. Many other applications are possible, due to the fact that the spindle of the machine can be set to operate at any angle. The adjustment is easily made after loosening the setscrews.

The base of the stand is of cast iron, with a finished table 8 x 8 in. The upright is of 1¼-in. cold-rolled steel. The range of travel of the slide is 12 in., and the range of travel of the rack in any one position is 3½ in. The weight of the stand is 30 pounds.

The design and construction of the stand permits the elimination of springs for controlling the rack travel.

Rockford Rack-Cutting Attachment

The Rockford Milling Machine Co., Rockford, Ill., has recently developed the rack-cutting attachment shown in the accompanying illustration for use on its milling machine. The attachment is intended primarily for the purpose of milling racks, but is not limited to this work alone. It is simple in design and rigid in construction. It clamps to the face of the column of the machine, and is further supported by means of the overhanging arm



ROCKFORD RACK-CUTTING ATTACHMENT

above the spindle. The method of clamping provides rigidity, even when taking the heaviest cuts within the capacity of the machine. The attachment is intended especially for use on the heavy-duty milling machine, but can also be furnished to fit the No. 1½ machine.

The attachment is driven from the main spindle of the machine through wide-face, hardened spur gears, driving the pinion keyed to the double-lead worm. The worm is of alloy steel, and provided with ball thrust bearings. A heavy bronze wormwheel of coarse pitch has keyed to it two wide-face spur gears with staggered teeth, providing a smooth drive. Spur gears are cut directly on the spindle, one very close to the front and the other to the rear bearing.

The spindle is of alloy steel and runs in tapered bronze bearings. A single nut provides means of taking up wear on these bearings. A solid shaft runs through the entire drive mechanism and carries a bearing at each end, so as to serve as an overarm support for the cutter arbor. The worm and all gears run in a bath of oil.

A rack indexing attachment and rack vise can also be furnished. The rack-indexing attachment is fastened to the T-slot at the left-hand end of the table, and consists of a bracket which carries an indexing and locking disk with change gears. It provides for cutting racks and making settings without relying on the dials of the milling machine.

The various gear combinations permit racks of different pitches to be indexed, by making either one-half turn, one complete, or two complete turns of the locking disk. Eighteen change gears provide for cutting diametral pitches from 3 to 6 by half pitches, all pitches from 7 to 16 and all even pitches from 18 to 32; also circular pitches from ⅛ to 1 in., varying by ⅛ in. The rack vise has jaws 36 in. long and will open 5⅝ inches.

Atlantic Simplex Safety Stop

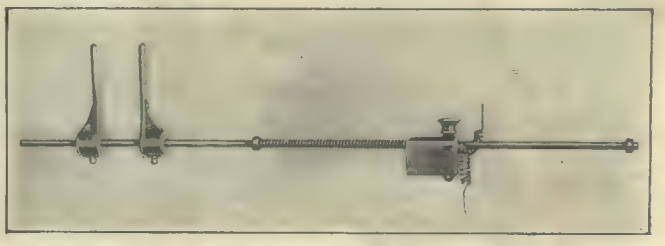
The Atlantic Co., 452 Classon Ave., Brooklyn, N. Y., has recently placed on the market the Simplex safety stop shown in the accompanying illustration. The device is intended for attachment to automatic machines of many types, so as to stop them in case of irregularity or breakage of the work, or change in tension size, speed or some other condition of operation.

The device is operated by current from either a battery, a generator, or the regular lighting circuit. It is wired in series with a Mazda lamp, which remains unlighted normally because the circuit is open. The circuit is closed when the shifter is caused to operate by the irregularity in the work. However, a circuit breaker instantly opens the circuit, so that only a surge of current is necessary. The contact points are thus left without current when the stop has acted, so that there is no danger of the operator coming in contact with the live leads.

A latch in the stop holds a notched shifter rod that keeps the belt in the running position. Wires run from the stops to the contact points that are placed where the trouble may occur in the machine or work. If these points close the circuit the latch is released, and the spring in the rod immediately moves the belt to the loose pulley or disengages the clutch. When the magnets in the stop are energized by current, an armature is drawn out of position so as to release the levers and latch. A hand stop entirely independent of the electrical connection is provided.

The stop can be furnished for either 6 or 110-volt current, either a.c. or d.c. It is made for ½, ⅝ or ¾ in. shifter rods. A spring providing any force up to 75 lb. can be utilized, so that it is possible to shift a 6-in. belt. The stop itself is 3¼ x 2⅝ x 2⅛ in. in size.

The stop may be mounted on the machine in many different ways, and different forms of contact points can be employed. It may be set to give the same effect as the action of a treadle or hand lever. The size of machined work may be controlled to within 0.001 in. by



ATLANTIC "SIMPLEX" SAFETY MACHINE STOP

using the needle of a lathe indicator to complete the electrical circuit. Breaking or knotting in threads or wires being fed continuously can be caused to operate the stop.

Machinist Retires at 102

When Andrew Rafferty, for many years employed as a machinist for the Baltimore & Ohio Railroad at its Washington, Ind., shops, retired a short time ago, there was much discussion as to how old he was. He would give no information on the subject himself so his friends started an investigation which resulted in the discovery that he was 102 years old. He received his naturalization papers in 1864 when he was forty-five years old.



NEWS SECTION

Senate Committee Approves House Tariff Rate on Machinery

A tariff duty of 35 per cent ad valorem for machine tools and parts of machine tools, which had been prescribed by the House of Representatives, was approved by the Senate Finance Committee in the bill reported on April 11. Steam engines and locomotives were given a rate of 20 per cent ad valorem by the Senate committee, an increase of 5 per cent over the rate prescribed by the House. The Senate added to the machinery paragraph, the following:

"Sewing machines, and parts thereof, not specially provided for, valued at not more than $75 each, 25 per cent ad valorem; valued at more than $75 each, 40 per cent ad valorem.

"Cash registers, and parts thereof, 25 per cent ad valorem.

"Printing presses, not specially provided for, 35 per cent ad valorem.

"Lawn mowers, 35 per cent ad valorem.

"Knitting, braiding and insulating machinery, and all other textile machinery, and parts thereof, finished or unfinished, not specially provided for, 50 per cent ad valorem."

Embroidery and lace-making machines, as well as machines for making lace curtains, nets and nettings, are given a 30 per cent ad valorem rate by the Senate. The same rate is applied to all other machines not specially provided for. In this latter case it is a reduction of 5 per cent from the rate contained in the House bill.

The machine tool item is subject to the usual proviso to the effect that "machine tools means any machine operated other than by hand power, which employs a tool for work on metal."

The bill provides that in addition to the duties ranging from one cent per pound to three and one-half cents per pound on steel suitable for toolmaking, an additional duty of 10 per cent ad valorem shall be provided when the steel contains more than six-tenths of 1 per cent of nickel, cobalt, vanadium, chromium, tungsten, molybdenum, or any other metallic element used in alloying steel. An additional cumulative duty of 72 cents per pound is levied on the tungsten content in excess of six-tenths of 1 per cent. A cumulative duty of $1.25 per pound is levied in addition on the molybdenum content of steel in excess of six-tenths of 1 per cent.

Anti-friction balls and rollers, metal balls and rollers used in ball or roller bearings, as well as the bearings themselves, whether finished or unfinished, are given a duty of 10 cents per pound and 55 per cent ad valorem. The Senate raised the ad valorem portion of the rate from 35 to 55 per cent.

Among the articles on the free list are the following:

Agricultural implements: Plows, tooth or disk harrows, headers, harvesters, reapers, agricultural drills and planters, cultivators, thrashing machines, cotton gins, machinery for use in the manufacture of sugar, wagons and carts, centrifugal cream separators operable by hand power, and all other agricultural implements of any kind or description, not specially provided for, whether in whole or in parts.

Temporary Receivership for Rivett Lathe and Grinder Company

As a result of the general business depression the affairs of the Rivett Lathe and Grinder Company have been placed in the hands of a receiver. The court has authorized the receiver to continue production without a break. The sale of receiver's certificates has provided ample funds for operation and the factory is now running on an increased schedule with the original personnel. The company is ready to receive and fill orders as usual and expects that a reorganization will soon terminate the receivership as assets are conservatively estimated to be three times liabilities.

Automotive Exports Gain

Total exports of automotive products from the United States during February gained 23 per cent over January, according to figures compiled by the automotive division of the Department of Commerce. A decrease of 2 per cent in number and 15 per cent in value of motor truck shipments was more than offset by an increase of 38 per cent in the value of motor vehicle parts exported as well as a gain of 29 and 26 per cent respectively in the number and value of passenger car shipments. Passenger cars valued below $800 and over $2,000 and motor trucks up to one ton and above 2½ tons capacity made the best showing. Shipments of electric cars and trucks decreased nearly two-thirds.

Courts Decide Government Suits Over War Contracts

The Bethlehem Steel Co. has been awarded $67,000 from the government for royalties on its patents on machinery which were used by the Government at the Watervliet Arsenal. This is a result of a decision of the U. S. Supreme Court in affirming the decision of the Court of Claims, holding that the steel company was entitled to this recovery. The Government appealed the case to the Supreme Court, but on April 10 Justice McKenna, for the court, sustained the Court of Claims in its award to the steel company.

The Court of Claims has dismissed the petition of the Poole Engineering and Machine Co., Baltimore, Md., against the Government for the recovery of $225,000 for excess labor and overhead costs on account of government gun carriage contracts. The suit was based on the claim that the Ordnance Department delayed deliveries of material for the work and also made numerous changes in the plans which added to the cost of manufacture.

Senate Grants $10,000 for Standardization of Farm Machinery

The Senate has adopted an amendment to the agricultural appropriation bill appropriating $10,000 for co-operative investigations by the Department of Agriculture and the Bureau of Standards of the Department of Commerce, looking to standardization and simplification of farm implements and machinery and repair parts, with a view to their more economical manufacture and use. Senator France, of Maryland, proposed the amendment, which provides for investigation by the Agricultural Department and urged the necessity for standardization and simplification of farm machinery. Senator Jones, of Washington, pointed out that the Department of Commerce, through its Bureau of Standards, was already engaged in standardization work, and that it could take up farm machinery. Senator Jones proposed a modified amendment for carrying on the work by the two departments, whereupon it was adopted. Senator King, of Utah, opposed extreme standardization on the ground that it will curb inventive genius.

Editors Have Busy Day at Washington

The meeting of the National Conference of Business Paper Editors on April 13 was of particular interest. In a brief meeting in his office, General Dawes told of the work of co-ordinating the activities of the different departments of the Government so as to conserve resources and avoid duplications. With General Dawes as a guide the editors went to the White House and were presented to President Harding, as a body who had co-operated fully and earnestly with the department in its endeavor to dispose of surplus property of the various war activities.

This was followed by a meeting in the Department of Commerce, presided over by James H. Defrees, to discuss the data and experiences which had arisen as a result of the Unemployment Conference. As was pointed out by Mr. Stone, of Rochester, the elimination of seasonal work as a cause of unequal employment, was more a merchandizing than a production problem, E. E. Hunt, secretary of the Unemployment Conference, spoke of the desirability of co-operation and the desire to publish data which would be of real value, rather than a book which looks well on the shelves but is never consulted. Ernest F. DuBrul spoke of the use of data on business cycles, the tendency to consider peak production as normal and the necessity of knowing costs.

Following this was a meeting at which Col. Roosevelt, Assistant Secretary of the Navy and Admiral Coontz spoke. Both pointed out that the reduction of the Navy to 67,000 men, as proposed by the Senate, would bring it below the 5-5-3 ratios. Both contended that personnel was the main thing in the Navy and asked for 96,000 men. Admiral Coontz pointed out that navy officers did much for foreign commerce, an admiral in Constantinople at the present time being the only means of business communication with Turkey. In speaking of the close relation between the Navy and business he said: "War is only commerce carried beyond a certain stage."

The usual dinner meeting with Secretary Hoover ended the program.

Cincinnati Letter

The shops in the Cincinnati territory are running about the same as they were a week ago. A few have added to their working forces. The Wm. Powell Co. is busy installing equipment in its new plant on Colerain Ave. The Cincinnati street railway directors have ordered the traction company to put on more cars to accommodate the workers during the early morning and late evening hours on the line running to the Oakley factory colony. The Newport Rolling Mill and the Andrews Steel Co. report that they are running 100 per cent of their pre-war capacity and that prices have advanced on their products.

The demand for used equipment during the last week has not been as large as in some weeks in the past, but prospects are very good. The manufacturers of radio apparatus are busier than they ever were before, and cannot keep up with the ever increasing demand. The general outlook is that April business will be at least as good as March.

Comparison of Proposed and Existing Tariff Duties

The following figures are taken from a complete list of proposed tariff duties and the present figures of the Underwood Law as published in the *New York Times* of April 12. In this list the unit of taxation, as weight, volume, square or cubic measure, or ad valorem is stated after the name of the article.

	Senate Bill	House Bill	Underwood Law
Pig iron (ton)	$1.25	$1.25	Free
Scrap iron and steel (ton)	$1.00	$1.00	Free
Molybdenum (lb.)	75c.	75c.	Free
Tungsten ore (lb.)	45c.	43c.	Free
Ferromanganese (ton)	$2.50	2.2c. lb.	Free
Manganese metal (%)	20	2.2c. lb.	10
Ferromolybdenum (lb.)	$1+15%	$1+17%	15%
Tungsten compounds (lb.)	60c.+25%	72c.+15%	15%
Tungsten alloys (lb.)	60c.+25%	72c.+15%	15%
Ferrosilicon, 8-30% silicon (lb.)	2c.	2¼c.	15%
Ferrosilicon 30-60% silicon (lb.)	2c.	2¾c.	15%
Ferrosilicon, 60-80% silicon (lb.)	3c.	3 1-5c.	15%
Ferrosilicon, 88-90% silicon (lb.)	4c.	4c.	15%
Ferrosilicon, over 90% silicon (lb.)	8c.	8c.	15%
Ferrochrome, 8% chrome (lb.)	3¼c.	3¼c.	15%
Ferrochrome, under 3% chrome (%)	30	30	15
Other steel alloys (%)	30	30	15
Cerium metal (lb.)	$2.00	30%	30%
Cerium alloys (lb.)	$2+25%	30%	15%
Bar iron (lb.)	0.2-1¼c.	0.2-1c.	5%
Steel ingots, &c. (lb.)	0.2c.-25%	0.2c.-20%	Free
Steel bars (lb.)	0.2c.-25%	0.2c.-20%	15%
Steel circular saw plate (lb.)	¼c.	¼c.	12%
Boiler plate (lb.)	7-20c.-20%	7-20c.-20%	12%
Sheet iron or steel (lb.)	45-100c.-20%	45-100c.-20%	12%
Coated iron on steel sheets (lb.)	0.2c.	0.2c.	15%
Structural steel (%)	30	25	10
Hoop and band steel (lb.)	25-100c-35%	25-100c.-20%	35%
Coated hoop and band steel (lb.)	¼c.	¼c.	Free
Wire rods (lb.)	0.3-0.6c.	0.3-0.6c.	10%
Steel wire (lb.)	¼c.-40%	¼c.-30%	10-25%
Galvanized wire (lb.)	¼c.	¼c.	15%
Anti-friction balls (lb.)	10c.—55%	10c.—35%	35%
R. R. fish plates (lb.)	¼c.	¼c.	10%
Other R. R. bars (lb.)	7.40c.	7.40c.	Free
Steel axles (lb.)	0.6c.	0.6c.	10%
Steel R. R. wheels (lb.)	1c.	1c.	20%
Seamed steel tubes (lb.)	¾-1¼c.	¾-1¼c.	20%
Flexible metal tubing (%)	35	25	20
Chains (lb.)	¼c.	¼c.	20%
Machine chains (%)	50	30	25
Nuts and washers, (lb.)	0.6c.	0.6c.	5%
Bolts, (lb.)	1c.	1c.	10%
Spiral nut locks, (%)	40	30	30%
Rivets and studs, (%)	40	25	20
Other steel rivets, (lb.)	1c.	1c.	20%
Iron or steel grit, (lb.)	¼c.	1c.	30%
Jewelers' saws, gross	40c.	40c.	12%
Steel printing plates, (%)	25	15	15
Needles, per M	$1.15+40%	$1.15+25%	20%
Latch needles, per M	$2+50%	$2+35%	20%
All other needles, (%)	45	30	20
Laboratory instruments (%)	50	40	Free
Nippers and pliers (dozen)	8-12c.+50%	8-12c.+25%	30%
Files (dozen)	25-77¼c.	25-77¼c.	25%
Swiss pattern files (%)	50	25-27½	25
Watch movements	$1.25-$10.75	$1.25-$10.75	30%
Watch case and parts (%)	50	35	30
Clocks and clock movements	50%	35%	30%
Same with jewels	$1-$3+50%	$1-$3+35%	30%
Clock parts (%)	55	40	30
Automobiles and parts (%)	25	25	30-45
Airplanes and motorboats (%)	30	30	*
Bicycles (%)	45	30	25
Motorcycles (%)	25	30	25
Steam engines and locomotives (%)	20	15	15
Sewing machines under $75 (%)	25	Free	Free
Sewing machines over $75 (%)	40	Free	Free
Cash registers (%)	25	Free	Free
Printing presses (%)	35	35	15
Embroidery machines (%)	30	35	25
Textile machinery (%)	50	35	25
All other machines (%)	30	35	25
Aluminum, crude (lb.)	5c.	5c.	2c.
Aluminum, plates, bars, &c. (lb.)	9c.	9c.	3½c.
Magnesium, metallic (lb.)	50c.	$1	25%
Magnesium, alloys (lb.)	50c.+20%	$1+20%	25%
Antimony metal (lb.)	2c.	1½c.	10%
Bismuth (%)	2½	Free	Free
Cadmium (lb.)	15c.	Free	Free
Liquidated antimony (lb.)	¼c.	Free	Free
German silver (%)	20	20	15
Nickel silver (%)	30	20	15
Copper rolls (lb.)	2½c.	2½c.	5%
Brass rods, &c. (lb.)	4c.	4c.	20%
Seamless brass tubing (lb.)	8c.	8c.	20%
Brazed brass tubes (lb.)	12c.	12c.	20%
Bronze rods and sheets (lb.)	4c.	4c.	20%
Bronze tubes (lb.)	8c.	8c.	20%
Quicksilver (lb.)	25c.	35c.	10%
Nickel in pigs (lb.)	3c.	5c.	10%
Nickel bars and sheets (%)	25	30	20
Tin in bars and pigs	Free	2c. lb.	Free
Lead bullion and pigs (lb.)	2½c.	2½c.	25%
Lead in sheets (lb.)	2½c.	2½c.	25%
Zinc-bearing ore—			
Under 10% zinc	Free	Free	10%
10@20% zinc	¼c.	¼c.	10%
20@25% zinc (lb.)	1c.	1c.	10%
Over 25% zinc (lb.)	1¼c.	1¼c.	10%
Zinc in pigs (lb.)	1¼c.	1¼c.	15%
Zinc in sheets (lb.)	1¼c.	1¼c.	15%
Zinc in plated sheets (lb.)	2c.	1¼c.	15%
Old zinc (lb.)	1c.	1c.	15%
Other metal articles or wares (%)	40	35	20@50%

The Machine Tool Market in Italy

By LUIGI MARZOLI

The metal working industries of Italy have experienced a great deal of trouble since the end of the European war. The heavy burden of our political mistakes has struck several bad blows to the young Italian industries, and particularly to the metal working branches.

No doubt you have noticed the greatest of our industrial griefs—when the workmen seized the factories. The result, however, was morally good, because the experiment has shown plainly the impossibility of running an industrial organization under socialistic laws and regulations. Since that time our workmen have become more reasonable in their demands and more efficient in their work, and it has been possible to purge the factories of the bolshevist elements.

We now have the great evil of taxation which is altogether too high and which is a tremendous handicap to all our industries. This is not only the case in Italy, but generally throughout Europe. However, our country leads all in taxation per capita and we are confident that our powerful allied creditors will show wisdom in trading with us, and in so doing aid business relations.

Our government has voted to seize all excess war profits, and this law has resulted in great difficulty for all those firms which had invested enormous amounts of money in new plants and equipment, but the government had to satisfy the radicals. The people have been disturbed by the length of the war and the unsatisfactory results, so something had to be done, even though it added more men to the armies of unemployed.

Labor unrest, heavy taxes, and in some cases poor management have ended in a very bad situation for some of our large mechanical industries like Ansaldo and Ilva. The average condition of these industries is one of hopeful waiting for better business. Very few are working at all, and those who have orders are working with reduced forces and on short-time schedules. There has been a great scarcity of waterpower due to the very dry winter.

The motor car builders have also suffered from lack of orders, which is partly due to the high internal taxation on car licenses. Fortunately this tax has now been reduced to about one-half and the motor car industry is registering improved business. It is worth mentioning here that the automobile industry is one of the most extensive industries in Italy and the automobile factories are the most fertile market for American machine tools.

The machine tool building industry in Italy was developed very little during and since the war. Firms like Tassoni, Zust, Michele Ansaldi, Dubosch and a few others have produced some well designed tools, but altogether there is no real competition. The strongest competitors in our markets for machine tools are the German manufacturers, but as our engineers prefer American built machines I believe it would be advisable for the American machinery and machine tool builders' associations to endeavor to make a commercial treaty with Italy, and thereby assure a special low tariff on imported American machine tools. Since July 1, 1921, Italy has applied a new general tariff rate on imports of machine tools. This rate imposes a duty of from 40 to 112.50 gold liras for every 100 kilos between 5 and 10 tons. Automatic machine tools carry an extra duty of from 15 to 50 per cent, according to the weight of the machine. Small tools such as taps, dies, reamers, milling cutters and twist drills are charged according to the weight from a minimum of 100 to a maximum of 540 gold liras. This new tariff is not very high, but the difficulty is that it must be paid in gold, which under the present exchange is four times the old rate.

It has been noticeable that very little business in the machine tool line has been done in this country since the middle of the year 1920, and we do not see any signs of improvement. In 1921 there were almost no inquiries for machines of any make. The situation in the small tool market is not quite as bad, and in spite of the keen German competition American and English made tools lead in the Italian market. American and English made files dominate the Italian shops and twist drills are also exclusively of American or English make. German made twist drills are now being introduced, but past experience has proved that they are of inferior quality. In Trieste during 1920 it was impossible to sell any but the German makes of tools, mainly because of their low price, but in 1921 American and English made tools were consistently inquired for because it was learned that the average German tool was of a very low standard. Most of the German machines introduced in Italy after the war were poor copies of American built machines. Of late, though, German designs have been greatly improved.

Regarding tool steel and special alloy steel it is remarkable the laxity of almost all American and English makers, who have done nothing to hold the priority which they had in Italian markets immediately after the war. In this field the German manufacturers have displayed wonderful organization in opening large stores with plenty of stock and giving the steel users the best attention and assistance in order to popularize their several brands of tool steel.

There is one field in the mechanical industries which shows some prosperity during these dull times. That is the application of scientific instruments in our shops. The managers of our factories have come to realize the wonderful results to be obtained by the application of modern control methods and testing apparatus, and if they cannot afford to buy new machine tools they have at least kept up to date with American made instruments of this particular class.

Business Outlook in Foreign Markets

Cable dispatches and other reports coming from representatives of the Department of Commerce in foreign countries, indicate a continued, though slow resumption of business. The demand for American products is good, but is retarded somewhat by the depreciated foreign currencies and the fluctuating exchange rates.

Czecho-Slovakia shows considerable activity in the iron and steel trade. Three companies have merged their selling organizations into what is called the "Combined Iron and Steel Works," and other concerns are expected to join in the movement. The purpose of the organization is to regulate the production and marketing of iron and steel products and to encourage trade with foreign countries.

In order to promote foreign trade the syndicate reimburses domestic machine shops which purchase iron from it, to the extent of 40 crowns per 100 kilos of iron—providing the finished product was shipped abroad.

The combine was started by the Prague Iron Works and has been joined by the Vitkovice Iron and Steel Works and the Austrian Iron and Steel Works.

The Japanese government (lower house) has passed a bill providing for the rapid extension of railways all over the empire. Large sums will be expended for equipment and improved service facilities.

In Belgium, iron and steel production is gradually showing improvement. Production for February was in metric tons: Pig iron, 91,710; raw steel, 78,870; rough castings, 5,130; finished steel, 81,870; finished iron, 7,751.

In Thrace, agricultural development is calling for modern implements and especially for tractors. There are about seventy-five tractors in use there at present, one-half of these being American.

A bill recently presented to the Spanish legislature provides for reductions in duties on several items including iron, steel and machinery and equipment. It is expected that the bill will receive favorable attention.

Industrial fairs and exhibitions are to be held at Munich, Germany; Marseille, France; Valencia, Spain, and Lausanne, Switzerland, during the next few months. American products will be shown at all of these.

Welding Society Meeting

Plans have been completed for the annual meeting of the American Welding Society, to be held in the Engineering Societies Building, New York City, on April 26, 27, 28 and 29.

The program has been laid out to cover a wide range of subjects pertinent to welding operations and the speakers have been chosen from the foremost in that field. Committees on various specifications and standardizing projects will report their findings. Various kinds of welding and welding apparatus will be explained and discussions allowed so as to bring out the sentiment of the organization.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
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In so far as domestic business is concerned the most important event of last week was an oversubscription to an offering of $150,000,000 six months Treasury Certificates bearing interest at only 3½ per cent.

Almost concurrently the Bank of England reduced its rate to 4 per cent and, although the Federal Reserve Bank statement showed no change in the reserve ratio or otherwise, the impression is strengthened that we are in for a long period of easy money on both sides the Atlantic. In New York the best commercial paper is salable at 4½ per cent, and eligible bank acceptances are quoted at 3½, while 90-day bankers acceptances are readily marketable in London at 2½ per cent.

An early reduction in the Federal Reserve rate for rediscounts is therefore confidently expected, some issues of Liberty Bonds have sold at par or higher, the market for other bonds is described as "boiling" and both railway and industrial shares have been very responsive to rumors or announcements that could be plausibly construed as bullish.

The Trade Balance

Sentiment on the Stock Exchange has in fact become almost unanimously optimistic, and the textile strike, the coal strike and a foreign trade statement for March, which shows an excess of exports of only $74,000,000 as compared with $134,000,000 in the same month last year, have been entirely ignored.

Of course cheap money is a powerful tonic, but it is questionable whether it can permanently overcome the dispiriting influence that the idle cotton mills and coal mines exert, and if the strikes last much longer the prevailing enthusiasm over the outlook may be chilled. Thus far there is but little indication that either the employers or the employees are disposed to yield or compromise. As to our foreign trade it has been for some time evident that we could not continue to export more than we import, but there is a traditional fear of an "adverse trade balance" in the United States and however logical it may be, its psychological effect may also be "adverse."

It is, however, probable that the impetus the upward movement has acquired will enable speculators to "carry on" for some time yet and while I would again advise those who use borrowed capital in their business to cover their prospective requirements at present rates and as far ahead as possible, there is as yet no reason to expect any serious reversal in the upward tendency of the security market.

As always at such periods, there is much talk of mergers, consolidations and other "deals" to excite the public imagination, and there is good reason to expect that in so far as the railroads are concerned some important consolidations are being very seriously considered.

Turning from finance to commerce and industry the most surprising item in the week's news is the domestic cotton consumption for March, which shows an increase when everyone expected a decrease as a result of the New England strike.

This brings the total domestic consumption of cotton from Aug. 1 to April 1 to 4,002,975 bales as compared with 3,170,592 bales during the same period last year, and furnishes convincing proof of the recovery that has taken place in one of our most important industries.

Exports are also running heavier, a very serious shortage of cotton goods is reported from Germany, as well as from other Continental countries, and the outlook seems to indicate an eager demand for as much cotton as the South is likely to produce next season.

The woolen industry has also been invigorated by an interview with President Wood of the American Woolen Co. in which he stated that "we are on the very brink of prosperity." His faith in this declaration is evidenced by the action of his company in advancing woolen cloths by from 10 to 45 cents a yard. Several leaders of the steel industry have expressed themselves in the same strain as to the future of their business, and nearly all the steel fabricating plants are now at work. Raw silk and silken textiles are also higher. Coffee has gone well above ten cents a pound for May delivery. Sugar is firm despite the bearishness of some trade authorities. The National Lumber Trade Barometer says that "production is not keeping pace with the demand" and prices are higher. Building materials have again advanced. Bradstreet's estimates the authorized expenditure for new construction in March at $234,000,000, as against $118,000,000 in the same month a year ago, and a serious shortage of mechanics is reported from many of the larger cities.

Automotives Prosperous

The automobile manufacturers seem to be confident of a big demand for cars. Gasoline is higher. So is rubber, and the retail stores patronized chiefly by the women compose about the only trade group that is not confidently cheerful. Possibly the prosperity has not reached to the outermost circumference of the business circle as yet, or possibly those who buy new cars can't buy new clothes also, but when the crops are marketed the money realized will probably find its way into the tills of the retail shops.

The only serious shadow athwart the future is a tariff bill that pleases nobody, and which if passed will probably reduce our exports because it will make imports almost impossible. The bonus bill still threatens also, but there is reason to hope that the dominant element in Congress has been made more cautious by the recent by-elections in Connecticut, Illinois and New York, and that its ear is now so close to the ground that it can hear the protests of the business men against these two measures.

All other foreign developments have been obscured by the Genoa Conference, where the friction that has from time to time occurred led Lloyd George to remark that "there is nothing so explosive as a peace conference." It is too early to say what will result from the gathering, but the fact that Russia, Germany and the Allies are now at the same council table is auspicious, and despite an occasionally acrimonious interchange of views there is every reason to hope that the conference will prove to be another milestone on the road to the economic reconstruction of Europe.

This hope is encouraged by the action of the foreign exchange market, which is distinctly firmer for sterling, francs and lire.

From the cable reports it would appear that Lloyd George, John Maynard Keynes and some others at Genoa are still disposed to think that European inflation can be corrected by the "revaluation" or "devaluation" of the paper currency outstanding, but this idea is regarded as visionary and the best opinion is that it will only be possible to stabilize exchange by reopening all the world's markets to trade.

If this can be accomplished the prosperity now so generally expected will be a fact, but America will not share it unless her people and her legislators are willing to admit the truth as stated by Lloyd George when he said:

"The world is one economic unit. Economically it is not even two hemispheres. It is one round unbroken sphere."

W. N. Best, Inventor of Oil Burners, Dead

William Newton Best, president of the W. N. Best Furnace and Burner Corporation, of New York, and the holder of many patents for inventions in the oil-burning industry, died on April 11 at his home in Brooklyn. He was in his sixty-second year. He was the author of "Science of Burning Liquid Fuel" and was a fellow of the Royal Society of Arts, London, and a member of the American Society of Mechanical Engineers, the American Institute of Mining and Metalurgical Engineers, the American Institute of Metals, the American Railway Mechanics' Association and was vice-president of the Goodwill Industries of Brooklyn.

The Trend of Business Improvement—Plants Resuming

The Wincroft Stove Works, Middletown, Pa., is maintaining close to capacity production at its plant, with a night force working in a number of departments. Present orders total approximately 50 per cent in excess of those at this same time a year ago.

The Earl Motors, Inc., Jackson, Mich., manufacturer of automobiles, has resumed operations in all departments of the plant. This is the first time that production has been on this basis for a number of months.

The Timken Roller Bearing Co., Canton, Ohio, has adopted a night shift in addition to regular day operation in all departments at its plant.

The Reading Iron Co., Reading, Pa., has increased the wage scale of puddlers at its plant from $6 to $6.50 a ton. The wages of laborers have been advanced from 22½ to 24½ cents an hour. The plant is maintaining active production under regular operating schedule.

The Osgood Bradley Car Co., Worcester, Mass., will increase its working force by 300 to 500 men. The plant is operating on a 48-hour week schedule, giving employment to about 1,000 men. The company has just received an order for 200 steel coaches from the Boston & Maine Railroad, at a contract price aggregating $2,000,000.

The Warner Gear Co., Muncie, Ind., is arranging for the early resumption of operations at close to normal capacity. Additions will be made to the working force.

Dodge Brothers, Detroit, Mich., manufacturers of automobiles, are perfecting arrangements for an increase in manufacture from 600 to 750 cars per day.

The Studebaker Corporation, South Bend, Ind., manufacturer of automobiles, is maintaining full capacity operations in all departments, and in May will increase the output of closed-type cars to 100 a day, representing about 25 per cent of the production of all styles. An appropriation of $1,250,000 has been arranged for plant expansion, to include the erection of a storage and shipping building to cost about $750,000, with equipment, and a power plant to cost $500,000.

The Chickasaw Car Co., Birmingham, Ala., is increasing operations at its plant to handle current orders. The company has secured a contract for 50 cars from the Atlantic Coast Line Railway, and will repair 3,000 cars for the Seaboard Air Line Railway. Negotiations are being closed for a portion of a 2,000 freight car order from the Louisville & Nashville Railroad.

The Pennsylvania Railroad Co. has increased operations to close to normal at its Todd's Cut, Del., car shops. Two hundred men have been added to the working force during the past fortnight, bringing up the working quota to about 1,000 employees.

The Warner Corporation, Muncie, Ind., manufacturer of automobile parts, has adopted a day and night production schedule, giving employment to about 350 men. The bulk of output is for the Durant Motor Co.

The Durant Motors, Inc., New York, is operating its plants at Long Island City and Lansing, Mich., on a capacity basis, and has plans in progress for enlargements at both factories for the establishment of departments for the manufacture of the new Star automobile. It is proposed to develop a total output of 20,000 cars a month. The bulk of operations will be devoted to assembling.

The Edward G. Budd Manufacturing Co., Philadelphia, Pa., manufacturer of all-steel automobile bodies, has adopted a capacity operating schedule at its plant, with night shift working in certain departments. The company has secured sufficient orders to insure this basis of production for about ten months to come.

The General Motors Corporation is adding to the working force at its Muncie Products Co. division, Muncie, Ind. About 900 men are now employed and this number will be increased each week. Other units of the company at this place are now giving employment to approximately 600 operatives.

The Liberty Motor Car Co., Detroit, Mich., has adopted a capacity schedule at its plant, with sufficient orders on hand to insure operations on this basis until well into July. The plant was reopened in February after a shut down of a number of weeks, and has increased the output twice since this time.

The Elliott Blair Steel Co., Mercer, Pa., has inaugurated capacity production at its plant, with the employment of two shifts of workers.

The Upson Nut Co., Cleveland, Ohio, has adopted a full time, full production schedule at its bolt and nut department.

The Logan Iron and Steel Co., Burnham, Pa., has adopted a full-time operating schedule in all departments at its plant. The company has orders on hand for staybolt iron and other material for locomotive construction.

The White Motor Co., Cleveland, Ohio, is increasing operations at its plant and will add about 150 men to the present working force.

The Pennsylvania Railroad Co. is increasing the number of employees at its car and locomotive shops at Renovo, Pa., including machinists, blacksmiths, boilermakers, pipe fitters and car repairmen. Additions will also be made in the working force at the Northumberland, Pa., shops. Both plants will revert to a pre-war basis of operation.

The Southern Pacific Railroad Co., Chicago, Ill., is taking bids for the construction of 2,000 single-sheathed, steel superstructure automobile cars of 50-tons capacity, comprising the largest order for this class of equipment ever placed by a western railroad.

The Lindstrom Tool and Toy Co., 50 Silliman Ave., Bridgeport, Conn., recently added one hundred and fifty employees in the toymaking department.

The Ashcroft Manufacturing Co., Bridgeport, Conn., subsidiary of Manning, Maxwell & Moore, Inc., report increased orders, necessitating hiring additional help. The plant is working steady.

Department of Agriculture as Aid to Farmer in Selecting Machinery

Increased activity in rural engineering problems is proposed by the Department of Agriculture. Prof. E. D. Ball, director of scientific work of the department recently asked the Senate Committee on Appropriations to increase from $33,000 to $48,000 the appropriation for rural engineering work. He says this work contemplates the possibility of improving the designs of warehouses, including storage cellars for sweet potatoes, deciduous fruits, farm buildings, farm machinery, etc. With the farmer spending millions for tractors, there are requirements for farm machinery to go with the tractors.

Dr. Ball also points out that the farmer is spending a large amount of money on buildings and machinery that do not pay. The department proposes to secure a rural engineer for this work but is handicapped by the $4,500 salary limitation. The American Association of Farm Machinery Manufacturers has endorsed the work, as it desires the department to study farm machinery and determine what is a most desirable type of farm machinery to use with a certain type of tractor. At present no one knows which is the most economical type of machine or plow or harrow necessary for the tractor. There is a desire to standardize farm machinery and reduce the number of extra parts of machines. It is said that the farmers could be saved millions of dollars a year if farm machines were placed on a standard pattern so that an extra part would fit one machine as well as another.

Robinson Company Makes Safety Record for 1921

The employees of the H. H. Robinson Company plant at Ambridge, Pa. have been awarded the Rice Safety Award bronze tablet by the National Safety Council. The company has achieved what was thought to be impossible—a year without accident and no lost time by workmen through such mishaps. The award was made at the fourth annual banquet of the Western Pennsylvania division of the council, which was held in Kaufman's in Pittsburgh.

W. E. Megraw, safety director of the Robinson company, received the tablet in the name of the employees. Twenty-five members of the company's staff attended the ceremonies.

Engineers to Travel on Gas Railway Cars

The Metropolitan Section and the New England Section of the Society of Automotive Engineers will hold a joint session on April 21. The members from New York will go to New Haven via gasoline driven rail cars, through the courtesy of the New Haven Railroad. The session will be devoted to a study of this comparatively new type of rail transportation. The engineers will have luncheon at the Yale University Dining Club at noon and will be addressed by Prof. Lockwood of the Yale laboratories.

Legislation To Convert Battleships to Airplane Carriers

The House Committee on Naval Affairs in reporting the naval appropriation bill for the year beginning July 1, 1922, recommends that two of the battleships and two of the battle cruisers to be scrapped under the naval limitations treaty, be converted into airplane carriers.

It gives the comparative costs for hull and machinery for completing the battleships and cruisers and for converting them into carriers for airplanes. It estimates that it would cost $115,000,000 for hull and machinery to complete the two battleships and the two battle cruisers and fifty-nine smaller vessels. To alter and complete two battle cruisers as aircraft carriers would cost for hull and machinery $31,887,000. It estimates that it would cost $48,000,000 for hull and machinery to build two aircraft carriers complete.

The Navy had estimated $53,000,000 for construction and machinery for naval vessels which was made unnecessary by the naval limitation treaty.

The bill, introduced by Represented Butler on April 7 follows:

A BILL

Authorizing the president to Scrap Certain Vessels in Conformity with the Provisions of the Treaty to Limit Naval Armaments, and for Other Purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress Assembled, That for the purpose of giving effect to the provisions in the treaty to limit naval armament, concluded Feb. 6, 1922, by the United States of America and the British Empire, France, Italy, and Japan, respecting the abandonment of shipbuilding programs and the scrapping of capital ships in excess of the number which the United States may retain in conformity with the said provisions, the President of the United States be, and he is hereby, authorized to make such disposition, as in his judgment may be proper, of any capital ship of the Navy built or building and to cause to be taken such action as is necessary for the scrapping of capital ships to be dealt with in that manner in accordance with the said provisions.

Sec. 2. That the President of the United States is hereby authorized and empowered to discontinue the construction of and to cancel or modify any contract entered into for and on behalf of the United States for the construction of seven of the first-class battleships and the six battle cruisers authorized in the Act entitled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1917, and for other purposes," approved Aug. 29, 1916, and for the machinery, materials, equipment, armor, armorment, and ordinance equipment therefor: *Provided,* That whenever any such contract is canceled or modified just compensation therefor shall be made in the manner and upon the basis provided in the Act of July 1, 1918, entitled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1919, and for other purposes," out of any funds hereafter to be appropriated for that purpose.

Sec. 3. That of the battle cruisers authorized in the Act entiled "An Act making appropriations for the naval service for the fiscal year ending June 30, 1917, and for other purposes," approved Aug. 29, 1916, the President of the United States is hereby authorized to undertake the conversion of the two battle cruisers now building which in his judgment are furthest advanced in construction, or will be the most economical to convert into airplane carriers, within the limits of cost heretofore authorized for said battle cruisers; and the President is hereby further authorized to utilize any such funds and materials that may be on hand or under contract at this time for the construction of battle cruisers heretofore authorized.

Proposed Merger of Machine Tool Concerns

THE proposed merger, mention of which was made in the March 23 issue, has not gone through.

An announcement has been made by the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, that it is not in any merger or combination, but will be operated independently as in the past, under the management of J. Wallace Carrel, vice-president and general manager.

A similar announcement has also been made by the Carlton Machine Tool Co., of Cincinnati. This company will continue to be operated independently under the management of Jack C. Carlton, president and general manager.

Chicago Letter

There is a rather cheerful spirit of optimism among the machine tool dealers in the Chicago district and according to all indications April promises to far exceed the past three months in the amount of business. In general, the orders booked are from widely scattered sources and very few of them are large.

No reports have come of the railroads buying in the past week, although their inquiries for machinery have become more pronounced. As usual the list is topped by the Santa Fe. This road has added some thirty or thirty-five machinery requirements to its outstanding list. An extensive list from the Illinois Central remains among the expectations of the dealers. This road, however, recently purchased a 15-ton pillar crane from the Whiting Corporation.

Activities continue strong in the steel industry. Last month was looked upon as a banner month.

Building permits for 1,327 buildings involving a cost of $19,333,900 were issued in Chicago during March. This cost practically exceeded all others since August, 1911. The marked increase in construction was also felt in other lines; for instance the Common Brick Manufacturers' Association of America, in its monthly digest, reports that the deliveries of brick through the months of February and March were at a rate that promises a season's output closer to normal than has been experienced in the last two years. This sounds a little like a statement made by a local manufacturer and dealer in machine tools to the effect that he could, after many months, truthfully say that business was satisfactory and somewhat pleasing.

The Rail Joint Company received an order for a number of 100 per cent rail joints from the Chicago, Indianapolis & Louisville R.R.; one for 1,250 rail joints from the Chicago & Eastern Illinois R.R.; and another for 18,000 joints from the Atchison, Topeka & Santa Fe. There is also a report that the Illinois Steel Company received an order from the Wabash Railroad for 160,000 tie plates.

The entire assets and liabilities of the L. A. Allthoff Co., of Illinois, have been taken over by the L. A. Althoff Manufacturing Co., Inc., Laporte, Ind. It is understood the corporation recently completed a plant and is in the market for a few machine tools and other equipment.

The Crown Foundry Co., East Peoria, Ill., a recently incorporated concern, is erecting a plant at East Peoria, and will manufacture gray iron, chilled and semi-steel castings. This company is in the market for complete equipment for the new plant.

A slight ray of hope has been placed by the machine tool dealers on the recent rumor of an increase in the price of steel.

Cleveland Letter

Another indication of the comeback in industry in the Cleveland, Ohio, district, is the announcement last week that the Sterling-Knight Motor Company is preparing to produce the Sterling-Knight automobile at an early date. Negotiations for the purchase of the Accurate Machine Company's plant, in the east end of the city, were completed. This part of the project alone involves $1,000,000 officials state. The company is headed by P. H. Withington, and the mechanical developments are under direction of J. G. Sterling, formerly chief engineer of the F. B. Stearns Company, of Cleveland. It is planned to build the complete chassis of cars in the plant. Already 200 cars have been sold, officials assert. Plans call for starting deliveries during August.

Plans for opening its Canton, Ohio, plant are being considered by officials of the Hydraulic Pressed Steel Company, of Cleveland. Both Cleveland plants are running day and night forces since the number of orders for steel building material, automobile parts and the like have increased.

Test of Airplane Wing in Flight

A full-sized airplane wing suspended below an airplane in high-speed flight will be tested at the Langley Field laboratory of the National Advisory Committee for Aeronautics. This will be the first time that a real wing has been tested in actual flight, and is the final step of developing a new method of testing the performance and lifting properties of airplane wings.

The method recently demonstrated successfully with model wings in air flights, consists in carrying the wing to be tested below an airplane in flight and, by means of suspension apparatus and recording instruments, to measure the forces of lift and resistance directly from the wing.

A complete airplane cannot be tested in flight as there is no means nor method of measuring the factors desired; there is nothing to suspend the plane from and its lift or pull cannot be measured by instruments carried on the plane itself.

Business Items

Announcement has been made of the division of the Lynn, Mass., works of the General Electric Company into two sections, to be known as the West Lynn Works and the River Works. F. P. Cox has been appointed manager of the West Lynn Plant and Nelson J. Darling manager of River Works, both succeeding Richard H. Rice, deceased, who formerly exercised control over the entire plant.

The stockholders of the Century Machine Co., Holyoke, Mass., have voted in favor of a plan to reorganize the company and largely increase the capital stock. The company manufactures machines for washing and sterilizing dishes and glasses.

The Palmer Steel Co., has been formed at Holyoke, Mass., with $100,000 capital, to design, fabricate and erect steel structures in the nature of bridges and buildings. It is stated that the concern has bought its machinery and will soon let the contract for a one-story building 80 x 200 ft., to be located in Williamsett, a suburb of Holyoke. Earl Palmer of Memphis, Tenn., is president of the company; Wayne E. Palmer of Holyoke is treasurer, and Raymond E. Palmer of 316 High St., Holyoke, is vice-president and general manager.

The Holyoke Water Power Co., Holyoke, Mass., is preparing plans for the electrification of the headgates at its big dam on the Connecticut. Hitherto they have been operated by a Boyden waterwheel and this will be retained for emergency use. The headgates are thirteen in number, and are operated singly. The company has filed plans for two electrical sub-stations, one to cost $3000 and the other $4000.

The Monarch Machine Tool Co. is considering the installation of a sprinkler system in its plant at Sidney, Ohio.

The Vaughn & Son Boiler and Machinery Co., Joplin, Mo., has purchased the firm of Robbins & Long, same city. The two plants will be combined at the Vaughn works on Grand Ave.

The Whiting Corporation, of Harvey, Ill., has moved its Chicago sales offices from 1245 Marquette Bldg. to 945 Monadnock Bldg.

The East plant of the American Tube and Stamping Co., in Bridgeport, Conn., will reopen about the middle of May. This plant has been closed since February, 1921. At a recent meeting of the directors of the company Edmund C. Mayo was elected president; F. Kingsbury Curtis, vice-president; C. P. Miller, treasurer; W. L. Warrell, secretary. New directors chosen were W. L. Abbott, R. F. Cutting, W. B. Day, C. L. Dimon, F. J. Kingsbury, E. E. Macy, J. V. W. Reynders, C. J. Sanford, Carlton Macy and W. R. Webster.

The New England Tube and Stamping Co., Inc., West Haven, Conn., has been incorporated under the laws of Connecticut, to manufacture automobile accessories, metal tubes and machine parts, sheet metal goods, etc. The capital stock is $200,000. The company will operate in the plant of the Coe-Stapley Manufacturing Corporation, the assets of which were recently purchased by P. J. Holdsworth, of New York. The incorporators of the new company are Mr. Holdsworth; J. M. Harding, 178 Lawrence St., New Haven, Conn.; and Robert R. Adams, Bridgeport, Conn.

The Connecticut Marine Boiler Works Co., 64 Kossuth St., Bridgeport, Conn., recently added the manufacture of a combination metal door and lock, to its present business. The door and lock has been patented by Mr. Wilson, president of the company, who states that his company already has an unusual large order for the product. The company will also engage in the manufacture of tin and galvanized iron appliances.

The assets of the Hartford Automotive Parts Co., Broad and Lawrence Sts., Hartford, Conn., will be disposed of by public auction at the offices of the company on May 3rd. The trustee states that no bid under $325,000 will be considered.

The Dalton-Ingersoll Manufacturing Co., manufacturer of plumbing goods, etc., Boston, Mass., has recently removed from 175 High St., into more commodious quarters at 365 Atlantic St.

The Welker Manufacturing Co., Middletown, Conn., has recently been incorporated to manufacture metal specialties. The capital stock is $50,000, and the incorporators are: O. B. Welker, 199 South Main St.; F. A. Beach and F. B. Fountain, all of Middletown.

John E. White was chosen president and general manager of the Graton & Knight Manufacturing Co., Worcester, Mass., at the recent annual meeting. Mr. White succeeds Walter M. Spaulding, who has been elected chairman of the board of directors. Five men were elected to the board of directors. They are: Harry G. Stoddard and Dr. Homer Gage, of Worcester; Stanley A. Russell, George B. Greene and W. R. Grace, of New York city.

At the annual meeting of stockholders of the American Electric Fusion Corporation, Chicago, Ill., it was decided to increase the capital stock of the concern to $40,000. New officers elected were: E. J. Henke, president; A. B. Bonneborn, vice-president; S. F. Strand, secretary-treasurer.

The Everyday Piston Ring Co., Inc., has purchased the building formerly occupied by the Kleen Sweet Products Co., at Commercial & Roosevelt Streets, Rochester, N. Y. The company has made many alterations to building and has installed specially made machinery and equipment for the manufacture of piston rings. Officers of the company are: George E. Burgess, president; F. E. Paige, vice-president and general manager; E. H. Perkins, secretary and treasurer.

The Rockford Milling Machine Co., Rockford, Ill., has made the following announcement: The Mid-West Machinery Exchange, Kansas City, Mo., will handle in the Kansas City territory the complete line of Sundstrand lathes, manufactured by the Rockford Tool Co. The English Tool and Supply Co., Kansas City, Mo., will handle the cone-drive millers. The Peden Iron and Steel Co., Houston, Texas, will handle the Rockford line exclusively in the state of Texas; the Greensboro Supply Co., Greensboro, N. C., will handle the Rockford line exclusively in North and South Carolina.

Personals

EDWARD BLAKE, JR., vice-president of the Greenfield Tap and Die Corporation, who has been general manager of the organization's drill plant at Taunton, Mass., has been placed in charge of sales and will hereafter make his headquarters in Greenfield. Mr. Blake was connected with Wells Bros. for several years and at one time was vice-president and general manager of the Lincoln Twist Drill Co., before that concern was sold to the Greenfield corporation.

K. W. ZIMMERSHIED has been appointed to assist P. S. DuPont, president of the General Motors Corporation.

WILLIAM S. KNUDSEN has been elected vice-president of the Chevrolet Motor Co. He will be in charge of operations.

DONALD MCSKIMMON has been elected treasurer of the J. T. Slocomb Co., Providence, R. I.

JOHN G. WOOLCOTT has been appointed buyer of the E. W. Webb Manufacturing Co., manufacturer of plumbers' goods, Boston, Mass. Mr. Woolcott succeeds C. W. Coleman, who recently resigned.

VOORHIES HAIGHT, formerly of the sales department of the Bridgeport Brass Company, Bridgeport, Conn., has accepted a similar position with the Waterbury Manufacturing Co., Waterbury, Conn.

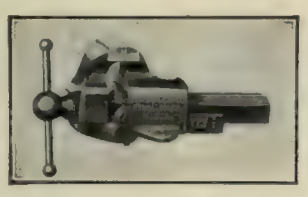
M. W. MELROSE has opened a machine shop in the Washington Garage, Brookline, Mass., where he will do cylinder grinding, crankshaft grinding and toolmaking.

HARRY C. KINNE, head of the engineering department of Bagley & Sewall Co., manufacturers of paper mill machinery, has returned to Watertown from a 10,000-mile business trip through the Western States. In commenting on business conditions governing the machinery interests, Mr. Kinne stated

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Vise, Bench, U-Beam
Athol Machine and Foundry Co., Athol, Mass.
"American Machinist," Jan. 5, 1922



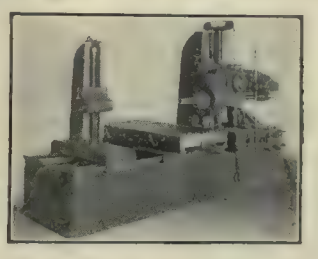
The vise has jaws of tool steel and a screw of the buttress type operating in a malleable-iron nut. The beam, eye and ball are unfinished. The vise is made in four sizes, with widths of jaws of 2½, 3, 3½ and 4 in. The jaw openings are, respectively, 3½, 4½, 5½ and 6 in., and the weights 13, 21, 30 and 37 pounds.

Grinding Machine, Automatic, Double, No. 1
Gardner Machine Co., Beloit, Wis.
"American Machinist," Jan. 5, 1922



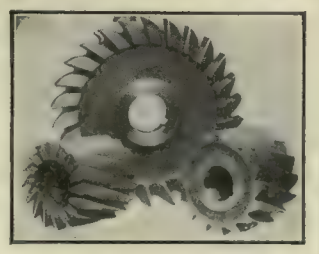
The machine is adapted to rapid grinding of piston rings, ball and roller bearing races, sad-iron sole plates, thrust washers and similar parts. The openings in the work carrier can be made to conform to the shape of the work. The carrier is provided with a range of feeds from six to forty pieces per minute. A handwheel adjusts the grinding members. Provision is made for accurately aligning the spindles of the machine. Steel collars carry the thrust. When grinding small work at a high rate of feed, an automatic feeding device for the carrier is employed.

Boring Machine, Horizontal, "Tri-Way"
Universal Boring Machine Co., Hudson, Mass.
"American Machinist," Jan. 5, 1922



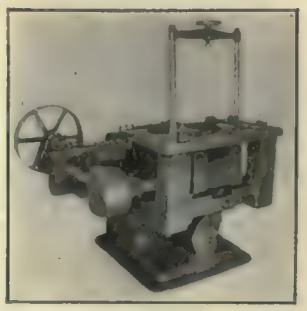
In this machine three instead of two guiding ways are provided for the carriage. The lever controls are grouped in the head end. The base extending beyond the head provides a rigid support for the motor. All speed and feed change gears are located in two flat removable trays. The bar-carrying heads move up and down simultaneously and can be fed by power in either direction. Power crossfeed is provided for the table, as is also power traverse to the carriage. Automatic knockouts are provided. The machine is made in two sizes, with three lengths of bed. Spindle speeds, 7 to 284 r.p.m. Feeds, ⅛ to 5⅜ in. per minute. Floor space, 17 ft. x 9 ft. 5 in. Height, 8 ft. Weight, 20,000 pounds.

Milling Cutters, "Parabolic"
National Twist Drill and Tool Co., Detroit, Mich.
"American Machinist," Jan. 5, 1922



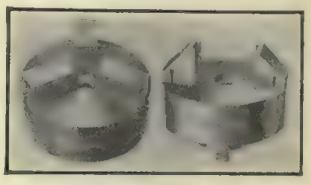
The cutter tooth to give uniform strength throughout is a parabola slightly modified at the small end. The number of teeth used is nearer to that of the conventional fine-tooth cutter than that of the coarse-tooth type. To secure the most effective chip thickness per tooth without excessive peripheral speed, a fairly large number of teeth was found desirable. The parabolic cutters are made in plain side and end-mill types, as well as in special designs.

Milling Machine, Straddle, Cycle-Feed Type, C-75
Newton Machine Tool Works, Inc., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922



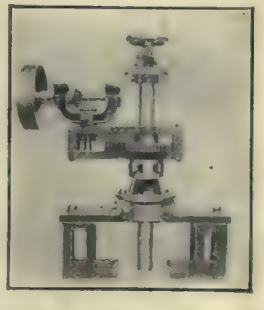
The machine is used in facing the bearings for crankshafts in automobile cylinder blocks. It is driven by a belt. The two spindles have individual hand adjustment for setting the face-milling cutters. The motion of the table is a rapid advance downward, a slow feed for the cut and an upward quick return to the loading position, where the table automatically stops on the level of the conveyor rolls. The table is provided with hardened steel jig plates. The rate of feed, or the time of one cycle, may be varied.

Chucks, Air-Operated, "American"
S-P Manufacturing Co., 872 East 72d St., Cleveland, Ohio
"American Machinist," Jan. 5, 1922



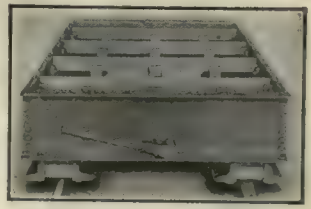
The standard sizes of the chucks range from 6½ to 18 in. in capacity, but larger chucks can be furnished. In the accompanying illustration are shown the three-jaw and two-jaw combination chucks. Special jaws or master slides to take false jaws can be furnished. The chuck bodies are made of one-piece semi-steel castings. The strain of the work bears on the end of the machine spindle. The air may be shut off in the cylinder and the work still firmly held. The chuck can also be hand operated.

Boring Unit, Portable
Pedrick Tool and Machine Co., 3638 North Lawrence St., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922



The device consists of the bar, the feed mechanism, the driving gear and the crosshead mechanism. The bar is 3 in. in diameter and 3 ft. long, and has a travel of 18 in., while the lower end of the bar is bored out with a taper hole to hold tools. By blocking the motion of the handwheel, the feed becomes automatic. Two changes of feed are ordinarily provided, although three may be furnished for special work. Power may be applied by belt, motor, or hand. The crosshead supports the guide for the bar. Space blocks provide room between the work and the end of the bar. Setscrews center the bar in the hole.

Tables, Truck, Work
Edwin Harrington, Son & Co., Inc., Philadelphia, Pa.
"American Machinist," Jan. 5, 1922



The table is used with straight-rail or fully adjustable multiple-spindle drilling machines for moving the work from under the machine entirely, or in small steps to obtain any desired indexing. The device may be furnished with any surface dimensions, number of wheels, character of top surface or method of movement. It can be supplied with a cast-iron top with T-slots and pin holes. On the inside of the frame vertical slots hold 4 x ½-in. work-supporting bars, which are covered with planks, so that the cutting tools may easily penetrate. A hand ratchet lever at the front drives the front wheel of each truck. A compound-wound direct-current motor controlled by a push-button automatic starter can be mounted below the table and geared to the drive wheel shaft, to move the table 60 in. per minute.

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Steel sheets, blue annealed No. 10, $2.25@$2.40, Pittsburgh, as against $2.25; black No. 28 at $3@$3.15 instead of $3, and galvanized No. 28 at $4@$4.15 compared with $4 per 100 lb. last week.

New York quotes advance of 25c. on black sheets No. 28 and 35c. per 100 lb. on galvanized. Electrolytic copper up 1c.; tin 1c.; lead and antimony 1c. per lb. Raw linseed oil quoted at 84c. as against 81@83c. per gal. in 5 bbl. lots.

Cleveland quotes advances of 1c. on old lead and zinc; 1c. on No. 1 yellow brass turnings.

Declines—Coke plates, bright, down 1c.; old copper 1c. and light brass 1c. per lb. in Cleveland warehouses.

Market Firmer—Structural steel quoted at a minimum of $1.50 per 100 lb., Pittsburgh; steel prices tending upward, especially in semi-finished material. Bolts, nuts, rivets and other shop supplies considerably firmer in tone; cutting under the regular price quotations having entirely disappeared. Market firmer in sheet bars, pipe, tin plates, steel wire products, strip steel, zinc and linseed oil.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21 00
Northern Basic	21 02
Southern Ohio No. 2	21 52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20 70
No. 2 Foundry, Southern, sil 2.25@2.75	22 67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound

	Light	Medium	Heavy
Pittsburgh	11 0	7 5	4 0
Philadelphia	8 0	5 0	2 65
Atlanta	5 5	4 5	4 0
Denver	7 0	4 5	3 0
Birmingham	12 0	6 5	3 5
Denver	8 0	6 0	5 0
New Orleans	6 0	4 5	3 5
Minneapolis	9 0	6 0	4 5
New York	9 0	6 0	3 0
Cincinnati	6 0	5 0	4 5
Cleveland	6.75	4 5	2 6

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill

	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
Blue Annealed				
No. 10	2 25@2 40	3 28	3 10	3 38
No. 12	2 [illegible] 45	3 33	3 15	3 43
No. 14	2 [illegible] 50	3 38	3 20	3 48
No. 16	2 [illegible] 70	3.48	3 30	3 58
Black				
Nos. 17 and 21	2 [illegible] 00	4 05	3 55	3 95
Nos. 22 and 24	2 [illegible] 05	4.10	3 60	4 00
Nos. 25 and 26	2 [illegible] 10	4.15	3 65	4 05
No. 28	3 00@3 15	4.25	3 75	4 15
Galvanized steel sheets:				
Nos. 10 and 11	3.00@3.15	4.25	3.75	4 15
Nos. 12 and 14	3.10@3.25	4.35	3.85	4 25
Nos. 17 and 21	3.40@3.55	4.65	4.15	4 55
Nos. 22 and 24	3.55@3.70	4.80	4.30	4 70
No. 26	3.70@3.85	4.95	4.55	4 85
No. 28	4.00@4.15	5.25	4.75	5 15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
	BUTT WELD				
1 to 3	71	58½	¼ to 1¼	44½	29½
	LAP WELD				
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
	BUTT WELD, EXTRA STRONG, PLAIN ENDS				
1 to 1½	69	57½	¼ to 1¼	44½	30½
2 to 3	70	58½			
	LAP WELD, EXTRA STRONG, PLAIN ENDS				
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.15
Cold finished flats, squares	3.85	3.50	3.65
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅝	8.00		12@13
¼	6.50		11@12
5/16 to ½	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.00
Lead (up to carlots), St. Louis, 5.15; New York	5.50
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.25	6.50	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	..
Solder (⅛ and ¼); (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.84	1.06	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	65-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter ..... *EXTRA*	0.15	.....	0.15
½ in. diameter ..... *EXTRA*	0.50	.....	0.50
1 in. long, and shorter ..... *EXTRA*	0.50	.....	0.50
Longer than 5 in. ..... *EXTRA*	0.25	.....	0.25
Less than 200 lb. ..... *EXTRA*	0.50	.....	0.50
Countersunk heads ..... *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

NEW and ENLARGED



Machine Tools and Machinery Wanted

Machinery wants published without charge

Machine Tools

Ind., Alexandria—The Zeigler Mfg. Co., manufacturers of metal stampings, etc.—[illegible] small straightening mill.
Two squaring shears, 72 in. to 120 in. cut.
One No. 4 Inclinable geared Bliss press, with small jobbering and coining outfit.
One spot welder.
One rotary shifting shear, geared.
One large arch screw press for die tryout [illegible] No. 3 Bliss preferred.
One Thomas grinder 12 in. x 24 in.
One pendulum shear press.
Cable chain No. 10.
Three thread rollers for sheet metal.
Four study threaders.
Four nut tappers.
Two rotary annealing furnaces.
Four rotary washers.
One punch grinder 6 in. x 32 in.
Five drill presses.
Five small tapping machines.
Two production hardening and heat treating furnaces.
Two multiscrew production rotary millers.

Ind., Evansville—The Faultless Caster Co., Wright-on Rd.—single stroke header.

Ky., Louisville—The Louisville Machine [illegible] 300 East Main St.—turret lathes and one 24 in. drill press.

Mass., Chelsea—R. T. Green Co., 210 Marginal St.—heavy bending rolls and air compressor of about 150 cu.ft. capacity.

Mass., Worcester—The Matthews Mfg. Co., 204 Gold St.—surface grinder.

Mich., Ann Arbor—The Bd. Regents, [illegible] of Michigan—equipment for engineering shops.

Mich., Detroit—[illegible] Hoffman & Co., 337 East Fort St.—small turning lathe.

Mo., Joplin—G. H. Davis Studio, 1044 Main St.—drill press and lathe for jewelry machine shop.

Mo., Joplin—The Economy Furniture Co., 114 Main St., W. B. Hunt, Purch. Agt.—power wood lathe.

Mo., Joplin—The Cooper County Electric Supply Co., 1412½ Main St., A. [illegible], Purch. Agt.—air compressor and lathe for repair.

Mo., Joplin—J. Irwin, 106 East 7th St.—power drill press.

Mo., Joplin—Farmer Bros., 7th and Virginia Aves., C. B. Farmer, Purch. Agt.—power drill press and power lathe for garage machine shop.

Mo., Webb City—J. A. Berg, North Hall and Dempsey Sts.—power lathe.

Mo., Webb City—The Webb City Auto Painting & Top Co., North Hall St. and Alley, J. F. Wilhite, Purch. Agt.—drill press, lathe and grinder for power.

Neb., Lincoln—The Pearl Furnace Co., 1231 O St., sheet metal machinery.—J. B. Van Volkenburgh, Purch. Agt.—42 in. pipe machine and 36 in. square shears.

N. Y., Buffalo—McKay-Hatch Co., Skillen St. along the tracks of the New York Central R.R.—drop hammers, machinery and equipment for forge shop.

N. Y., Elmira—The Highway Products & Mfg. Co., 735 Baldwin St.—sheet metal working tools and equipment for the manufacture of corrugated iron culverts, 12 in.-48 in. diameter.

N. Y., Hicksville — Karlson-Lee — Star drilling machine.

N. Y., Lancaster—The Bd. Educ., F. A. Schaefer, Purch. Agt.—wood and metal working tools for manual training classes in high school.

N. Y., Mayville—F. M. Waite—small tools and machinery for garage now under construction.

N. Y., New York—C. R. Bates Co., Inc., 21 Howard St., manufacturer of railroad and shipbuilders supplies—metal cutting tools and drills.

N. Y., North Tonawanda—White & Haskell Co., Main St.—one 14 in. lathe; small drill press; air compressor and tank, for machinery and repair shop.

N. Y., Ogdensburg—The Ogdensburg Water Wks. Dept., D. J. Crichton, Purch. Agt.—power driven pipe threading and tapping machine.

N. Y., Rochester—B. G. Costich, 251 Hayward Ave.—tools, machinery and equipment for repairing gas motors.

N. Y., Rochester—H. Lipshitz, 461 Joseph Ave.—one 16 in. jointer, 16 in. rip saw, wood turning lathe, bore machine and spindle.

N. Y., Watertown—H. Derouin Co., 137 Charles St.—sheet metal working machinery and equipment.

O., Alliance—The Safety Ice Pick Co., 808 East Cambridge St., G. Trumpeter, Genl. Mgr.—general machinery for ice pick factory.

O., Youngstown—The Youngstown Sheet & Tube Co., East Youngstown St., Address Purch. Dept.—machinery for the manufacture of steel plates.

Pa., Pittsburgh—The American Mine Equipment Co., W. D. Stockly, Purch. Agt.—two punch presses, equivalent to the Niagara No. 27 plain press, 2 in. stroke, 3 in. hole for punch shank.

Pa., Pittsburgh—The Edgewater Steel Co., Edgewater Sta., W. A. McKean, Purch. Agt.—one Ridgway type hub facing machine for car wheels, motor driven.

S. C., Lena—H. L. Lawton—one hundred eleven ft. of shafting, 8 4⅞ in. collars, 3 bevel gears 24 in. diameter 4⅞ in. teeth, 5 flange couplings, 16 pillow boxes.

Vt., Burke—Wiggins Machine & Mfg. Co., Inc., A. V. Wiggins, Pres.—turners and turret equipment for 3 x 36 Jones & Lamson and No. 4 Warner & Swasey turret lathes, (used).

Va., Norfolk—J. B. Porter, P. O. Box 255—tinners squaring shears to cut up to 20 gauge, also tinners cornice brake, (used).

Wis., Manitowoc — The Hamacheck-Bleser Co., 11th and Franklin Sts.—presses and repair equipment for proposed garage and repair shop.

Machinery

Ala., Sheffield—K. Sparks—dredging machinery to dig sand and gravel and deliver same on barges, including chain, bucket, dredge with 5 to 7 cu.ft. bucket and about 60 ft. ladder.

Conn., Ansonia—The Jayne Garage, 163 Wakelee Ave.—one ton chain hoist.

Conn., Bridgeport—R. H. Gorham, R. F. D. 3—one ton chain hoist for farm.

Ia., Des Moines—The Bd. Educ., G. L. Garton, Secy.—manual training shops and machinery for Theodore Roosevelt High School.

Ill., Pontiac—The Allen Candy Co.—ice machinery for proposed ice plant.

Ind., East Chicago—The Green Eng. Co., Kennedy St.—belt driven air compressor of 300-450 cu.ft. capacity to operate on 80-100 lb. pressure, (used).

Kan., Pittsburg—The Pittsburg Candy Co., 1211 North Bway.—machinery for making candy.

Ky., Sturgis—W. Herbert—complete line of coal mining machinery, including hoists, conveyors, washing machinery, mine and power plant equipment.

Mass., Fall River—Fyans, Fraser & Blackway Co., 83 Anawan St.—dyeing machine for cotton goods, (continuous).

Me., East Wilton (Wilton P. O.)—Gledhill Woolen Co.—2 jack winder machines.

Mich., Detroit—A. W. Fellers, 6035 14th Ave.—woodworking equipment including matcher and finishing machine.

Mich., St. Clair—The Diamond Crystal Salt Co., F. Moore, Mgr.—equipment for proposed plant at Courtright, to have capacity of 700 bbl. daily.

Mo., Joplin—The Joplin Marble Wks., 1047 Main St., W. D. Northern, Purch. Agt.—automatic drilling machinery and power hammers.

Mo., Joplin—The Monarch Garage, 410 Penna Ave., R. A. Nicely, Purch. Agt.—leather working machinery for automobile upholstery department.

Mo., Joplin—Walkers Planing Mill, 1305 Joplin St., H. H. Walker, Purch. Agt.—woodworking machinery for the manufacture of wooden boxes.

Mo., Joplin—The Ward Optical Co., 530 Main St., W. E. Ward, Purch. Agt.—power optical grinder.

Mo., Springfield—The Saint Louis—San Francisco R. R., B. T. Wood, Vice-Pres. and Ch. Purch. Officer—$200,000 worth of machinery for repair shops here.

Mo., St. Louis—L. Litch, 2927 South 13th St.—printing press.

Mo., St. Louis—D. O. O'Leary, 2600 Bellegrade St.—woodworking machinery.

Mo., St. Louis—G. Stein, 1229½ Chauteau St.—printing press.

Mo., Webb City—Denny-Maier Upholstering Co., 210 North Main St.—planer, wood lathe for furniture repairing also woodworking machinery.

Neb., Lincoln—The Lincoln Storage Battery Co., 1425 N St., R. C. Fields, Mgr.—grid moulds for 5⅝ in. x 4⅝ in. x ⅛ in. and for 5⅝ in. x 4¼ in. x ⅛ in. battery grids, both for straight lug grids.

Neb., Lincoln—The Port Huron Mchy. Co., 817 R St., tractor supply house, W. J. Edwards, Purch. Agt.—power hack saw and 2 hp. electric motor, (used).

Neb., Lincoln—The Ziegler Battery Co., 1609 N St., G. Ziegler, Purch. Agt.—will install electrical department for repair of automobile generators and starting motors, and is in the market for repair parts and replacement material.

N. Y., Avon—The Avon Knitting Co., Inc., C. T. Davis, Secy.—machinery for the manufacture of knit goods.

N. Y., Binghamton—J. H. Carver Co., Inc., 72 State St., J. H. Carver, Purch. Agt.—flat four wheel industrial trucks and one large size paper baler.

N. Y., Brooklyn—The Natl. Fdry. Co., 10 Sandford St.—electric arc welding outfit with 7½ hp., d.c. motor and generator.

N. Y., Buffalo—The Richardson & Boynton Co., Kensington Ave.—foundry machinery and equipment.

N. Y., Dexter—The Dexter Sulphite Pulp & Paper Co., C. Campbell, Purch. Agt.—paper cutting and slitting machinery.

N. Y., Friendship—F. J. Moser—compressor, small 2 stage, capacity 25 to 50 ft. per min., pressure 250 lbs.

N. Y., Geneva—W. L. Packard, 780 South Main St.—one No. 5 magazine for printing job work office.

N. Y., Hammand—The J. R. Scanlon Co., Main and Depot Sts., J. R. Scanlon, Purch. Agt.—one portable forge and blower; battery charging outfit and panel.

N. Y., Harrisville—The Diana Paper Co.—paper cutting and slitting machinery.

N. Y., Long Island City—The Cornellist Textile Corp., 45 Jamaica Ave.—tentering machine, (used).

N. Y., New York—The Gloria Knitting Mills, Inc., 27 East 21st St.—several 8 in. Brinton knit machines and ribbing machines.

N. Y., New York—The Hammond Typewriter Co., 537 East 69th St.—locomotive crane, 40-50 ft. boom, with electric or gasoline hoist.

N. Y., New York—The International Paper Co., 30 Broad St.—paper cutting and slitting machinery.

N. Y., New York—Neemes Bros., Inc., 206-18 1st St., R. R. Rees, Purch. Agt.—air chippers for chipping cast iron castings; 3 or 5 ton jib crane; cupalo bottom for 60 in. shell; air compressor of about 175 cu.ft.

N. Y., Norfolk—The Hanna Paper Corp., W. Simons, Purch. Agt.—paper cutting and slitting machinery.

N. Y., Port Gibson—H. R. Ericson—small or medium sized printing press.

N. Y., Potsdam—The Racquette River Paper Co., R. E. Sisson, Purch. Agt.—paper cutting and slitting machinery for kraft paper.

N. Y., Rochester—A. W. Hopeman & Sons Co., Lyell Ave.—machinery for furniture plant now in course of construction.

N. Y., Silver Creek—J. U. Hammond—machinery for bottling beverages and roasting coffee, for proposed factory in Jamestown.

N. Y., Utica—The Boonville Sand Corp., H. V. Owens, Purch. Agt.—sand and gravel conveying, screening and grading equipment.

N. C., Burlington—T. J. Horner—machinery and outfit for the manufacture of mattresses, (used).

N. C., Mebane—Crawford & Crawford, J. Crawford, Purch. Agt.—wood veneering machinery, (new or used).

N. C., Salisbury—J. T. Wyatt, Box 10, manuafcturer of paint—paint grinding mill, (used).

O., Cleveland—The Cleveland Graphite Bronze Co., 2906 Chester Ave.—one 6 x 6 air compressor.

O., Youngstown—The Lake Erie Limestone Co., 906 Wick Bldg.—one conveyor about 130 ft. long, 30 in. belt, and one rotary screen.

Pa., Franklin—G. E. Glines and F. A. Howard—$10,000 worth of refrigeration machinery for proposed milk plant on 10th St.

Pa., Norristown—The Amer. Asbestos Co., Strgr. and Stnbrdg.—heavy belting looms for making solid woven belting from 3-10 in. and about ⅜-⅝ in. thickness.

Pa., Phila.—The Chesterman Leeland Co., 902 Montgomery St.—small finishing machine for elastic webbing making.

Pa., Phila.—Wertz & Volk, c/o D. D. Wertz, Archt., Real Estate Trust Bldg.—steam kettles, conveyors, etc., for slaughter house.

Pa., Pittsburgh—The Amer. Sheet & Tin Plate Co., Frick Bldg., M. S. Dennis, Purch. Agt.—jib crane and traveling crane.

Pa., Pittsburgh — The Pittsburgh Des Moines Steel Co.—10 ton, 3 motor crane, 23 ft. 9 in. span.

S. C., Greenwood—M. C. Marshall—complete line of canning machinery and equipment for canning fruits and vegetables.

Va., Norfolk—E. B. Murchant, Genl. Delivery—combination woodworking machinery, (used).

Va., Roanoke—C. Dinguid, 824 13th St.—complete line of machinery for the manufacture of brooms.

Va., Waverly—The Natl. Peanuts Product Co., C. E. Reick, Mgr.—peanut butter mill and miscellaneous candy manufacturing machinery, (new or used).

Va., Winchester—The Winchester Lumber Corp., W. B. Cornwell, Genl. Mgr.—machinery for the manufacture of hard wood flooring, (used).

Wis., Blair—The Blair Canning Co., A. J. Boe, Purch. Agt.—hullers, viners, sorters, operated by line shaft, for vegetable canning plant.

Wis., Eden—The Empire Dairy Co., c/o B. McCrory, Route 1—creamery machinery including separators, churns and testers.

Wis., Holmen—The Holmen Creamery Assn., V. Keppel, Mgr.—modern butter making machinery, shafting, belting, etc., for proposed creamery.

Wis., Milwaukee—The Ideal Dairy Co., c/o G. R. Weiland, 415 32nd Ave.—dairy products machinery, separators, churns and print machines, steam power driven.

Wis., Milwaukee—J. Merkowski, 926 16th Ave.—portable saw mill to saw logs about 18 in. in diameter.

Wis., Milwaukee—The Monarch Mfg. Co., 70 Chicago St., manufacturers of overalls, clothing, etc., S. Brochman, Purch. Agt.—power stitching and stamping machines.

Wis., Milwaukee—R. Tubesing, 852 6th St.—gas storage tank and pump.

Wis., New London—Hamilton & Sons Co., E. Hamilton, Pres.—canning machinery and conveying machinery for proposed cannery.

Wis., Stevens Point—The Pfiffer Lumber Co., 229 Franklin St.—electric motors, woodworking machinery, planers, lathes, etc.

Ont., Dundas—The Thornton Blanket & Woolen Co., R. R. No. 1.—woolen weaving and picking machinery.

Ont., Galt—The Riverside Silk Mills, River St.—special machinery and equipment for the manufacture of silk.

Ont., Guelph—The Dominion Linens, Ltd., D. M. Sanson, Pres.—additional machinery and equipment. Estimated cost, $40,000.

Ont., London—The Pure Gasoline Co., 362 Dundas St., J. Factor, Mgr.—gasoline and lubrication equipment for proposed gasoline stations.

Ont., London—T. Terry, 150 Fullerton St.—machine shop equipment.

Ont., Port Stanley—The London Port Stanley Ry., London—$35,000 worth of electrically operated dmachinery including, buckets, derrick and operated machinery for coal handling depot.

Ont., St. Mary's—The Hurlbut Shoe Co., C. E. Hurlbut, Mgr.—special shoe machinery and equipmemnt. Estimated cost, $30,000.

Ont., Toronto—The Orange Crush Bottlers, Ltd., 100 Claremont St.—equipment for branch bottling plants at London and Windsor. Estimated cost, $30,000.

Metal Working Shops

Cal., Oakland—C. A. Hancock, c/o H. J. Christensen, Federal Bldg., has awarded the contract for the construction of a 1 story garage on 23rd and Valdez Sts. Estimated cost, $40,000.

Cal., Oakland—The Universal Products Co., Thayer Bldg., has had sketches made for the construction of a factory for the manufacture of household products. Estimated cost, $100,000. F. H. Horswill, Thayer Bldg., Archt.

Cal., San Francisco—D. A. Reidy, Archt., Pacific Bldg., is receiving bids for the construction of a 1 story factory on Bryant and Sterling Sts., for the Magnolia Metal Co., Pacific Bldg. Estimated cost, $12,000.

Cal., San Francisco—The United Garage Co., c/o O'Brien Bros., Inc., Archts., 240 Montgomery St., is having plans prepared for the construction of a 5 story commercial garage on Ellis St. near Mason St. Estimated cost $165,000.

Cal., San Jose—N. Kooser, 446 South 2nd St., has awarded the contract for the construction of a 2 story garage on River and Santa Clara Sts. Estimated cost, $40,000. Hayes & Canelo, lessees.

Conn., Stamford—The Victor-Page Motor Corp., Farmingdale, N. Y., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory, (1st unit) on Melrose Ave., here. Estimated cost, $40,000.

D. C., Wash.—W. W. Biggs, 1310 14th St., N.W., has awarded the contract for the construction of a garage. Estimated cost, $85,000.

Ill., Dixon—E. R. Watts has awarded the contract for the construction of a 1 story, 54 x 150 ft. garage. Estimated cost, $40,000. Noted March 30.

Ill., Joliet—The Reo Joliet Sales & Service Co., 121 South Bluff St., will soon award the contract for the construction of a 1 story, 50 x 124 ft. garage. Estimated cost, $42,000. Private plans.

Mass., Charlestown—D. J. Kane, 73 Tremont St., Boston, has awarded the contract for the construction of a 2 story, 103 x 120 ft. garage on Warren St. Estimated cost, $60,000.

Mass., Springfield—The U. S. Spring Bed Co., 228 Birnie Ave., has awarded the contract for the construction of a 1 and 2 story, 70 x 100 ft. and 50 x 100 ft. addition to its plant. Estimated cost, $40,000.

Mich., Ann Arbor—The Bd. Regents, University of Michigan, will soon award the contract for the construction of a 4 story, 189 x 248 ft. engineering building, shops and laboratory, on East University Ave. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Engrs. Noted Dec. 15.

Mich., Detroit—M. Zack, 121 Josephine St., is having plans prepared for the construction of a 1 story, 22 x 60 x 86 ft. machine shop and garage on Holbrook St. Estimated cost, $20,000. J. Weinberg, 401 Congress Bldg., Archt.

Mo., Jefferson City — The Automatic Water Pump Mfg. Co., 236 East High St., will build six or seven 1 story factory buildings. Estimated cost, $100,000. Noted March 30.

Mo., St. Louis—The Johnson Automobile Co., 3667 Olive St., will soon award the contract for the construction of a 2 story, 50 x 52 ft. garage on Olive St. Estimated cost, $45,000. W. L. Johnson, Pres. W. P. McMahon, Title Guaranty Bldg., Archts. Noted March 30.

N. Y., Buffalo—E. R. Emig, 871 East Ferry St., plans to build a machine shop on East Ferry St. Estimated cost, $10,000. Architect not selected.

N. Y., Buffalo—The New York Central R.R., Grand Central Terminal, New York, plans to build a forge shop here. Estimated cost, $12,000. McKaig Hatch Co., 1584 Niagara St., Archts.

N. Y., Buffalo—The Stearns Electric Equipment Co., 66 Bway., plans to build an addition to its shop. Estimated cost, $12,000. Architect not announced.

N. Y., Falconer—C. J. Wilcox, Ashville, plans to build a 2 story, 50 x 130 ft. factory on East Main St., here. Estimated cost, $10,000. Architect not announced. Progressive Machine Co., lessee.

N. Y., New York—The Prudential Iron Co., 633 Concord Ave., plans to construct a plant and office building on 140th St. adjoining the New York, New Haven & Hartford R.R. tracks. Estimated cost, $150,000. Architect not selected.

O., Willoughby—L. Martin & Sons, Curtland, (Willoughby P. O.), are having plans prepared for the construction of a 1 story, 65 x 82 ft. garage here. Estimated cost, $40,000 Private plans.

Pa., Greenville—The Buhler Steel Truck & Car Wheel Co. plans to build a factory to expand its lines. Architect not selected.

Pa., Phila.—W. L. Chew, Archt., 149 South 15th St., is receiving bids for the construction of a 1 story, 21 x 18 ft. garage on Fernhill and Chewsville Aves. for A. Scott [illegible] Frankford Ave. Estimated cost, $10,000.

Pa., Phila.—R. W. Pollock, Archt., 1502 Chestnut St., will receive bids until May 1 for the construction of a 2 story, 46 x 52 ft. sales and service station, 58 [illegible] South Broad St., for J. A. Cunningham. Estimated cost, $30,000.

Tex., Beaumont—The Rourke Supply Co., 234 Franklin St., plans to enlarge its machine shops.

Utah, Salt Lake City—The Utah Steel Products Co., Boston Bldg., plans to build 1 story steel fabricating shop here. Estimated cost, $100,000. A. J. McKinnon Co., 2412 Donald Ave., Cleveland, O., Engrs.

Wis., Manitowoc—Hamschock-Bleser Co., contractor, 11th and Franklin Sts., and Smith & Reinhardt, archts., Dempster Bldg., Manitowoc, will receive bids until April 23, for the construction of a 1 story, 50 x 150 ft. garage and repair shop. Estimated cost, $15,000.

Wis., Milwaukee—R. Tybring, 612 6th St., has awarded the contract for the construction of a 2 story, 52 x 120 ft. garage on Pond du Lac Ave. Estimated cost, $18,000.

Ont., London—The Pure Gasoline Co., 142 Dundas St., will build and equip 14 bulk gasoline stations. Estimated cost, $100,000. J. Penny, Mgr.

Ont., London—T. Terry, 159 Fullerton St., will soon award the contract for the construction of a 1 story, 50 x 200 ft. garage and machine shop. Estimated cost, $15,000. Private plans.

Ont., Ottawa—The Beach Motors, Ltd., 144 Albert St., will build a 2 story, 112 x 140 ft. garage on Bank St. Estimated cost, $100,000.

U. S., Fred Harbor—The Bureau of Yards and Docks, Navy Dept., Wash., D. C., will receive bids until June 7 for the erection of a machine shop here.

General Manufacturing

Cal., Hayward—P. Vernic is having plans prepared for the construction of a 1 story bakery on Castro St. between A and B Sts. Estimated cost, $20,000. Herrmann Bros., 1110 C St., Archts.

Cal., San Francisco — The Cyanamid Products Co., Inc., 523 Vanness Ave., is having plans prepared for the construction of a 2 story paste factory on 20th St. and Potrero Ave. Estimated cost, $20,000. C. J. Hoverman, Anglo Bldg., 14th and Mission Sts., Archt.

Cal., San Francisco — The Natl. Ice Cream Co., 111 Guerrero St., has had plans prepared for the construction of a 2 story warehouse and packing plant on Guerrero St. near 16th St. Estimated cost, $24,000 W. Moser, Nevada Bank Bldg., Archt.

Cal., San Francisco—The Southern Pacific Co., S. P. Bldg., and the Pacific Fruit Express Co., 65 Market St., are having plans prepared for the construction of an ice and loading plant on Bakersfield St. Estimated cost, $400,000. W. C. Phillips Co., 111 California St., Engrs.

Cal., San Luis Obispo—C. Jansen has awarded the contract for the construction of a 2 story bakery. Estimated cost, $15,000.

Cal., San Rafael—The San Rafael Ice Co. plans to build a 50 x 100 ft. ice plant, to have capacity of 15 ton per day. Estimated cost, $35,000. E. P. Grady, Pres. Architect not selected.

Fla., Orlando—The Orlando Water & Light Co. plans to increase capacity of gas plant from [illegible] to 500,000 cu. ft. per day. Estimated cost, $75,000.

Ill., Chicago—A. S. Abbiehuler, Archt., 29 East Jackson Blvd., will soon receive bids for the construction of a 4 story, 100 x 125 ft. printing plant on Peterson Ave. and Ashland Ave. for the Atwell Printing & Binding Co., Sherman and Polk Sts. Estimated cost, $100,000. Noted Jan. 12.

Ill., Chicago — The Peerless Air Brush Co., 1219 West Washington St., has awarded the contract for the construction of a 2 story, 150 x 150 ft. factory at 3909-15 Diversey Parkway. Estimated cost, $75,000. Noted March 30.

Ill., Clinton—The Pullman Products Co. plans to build a 2 story, 66 x 132 ft. dairy and creamery. Estimated cost, $50,000. Architect not selected.

Ill., East St. Louis—The Highland Ice Cream Co. will build a 1 story, 45 x 105 ft., 57 x 58 ft. and 26 x 30 ft. ice cream plant on St. Clair St. Estimated cost, $75,000.

Ill., Pontiac—The Allen Candy Co. plans to build a 1 story ice plant. Estimated cost, $12,000. Architect not selected.

Ind., Hammond—M. R. Carpenter, Archt., 140 North Clark St., Chicago, will soon receive bids for the construction of a 1 story, 30 x 151 ft. ice cream factory for the Consumers Ice Co., c/o architect. Estimated cost, $50,000.

Kan., Pittsburg—The Pittsburg Candy Co. plans to build a 2 story candy factory at 1111 North Broadway. Estimated cost, $25,000.

Ky., Louisville—The Kentucky & Indiana Dairies Co., 500 Fehr Ave., plans to construct a creamery building on Fehr Ave. Estimated cost, $6,000. Architect not announced.

Mass., Clinton—The Bigelow Hartford Carpet Co., 55 Main St., Thompsonville, Conn., is having plans prepared for the construction of a 1 story dyehouse, etc. Private plans.

Mass., Lawrence—Walworth Bros. Inc., Merrimack St., has awarded the contract for the construction of a 3 story, 50 x 130 ft. addition to its textile mill. Estimated cost, $60,000

Mass., North Dighton—The Mt. Hope Finishing Co. will soon award the contract for the construction of a 1 story, 115 x 300 ft. main building; 1 story, 50 x 150 ft. soap house; 1 story, 40 x 155 ft. dairy; 1 story, 50 x 150 ft. chemical laboratory and four 1 story steel storehouses. Private plans.

Mass., Southboro—The Dennison Mfg. Co., Framingham, has awarded the contract for the construction of a 4 story, 68 x 390 ft. plant, here, for the manufacture of tags, etc. Estimated cost, $400,000.

Mass., Springfield—The Bakery Finance Corp. (Grocers Bead Co., owner), Dexter Bldg., has awarded the contract for the construction of a 2 story bakery. Estimated cost, $150,000.

Mass., Springfield — The Springfield Blower Co., 89 Morris St., plans to build a 1 and 2 story plant (blower systems), on Ashley St. Architect not selected.

Mo., Hannibal—The Bluff City Shoe Co., c/o W. A. Meyer, Pres., has awarded the contract for the construction of a 2 story factory at 1201 Collier St. Estimated cost, $25,000. Noted March 2.

Mo., Jefferson City—The Strawboard Mfg. Co. is having plans prepared for the construction of a 2 story, 60 x 150 ft. strawboard factory. Estimated cost, $36,000. Private plans.

Mo., St. Louis—The American Syrup & Preserving Co., Ruskin Ave., will build a 2 story, 60 x 255 ft. warehouse and factory on Penrose Ave. Estimated cost, $25,000. Noted March 30.

Minn., St. Paul—The Daily News Publishing Co., 94 East 4th St., has awarded the contract for the construction of a 3 story, 100 x 150 ft. newspaper plant, etc., on 4th St. between Cedar and Minnesota Sts. Estimated cost, $100,000. Noted Feb 16.

Mo., St. Louis—J. O. Chenoweth Dyeing & Cleaning Co., 1400 Washington St., will soon award the contract for the construction of a 2 story, 119 x 160 ft. dyeing and cleaning establishment on Delmar Blvd. and Bayard Ave. Estimated cost, $50,000. A. B. Groves, 314 North 4th St., Archt. Noted Dec. 15.

N. J., Camden—J. B. Van Scriver Co. has awarded the contract for the construction of a 7 story, 57 x 91 x 199 x 220 ft. factory on Federal St., for the manufacture of furniture. Estimated cost, $600,000. Noted Feb 23

N. J., Trenton—C. V. Hill & Co., 360 Pennington Ave., will build a 2 story, 48 x 190 ft. addition to its refrigerator works. Estimated cost, $25,000.

N. Y., Albany—The Oneida County Creameries Co., Inc., Paul Bldg., Utica, has awarded the contract for the construction of a milk plant on Tivoli St., here. Estimated cost, $40,000. Address S. J. Norton, 432 2nd Ave., Albany, Mgr.

N. Y., Batavia—The Gypsolite Co., Inc., has purchased a site on Harvester Ave. and plans to build a 1 story, 60 x 400 ft. factory. Estimated cost between $75,000 and $100,000. Address J. F. Haggerty, Pres., 66 Bedford Ave., Buffalo.

N. Y., Buffalo—E. T. Danahy, 602 Babcock St., plans to build a packing plant, office and garage on Babcock St. Estimated cost, $46,000.

N. Y., Little Falls—The Barnet Leather Co., 81 Fulton St., New York City, will soon award the contract for the construction of a factory here. Estimated cost, $100,000. Thomas & Binger, 280 Madison Ave., New York City, Archts and Engrs.

N. Y., Naples—The New York Pea Packers Inc., has awarded the contract for the construction of a cannery, including a 1 story, 40 x 110 ft. main building, a 1 story, 72 x 85 ft. vinery shift and a 1 story, 20 x 30 ft. office building.

N. Y., New York—The New York Tribune, Inc., 154 Nassau St., will soon receive bids for the construction of a 7 story printing plant and office building at 219-29 West 40th St. Estimated cost, $500,000. Lockwood, Greene & Co., 101 Park Ave., Archts. and Engrs.

N. Y., Rochester—The Rochester Printing Co. plans to build an addition to its printing plant at 59-63 Main St. Estimated cost, $50,000.

O., Cleveland—The Hough Ave. Home Bakery, 8708 Hough Ave., has awarded the contract for the construction of a 1 story, 51 x 114 ft. bakery and commercial building, on Hough Ave. Estimated cost, $40,000.

O., Kenmore—The Palmer Match Co., Akron, is receiving bids for the construction of the 1st unit of its match factory here, 2 story, 82 x 225 ft. Estimated cost, $50,000. Ultimate cost, $700,000. Noted Aug. 4.

O., Youngstown—The Lake Erie Limestone Co., 906 Wick Bldg., is receiving bids for the construction of a 3 story, 34 x 34 ft. screen house. Estimated cost, $10,000. Private plans.

Pa., Franklin—G. E. Glines, F. A. Howard, and other business men of Franklin, plan to build a milk plant on 10th St. Estimated cost, $25,000. Architect not announced.

Pa., Phila.—Wertz & Volk, c/o D. D. Wertz, Archt., Real Estate Trust Bldg., has awarded the contract for the construction of a 1 story, 62 x 70 ft. slaughter house at 2838-44 North 28th St. Estimated cost, $25,000.

Pa., Phoenixville—The Weiland Packing Co., 551 West Bridge St., is receiving bids for the construction of a 3 story, 53 x 62 ft. sausage factory. Estimated cost, $60,000. T. A. Stoutenberg, 1509 Champlost Ave., Phila., Engr.

Pa., Pittsburgh—H. J. Heinz Co., 1062 Progress St., will soon award the contract for the construction of a 6 story, 92 x 150 ft. spaghetti factory. Estimated cost, $150,000. S. A. Hall, c/o owner, Archt.

Wis., Holmen—The Holmen Creamery Assn. will receive bids until April 24 for the construction of a 2 story, 70 x 72 ft. creamery. Estimated cost, $35,000. V. Keppel, Mgr. Private plans.

Wis., New London—Hamilton & Sons Canning Co. plans to build a 2 story addition to its canning plant. E. Hamilton, Pres. Private plans.

Wis., Stevens Point—Pfiffer Lumber Co., 229 Franklin St., will build a 2 story, 60 x 100 ft. planing mill on Franklin St. Estimated cost, $48,000.

Ont., Courtright—The Diamond Crystal Salt Co., St. Clair, Mich., is having plans prepared for the construction of a salt refining plant with a capacity of 700 bbl. daily. Estimated cost, $80,000. F. Moore, Mgr.

Ont., Dundas—The Thornton Blanket & Woolen Co., R. R. No. 1, plans to build a 2 story, 60 x 84 ft. blanket factory. Estimated cost, $18,000. Architect not selected.

Ont., Galt—The Riverside Silk Mills has awarded the contract for the construction of a 3 story, 50 x 100 ft. addition to its factory on River St. Estimated cost, $100,000.

Ont., Ottawa—The Ottawa Dairy Ltd., 393 Somerset St., W., plans to alter and build additions to its dairy. Estimated cost, $75,000. J. Bingham, Mgr.

American Machinist

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Special Tools and Fixtures in a Southern Railroad Shop

Chuck for Holding Driving Boxes—An Expansion Mandrel—Fixture for Squaring Rod Brasses—A Multiple Toolholder—Chuck for Turning Packing Rings

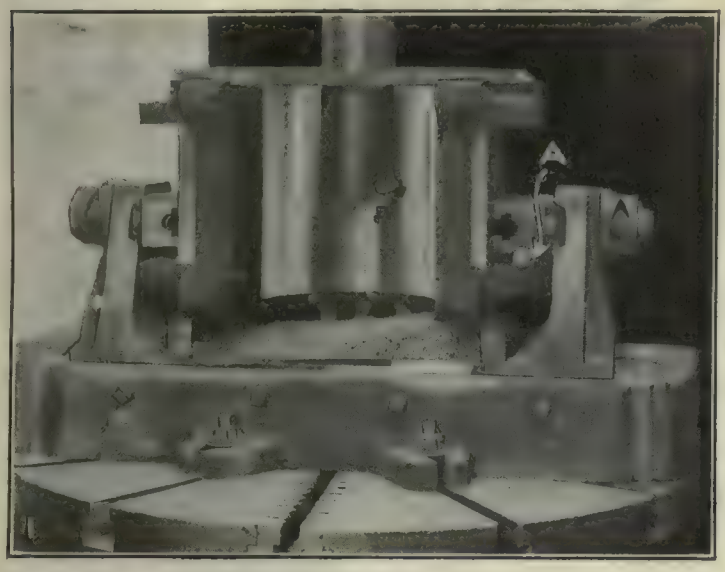
By S. ASHTON HAND
Associate Editor, AMERICAN MACHINIST

WHILE railroad repair shops have not been noted for progress in the use of special tools and fixtures for getting out repair parts for locomotives, a visit to some of the shops in the South has shown that their executives are fully alive to the advantages of tooling up for the work.

The tools and fixtures described and illustrated in this article are in use in the 17th St. shops of the Chesapeake & Ohio Railway, Richmond, Virginia.

Driving boxes are clumsy things to handle on the boring mill with no other holding arrangements besides the ordinary bolts, clamps and parallels. In Fig. 1 is shown a driving box mounted in a chuck on a boring mill. The chuck is a modification and enlargement of the two-jawed box chuck so well known to brass finishers and the wonder is that it was not adapted to heavy work long ago. However, it remained for F. B. Moss, assistant master mechanic of the Fulton Shops, East Richmond freight terminal, to develop the chuck in its present form. False jaws to accommodate work of almost any shape can be readily attached to the permanent jaws, thus adapting it to a variety of work. The driving box shown in the chuck rests on parallels and is forced down on them by wedges driven between the chuck jaws and the lower flanges of the box, as at *A*. The wedge on the opposite side of the box is driven in from the back and so is not visible in the illustration.

In some driving boxes in use on the locomotives of this road the crown brasses are made in two parts and spread by a wedge at the top of the crown to hold them tightly in place. Such a driving box is shown in the halftone, Fig. 2, and in detail in the line drawing, Fig. 3. No matter how tightly crown brasses are forced into driving boxes nor how well pinned in place, they will work loose in time can and be tightened only by putting in shims and new pins—a job that necessitates the removal of the boxes from the frames. In boxes such as shown in Figs. 2 and 3 the crown brasses can be tightened at any time on the road by drawing in the wedge.



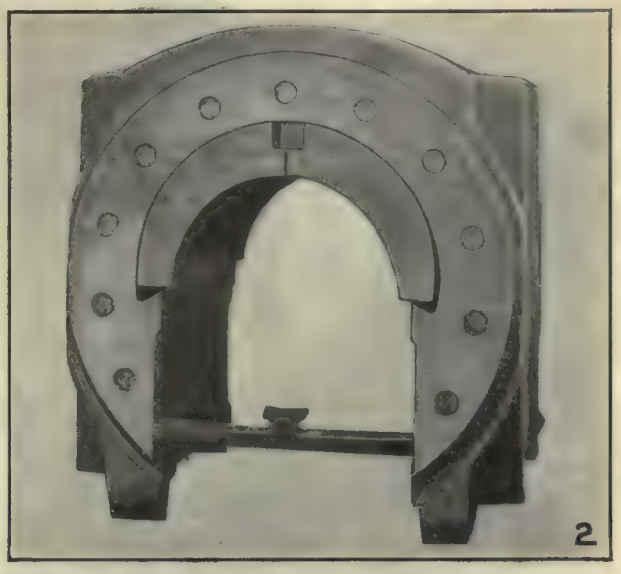


FIG. 1. CHUCK FOR HOLDING DRIVING BOXES. FIG. 2. DRIVING BOX WITH TWO-PART CROWN BRASS

A smaller chuck of the Moss type, arranged for boring rod brasses, is shown in Fig. 4. False jaws in the form of V-blocks are used to hold the work and it will be noted that they are so mounted as to permit adjustment at a right-angle to the gripping axis of the chuck. Ability to shift the work in two directions makes the truing up an easy matter.

An expanding mandrel operated by a three-lobed cam in connection with rollers is shown in Fig. 5. The cam *A*, with lobes in the form of ratchet teeth, is an integral part of the mandrel body. The rollers *B* are mounted on arms pivotally attached to the plates *C* and *D*, which

are free to revolve within certain limits about the cam *A*, and it will be readily understood that motion in one direction or the other will cause the rollers to approach

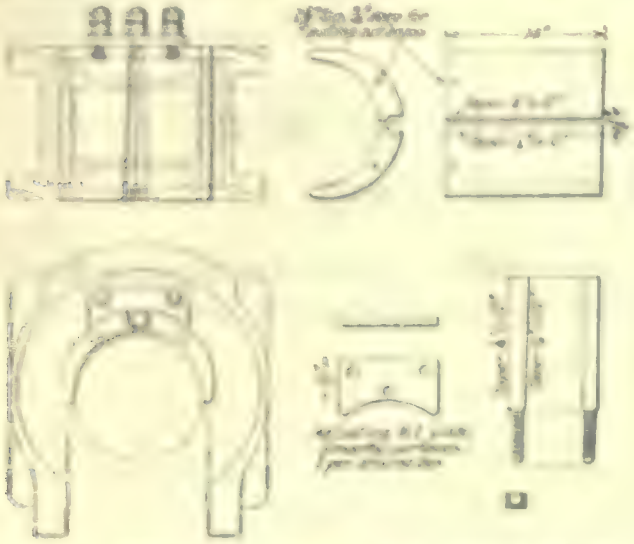


FIG. 3. DETAILS OF DRIVING BOX, CROWN BRASS AND WEDGE

the cam, the motion being limited by a stop pin. To use the chuck, lower plate *D* is revolved so that the rollers are opposite the low points of the cam lobes and then locked by turning the handle *E*, when the work can be put in place. Turning the handle *E* in the opposite direction allows the spring to revolve the plates and

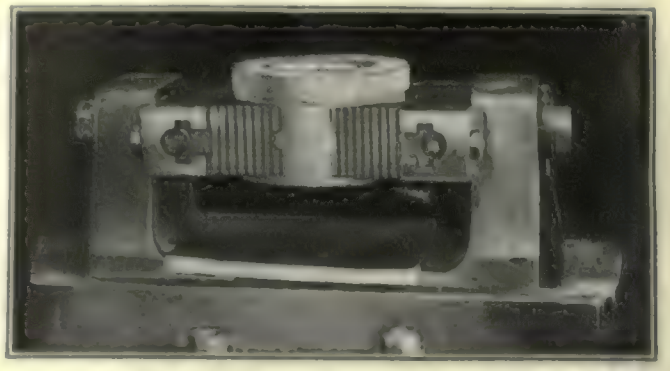


FIG. 4. SMALL MOSS CHUCK WITH V-JAWS

move the rollers along the inclines of the cam until they grip the interior of the work. Any tendency to revolve the work by the pressure of the cut will further

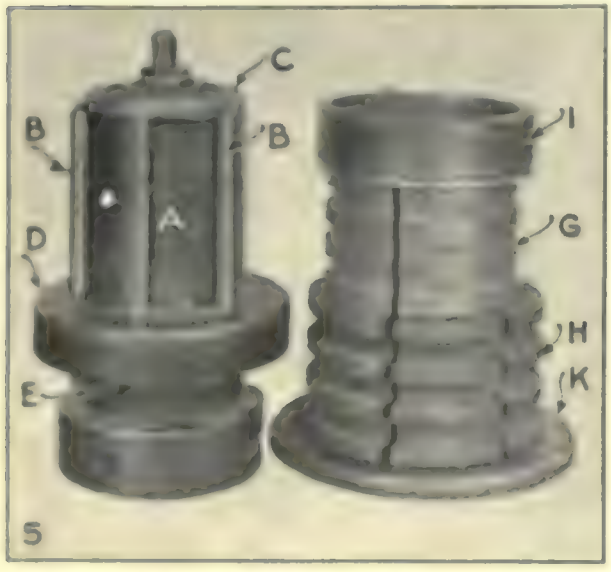


FIG. 5. A ROLLER-TYPE EXPANSION MANDREL.

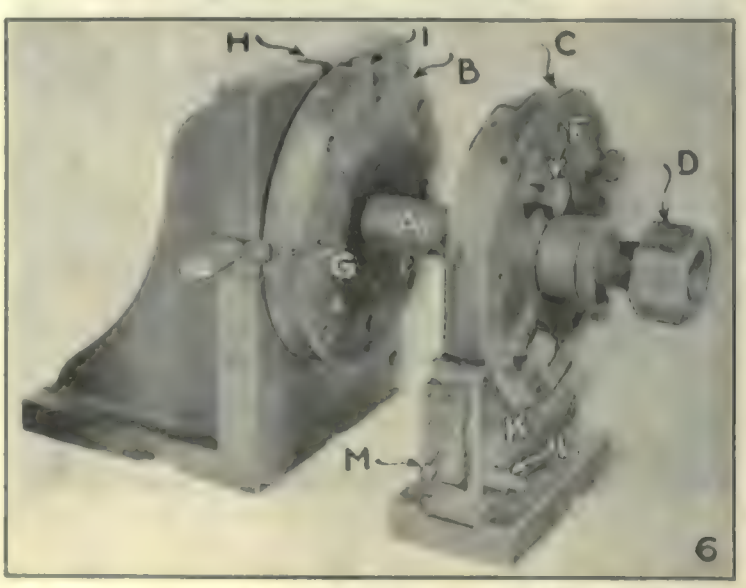


FIG. 6. FIXTURE FOR SQUARING ROD BRASSES

or recede from the center. The rollers are normally kept opposite the high points of the cam lobes by a spring in the lower plate *D* tending to revolve it around

expand the rollers and tighten their grip. For various sizes of work, split shells such as shown at *G* and *H* are provided. The collars *I* and *K* are used to position short

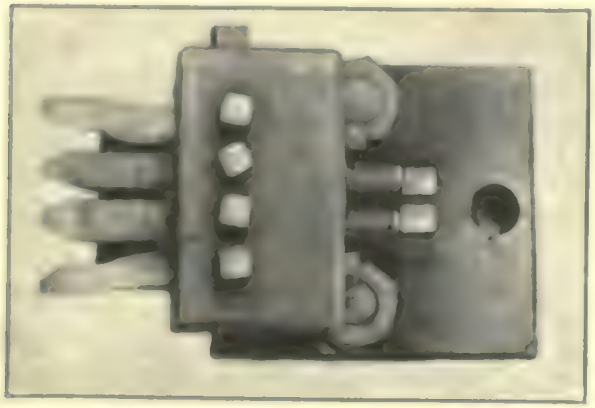


FIG. 7. TOOLS FOR SQUARING ROD BRASSES.

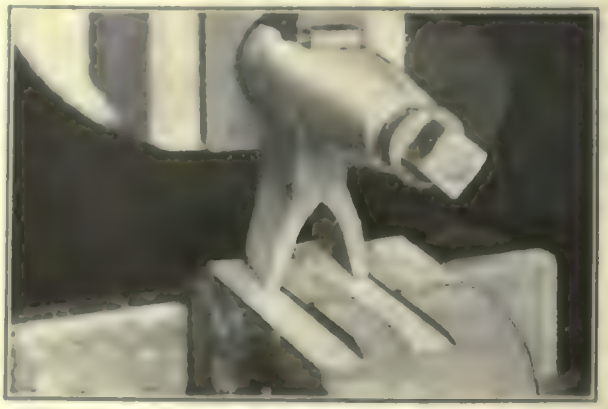


FIG. 8. SPLAYED TOOL FOR SHAPING BRASSES

work on the mandrel to allow facing the outer end. The mandrel can be attached either to the nose of a lathe spindle or to the threaded end of a base for mounting on the table of a boring mill.

Squaring Connecting-Rod Brasses

Flanged brasses for the crankpin ends of connecting rods are squared in a slotting machine and are held in the fixture shown in Fig. 6. The brass, either in one piece or in two pieces soldered together, is mounted on a bushing on the central arbor *A* and clamped between the cupped points of screws in plates *B* and *C*, by means of the nut *D*. Slippage under pressure of the cut is taken care of by tightening the screws *E*, in the outer plate, their cupped points and those of the screws in the inner plate biting into the softer metal of the work. Notches and latches are arranged as at *G* for indexing the work. It will be noted that the upper notches *H* and *I* do not match. This difference is made so that when the side latches are disengaged from their notches and a latch at the top engaged with notches *H* and *I*, the work will be thrown out of square to allow one side to be machined at an angle to fit the tapered adjusting key in the rod. This adjustment is made only when machining brasses without flanges to be fitted into rods machined from the solid and not provided with straps.

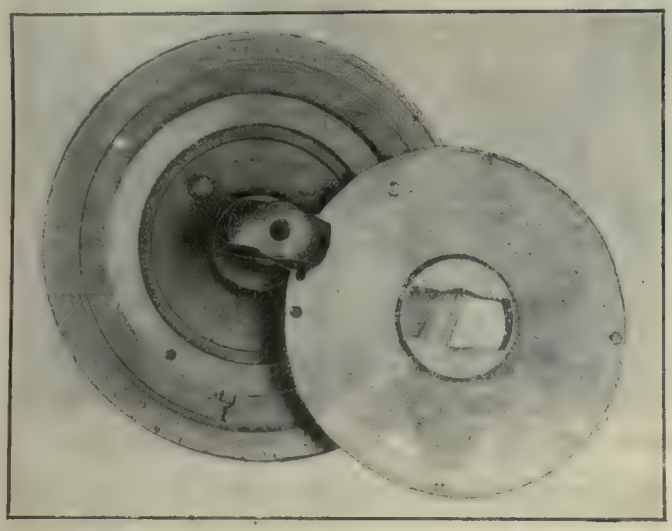


FIG. 9. CHUCK FOR TURNING AND FACING PACKING RINGS

The fixture is provided with an adjustable outboard support *K* to prevent springing under the downward thrust of the cutting tool, and is so arranged that it can be lowered to permit easy removal of the outer plate when taking off or putting on work. Adjustment is made by a cam on the shaft *L*, the construction being such that when the proper height is reached the cam can be rotated no further. The support can be locked in position by the screw *M*.

Multiple and Splayed Tools

A set of tools for machining flanged brasses in the slotting machine is shown in Fig. 7. The over-all distance of the outside tools is a little less than three-quarters of the width between the flanges of the brass. The outer tools are side tools and after one of them has finished the inside of one flange, the inside of the opposite flange is finished with the other tool. In finishing the body of the brass between the flanges the gang of tools is fed bodily in to the proper depth and then traversed. As the ends of all the tools are in the same plane, the amount of traverse necessary to machine the

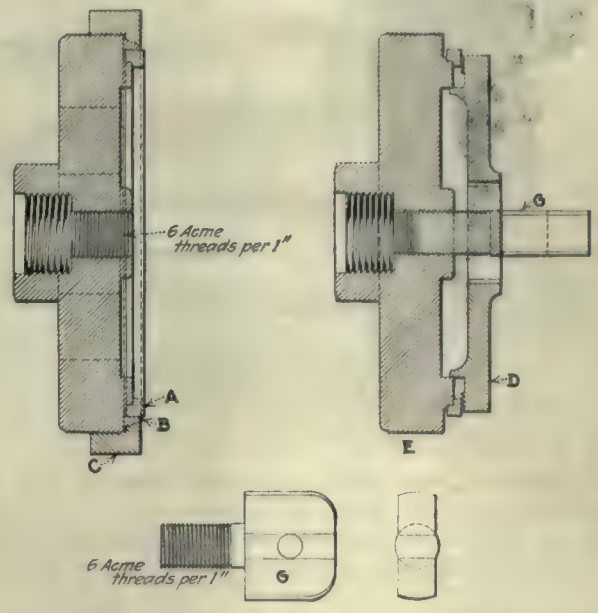


FIG. 10. DETAILS OF CHUCK, SHOWN IN FIG. 9

brass between the flanges is a little over one-quarter of the distance between them.

Small brasses without flanges are machined in a shaper by a splayed tool, as illustrated in Fig. 8, and it will be readily understood that a cut can be taken across the work by a tool traverse of about one-half the distance.

Turning and Facing Packing Rings

After a piece has been cut out of packing rings to give them a spring fit in the valve chamber, they must be compressed until the cut edges meet, turned to the proper diameter and faced on the edge where they were severed from the pot casting. A chuck for holding rings for this turning and facing is illustrated by the half-tone, Fig. 9, and in detail by the line-drawing, Fig. 10. The body of the chuck is provided with a projection to fit the notch in the side of the ring. When the ring *A*, Fig. 10, is in place inside the split tapered-ring *B*, the outer thread-ring *C* is screwed home, its tapered opening compressing both the taper ring and the packing ring. In this position the packing ring is held firmly and can be readily faced to the proper width. After facing, the cover *D* is put on as at *E* and clamped by the screw *G*. The outer and split rings can then be

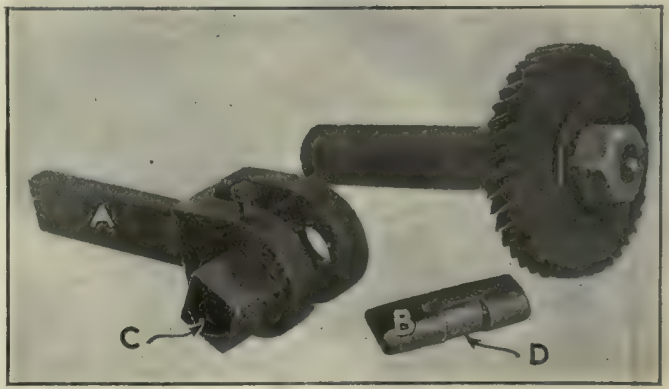


FIG. 11. TOOLS FOR SLOTTING SPRING-HANGER PINS

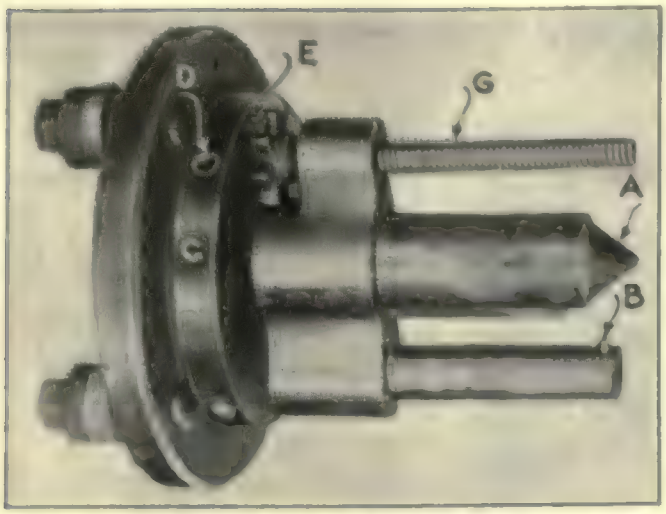


FIG. 12. DEVICE FOR TURNING LIFT-SHAFT JOURNALS

removed leaving the periphery of the packing ring exposed so that it can be turned to size.

Screw *G* need not be removed from the chuck as the cover is provided with a central hole of such size and shape as to allow it to pass over the oblong head of the screw.

A spring-hanger pin is a rough forging and the only machine work required to be done on it is the milling of a slot in one edge to catch in the spring eye and keep the pin from slipping out endwise. The tools for cutting this slot are shown in Fig. 11. The shank of the holder, *A* is held in the toolpost of a lathe and the pin *B* is placed through the oblong opening of the sleeve at *C*. With the milling cutter held between the lathe centers and the pin fed against it until the proper depth is reached, the sleeve *D* is rotated by a wrench on its squared end. As the pin rotates with the sleeve, the slot is milled with a convex bottom as at *E*.

Device for Turning Lift-Shaft Journals

Turning the journals on lift shafts under ordinary conditions requires a lathe of at least 40-in. swing and is an ugly job as the operator is liable to injury from the long projecting arms as they revolve. A device for turning lift-shaft journals while the shaft is held stationary is shown in Fig. 12. The device is fastened to the faceplate of a lathe, the center at *A* taking the place of the usual live center. With the lift shaft mounted between centers, and held stationary by the arms resting against the lathe bed, the journal is turned by the tool *B*. The collar *C* is held stationary by a pin screwed into the tapped hole *D* resting against any convenient part of the machine. As the rest of the device revolves, the star wheel strikes the pin *E* and gives part of a turn to the feed screw *G*, feeding the tool along the journal.



FIG. 13. APPARATUS FOR REVOLVING DRIVING WHEELS.

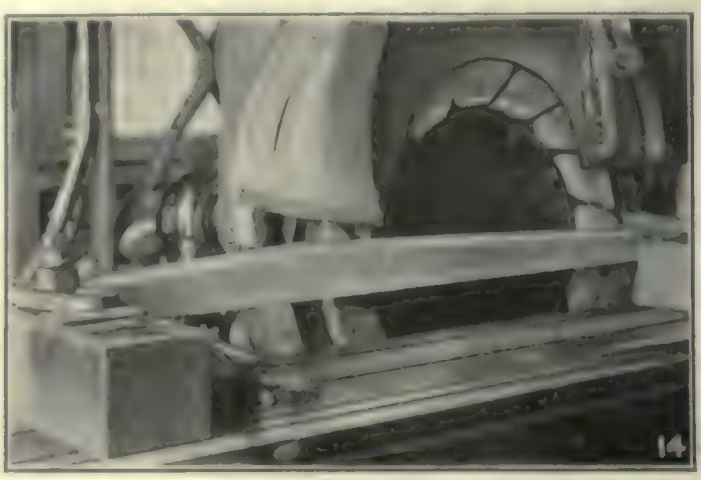


FIG. 14. GRINDING CROSSHEAD GUIDE-BARS

In Fig. 13 is shown an air-driven apparatus for revolving the driving wheels of a locomotive when setting the valves. One pair of driving wheels rests on rollers, two of which are located at *A* and *B*. The other rollers being under the driving wheel on the opposite side of the engine, are not visible. The rollers are driven by an air motor at *C* through worm gearing at *D* and *E*. This device is very convenient and besides saving time and labor, takes up but little storage room when not in use.

Crosshead guide-bars are trued up on a Diamond face-grinding machine, using abrasive blocks set in a chuck in place of a cupped wheel, as can be seen in Fig. 14.

Driving-wheel tires, when worn so that they are only fit for scrap, are removed from the wheel centers by cutting through with a gas torch. Fig. 15 shows a tire so cut, the cutting time being less than two minutes.

All the tools herein described, with the exception of the Moss chuck were either designed by or built under the direction of S. L. Gary, machine shop foreman.



FIG. 15. TIRE CUT BY A GAS TORCH

Methods of Machine Tool Design

Conclusion of the First Article—Design of Commercial and Single-Purpose Machines Contrasted—Shorthand Symbols for the Designer

By A. L. DeLEEUW

PERHAPS the most essential thing the designer should keep in mind is that he must never try to solve more than one problem at a time; and while he is busy with the general problem of the construction of the machine he should not trouble his mind in regard to any details. He should simply take for granted that he will get what he needs for the building up of his scheme.

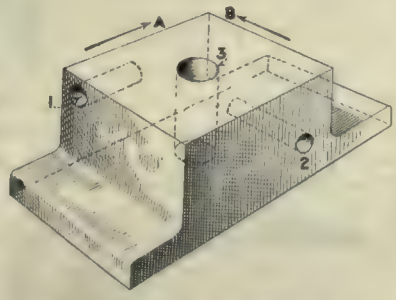


FIG. 1. SAMPLE PIECE TO BE MILLED AND DRILLED

To elucidate let us take an example. We are given a piece in which three holes must be drilled in three different planes and which must be milled in one of these planes, and we are asked to design a machine that will automatically perform these operations, but in which the piece will be chucked by hand. Fig. 1 represents this piece.

We see immediately that it will be a very simple matter to hold the piece during the operation. We must lay it up against a stop and we must bring clamps down on the projecting flanges. We notice that hole No. 3 is in the surface which must be milled, so that the milling and drilling cannot take place at the same time. An investigation of the piece shows us that the three holes do not intersect each other, so that it will be possible to drill all three at the same time. Knowing that it is not possible to do all operations at the same time, we will try to do the next best thing and have two operations, though, of course, with one setting.

Which Operation First?

The only question left to decide is this: Shall we first drill all holes and then mill; shall we first mill and then drill all holes; or shall we drill two holes and mill the surface and then drill the third hole? Suppose we make up our mind that there is no good reason why we should follow the third scheme and that there are several good reasons why we should not; reasons like this, for instance—that as we have a feed motion for two drills we might just as well employ this feed motion for the third drill also. Suppose, then, that we have eliminated the third choice. The question now is: Shall we first mill or drill?

Starting the drill for hole No. 3 will be facilitated if we mill first; it will also be possible to bring the jig-eye for this drill closer to the work. This seems to us to be a sufficient reason to adopt the first scheme, namely, mill first and drill afterward. We can now make a mental picture of the machine we will have.

There will be a surface on which the piece will be located, with the necessary stops and clamps. There will be two drill heads, one to the right and one in front for holes Nos. 2 and 1. This makes it probable that the loading side will be opposite hole No. 2. There will further be a slide, or slides, for the third drill spindle and for the milling spindle. It is not quite certain at the present whether we will use a spiral mill or an end mill. Considering this matter in a preliminary way we feel that the end mill will make a more open construction and perhaps somewhat simpler, and we therefore consider this construction as our first choice. However, we make a note of the fact that the other construction is also a possible one.

The drill spindle as well as the milling spindle must have a transverse movement; the one for getting into position and out of it, the other for the feed, and it seems reasonable to combine these two spindles in one slide. Of course, it would have been possible to make the milling spindle move in the direction of arrow *A* and the drill slide in the direction of arrow *B*, but we see no arguments in favor of such a construction. We will combine both slides into one, move the slide over by means of a cam while milling, and bring it to rest against a stop, after which the drill spindle will come into action.

Working Out the General Scheme

It should be noted that we have now before us a general scheme of a machine, but without any details. And it should be kept in mind that it may very well be possible that later on we may be induced to change this general scheme because one of the details offers so many difficulties that it is not wise to pursue the original plan. However, we will now use the plan as we have it, analyze it, and determine what are the different elements which we must provide.

So far as we have outlined this machine it is, in reality, a combination of machines; or, if one wishes to call it so, a combination of functional units: a unit for holding the piece, two units for drilling holes Nos. 1 and 2, and a unit for drilling hole No. 3 and for milling. Each of these units must be analyzed. So far as we can see no difficulties present themselves at all in regard to the means for locating and holding the piece. Each of the two drill spindles for holes Nos. 1 and 2 must have a driving and a feeding mechanism, and the unit for hole No. 3 and for milling must have two distinct driving and feeding mechanisms and a return for the slide to its original position. We take for granted that we will be able to meet all these requirements and do not trouble ourselves with doubts as to difficulties we may encounter.

Determining the construction of drill spindle for hole No. 1 we would follow a reasoning somewhat like this: This spindle has to drill only one size of hole and always to the same depth. Therefore, the spindle requires only one speed and one feed. And as the depth is always the same it is possible to accomplish this feeding by means of a cam. However, as the drill wears we would get holes of different depths unless we have some means either for adjusting the drill or the spindle or the cam, and we will keep this in mind.

We will not go further into this matter at the present time, as the foregoing seems to be sufficient to indicate the general line of thought we must follow and how we much come closer and closer to the details as we go along, always keeping in mind that it may be necessary to change our plan in case we should meet an insurmountable difficulty.

Commercial Machine Presents Different Problem

The example we chose was that of a special machine, in which the requirements are very definite. We are confronted with an entirely different problem when we must design a commercial machine, or rather we should say, a general utility machine. Merely looking at the piece to be machined placed the requirements of the special machine before us in a very definite form. When it comes to the design of a general utility machine we have no starting point for an analysis of its requirements. In fact, determining the requirements of a general utility machine is not a part of the designer's work. This should be done by the sales department which, however, should consult with the designers as to the possibility or advisability of embodying certain features in the proposed design. It is regrettable but nevertheless very true that most lathe spindle bearings are not proportioned according to the best machine design practice, but according to the proportions of a similar spindle of a similar lathe made by the closest competitor. Whether this is good practice or not makes no difference; we may just as well recognize the fact that competition is one of the controlling factors in machine tool design and that the practice will continue until the buying public has been educated to a point where it can judge for itself as to the merits of a machine tool. Even now there seems to be some improvement along this line, caused by the fact that some of the larger concerns who buy machine tools entrust the work of specifying and analyzing to their engineering departments, leaving the commercial end of the buying to the purchasing department.

Though the designer of a commercial machine is much handicapped by these conditions, it must not be thought that there is no scope for his work. He has to proportion the machine and provide new features and mechanisms. He has to take into consideration the fact that a complete line of such machines may be built, either now or in the future. He should construct the machine so that some of the units can be used interchangeably on a number of sizes in the line and build his machine out of functional units, which may be combined in various ways so as to make up a number of styles of machines. For instance, a single feed box unit may be used for two or three sizes of machines; a single drill head may be used for a number of sizes of radial drills, etc.

Advantage of Interchangeable Units

The building of a machine out of interchangeable units becomes possible by dividing up a machine into functional units. We may have a unit for the drive, another for the feed, still another for quick traverse, another again for the supply of cutting compound, etc. Each of these units should be treated as a separate machine. It is only necessary to provide a place on the frame of the machine to which this unit can be bolted; and if a number of different machines all have the same bolting surface and the same means for connecting up with the mechanism contained in such a unit, it follows

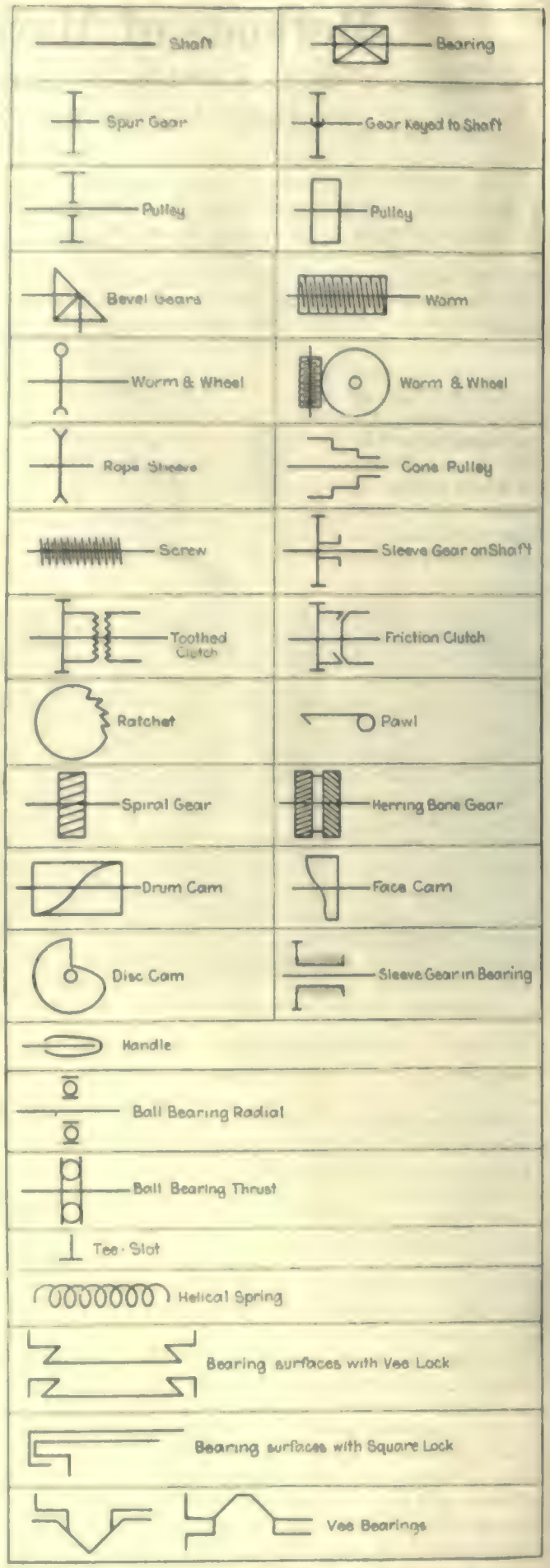


FIG. 2. DESIGNER'S SHORTHAND SYMBOLS

that that unit can be used on such a line of machines. This system of building machine tools as far as possible out of functional units leads to great economy in the building of the individual machine and makes possible an almost endless variety of combinations; in other words, it makes the line of machinery built by a manufacturer as elastic as it is possible to make it.

Some twenty or thirty years ago, if a new machine had to be developed, it was quite the customary thing for the proprietor of the machine tool establishment to hunt around in the pattern storage to see if he couldn't find some pattern which might be made the basis of the new machine. He was willing, of course, to make some slight modification in the pattern, but the idea that no new expensive pattern would have to be built for the main part of the machine was so alluring that this method of starting a new machine tool was quite the regular practice in those days. It was left to the unfortunate newcomer in the machine tool business, the man who did not have a lot of old scrap patterns lying around, to design the machines from the ground up, and, in the opinion of the writer, this may have been one of the main reasons why the most important developments in machine tool design did not originate with the older and best established concerns.

It is almost unnecessary to say that the old practice, should it still exist, must be abandoned. *The frame of a machine must be built around its mechanism, and not the mechanism into the frame.* There is not so much danger at the present time that the old method will be followed. Thirty years ago practically all of the mechanism of a machine was hung on the outside of the frame, and it was a simple matter to adapt the frame to a new kind of mechanism merely by changing a few bosses or pads. Nowadays it is customary to have the mechanism completely covered, preferably by the frame itself, so that changing over from one mechanism to another almost necessarily means the making of a new frame.

Mention was made of the necessity of confining the mind to one problem. The human mind is so constructed that it cannot contemplate more than one thing at a time. However, when analyzing a problem the designer will naturally find a number of items which are not obvious and which he must solve, and it may well be that in solving one item a certain way he makes the solution of another item more difficult or even impossible. Nevertheless, he must take up one item at a time. When he has solved number one he should go on and solve number two, and then check the one by the other; after which he can go on with number three and check its solution by number one and number two. It may often be that the designer finds more than one solution for a single problem. If he does, he should select one which appears best to him, but make a note of the others, so that, if he should find later that the first solution selected by him leads to trouble later on, he will be immediately in a position to substitute a new solution for the one discarded.

It has been the writer's experience with draftsmen and designers that they often speak of the *troubles* they meet in the design of a machine. This term should never be used. The only thing one can meet in the design of a machine is a problem. It is only when the designer tries to solve more than one problem at a time that he gets into *trouble*, but this trouble is of his own making.

While on the subject, which might almost be called the psychology of design, the writer cannot resist the temptation to mention the kind of idea, almost superstition, which seems to prevail that the ability to design a machine is a wonderful gift, the result of genius of some kind, and that the designer is fully entitled to the artistic temperament and all its attributes. There are a great many stories in circulation about designers who need a couch in their office because inspiration will not come unless they are in a horizontal position and supported by cushions of a certain degree of elasticity. Other stories tell of the designer who gets wan and thin from the intensity of his efforts; who for days is groping for the intangible idea which is constantly flitting around his head like a mosquito in summertime, but upon which he can no more lay hands than upon the aforesaid mosquito. Then, one night he wakes up from a deep sleep (generally about three o'clock, though the writer does not know why another hour would not do just as well), and he finds that his guardian angel

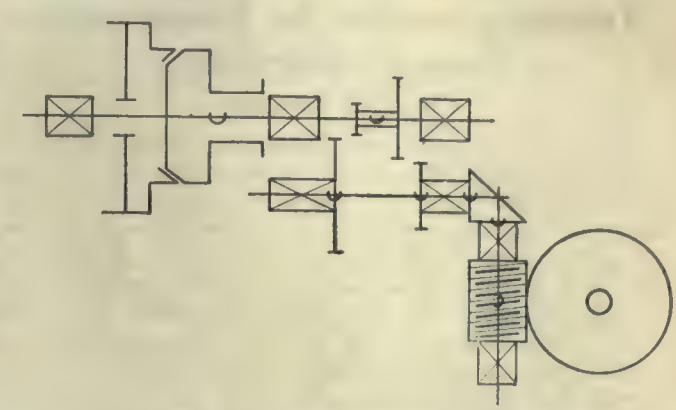


FIG. 3. A MECHANISM INDICATED BY SYMBOLS

has worked out the entire problem during his sleep and that all he has to do now is to sit down in his pajamas and put the thing on paper, after which the designer can once more give his attention to the now very necessary process of getting back to normal weight.

As a matter of fact, designing a machine is nothing else than a process of careful analysis and patient selection and checking of elements and devices with which the designer is supposed to be familiar. This is not an easy task, but neither does it call for gifts which a well-prepared engineer does not possess.

To a certain extent the preliminary analysis of a machine can be carried out without any drawings. In fact, drawings would be of no advantage as long as we have no clear idea of the construction of the units which we employ. It would not be possible, for instance, to represent a feed box by a drawing unless we have a very clear idea of the construction of that feed box. By and by, however, the analysis brings us closer to details, and it becomes necessary to find some way of representing our ideas on paper in some other way than by words. To make a complete drawing of a device when we know almost with certainty that we will modify it in every detail later on does not seem attractive. Drafting is a slow process, and the careful putting down of details of gears and shafts and clutches is not necessary until we have, and wish to preserve, all the dimensions and details of these elements. To overcome the necessity of making drawings which later

on will be annihilated, the author has been using for many years a set of symbols for various machine elements. One might call it a "drafting shorthand system."

In Fig. 2 are shown the symbols referred to. This, however, does not mean that somebody else could not use other symbols equally good and more in harmony with his personal taste. Fig. 3 shows an arrangement of a gear mechanism represented by means of these symbols. There is a pulley with friction clutch, the clutch being keyed to a shaft. To this same shaft is keyed a pair of sliding gears which can mesh with two stationary gears on another shaft; and to this second shaft is keyed a bevel gear, driving another bevel gear on a third shaft, on which is keyed a worm driving a worm wheel. It takes only a few minutes to draw up such a complete mechanism preparatory to analysis.

This matter will be taken up more in detail in the following chapters.

Training Leaders for Foremanship Classes—Discussion

By J. T. Towlson

In respect to that most interesting article by D. J. MacDonald under the above title, on page 249, Vol. 55, of American Machinist, it is hoped that what a foreman with an experience of over thirty years has to say on the subject will be of some service, as well as interest. The shop foreman, the ideal one, is born and not made, as the saying is. In any case, his making is not by others, but by himself. If he is of the material from which real foremen are made, he will possess just the correct amount of common sense to enable him to gather knowledge, both of men and of machines; while if he does not possess, or is not constituted of the right kind of material, no instruction will ever bring him up to within miles of the ideal foreman.

I have found that many briefs have been held, and rightly so too, on behalf of the rank and file of the men engaged in our engineering industries; and also that earnest and intelligent writers have penned lengthy dissertations, setting forth the difficulties, the responsibilities and the burdens of employers. But, as to the foreman—whether it has been supposed that a super mechanic who has dropped into a foremanship is so exceedingly fortunate as to be quite outside the pale of any possible reason for dissatisfaction, or whether it has been assumed that he is identified with a sufficiently intelligent and progressive class which is well able to assert its right—no one has seen the need of holding a brief for him. The number of writers who have assisted in adjusting his real or imaginary bearings are lamentably few, so the only thing to be done is to take up the cudgel for him.

There need be no hesitation in stating, for it is so well known, that his remuneration is small—too small, and besides this that he is a kind of "buffer state" between master and man. There is also a sad want of respect shown to him from those who have thought so well of his value and capabilities as to place him in charge of a hundred or so men and machines.

For the purpose of making it sufficiently clear to the reader the type of shop foreman referred to, it may at once be said that there are several classes, and of these three stand out distinctively.

Firstly, the real live man, who by insistent observation and study of men and machines, and who by a naturally quick and intelligent grasp of the elements that are calculated to build up the ideal foreman, and who by earnestness and solicitude to do right, all but succeeds in attaining the ideal.

Secondly, there is the man who, with less natural ability and talent, with lack of enthusiasm and grit, fails to reach a position or condition anywhere near that which should be the goal.

Thirdly, there is the foreman who has no natural ability, has wasted his time, neglected his books and possesses no enthusiasm and no ideal even as a mechanic. He has been "pitch-forked" into the position on account of his policemanship proclivities, or some other equally pernicious quality. He jogs along week by week, draws his pay and assumes no responsibility for work done. If a job is right, he did it; while if it is wrong, he had no hand in it. He puts up with all kinds of indignities without complaint, he possesses no pride as a mechanic or an engineer, and he depends entirely upon his men or his boss in all extra difficult jobs. He thus breaks on each and every day of his life every rule and law that tends to preserve the prestige and dignity of the foreman's position—a foreman only in name.

The foreman who is positioned in the first class of the foregoing category is in the first place a born mechanic, ultra practical, but with sufficient common sense to be aware that there is not that conflict between practice and theory that is commonly imagined by the ignorant. He is well read, in touch with modern ideas and has an all-abiding conscientiousness toward his employers, but none the less towards his men. Notwithstanding differences of pay, he considers himself the social equal of his better-paid associates; he is respectful to his managers, yet cannot be servile to any man.

Treatment of a Foreman

This ideal foreman expects to be treated as a gentleman, for such he is; he requires to be consulted in respect to changes in discipline and in the general control of his men and machines. He is ready and willing to co-operate and to second the wishes of his bosses, if he is so consulted.

It will, then, be readily understood that this kind of foreman will rightly deem that his dignity has been lowered and his prestige assailed if he is not treated in the proper manner. The absence of respect and trust will go far to render him dissatisfied, tending to cripple his valuable initiative, and crushing with loss to his employers his individuality. There may be times when he wishes himself back at his tools again. He is often paid at too low a rate, although he may be entrusted with the execution of costly work, the profit from which he is well able to make or to mar.

It would be well for Mr. MacDonald to direct his valuable efforts toward training teachers of managers, especially in the direction of enabling the managers to understand the shop foreman's mentality. He might show them the unprofitable effect of inflicting strict rules and regulations, and enable them to understand that man-to-man treatment of such vertebrates would be found infinitely more productive of profit, than a system which includes the papering of the shop walls with "Thou shalt nots" and dire penalties.

In closing my defense of my friends, the live shop foremen, with sincerity I state that employers would do well to make friends with their foremen, for certainly in that way lies success.

Machining the Peerless Crankshaft

Crankshaft for an Eight-Cylinder Motor—Double Connecting Rods Require Long Crankpin Bearings—Details of Oiling and Methods of Drilling Oil Holes

By FRED H. COLVIN
Editor, American Machinist

THE crankshaft of the Peerless eight-cylinder motor has four throws, a center bearing, and is counterweighted, as can be seen in Figs. 1 and 2. The pins are long enough to accommodate the connecting rods side by side, instead of rods of the interlocking or spade type. A good idea of the problems involved in machining this crankshaft can be had from Fig. 1, which shows the general dimensions as well as the design of the shaft, the location of the oil holes, etc. Where tolerances are not given, the practice of the Peerless company is to hold all dimensions given in fractions (except drill and commercial stock sizes) to come within plus or minus 0.010 in. Dimensions given in decimals but with no specified tolerance are to be within plus or minus 0.003 in. Where tolerances are given, they are, of course, to be followed.

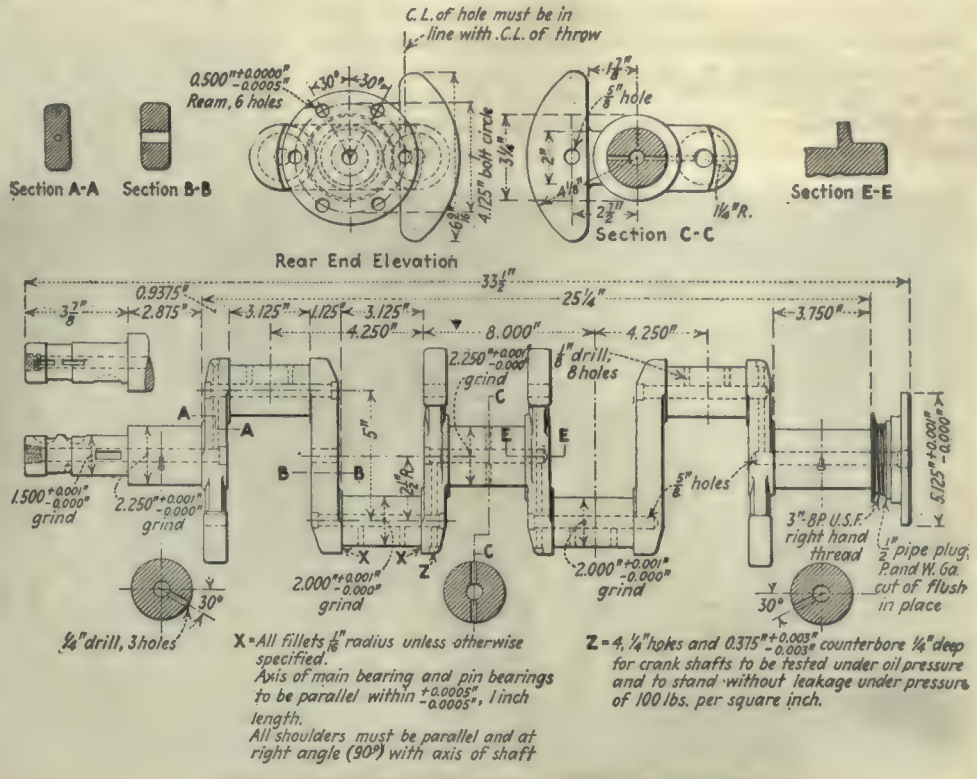


FIG. 1. DETAILS OF PEERLESS CRANKSHAFT

The oil distributing channels are divided into three sections, one being fed from each main bearing and one from the center bearing. The center bearing feeds the second and third crankpins while each of the end bearings supplies oil only to the pin next to it. It will be noted that each crankpin has two oil holes, these being located so as to come in the center of each connecting rod bearing. The thread at *A* is cut simply to aid in keeping all the oil drip possible within the crankcase. The thread tends to carry the oil to the beveled flange which comes inside the motor casing so that the oil finds its way down into the pan instead of to the clutch. The sequence of operations is:

Operation	1	Sandblast.
Operation	2	Straighten.
Operation	3	Rough-turn center bearings and counterweights.
Operation	4	Finish-turn center bearings.
Operation	5	Turn flange and rear line bearings.
Operation	6	Turn front bearing and gear fit.
Operation	7	Turn pin bearings.
Operation	8	Re-straighten.
Operation	9	Drill holes in flange end.
Operation	10	Drill, re-center and finish face.
Operation	11	Grind flange.
Operation	12	Grind line bearings.
Operation	13	Drill and ream flange holes.
Operation	14	Drill, §-in. oil hole through pin bearing.
Operation	15	Drill §-in. hole through line bearings and counterbore for plugs.
Operation	16	Grind pin bearings.
Operation	17	Finish-turn flange and thread.
Operation	18	Drill ⅜-in. oil holes.
Operation	19	Drill and counterbore ½-in. holes.
Operation	20	Face to proper length.
Operation	21	Tap holes in end.
Operation	22	Mill keyways.
Operation	23	Balance.
Operation	24	Inspection.

The rough-turning of the center bearings and also the counterweights is done on a LeBlond lathe as shown in Fig. 2. The gear end of the shaft is held in the four-jawed chuck shown, although a bent tail dog is also used to assist in securing sufficient driving power. The tool for the bearing is held in the special toolblock at *A* and is adjustable from the back by the screw shown. Tools for turning the four counterweights are held at *B*, *C*, *D* and *E*. The center bearing is also finish-turned on a LeBlond lathe.

Two methods are used for turning the four crankpins. Fig. 3 shows a Wickes lathe which drives the crankshaft from both ends and turns two pins at once. Each toolhead carries a broad-faced tool as shown at *A* and *B*. Ample lubrication of the cutting tool is secured by means of the two pipes which carry the cutting lubricant directly on to the pin being turned.

The other method of turning pin bearings is shown in Fig. 4, in which a LeBlond lathe is used. The crankshaft is driven from both ends, the middle pins being turned in the position shown. This arrangement holds the crankshaft very firmly and tends to prevent spring while turning pins 2 and 3. The crankshafts are gripped by the web and also by the other pins, jaws *A* and *B* being used for this purpose. These same chucks can be used for turning pins 1 and 4. The cross-slides carry two sets of tools, one for turning the pins and the other for facing down the webs or cheeks.



FIG. 3. ROUGH TURNING CENTER BEARING.



FIG. 4. TURNING PIN BEARINGS ON WICKES LATHE

After re-straightening, to take care of any spring due to the rough-turning or the release of stresses in the forging, the flange holes are drilled and the flange and the line bearings ground. Three drilling operations are shown in Fig. 5. Beginning at the left the flange holes are being drilled with a multiple-spindle head, while the other operations are the drilling of the oil holes through the bearings, as indicated in Fig. 1. These fixtures (Fig. 5) show how the crankshaft is held in position and how the drills are guided for the different drilling operations. It will be noted that it is necessary to drill through one of the counterweights in order to get at crankpins 2 and 3. The long drill shown at *A* reaches down through the second pin and drills the next without removing the shaft from the fixture. The drilling of the end crankpins is shown at *B*, in which the two counterweights are drilled through to avoid changing the crankshaft end for end.

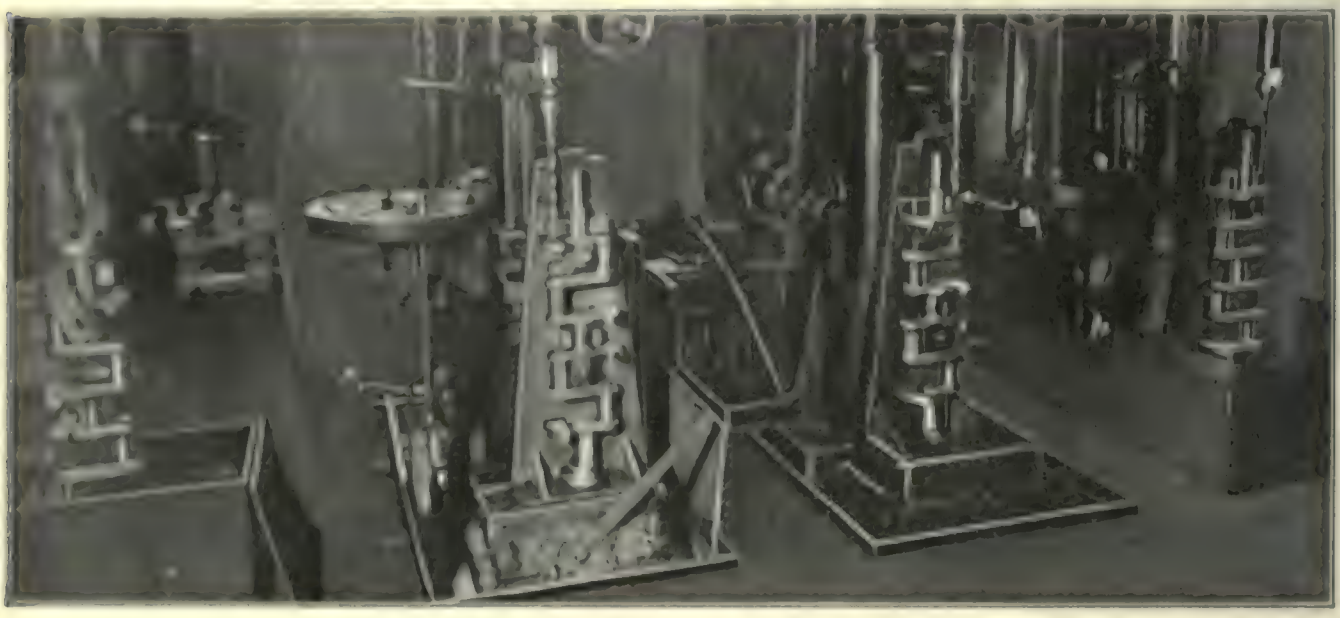


FIG. 5. DRILLING FLANGES AND OIL HOLES

The pin bearings are next ground, after which the connecting oil holes are drilled in the crank webs and the distributing oil holes drilled in the bearings, as in Fig. 6, which shows the method of holding the crank-

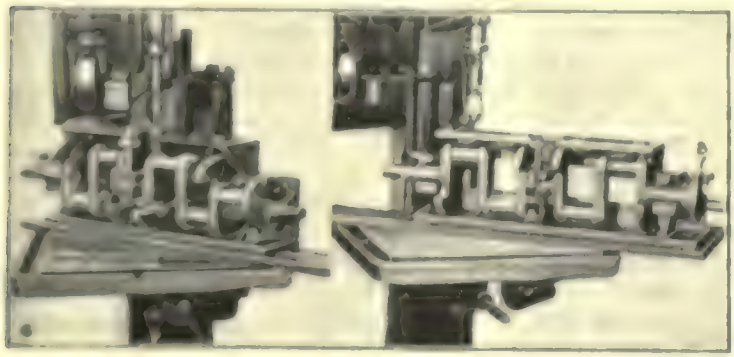




FIG. 6. DRILLING OIL PASSAGES AND DISTRIBUTING HOLES. FIG. 7. TAPPING THE ENDS

shaft, the central bearing being clamped as at *A* in both cases. The crankshaft is indexed by means of the flange holes as at *B*, and the outer end supported as shown. The same type of drilling fixture answers for both operations, making it unnecessary to transfer the crankshaft from one fixture to another. The drilling machines are conveniently placed so that the fixtures can be readily moved from one to the other.

The tapping of the holes in the end of the shaft is

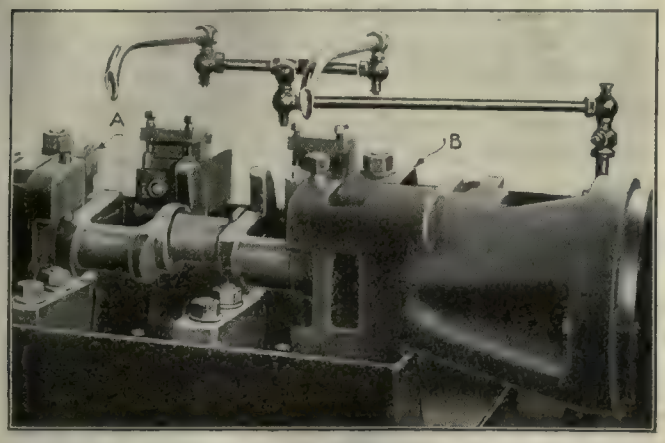


FIG. 4. TURNING PIN BEARINGS ON LEBLOND LATHE

done on an old lathe provided with the swiveling fixture as shown in Fig. 7. This fixture clamps the shaft by the end bearings as shown, the fixture being indexed by the pin *A* and swiveling on the stud *B*.

Saving Money in the Assembly Department

BY R. F. HELLER

In these days of economy and cutting down the costs of production the assembling department appears to be the one department where the greatest showing along these lines can be made. This is due to the assembling department usually being the largest, particularly in factories where minor machining operations to size are done in this department, and where the majority of operations are performed by hand. Opportunities to change from old methods to new are unlimited if the foreman is at all resourceful and such changes usually require little or no cost for new equipment.

To cite a particular instance, we have quite a number of close fitting jobs of studs and pins of all sorts on which the cost of grinding was prohibitive and we were at the mercy of the screw machine department as to quality. We pressed that department continually for better work until finally the foreman got an idea. He rigged up a still useful thread-rolling machine by grinding some obsolete threading dies smooth. He now rolls almost every stud and pin we use as smooth and round as one may wish, eliminating all the misery from the previous disagreeable fitting jobs, at less cost. Where very close fits of such pins and studs are required it is advisable to sort such work to size by a graduated taper gage, then it is easy to ream to fit.

Getting acquainted quickly with the various parts of a machine is the secret of success in assembling work, otherwise you work in the dark. In making changes great care must be taken to assign the proper grade of help to perform these operations under the new method so as to affect a full saving, as in most cases we contemplate changes with the idea of simplifying the operations in view. Under the old method it perhaps required three minutes for a skillful operator at the rate of 45 cents per hour to perform an operation. If under the new simplified method it required but two minutes for a 30-cent operator, it would be advisable to use the 30-cent operator and effect the full saving.

Great care must also be taken in setting new rates or time required to perform new operations. They must be set high enough to make it attractive to the operator to get full possible production. On the other hand, if set too high, besides the loss on the particular operation set wrong, it gives the operators a chance to make what they consider a day's pay too quickly and gives them time to idle away in gossip. In many cases this sows seeds of discontent among fellow workers and takes up the foreman's time in following up uncalled for troubles.

GIVE CREDIT FOR SUGGESTIONS

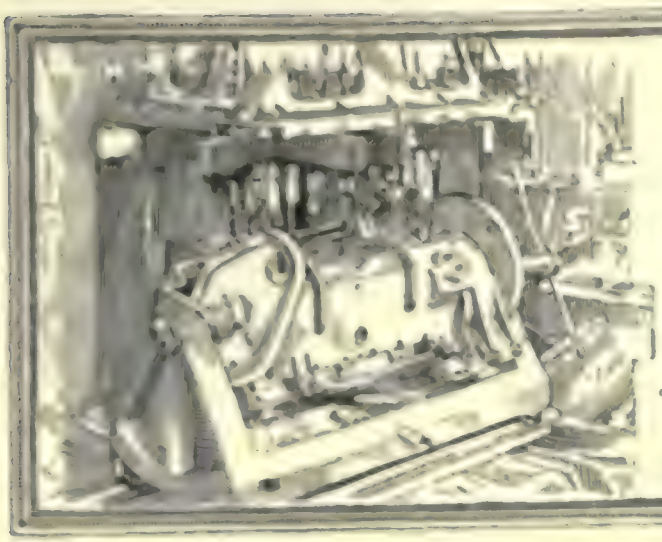
Many good suggestions can be derived from the operator by keeping in close touch with him, for he is thoroughly familiar with the operations he performs and if at all intelligent he is the most reliable source of information. It is well for a foreman when he receives such suggestions from his men, to mention who suggested them when he presents them to his superiors, as that will further encourage such suggestions from the men. The management in turn will give the foreman more credit than if he presented the suggestion to them, omitting to mention who in reality suggested it.

A foreman should never neglect to listen to kicks and complaints from operators about defective parts or material, though they may be put to him in a crude and most unbearable way. For, from such sources often come the best information as to further improvements. The best foreman is he who can listen to such complaints without his temper being the least affected. He can then bring these troubles to the attention of the proper sources and hammer continually until the trouble is removed. This affects a saving of scrap and of time in the assembling department, as this department is a source of information as to the quality of work produced in every other production department of the plant.

Scrap can be cut down considerably and time saved in sorting by having proper boxes to hold scrap and defective parts, each marked plainly, set at each operator's work place. The operator separates it as he finds it, and it also tends to make him more careful about scrapping anything he may be able to use, as he knows you are interested in what he scraps. These boxes should be collected at regular intervals.

In hiring green help it is usually customary to interview applicants as to their past experience and capability before placing them in positions they are fit for, as near as possible to your judgment. After presenting new help to a reliable operator or key man to break in, and seeing that he is fully equipped with necessary tools and material, it is always a good point to mention the fact of your conviction "That you feel sure he will do well" so that the new operator hears it. The new operator will appreciate that you expect him to make good and will seldom fail to come up to your expectations.

Make no promises that you cannot keep, but keep those that you do make. Give and demand a square deal. Be pleasant, never lose your temper and you cannot fail.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Engine and Turret Lathe Tools for Turning Spherical and Curved Surfaces—Internal and External Finishing—Generating and Forming Attachments

IN THE design of tools for turning spherical surfaces it is advisable, as far as possible, to generate the surface by swinging the tool on a radius of the required size. On small work of brass or of other materials of such a character that they can be readily formed, it is possible to obtain good results by the use of a formed tool carried either on the turret or the cross-slide. The method previously shown in Fig. 356 can be applied also to the forming of a spherical surface. It is an advantage to make tools self-contained so far as possible, and thus allow other tools to be used in the turret or cross-slide in the same setting of the work.

In Fig. 366 is shown a simple form of spherical turning device for the work *B*. The body of the tool *C* is fastened to the turret, and is U-shaped so that it receives a swivel member *D*. This member carries a tool *E* held in place by two setscrews *F*. The swivel is pivoted at *G* in the body of the holder. The upper portion is attached to a stem *H* in such a way that it can be readily turned by moving the handle *K*. The stem *H* is fitted with a stop pin *L* which comes to rest against the stud *M*, thus limiting the movement of the tool.

In operation, the workman feeds the tool by hand by grasping the handle *K*, thus generating the surface. Tools of this sort can often be used for small work; but it is important that they should be used as close to the end of the spindle as possible, in order that the work does not have too much overhang and thus cause vibration. Particular attention must be paid in the design to the rigidity of the tool, as no support is provided.

When a forming plate is used for controlling the shape of a curved surface, a very simple arrangement can often be made. An example of this sort is shown in Fig. 367, where the work *A* has the projecting end rounded as shown. This operation does not require a particularly accurate job, yet the stock must be removed and a smooth surface machined. The bracket *B* is attached to the ways of the lathe and carries a forming plate *C* as shown. The cross-slide is fitted with a toolblock *D* in which the tool *E* is carried. Adjustment is made by means of the setscrew at *F*. At one end of the block the roll holder *G* is fastened in such a position that the roll *H* comes in contact with the form plate.

In operating the device, pressure is applied either by weight or springs in the direction indicated by the arrow at *K*, thus holding the roll firmly against the form plate. The crossfeed screw feeds the tool across the end of the work, and the direction of travel is controlled by the contact of the roll with the plate. A very simple device somewhat cheaper than the attachment can be made by using a form plate carried directly in the tailstock of the lathe. This does not require a special bracket *B*, and it can be made up somewhat more cheaply.

Inside Generating Tool

Considerable ingenuity is often needed in designing a tool for boring an inside curved surface. A simple device for this purpose is illustrated in Fig. 368. The work parts *A* and *B* are fastened together so that the two pieces are bored at the same time. The body of the toolholder *C* is held on the cross-slide of the lathe by a simple bracket. The forward end of the bar is piloted at *D* in the work. A slot is cut entirely across the bar at *E*, and in this slot a swivel member *F* is carried. The tool *G* is inserted in the swivel member and held in place by two setscrews, as shown. One end of the swivel block is cut in pinion form as indicated at *H*.

The side of the bar *K* has a rack cut upon it which

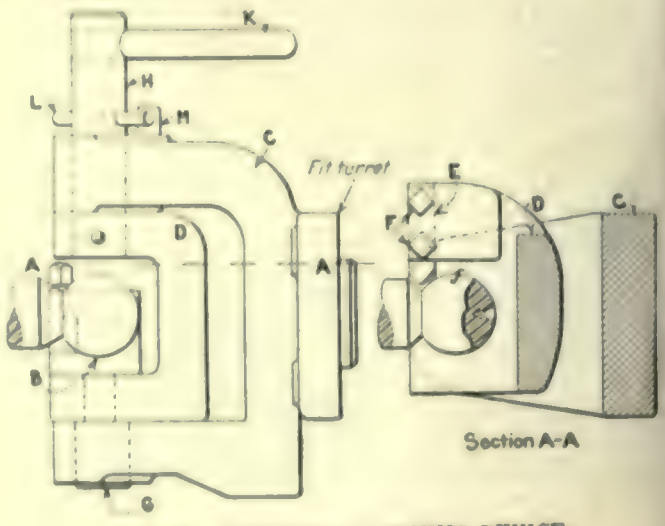


FIG. 366. SPHERICAL TURNING DEVICE

[illegible] All rights reserved

engages with the pinion *H*. The end of the bar *L* enters the hole at the end of the holder, thus giving additional support. The bar *K* extends entirely through the holder *C*, and is furnished with a stiff coil spring at *M* acting against the collar *N*. In operating the device, the cross-slide is moved into position and locked; after which the tailstock is screwed up against the end of the collar *N* and the feed is obtained by movement of the tailstock screw.

In Fig. 369 is illustrated a device used for turning the spherical surface *C* on the work *A*, which is held in chuck jaws *B*. The surface is generated by a radial movement and not by a form in this case. The cross-slide *D* is fitted with a bracket *E* on which is mounted a swiveling member pivoted at *L*. This swivel contains a toolholder *G* in which the tool *F* is adjustably held. The member *H* is fastened to the turret face and connected with the link *K* fastened to the swivel. The forward movement of the turret causes the tool to

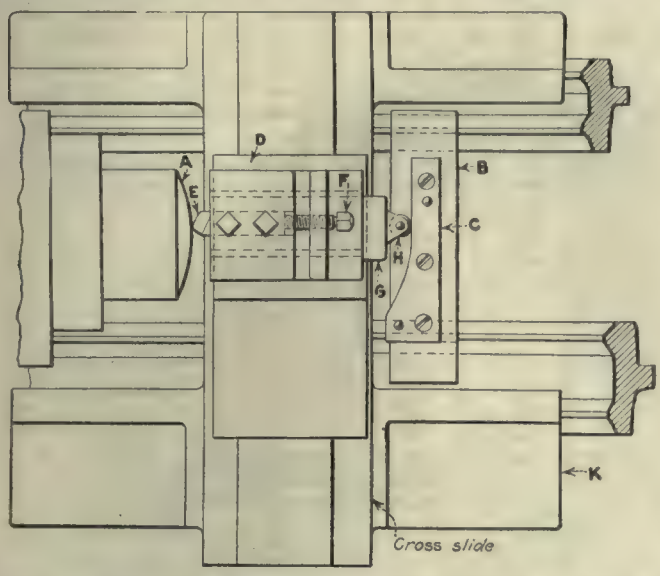


FIG. 367. DEVICE FOR ROUNDING THE END OF A CASTING

travel in an arc of the desired radius, so that the curved surface is produced by a true generating action.

Care must be taken in designing tools of this sort to make sure that the swiveling member is well supported and gibbed, so that there will be no lost motion or vibration. In the case shown, the swivel is turned circular at *M* and is held down by means of a circular strap *N*, which is fitted carefully so that there is no looseness. If required for a large diameter, it may sometimes be necessary to design a special cross-slide to hold the turning tools, in order that sufficient support for the swivel member may be obtained. The designer should be very careful to lay out the extreme movements of the swivel in both directions, to make sure that there are no interferences.

Spherical Turning Attachment

There are numerous cases in which a simple attachment can be made for an engine lathe to turn a spherical surface, such as that shown at *A* in Fig. 370. The work in this case is held on an arbor *B* driven by a special dog *C* in a slot in the faceplate. The outer end of the arbor is supported by a center in the tailstock *D*. The ordinary positions of the carriage and tailstock are reversed when using this fixture, as the tailstock is placed between the carriage and the headstock.

A special bracket *F* is fastened to the ways of the machine directly under the work, and on this bracket a swiveling member *G* is mounted. This member car-

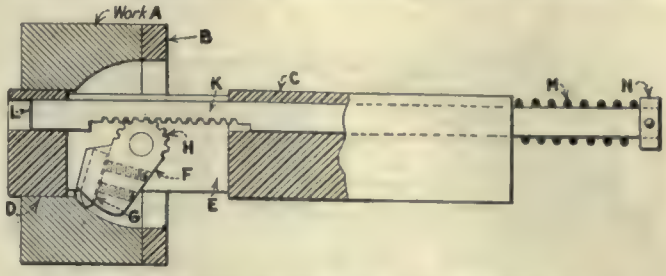


FIG. 368. INSIDE SPHERICAL GENERATING TOOL

ries a toolblock *H* in which the tool *K* is supported. The toolblock *H* is so arranged that it can be adjusted readily toward the center pivot *N*, so that various diameters can be turned. The carriage *E* has a block *L* fastened to it and connected to the link *M*, the other end of which is attached to the swiveling block *G*. It is only necessary to set up the work in the desired position and use the longitudinal carriage feed in the regular way. The tool *K* then travels on the circumference of a circle, the size of which depends upon the distance the tool is set from the center.

The operation of this device is very simple and the design is economical with regard to construction cost. In the example shown, the tool *K* is at the rear of the lathe so that there is a lifting cut upon the swivel. It would probably be better to arrange it so the tool is at the front of the lathe, as the pressure of the cut would then be downward instead of upward. The general details of the arrangement would be the same in either case.

Combined Curved and Straight Turning

It is rather difficult to turn a given diameter so that it becomes perfectly tangent to a curved surface on the same piece of work. In the example shown in Fig. 371, the end of the work is turned to a radius *A* which becomes tangent to the outside diameter and forms a

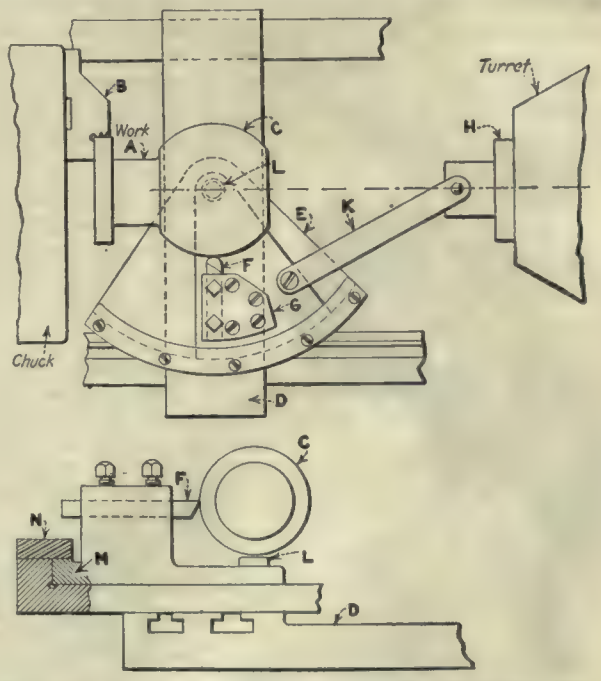


FIG. 369. CURVED GENERATING ATTACHMENT FOR TURRET LATHE

continuation of it. In order to make sure that there would be no interruption or shoulders on the work, it was decided to develop an attachment in which the same

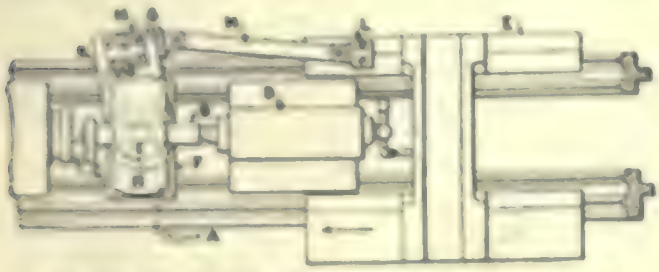


FIG. 370. RADIAL TURNING ATTACHMENT FOR ENGINE LATHE

tool would cut the radius and turn the outside diameter.

The work is held on centers in an engine lathe, and the regular cross-slide is removed from the carriage. A special bracket *B* is bolted to the back of the carriage, as shown, and in this bracket a dovetailed member *C* is fitted so that it will slide freely in a longitudinal direction. A link *D* of the proper radius is pivoted at *E* on the sliding member. The other end *G* is pinned to the block *F*, which is attached to a special toolslide *K* fitted to the dovetail on the carriage. This toolslide carries a turning tool *H* held in place by setscrews and furnished with a backing-up screw for fine adjustment. The latter is not shown in the illustration.

The block *L* is fastened to the sliding member *C* in such a position that the shoulder *M* acts as a stop against the radius bar *D* at the completion of the radius-turning movement. The rod *N* is fastened to the end of the slide *C*, and passes through a bracket *R* which is securely fixed on the ways of the lathe. The spring *P* thrusts against the collar *Q* pinned to the shaft, which latter is a sliding fit at *O* in the bracket mentioned.

In operating the device, the carriage is fed in the direction indicated by the arrow at *S*, and the radius rod remains in contact with the stop *M* while work is being turned cylindrical. When the collar *T* strikes the edge of the bracket *R*, the cylindrical turning operation ceases and the radius turning starts. It is evident that the movement of the member *C* is arrested at this point, so that the motion of the slide is controlled by the longitudinal feed of the carriage and the tool *H* travels about a center as constrained by the bar *D*, thus completing the work.

In generating a radius on the inside of a piece of work, the tools used for the purpose are affected very largely by the size of the work and the accuracy required. When a condition like this is found, great

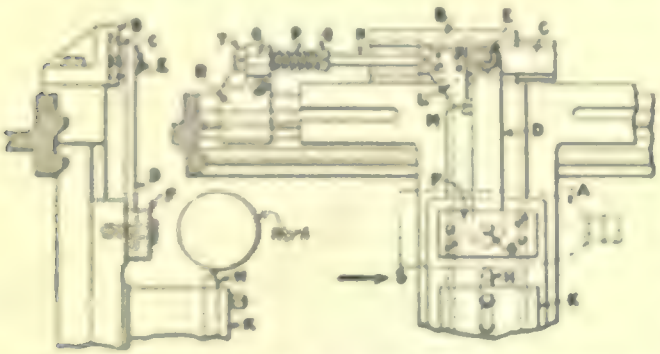


FIG. 371. COMBINED CURVED AND STRAIGHT TURNING ATTACHMENT

care must be taken in the design of a generating tool to make sure that it has sufficient rigidity to withstand the pressure of the cut. A support for the end of the bar in which the generating attachment is contained is of great importance.

In Fig. 372 is shown a piece of work *A* held in chuck jaws *B* on a turret lathe. The inside curved surface is to be generated to a true spherical form. The chuck is furnished with a bushing *C* which acts as a support for the bar *E* held in a bracket *D* on the face of the turret. The end of the bar *F* enters the bushing, and a collar *G* comes against the face of the bushing and acts as a longitudinal stop, thus positioning the bar.

The boring tool *K* is held in a swivel block *H* in a slot in the bar. It is pivoted at *P*, and a link *L* connects the swivel member with the sliding block *M* which is fitted to a longitudinal slot in the bar. The link *N* connects the bracket *D* with the sliding block mentioned, so that

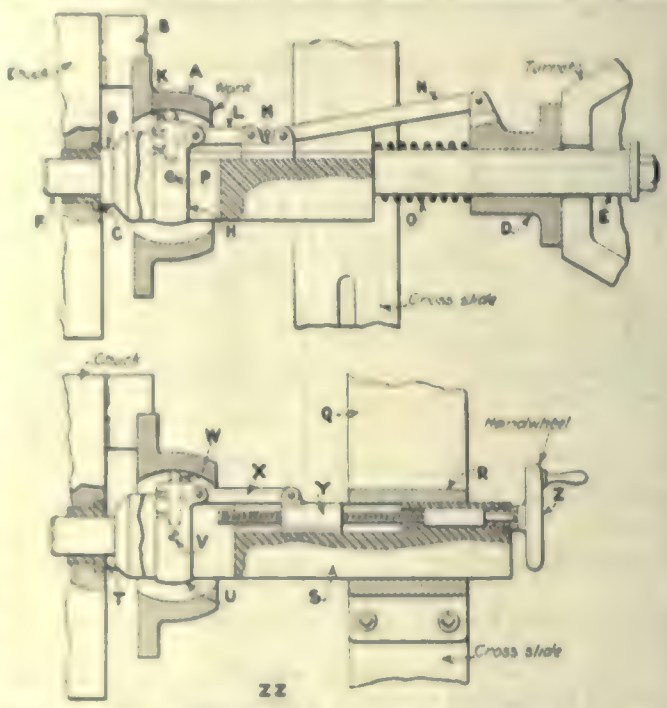


FIG. 372. TWO METHODS OF BORING AN INSIDE CURVED SURFACE

the tool can be fed. A heavy coil spring *O* is placed between the shoulder of the bar and the end of the hub on the bracket *D*. This spring keeps the thrust washer *G* up against the face of the bushing *C* at all times. In operation, the turret is moved forward until the tool is in position ready to start the cut, after which the feed is engaged. The turret then travels forward, carrying with it the bracket *D*, pushing the link *N* along, and thus causing the tool *K* to describe the proper radius.

A somewhat similar arrangement for the same piece of work is shown at *ZZ*. This application, however, is made to an engine lathe. The cross-slide *Q*, has mounted upon it a holder *R*, into which the bar *S* is clamped. The end of the bar is piloted in a bushing at *T*, but no stop collar is used. A swivel block *U* is provided with a pivot at *V* and contains the tool *W* which does the boring. This block is connected by means of a link *X* to the block *Y*, which is tapped to receive a threaded rod connected to the handwheel *Z*. By operating this handwheel, the block *Y* travels in the slot to which it is fitted, thus moving the link *X* and causing the tool to travel in the desired direction.

Shall We Standardize Tapers?

THE following paragraphs conclude the expressions of opinion on the merits of various tapers. These statements are given with a view to crystallizing sentiment in favor of one particular type, suitable to all branches of the machine-tool industry. The first and second parts of the articles were published April 13, and April 20, respectively.

No. 40. It would seem to us that with the thousands, and even hundreds of thousands of machines and items already arranged for the tapers already in existence, the Morse more especially (with the exception of perhaps certain milling machines), that the change along the lines you suggest would be very confusing and expensive for all concerned, and we should question the advisability of considering any change. In our case, we probably do not have more than a dozen orders in a year for a taper differing from our regular Morse taper, and they are generally for the Brown & Sharpe taper. We think the same rule would apply to the Brown & Sharpe people in any application that might come to them to fit their machines differing from their own taper.

We should think it would be a very serious matter to consider after so many years of having an established taper, such as the Morse taper, to consider making any change. From our own standpoint you can understand it would be a very serious matter for us to consider, and we should hesitate about doing so.

No. 41. Inasmuch as there are several good standards, the most popular of which are probably Brown & Sharpe and the Morse, the bringing about of a single standard for tapers would naturally meet with opposition from some manufacturers and the many users who might feel that a single standard would cause them some inconvenience and expense. Most of the specifications received by us are for the Morse standard, although there are some for the Brown & Sharpe.

We shall be glad to co-operate with whatever policies the engineering societies may decide upon. At any rate, we wish you success and regardless of opposition, we feel that you are making a step in the right direction.

No. 42. The question brought up in your letter is one that we, too, would like very much to see settled, and we think there is no time like the present for accomplishing the standardization of tapers. We would say by all means the Morse taper, and would like very much to see all machine tool builders adopt it as a standard. In this same connection we might state that we have been trying to get tap manufacturers to standardize on the diameter of their taps for the past three years, but have been unsuccessful, and it is therefore necessary for us to make a different size collet for each different make of hand taps and for each size of tap that is made. We would welcome any standardization of these diameters by the various tap manufacturers.

No. 43. Our use of tapers is quite limited and practically confined to the purchase of tools with them. It would be a convenience, of course, to have one standard for many uses and we would welcome such uniformity.

No. 44. We can readily understand your purpose in raising this question, although it seems to us to be somewhat late in the day to standardize on tapers. If it was decided that a taper different from the one we now use should be adopted as standard, it would cause us no end of trouble. We have 10,000 machines out using the taper that we have considered as standard. To change over all new machines to another taper, and have two different types of tapers, requiring two different sets of spindles for repairs, would lead to considerable difficulty and confusion. Should we on occasions send the wrong taper, considerable expense would have to be incurred, as our men would be obliged to go to the customer's plant and straighten the trouble out.

If the taper in the spindle of our headstock does not happen to fit, a demonstrator may have to travel several hundred miles to help the customer decide why it does not fit.

We make a taper hole in the headstock and footstock spindles because we want to have a certain condition of proper fit and support for the centers of these two heads. A Jarno taper has been selected because the formula determining the size of the taper is an easy one to remember and follow, and because it has just the right amount of taper to make the centers fit with the proper degree of tightness.

No. 45. This company has for many years used and advocated the Jarno taper for the spindles of both milling machines and lathes. We have believed, and still believe, that the Jarno taper is by far the most desirable among those commonly used as standard.

However, we recognize the desirability of uniformity of practice among manufacturers, and for the sake of uniformity we would be willing to consider the adoption of other standard tapers. In fact, we are already equipping some of our milling machine spindles with Brown & Sharpe tapers and are seriously considering the matter of equipping some of our lathe spindles with Morse tapers.

No. 46. There can hardly be a doubt as to the Morse taper being best for machine tool use. Nearly, if not all small tools, drills, etc., have the Morse taper—it drives out easier. We feel sure that Morse is "IT" and we would sure like to see it made standard.

No. 47. We believe a standard taper for machine tools would be a very good thing. We have always used the Morse system and it is standard for all drilling machines so far as we know. Regarding the other systems we have not used them enough to be able to intelligently discuss them.

Uses Jarno, and Modifications

No. 48. At the present time there is considerable controversy and difference of opinion, in our own organization, as to the proper standard taper to be used in engine lathe spindles, the question being whether we should finally standardize on Morse tapers or a modified Jarno.

We are all fully conversant with the fact that Morse tapers are used in vertical drilling machines, this being the standard adopted, and that in general a standard has also been adopted for milling machines. The fact remains, however, that there are various types of tapers used in engine lathes and it seems to be the opinion of some that it would be much better to adopt a taper which does not conform to the taper of drill shanks, thereby positively eliminating the possibility of using our tailstocks for drilling purposes.

Every good mechanic appreciates the fact that the tapers of the head and tail spindles are very essential parts of the machine and should not by any chance be bruised or abused in any way by inserting shanks with tangs similar to those used on drills. However, in order to use a Jarno taper we have considered modifying the length, as there is no doubt that the general feeling exists that the Jarno taper is rather long.

We therefore have considered using a Jarno taper with the formula: No. of taper $= D$ (large diam.) $+ 8$; length $= 2\ D + 1.75$ in.; small end $= D - 0.05\ L$, with the hole relieved $\frac{1}{32}$ in. back of the taper. Where the customer insists on using a Morse or Brown & Sharpe taper a sleeve may be furnished having a modified Jarno taper on the outside and a Morse or Brown & Sharpe taper on the inside.

There is a still further advantage in using a modified Jarno taper in that the practice today calls for large holes through the head spindle, which by investigation, shows that they vary according to the size of the lathe in fractions of an inch, as per example, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, etc.

By referring to the Morse taper table, it will be noted that the small end of the taper varies by quarters, therefore it will readily be seen that by using Morse tapers it becomes necessary to use adapters which introduce a second joint or fitting, or to lose approximately one-half the

length of the bearing on the taper should they eliminate the adapter. By using the modified Jarno, the small end will vary in diameter according to the size in approximately one-eighth of an inch, and, therefore, lends itself admirably to the work.

We would certainly appreciate having a standard established and we can see no reason why such a standard should not be adopted by all lathe builders throughout the country.

No. 49. We feel that it would be almost as bad a proposition to change our standard—namely, Morse taper to either the Jarno or Brown & Sharpe, as it would be to change our system of measurement to metric. While it could probably be done, if spread over a long period of time, we feel that without question, our customers would be to a great extent still asking us to manufacture machines with the present standards. This would be on account of the fact that they have thousands of dollars tied up not only in drills but special tools, collets and chucks. To attempt to change, or to attempt to use several different tapers, would cause confusion and would add complication to an already complicated system. Without doubt, it would be ideal for a new plant to be able to interchange arbors, drills, chucks, etc., between milling machines, lathes and drilling machines. It would, however, be a hardship to ask plants already established to carry the additional equipment necessary until their present equipment has become obsolete, which—in many instances—might prove to be thirty or forty years.

A Study of Tapers

No. 50. We are of the opinion that none of the existing tapers are correct in theory and design and that none of them should be adopted as a standard taper for machine tool builders. We feel that there should be two standard tapers; that a taper ½ in. per foot should be adopted for drills, and drill presses; and a taper of ¼ in. per foot for all milling machines and milling machine tools. Then, too, the taper shanks now in use are much longer than necessary. The lengths of the tapers were designed at a period when taper holes were finished by hand; now, however, taper holes, as well as taper shanks, are ground to size. The resulting fit is as perfect, theoretically at least, as human ingenuity can make it. In our opinion taper shanks two-thirds of their present length would be sufficient. This is particularly true of the larger size of tapers.

To be more specific, the Brown & Sharpe tapers, if made with a taper of 0.500 in. per foot, might be adopted for all milling operations with the exception that the No. 6 and No. 8 tapers could be entirely eliminated as they are seldom used. There also is no practical reason for having two No. 9 tapers and two No. 10 tapers. As to the lengths for these tapers we would suggest the following:

Nos. 1 to No. 5 could be adopted as they are; No. 7 should be 2½ in. in length; No. 9 should be 3 in. in length; No. 10 should be 3½ in. in length; No. 11 should be 4 in. in length; all sizes above No. 12 should be 4½ in. in length.

The Morse tapers, if made uniformly 0.625 in. to the foot, might be adopted for all drill operations with the exception that the lengths should be as follows:

No. 0, 1¼ in. long; No. 1, 1¾ in. long; No. 2, 2 in. long; No. 3, 2½ in. long; No. 4, 3 in long; No. 5, 3½ in. long; No. 6 and larger, 4 in. long.

While firmly believing that the adoption of some one standard would be most beneficial to the machine builders, as well as to the users, we are of the opinion that it will be impossible to accomplish anything in this direction. An attempt to adopt a standard along the above or similar lines, would in our opinion result in adding another system of tapers to those already existing, but would not supplant any of them. Even if some one system could be devised that would meet with the approval of all machine tool builders, it would require a long period of years and constant striving to secure the universal adoption of the system.

Wants Standard Spindle Noses Too

No. 51. Our superintendent suggests that all Morse tapers should be ½ in. to the foot instead of random tapers, as is the case at present with the different size tapers. All Brown & Sharpe tapers should be ½ in. to the foot if both tapers are to be retained. If a single standard is to be adopted, that standard should be either one of the above, or one of about ⅝ to the foot. It would simplify matters considerably if one standard taper were to be used.

Another thing to which you may call attention in the manufacture of machine tools is the standardization of certain threads and parts for different machines. For instance on the spindle nose of a lathe or a milling machine, a certain standard should be maintained for each size lathe so that the purchaser of lathes could use the same chuck on all 16-in. lathes, and the same chuck on all the 20-in., etc. At the present time every manufacturer places his own idea of the number of threads to the inch on the nose of the spindle of both the lathe and the milling machine, and consequently the purchaser of the machine must have a large supply of chucks on hand to fit all different makes of lathes.

No. 52. As an engineer the problem that presents itself is to standardize, if possible, upon one kind of taper. From the standpoint of the shop the problem is to utilize all of the tools and equipment which they now have. This shop uses both Brown & Sharpe and Morse tapers. We have no machines with the Jarno taper. The latter is very convenient because of the ease with which it may be figured, but from practical experience its limited application to various machine tools, in so far as this shop is concerned, would suggest its entire elimination.

As to the other two tapers, the Morse so far predominates in numbers over the Brown & Sharpe that I would suggest it be used exclusively, if either of the two are to be made the standard. This, of course, is merely the reflection of the practice of one shop. Practically, I question seriously whether any change could be made for a considerable number of years in any shop, but I do feel that new equipment using one or the other of the two tapers would help in the long run in the matter of economy in production in this country.

Jarno Seems Best, But—

No. 53. Undoubtedly, the Jarno taper has advantages which do not appear in the others and we should say of the three mentioned that this one would be the best if we could have but one. We have, however, so much machinery and so many small tools tied up to the other two systems that it looks like a rather hopeless task to attempt to make any very radical change. We will be satisfied to use Brown & Sharpe tapers for our milling tools and Morse tapers on our drill presses, although it would be very nice if the drills could be used in the milling machines and, occasionally, if an end mill could be inserted in a drill press, which would be the case if the same taper were used for everything.

If a standard is to be gradually adopted, it looks as if the Jarno would be the best thing to aim for, although we cannot just now see where it will be able to get a substantial foothold which will be necessary before it can compete with either of the other two as a universal standard.

No. 54. In connection with our line of drilling machines, we furnish spindles with No. 2 Morse taper hole and do not recall ever having a request for machines with any other taper. For milling machines, we have adopted a Brown & Sharpe taper for the hole in the spindle and this has been generally satisfactory.

There is no doubt, however, that the adoption of a standard taper would have a great many advantages. Just what this taper should be, however, should be decided by wiser heads than ours.

No. 55. I feel it is extremely unfortunate that various tapers should be employed in the production of machine tools, and on the face of it, it would seem to me that there would be no reason why a standard taper could not have been utilized in place of the various tapers which are now employed. The Jarno taper appeals to me as being the most simplified type of taper that could be employed, and if we should at any time develop a line of grinding machines, you can rest assured that the Jarno taper will be the one used in our designs.

No. 56. We are using more of the Morse tapers than the

Brown & Sharpe or Jarno. As a matter of choice, we favor Morse only because it seems to be more universal in our shop. We are in hearty accord with the adoption of a single standard in this connection because of the expense and trouble found in maintaining two or three tapers in the shop.

GENERALLY ENDS IN DISCUSSION

No. 57. This question has been discussed many times, and it generally ends there. We have frequently been applied to on the subject of drill shank tapers, and have stated our own practice. We decided, probably in the sixties or earlier, that the §-in. taper per foot was too small for satisfactory use on account of its tendency to wedge. A taper of ¾ in. per foot was found to be better, and we adopted it for lathe centers and drills. We also found that driving by a tang on the small end of the shank was very unsatisfactory and that tangs were frequently broken off, thus ruining the drill. We therefore adopted the plan of keyseating drill shanks and provided drill chucks with a long parallel key or spline for driving. This construction has proved to be eminently satisfactory. We never break a shank. While many people have conceded the superiority of our standard, comparatively few use it, and drills thus made cannot be obtained from stock.

No. 58. We agree with you that it is emphatically important that we should have a single standard. The Morse taper seems to be very satisfactory for drills, and as that taper has been in existence a long time, we do not see any reason why the same taper could not be used in lathe spindle and other machine tools where a taper in the spindle is required.

A number of years ago the writer was appointed as a committee of one to look up and endeavor to standardize electric motors for machine tools. His correspondence with the various manufacturers of electric motors was very interesting. Each manufacturer acknowledged that it would be an excellent idea to have electric motors standardized, but each manufacturer wanted all the other manufacturers to come to his standard. We hope that the standardization of tapers for spindles may be brought about.

Romances of Metal Working—The Legend of Rudolph of Nuernberg

BY H. H. MANCHESTER

The tradition of Rudolf of Nuernberg was narrated by Conrad Celtes in his description of the city of Nuernberg, about 1491.

From this story Rudolf of Nuernberg was long considered the inventor of wire drawing in the 14th century, but we know that the invention had been made several centuries before. As a matter of fact, the story itself emphasizes his work as involving great improvements, rather than the original invention. The legend may be retold as follows:

Rudolf and his son were wire drawers in Nuernberg in the 14th century. At that time there was a great demand for heavy iron wire to be used in chain armor, and for fine wire to be used in winding with yarn for purposes of embroidery. In those days the process of making wire was either the ancient one of cutting a thin strip of metal and hammering it round, or else of drawing the wire through the steel draw plate by main strength with the aid of pincers to grasp the wire, and perhaps a swinging seat to allow a longer and easier pull. Of course, this was hard work, and Rudolf discovered that it could be lightened by the use of wheels. Whether this was the winding of a wire on a drum, as it was represented in pictures early in the 15th century, or whether Rudolf actually discovered how to apply water power to wire drawing, which is not represented in pictures for another century, is uncertain, but the greater likelihood is that his improvement was the use of drums for winding the wire through the draw plate.

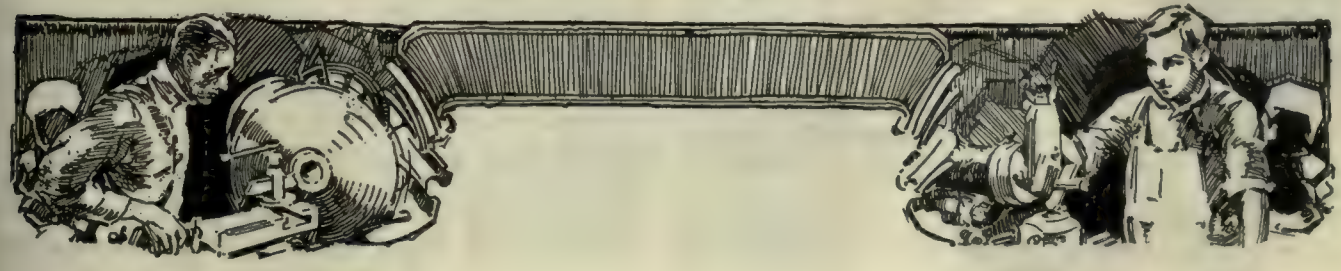
At all events, his process was so much easier and faster that he soon acquired considerable wealth. He



WIRE DRAWING IN OLDEN TIMES

tried to keep his process secret, and was in a measure successful, but he could not disguise his growing prosperity. As a consequence, the other members of the guild began to suspect that he was concealing craft secrets from them, and getting hold of his son succeeded in so wheedling and bribing him that he eventually disclosed the entire secret.

This so enraged Rudolf that he flew at his son in an attempt to kill him, but he managed to escape into exile, the outcome of which was to extend the knowledge of wire drawing still further.



A Chart to Aid the Figuring of Helical Gears

Relation Between the Elements of Helical Gears—Method of Constructing the "Spiral" Gear Protractor—More Rapid Solution of Problems in Helical Gearing

By W. C. STEUART

Chief Engineer, Lewis & Harvey Plant, Bethlehem Steel Co.

I AM GOING to call them spiral, instead of helical gears for the same reason that most people say "aren't" or "ain't" for "are not"; I do not want to appear priggish. I shall call them "Spiral Gears," for that is the term which most of us use.

When I was a cub draftsman, some eighteen or nineteen years ago, spiral gears were regarded among us

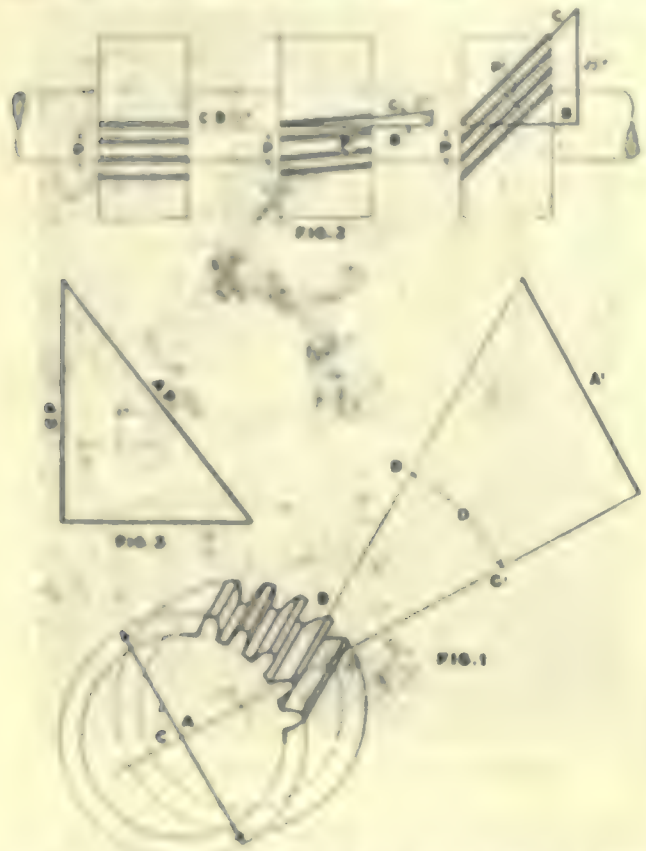


FIG. 1. ELEMENTS OF A HELICAL GEAR. FIG. 2. COMPARISON OF SPUR AND HELICAL GEARS. FIG. 3. RELATION BETWEEN PITCHES

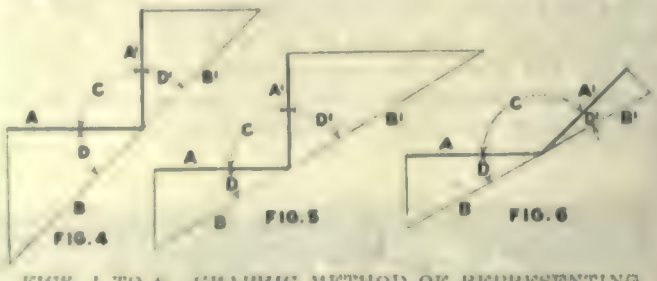
as a sort of dark and bloody mystery. Even the "Chief" himself did not know how to figure them, and if a pair of spiral gears were wanted to fit into the design of a machine, we would send the center dimensions, clearances, etc., to some gear manufacturer who would design a pair of gears to suit and send us a special cutter for cutting them. As for cutting them with standard spur-gear cutters, we did not know such a thing was possible. We have all learned a few things since our cub days, however, besides knowing better than to go out into the shop to borrow "a left-handed monkey wrench" or a "lifting and striking tool" for some bald-headed and bespectacled senior who appeared to our admiring eyes to have a more profound knowledge of engineering than Professor Sweet.

The not over-abundant knowledge I have since acquired on the subject of spiral gears, I propose to set forth in this article, together with a description of a spiral-gear protractor which any draftsman may make for himself, and which he will find a decided help in designing. I am going to write this article with the supposition that the reader knows nothing about spiral gears beyond having seen them, so that it will be as intelligible as possible to all of my readers.

If the reader will get the idea firmly fixed in his mind that a spiral gear is nothing but a short section of a multiple-thread screw, or of a worm, and that the driver and the driven bear the same relation to each other as a worm and wheel, he will have made quite a step toward an understanding of the subject. If he will further bear in mind that, owing to the great lead and the similarity of form between the driver and the driven, the worm may become the wheel and that, consequently, either one of a pair may be the driver, he will have gone still another step.

Just as we may theoretically unwind the thread of a screw and lay it out upon our drawing paper as a triangle whose base is the circumference of the screw, its altitude the lead and the angle of the hypothenuse the angle of the thread, so we may lay out a spiral gear and apply to it the same terms. Thus, a spiral gear having a tooth angle of 45 deg. will have a lead exactly equal to its circumference. A glance at Fig. 1 may help those to whom this is not entirely clear. Here the diameter C is spread out, as it were, into the circumference and becomes the base of the triangle, or C'. The line of the tooth B is extended on the tooth angle D and becomes the hypothenuse B', while upon completing the triangle, A' becomes the lead. In order to show the relation between spur and spiral gears, there is shown in Fig. 2 a diagrammatic representation of spur and spiral gears each having but two teeth, the others being cut away to avoid confusion.

A little consideration of the diagram will show that for a gear of a given number of teeth, as the angle of the teeth departs more and more from the right angle of a spur-gear tooth, one of two things must happen: either the diameter of the gear must be increased, or the pitch and size of the teeth must be decreased, in



FIGS. 4 TO 6. GRAPHIC METHOD OF REPRESENTING MATING HELICAL GEARS

order to keep the gear of the same pitch diameter. Fig. 3 shows the relation between the circular and the actual pitches of the teeth of spiral gears.

It will be seen that, if we do not wish to increase the

pitch diameter of our gear, we must have cutters that will cut teeth smaller than standard pitch in proportion to the increase in angle. This would mean that for every change in tooth angle, be it only by one degree, we would have to use a different cutter, and no two gears of different angle, even though they had the same number of teeth, would have teeth of exactly the same size. If, instead of this, we use a standard spur-gear cutter, all gears of the same pitch will have the same size teeth, like spur gears, but their pitch diameters will increase as the angle of their teeth departs from the zero angle of a spur gear. Now, as good workable spiral gears may be cut with spur-gear cutters, it follows that this is the most economical and satisfactory method to follow in designing them.

No special cutters whatever are required, while with the other system a special cutter is necessary for every gear. With the one system, a shop with the usual complement of spur-gear cutters is prepared to produce any gear that may be required; with the other system such an infinite number of cutters would be needed that it would be out of the question to carry them all on hand.

In designing a pair of spiral gears, the following factors are either fixed or known: The distance between centers, the ratio, the pitch, and the face width. In addition to the above, the maximum diameters are frequently set, and since these diameters may be varied at will, as has been already explained, we may make them to suit clearance conditions, and make the gear with the least number of teeth to have the largest pitch diameter.

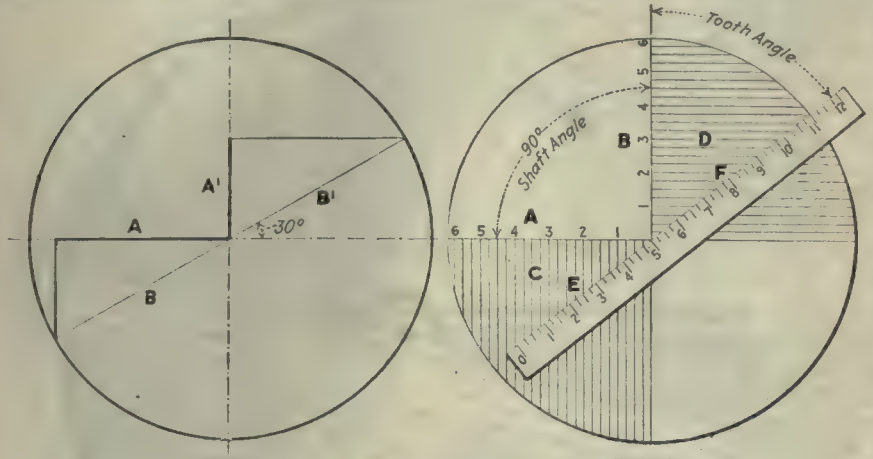


FIG. 7 FIG. 8

FIG. 7. LAYING OUT GEAR DIMENSIONS. FIG. 8. SIMPLE CHART FOR DETERMINING GEAR DIMENSIONS

Our unknown quantities are: The pitch diameters, the number of teeth, and the tooth angles. Here we have three unknown quantities at once, and since they are all interdependent, the slightest variation in one will vary the other two. So how are we to start at our figuring? We are left to make a wild guess, and then flounder around by cut-and-try figuring until we hit upon the right combination.

Now, we may call the graphic method to our aid and obtain a close approximation to our requirements, so that very little figuring will be required.

Referring to Figs. 4, 5 and 6, we have in each, two triangles representing two spiral gears in the manner already explained, the angle *C* being the shaft angle, which in Figs. 4 and 5 is 90 deg., and in Fig. 6 is only about 45 deg. from two right-angles, at which point the gears would become spur gears. *A* and *A'* represent the pitch diameters of two spur gears having the same numbers of teeth and pitch and, consequently, the same ratio as the spiral gears. *B* and *B'* represent the respective pitch diameters of the spirals themselves, and *D* and *D'* are the tooth angles. In Fig. 4 the tooth angles are 45 deg. and the pitch diameters of the spiral gears bear the same proportion to each other as those of the equivalent spur gears.

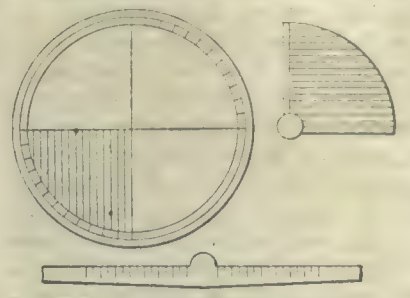


FIG. 9. PARTS FOR CHART

In Fig. 5 the angle is changed to about 30 deg. with the result that, while the number of teeth, ratio and, consequently, the equivalent spur-gear diameters remain unchanged, the pitch diameters of the spirals are so altered that not only is the center distance greatly increased, but the ratio of the pitch diameters to one another is so changed that the gear with the smaller number of teeth now has the greater pitch diameter. This, however, in no way alters the speed ratio of the gears, since we have not changed the number of teeth. It should be borne in mind, therefore, that the number of teeth in spiral gears and not the pitch diameters fixes the speed ratio, and this is what gives spirals their great flexibility.

In Fig. 6 we still have the same number of teeth, that is, the same equivalent spur-gear ratio, with the same tooth angle in the larger gear; but the shaft angle has been changed to 45 deg., so that the smaller gear, or rather the gear with the least number of teeth is now indeed the smaller gear.

Spiral gears may be laid out by this method and their various proportions determined approximately, the accuracy depending entirely upon the care with which the laying out is done, but the graphic method does not solve the problem of quickly finding the unknown quantities any better than the figuring method, for the one known quantity in our diagram is the combined lengths *B* and *B'* representing the combined pitch diameters of the two spirals, or twice the center distance. We know the ratio between the spiral gears, and consequently the ratio between the equivalent spur gears, but we do not know the exact sizes that will produce spiral gears to fit into our center distance.

It was to solve this problem of quickly finding the unknown quantities by a method of easily and rapidly varying them graphically that the writer devised an operating chart which he calls the spiral gear protractor, later described. To make our triangle elastic, as it were, was the problem. By operating the protractor or chart, we may easily and quickly vary all of the unknown quantities entering into the problem and obtain a close approximation to the desired solution, such as could only be found by repeatedly figuring and re-figuring. This approximation may be found in two

or three minutes at most, and then the problem need only be figured once or twice to determine the exact dimensions. It is safe to say that from a half hour to an hour of figuring may be saved on each problem.

Let us inclose our two triangles within a circle, as in Fig. 7, and we will have made the first step. Now refer to Fig. 8. Here the circle has inscribed therein a right angle, which represents the bases of our two triangles in their proper relation to one another so long as the shaft angle remains 90 deg. Now, if we further divide the bases of our two angles into any convenient number of fractions of an inch, and draw from these divisions lines at right-angles to the bases, it is obvious that we have two sides, respectively, of any two right-angle triangles, being limited only by the size of our circle and the value we choose to assign to our divisions. Now, if we lay a scale across our diagram, with the edge passing through the center of the circle, we will complete our two triangles, with the angles and dimensions varying according to the position of the scale.

For example, suppose that we were laying out 8-diametral pitch spirals. Our tooth angle would be the angle of the scale as measured with a protractor; E measured on the scale would be 5 in., the pitch diameter of one of the spirals; and F, 9½ — 5 = 4½ in. would be the pitch diameter of the other spiral. Following C up from E we get on A at 4 in., the diameter of an equivalent spur gear, and consequently the spiral gear E would have 32 teeth. Employing the same process with F, we get 3 in., or 24 teeth.

After using the charts, as in Fig. 8, several improvements suggested themselves. It was seen that it would be an advantage to have the scale rotate about the center of the card, and also to have it graduated so as to read from the center towards both ends. It was further seen that, if one of the two quadrants was pivoted at the center, so as to permit its angle with the other quadrant to be altered, the device could be used for gears having shaft angles from 90 deg. down to parallel or spur gears. The device therefore resolved itself into the form shown in Fig. 9, the circular card, the quadrant and the scale. The complete protractor is shown in Fig. 10. The illustration was prepared from one that is 9½ inches in diameter.

In Fig. 11 is shown a diagram of the protractor set to a shaft angle of 25 deg. and with the two triangles ABF and $A'B'F'$ marked in heavy lines for the sake of clearness. The quadrant D is set to the 25-deg. shaft angle, and the scale is reading to tooth angles of about 32 and 58 degrees.

Construction of Protractor

It will be observed that the working protractor shown in Fig. 10 has a half circle instead of a quadrant. The reason for this is that when the shaft angles approach parallel and the tooth angles are very rank—that is, when one of the gears is almost a spur gear—it will be found that the scale will swing past the 90-deg. line of the swinging sector, and it is necessary to have another quadrant in which to read the result. It will be further observed that the quadrant commonly used is the one in which the answer to our problem is read. Here we read on the margin "THIS SIDE, SPIRALS OF SAME HAND"; and when the reading is in the other quadrant, it reads "THIS SIDE, SPIRALS OF OPPOSITE HAND." This means that after we pass a certain combination of shaft and tooth angles, our spirals, instead of both having their teeth cut to the same hand, one of them must be cut right-hand and the other left-hand. When spirals are used to drive parallel shafts, as in the case of some French lathe headstocks they are always cut right and left hand. The French arrange their lathe back gears so that the back-gear shaft and the spindle sleeve have each a right- and a left-hand spiral, thus neutralizing the thrust. Gears having shaft angles of 90 deg. are invariably of the same hand, and it is rarely that they become of opposite hands until the shaft angle becomes 60 deg. or less.

It should now be easy to understand the complete protractor, as shown in Fig. 10. The circular card A

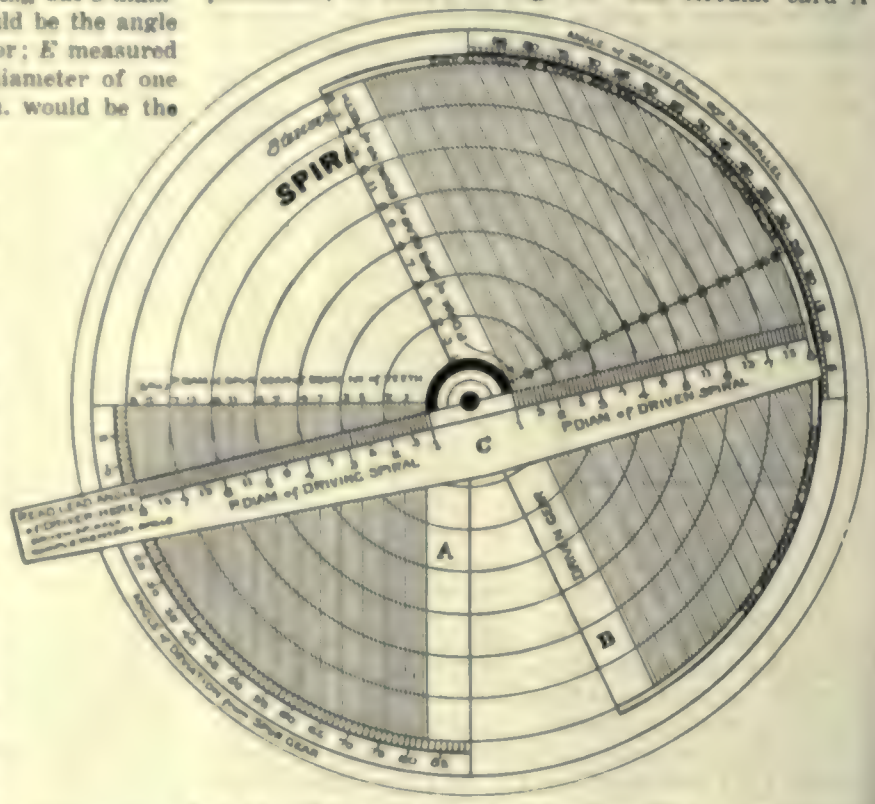


FIG. 10. THE "SPIRAL" GEAR PROTRACTOR

has two diametrically opposite quadrants, the lower left-hand one being graduated on the margin to degrees and marked "ANGLE OF DEVIATION FROM SPUR GEAR." It is also divided into the vertical lines which are figured for scales of half and quarter size, and marked "PITCH DIAMETER OF SPUR GEAR OF EQUAL NUMBER OF TEETH." This quadrant is used for reading the diameter, number of teeth and tooth angle of the driving spiral. The other quadrant is graduated in degrees only, and is used for setting the movable sector to the shaft angle, and is marked "ANGLE OF SHAFTS FROM 90 DEG. TO PARALLEL." The tooth angle of the driven gear is always the complementary angle of the driver, allowing for the shaft angle.

The movable sector *B* has two quadrants divided with vertical lines like the circular card, and marked in the same way. It has the marginal directions with regard

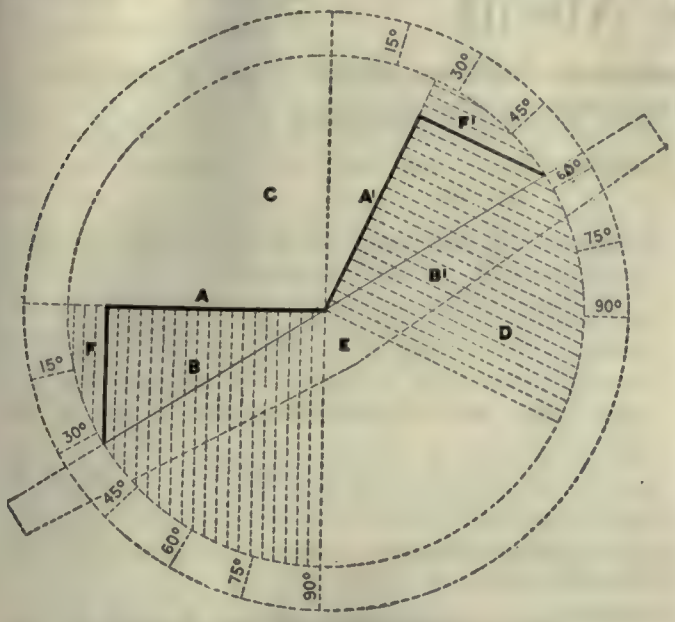


FIG. 11. READING THE PROTRACTOR

to the hand of the spirals, as already explained. It is used, of course, for the driven gear.

The swinging scale is graduated in half and quarter size to match the quadrants, and reads from the center toward both ends. On its scale we read the pitch diameters of our spiral gears, and from its angular position we read the tooth angles. It is marked on the right-hand end, "PITCH DIAMETER OF DRIVEN SPIRAL," and on the left-hand end, "PITCH DIAMETER OF DRIVING SPIRAL." On the extreme left-

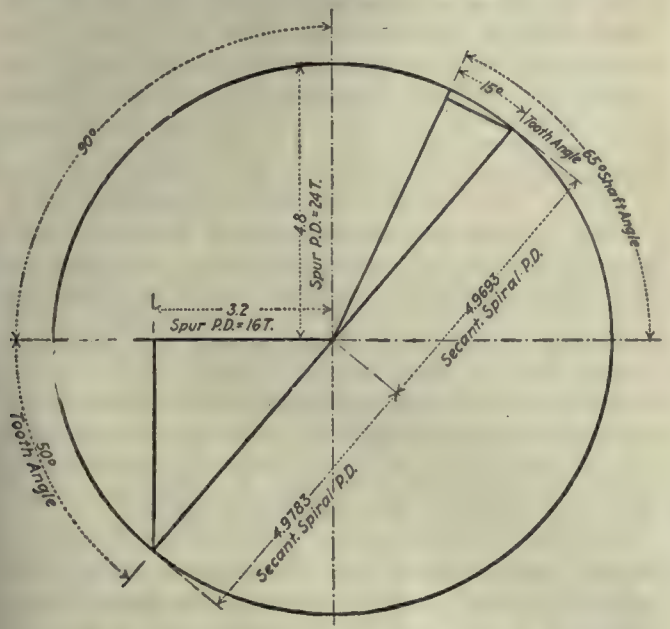


FIG. 12. ACCURATE SOLUTION OF A GEAR PROBLEM

hand end of the scale is marked, "READ LEAD ANGLE OF DRIVER HERE." "DRIVEN SPIRAL = COMPLEMENTARY ANGLE."

Let us conclude with a concrete example of the use of the protractor. Suppose we have two shafts whose centers are 5 in. apart and set at an angle of 65 deg. from parallel. We desire to drive from one to the other with a pair of 5-diametral pitch spiral gears having a ratio of 1 to 1½, but of equal diameters. It has already been explained that this is possible by varying the tooth angles.

Set the central dividing line of the sector *B*, marked "SET TO SHAFT ANGLE," to the 65-deg. angle, as indicated on the margin of the circular card *A*. As previously explained, the tangent lines on card *A* and sector *B* represent what our gear diameters would be if their shafts and teeth were parallel, in other words, if they were spur gears. The actual diameters increase as the tooth angles depart from the square line of a spur gear tooth. The spiral gear pitch diameters will be found on rule *C*.

We now proceed to find the desired tooth angle, placing the scale *C* in various positions, until its angle is such that two equal diameters of 5 in., representing the necessary pitch diameters of the two spirals, as marked on this scale, coincide with the tangent lines referred to above, originating from two spur-gear diameters having a ratio of 1 to 1½.

We will find that when the scale *C* is set to an angle of 50 deg., 5 in. on the left-hand scale coincides with 3.2 in. on the card *A*, and 5 in. on the right-hand scale coincides with 4.8 in. on sector *B*. Therefore, our driving gear will be approximately 3.2 in. in pitch diameter, and its tooth angle 50 deg., while the driven gear will be 4.8 in. in pitch diameter and its tooth angle 65 — 50 = 15 degrees.

The precise angles may now be determined by a little trigonometry, without the repeated trials that would be necessary if we had to depend entirely on calculation. To obtain the exact dimensions of the spiral gears, construct a diagram as shown in Fig. 12. Our shaft angle is already fixed, the tooth angles have been determined on the protractor and it only remains to ascertain the exact pitch diameters. To any one familiar with trigonometry, it will be plain that our spiral pitch diameters are the hypothenuses of our two angles whose bases are the spur pitch diameters, and therefore we have only to multiply these base dimensions by the secants of the tooth angles or use the more usual formula: 1 ÷ cosine = secant.

Therefore, since the spur P.D. ÷ cosin. 50° = spiral P.D., 3.2 ÷ 0.64279 = 4.9783 in. for the driver.

And, the spur P.D. ÷ cosin. 15, or 4.8 ÷ 0.96593 = 4.9693, spiral P.D. of the driven.

Our centers will then be:

$$\frac{4.9783 \times 4.969}{32} = 4.9738 \text{ in.}$$

This is as close as it is possible to get to the desired center distance of 5 in. without changing the relative spiral pitch diameters; that is, making them unequal, or by cutting the spirals a little over size, which is perfectly practicable.

It has already been explained that no special cutters are required, but that standard spur-gear cutters may be used. We cannot select these by the usual method, i.e., by the number of teeth of our gear, but the following formula must be used: Divide the number of teeth in the gear by the $\sin^3$ of the tooth angle, and the product will be the number of teeth for which to select the cutter.

Something for Service Station Men to Think About

Causes of Service Cost to the Producer—Component Parts too High—Parts Needed for Repairs Take Precedence Over Parts for Production

By Norval A. Hawkins
Director of Sales Section, General Motors Corporation

TODAY the automotive manufacturing industry in the United States represents an investment of over two billions of dollars. There are about 700,000 individuals directly engaged in the manufacture of motor vehicles, parts and accessories, and in addition there are more than half this number directly identified with the retail sales and service end of the business, giving a total of approximately one million people who are making a living for themselves and their families directly from this, the second largest industry in the world.

There are five causes and *only* five causes of service cost to the producer, or the car owner or both. They are as follows:

(1) Faulty engineering design; (2) faulty production, including careless workmanship, and faulty material or both; (3) incompetence on the part of the service repair men; (4) incompetence on the part of the user; (5) the wear and tear of normal use.

The first, second and third causes for service expense are directly within the control of the manufacturer, and we as service managers should make it our business to take some interest in the fifth cause.

Service should properly begin with the design of the car—in fact it should begin with the very conception of a product and it should be projected through the engineering, manufacturing and marketing process, assuming an ever increasing importance after the product is in the hands of the user and until the time that it is ready for the discard through legitimate and honest wear—*after having given an adequate return on the customer's investment.*

Three Kinds of Service

Service, in terms of our industry, divides itself into three classifications:

1. Parts manufacture and distribution.
2. Mechanical repair work.
3. Moral or psychological service.

The reason that many dealers have failed to make a profit on their parts business is because we fellows back at the factories have *guessed* at what they needed rather than making it our business to *know* what they were going to require. The result has been reflected in great volumes of telegraphic orders, express shipments and unnecessary expense to the car owner.

Within our own organization we found through a careful analysis that from 20 to 35 per cent of all repair parts orders during the first six months of 1921, were telegraphic and that almost 50 per cent of our parts shipments were going forward by express or parcel post as rush orders with a consequent high percentage of errors.

Scientific anticipation of repair parts requirements and the distribution of parts on a wholesale basis are necessarily the forerunners of an efficient unit package system and we've all got to come to it.

We have no right to penalize our customers for our own inefficiencies incident to the repeated physical handling of our repair parts. We have not discharged our obligations to the car owner, we have not met our responsibility until we get these parts to him at the right price.

We recently made an investigation on a number of cars of representative makes to determine the relation between aggregate repair parts prices and the list prices of the finished products. The ratio ran from one and one-half to two.

Discrepancy in Costs of Parts and Assembled Car

Why should it be necessary to get twice as much for a disassembled car as you get for an assembled car? The complete car has a great deal more mechanical labor chargeable to it. There is always an unavoidable breakage of material incidental to the assembly process. It is supposed to require a more expensive type of salesman to sell a finished car and it is usually necessary to demonstrate it before consummating a sale.

It surprises me to learn that a number of companies have even discontinued the practice of supplying owners with parts catalogs.

We, of the automobile fraternity do not hesitate to spend $7,500 in the Big Weekly to call our product to the attention of the buyer and if Mr. Buyer answers the ad, we send him eighteen form letters, six folders, a dollar and a half catalog and a liveried chauffeur to take him for a ride in the park—then after he buys the car we refuse point blank to give him a parts catalog and some of us even go so far as to attempt to charge him for it.

I am in favor of lower and uniform prices on repair parts but please don't misunderstand me. I am not at all in sympathy with those of you who do not think that a service department should be conducted for a profit and if you want to earn the status with your respective organizations to which you are entitled, if you want to be looked upon as producers instead of parasites—if you want to be business executives instead of clerks—you've got to look at it just as I do. If you are ambitious for recognition in an executive way, you MUST be able to show your results on the right side of the ledger.

We have just inaugurated a policy within General Motors, handed down from the president through the executive committee, that provides for service parts requirements being given precedence over production requirements, first, last and always—irrespective of the new car orders on file—and without consideration for any temporary financial loss.

We have arrived at the very sound conclusion that keeping the old cars running is of far greater and more lasting importance than the matter of getting the new cars sold.

The old car owner must be given first consideration if

Excerpts from a talk before Service Managers' Meeting of National Automobile Chamber of Commerce.

we expect to get new car owners. The repair parts phase of the industry must be conducted for profits but these profits must come through greater efficiencies all along the line rather than by the maintenance of prohibitive repair parts prices.

It is my prediction that within three years every reputable repair shop in America will be operating on some form of flat rate system. Whether we like it or not, we've got to come to it and when we *do* come to it we'll be surprised at just how low our past efficiency has been.

In our *factories* we know just how long it takes to do a specific operation, and the exact cost of the material and labor involved, whereas on the other hand, our service stations refuse point blank to tell a man what a repair job is going to cost him and as a matter of fact, they seldom charge any two people the same amount for doing the same job.

To me the necessity for standardizing repair operations is so obvious and so simple of accomplishment that it makes me mad when I hear a service manager say that it is impractical in connection with his particular product.

I'd like someone here to tell me the difference between putting on a steering knuckle in a factory and in a service station insofar as the problem of cost analysis is concerned.

Moral or Psychological Service

And next we come to our third classification of service, namely, *moral* or *psychological service.*

In addition to the tangible repair parts distribution and mechanical phases of our service activity, there is this intangible moral phase.

Take the matter of keeping cars clean in a repair shop. A man may bring his car into your service station ever so dirty but this does not license you to turn it back to him in a still more untidy condition.

In the first place, the repair shop itself should be kept clean and there is no necessity for the mechanic to wear the same pair of overalls throughout the season without washing. A clean repair shop is one of the dealer's best advertisements.

A repair job should never have a *"finish"* tag put on it until the body interior has been dusted out and the steering wheel wiped off.

When the bill for a repair job runs over $15 I would say that the dealer should give the car a wash and a polish free of charge and he'll find it the best investment he ever made.

If I sent a coat to a tailor shop to have a button put on or a rip sewed up and the tailer spilled a can of machine oil on it or let his dog use it for a bed, I would raise the dickens and so would you, and yet every day cars are being turned out of our "authorized service" stations so greasy and mussy that after you've ridden around the next block you're a fit candidate for a Turkish bath.

Even our finest closed jobs are not immune—in fact, the average mechanic seems to fairly revel in the joys of disseminating grease and oil on a broadcloth interior—he may miss the universal joints, the transmission and the differential but the front cushion and the steering wheel—*N-E-V-E-R!!*

Manufacturers have made much progress during the past five years in the development of enclosed jobs with piano finish and luxurious appointments. The most painstaking care is used in the selection of the proper material for the cushions, carpets, curtains, etc., but the average garage mechanic on the other hand has not yet learned to appreciate the difference in fineness between a $10,000 limousine and a truck.

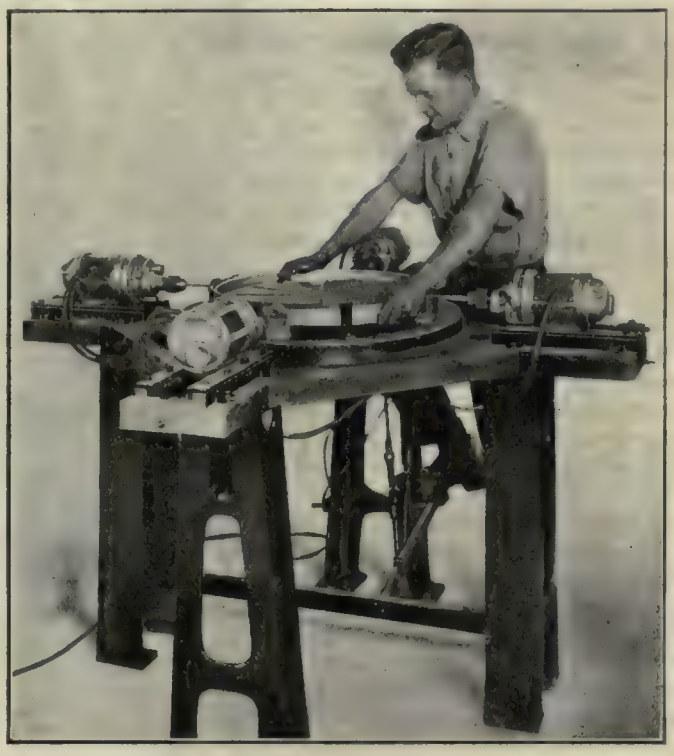
In the future, automobiles and the service that must inevitably follow will have to be sold and sold hard—our most valuable allies are the 9,000,000 car owners whose continued good-will rests largely in the hands of the service men.

It is to you men we must look for the greatest future development of the automotive industry as a whole—and remember that *"He profits most who serves best."*

Rapid Drilling of Barrel Covers

Special Correspondence

A sanitary barrel made from steel metal and intended for the holding of such materials as sugar and flour, required the drilling of four small holes in the periphery



MACHINE FOR DRILLING A BARREL COVER

of the head. Since rapid production of the heads was desired, the arrangement shown in the accompanying illustration was developed.

The machine consists chiefly of four ¾-in., 220-volt, Black & Decker portable electric drills. The handles and the switch mechanisms of the drills are not used, the housings being mounted on slides resting on a heavy table. The slides are operated simultaneously by means of a pedal, so that all the drills can be fed to the work at the same time. The drill bits enter through jigs having hardened bushings, and a fixture is provided for holding the barrel head.

When operating the machine, the attendant merely places a barrel head in the fixture, and then presses his foot on the pedal to feed the drills through the work. There is a retaining ring on one side of the work-holding fixture to keep the head from rising, while the operator holds the other side so as to prevent vertical motion and vibration.

A Hollander's View of Leipzig Fair

By D. DeVries

Manager R. & Stokvis & Zonen

The writer is just back from Germany where he visited the Leipzig machine tool exhibition. It would be very instructive for an American to visit such an exhibition. If one to whom each machine is an old acquaintance, no matter what its changes in design, strolls along the various stands, his eye is caught here and there and he says, "Not bad, by Jove, the Americans have big competition."

Take, for instance, the stand of Raboma radial drills. Here is a big drill but if one compares it with a modern American machine he will say, "Well, that machine is an engineering problem to the workman. Too many ornaments. It needs a college graduate to handle it."

We had a talk with Samson, makers of vertical grinders of the Pratt & Whitney type. They also make a shaper which the manager pretended was a copy of a Gould & Eberhardt shaper, but he was only pretending it was a copy. It might have been a copy of an obsolete Gould & Eberhardt shaper, but both Mr. Peskine and I laughed heartily in his face and told him, "You Germans try to copy and when you are ready with your copy the American again has escaped and looks only upon it as of bygone days."

The general impression of such an exhibition, and it was a big exhibition only of machine tools, is that there is life and drive in the Germans, but that the class of their machines and the class of their workmanship is miles below the American standard. On the other hand they manufacture cheaply and today there is but one desire in the world, "Buy cheap, buy cheaper, buy cheapest, buy for nothing." Quality does not speak any more in Europe, it is the price that talks and as long as German labor is as cheap as it is today and the call for low prices as strong as it is now, the machine tool world of today belongs to the Germans.

We saw copies of Cincinnati milling machines with Wanderer and copies of Kearney and Trecker with Mammuth, but what poor copies they were. We explained to one of the representatives the treatment through which gears go in America before they become gears ready to be put in place, and he listened with open mouth and then said, "Just think, that's nice, but we would not get paid for it." Cheap, you see!

In lathes there was nothing special. A good German lathe sells for one-quarter, or less, of the price of an equivalent American tool.

The German workman works and produces today for five American cents an hour. He has to fight for weeks and weeks in order to get another two cents and that is why Germany is not able to buy. A few people are earning heaps of money, but because it is in paper marks they try to spend it as soon as they get it, so you see much luxury in Germany. Big dinners, filled hotels, wine and champagne and what surrounds it, but the greater percentage of the people live in poor condition. The splendor of the rich is displayed but the poor suffer in silence within the walls of their houses.

While America, England, France, Spain, Italy and smaller countries are struck with a depression worse than any living man can remember, there is a big boom in Germany. Most of the machine tool firms are sold out for six to eight months and everybody at this exhibition looked gay and prosperous. Everybody had booked big orders. They had their inland prices for Germany and export prices planned according to the rate of exchange, one scale for Holland, another for France and still another for England, all fixed by conventions and committees. It was noticeable how many Englishmen visited the exhibition willing to buy and buying. It was estimated that about 3,000 Dutchmen visited the show and there were many French, Belgians and Scandinavians, but few Swiss and hardly any Italians and Spaniards. A committee of the Russian Soviet visited the exhibition and we saw some Japanese and Chinese, but the great majority were the Germans themselves.

According to the present export organization which Germany has shaped for herself, machinery can only be exported at a fixed price, a price about twice as high as the domestic price but about half what the rest of the world asks. They have formed, so to say, a world of their own in which they all prosper and live on the rest of the world and one is forced to ask whether it is better to win a war or to lose it. At present the losers seem to be on top but common sense will say that such a thing cannot last forever and when the break comes it will be an awful one.

The present boom can only continue as long as the mark keeps on depreciating in value. The exchange today is about 250 marks for the dollar, so a little more and the mark has no value at all. What then? Then misery must come as it came gradually but with certainty in Austria and Russia, and another section will be added to that part of the world from which the rest can expect nothing for the happiness of the whole. The Germans do not deserve such a condition. They are a hard working, industrial nation who are doing their best to keep pace with the rest of the world. However, when it comes to a really excellent design and progressive ideas in the machine tool line, they lack initiative. They are too much out for success in another way than the Americans. If an American manufacturer cannot produce a thing for less than five thousand dollars, he will not offer it for less even if he gets no orders, but if a German cannot get five thousand dollars, he will try to get the order for four or for three or even for one thousand dollars, sacrificing everything for being booked well ahead with orders.

Our final impression of this visit to the Leipzig exhibition was that Germany is not killed at all, but keenly alive and that in the long run she will fit into her own place. That place, however, will not be the place the American machine tool builders are looking for, which is to be at the top in design and workmanship, in service and production.

Copy of a personal letter written to a friend in America and printed by permission.

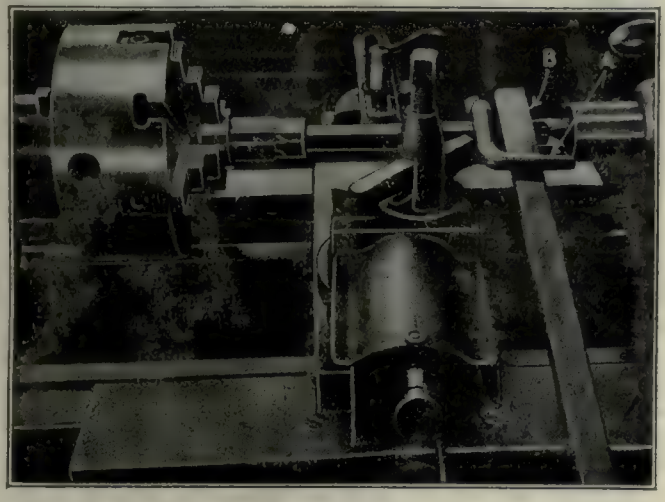
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Avoid Danger When Drilling in a Lathe —Discussion

BY S. KELLY

The article on page 271 by Harry Senior, entitled "Avoid Danger When Drilling in a Lathe," covers a subject that has received a great deal of consideration in AMERICAN MACHINIST and similar publications. Each writer usually suggests some modification of this dangerous and pernicious practice of drilling or reaming holes by means of a drill or reamer held upon the tail



THE WAY TO MAKE A DANGEROUS JOB SAFE

center and prevented from turning by a *single ended lever* consisting of lathe-dog and tool shank, steel bar, or "pine stick."

The use of such a lever in this manner tends to cause the end of the drill or reamer to rise and the greater the pull upon it the greater is the power exerted, due to the lifting effect of the lever, to force the end upward and off center.

The way to make the best of a bad situation is, as Mr. Senior describes, to fasten a dog to the reamer shank, allowing the tail to rest upon a tool, bar, or pine stick in the toolpost in such manner that the carriage is eased along with the feed of the tail spindle and thus prevents the reamer from moving forward sufficiently to allow it to jump off the center.

With one hand feeding up the tail spindle while with the other he tries to "ease" the carriage along so that the toolpost will always bear firmly against the dog, the machinist certainly has his hands full. Is it any wonder that there should be so many machinists with mained hands and fingers?

There is but one safe and sane way to perform such a job, and that is to use drills and reamers having standard taper shanks to fit into a socket, or sockets, in the tail spindle. By this method there is no danger when the tool breaks through the work.

Superintendents, foremen and factory inspectors should forbid the use of the dog and single end lever, even when used in conjunction with a "pine stick."

[This letter was submitted to Mr. Senior and his reply is printed herewith—Editor.]

Your correspondent did not read my letter understandingly. This may have been my own fault in that I did not make the operation entirely clear and to remedy such defect as well as to prevent further misunderstanding and make certain that I have mitigated to some extent the evils of what may be a really dangerous job, I have this time included an illustration.

There is no such thing as a "single-ended" lever. I need not enter into a discussion of the various classes of levers, for I am sure that all mechanics know that to be a lever at all a piece must have a weight to move (or resist), power applied to move it, and a fulcrum or point of resistance. Whether my pine stick is a lever of the first, second or third class depends upon the individual conception as to which points represent the three factors; but it most certainly has two ends.

In the illustration let us suppose that the reamer has "snagged," the lathe is stopped, and the full power of the belt is being delivered to the holding device, tending to throw the shank off the center. The tail of the dog is bearing down upon the stick at *A* which, as Mr. Kelly says, would tend to lift the reamer shank off the center. But the downward pressure must be supported somewhere, and it *is* so supported at points *B* and *C*.

Because of the fact that the distance from *A* to *C* is, let us say, ten times the distance from *A* to *B*, nine tenths of the downward pressure delivered by *A* reappears as a downward pressure delivered by the stick upon the reamer shank at *B*. The tendency of the shank to rise by reason of the pressure delivered at *A* is, therefore, so nearly balanced by the downward pressure of the stick at *B* that the resultant is negligible. The further away the point *C* the more nearly is the balance established.

As regards "easing" the carriage along by hand—don't do it. Make sure that the tool shank (or whatever you put in the toolpost) bears against the yoke of the dog in such a way that the reamer cannot move toward the chuck without also moving the carriage, but be equally sure that it is so placed that it cannot interfere to prevent the reamer, dog and all, *from rotating with the lathe in case the stick should break.* You can then forget that the carriage is there; the pressure of the tail spindle will do all the "easing" that is necessary while the carriage will stay on the job ready to prevent any forward movement induced by the tendency of the reamer to "draw in," or when the drill breaks through the work.

There are two objections to the method, suggested by Mr. Kelly, of using taper shank tools. In a manufacturing operation upon specially fitted machines this would unquestionably be done; but in the toolroom and

the job shop it is often necessary to use tools that have no taper shanks, and even if such tools are available the feather and spline in the tailspindle of the average engine lathe is not calculated to shoulder the responsibility of resisting the torsional strain of the cut.

A Device for Riveting Small Parts

By Casper J. Dorer

It is often necessary when riveting small sheet-metal parts together on a large production basis, to have the two parts held together in an accurate relative position and to have the rivets driven accurately. Too often this fact is lost sight of, with the result that the rivets are driven in crooked, are never tight, and eventually shake loose. The rivets can also be made to serve as dowels if properly set. The accompanying illustrations show a type of riveting fixture which is being successfully used for this kind of work in our production department.

The rivet used in this particular case is ⅜ in. long and 0.070 in. in diameter. Owing to the smallness of the rivet, it is necessary to set it in place with a small pair of tweezers. The two pieces of stock are 0.015 and 0.097 in. thick respectively, and are attached to a shaft 10 in. long, which extends downward through the center of the fixture and through a clearance hole in the bench.

The fixture is easily and very quickly operated by an inexperienced operator, is foolproof and requires no hunting or balancing of the rivet head with the punch. It is generally this part of the operation that consumes the most time.

Upon examination of Fig. 1 it will be seen that the punches *A* are held in a vertical plane in the bracket *B*, the bearing being fairly loose. These punches are always held in their operative position away from the work by springs, and kept from coming out by screws *C*. When struck with a hammer these punches always

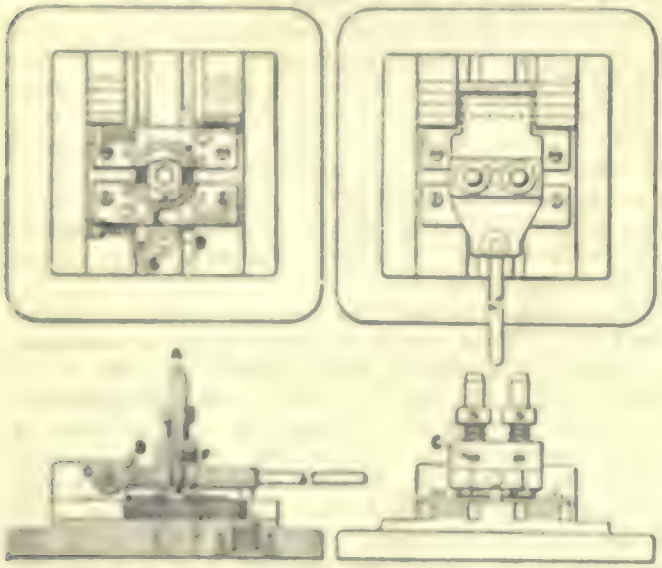


FIG. 1. DETAIL OF RIVETING FIXTURE

impart a perpendicular blow on the head of the rivet even if the operator should strike the top of the punch a deflecting blow. In order to prevent the rivet from sliding out from under the punch in case the rivet is not set square, the end of the punch is contoured slightly to suit the head of the rivet, thus causing the rivet to line up when the punch strikes it. Care must be used in forming the ends of the punches so that the concave part is not too deep as it is apt to cause the punch to split. The punches must also be placed in correct alignment with the rivet holes so that the force of the blow goes directly through the holes and is not deflected to one side.

The two pieces of work are placed in a nest *D* and over locating pins *E*, which keep them in their correct relative position while riveting. The bracket *B* is then swung down over the work until the button *F* rests upon

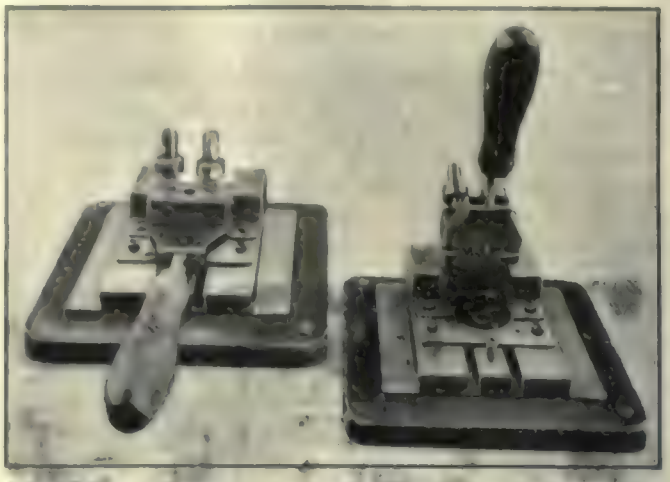


FIG. 2. THE FIXTURE IN OPEN AND CLOSED POSITION

it, the operator continuing to press down upon the handle so as to hold the work tightly together while he strikes the punches a blow with a hammer held in the other hand. It is essential that button *F* be of correct length so that punches will be in a vertical plane when the bracket is resting on the work. Thus the bracket serves a double purpose, acting as a guide for the punches and a clamp for the work.

A head such as is commonly formed on the opposite side is not made in this case. Instead the rivet strikes against the serrated hardened tool-steel strip *G*. The strips are set in the base of the fixture and are shiftable endwise, thus making it easy to renew the riveting surface. They are held in place by setscrews set in from the side.

The half tone, Fig. 2, shows the fixture both in open and closed position.

Enlarging Gas Engine Pistons

By Ivan C. Beach

In reference to a letter by David Tyke, on page 287 of American Machinist, the writer had a similar experience when he was called upon to refit pistons that were only a few thousandths under size.

I heated the pistons to a good red heat, stood them on a smooth plate (an old faceplate) on the floor with the solid end up and placed a weight of about twenty pounds upon each. When they had cooled I found that they had expanded about 0.012 in. and I had no difficulty in fitting them.

[The "swelling" of cast iron by repeated heating and cooling is often done. We doubt if the weight helped any. Have any of our readers data upon the amount of enlargement that can be thus obtained, or the wearing qualities of iron so treated?—Editor.]

A Shop Man's Method of Figuring Change Gears—Discussion

By H. Herring
Stockport, England

I have read with interest the article by J. Crommel, on page 78 of American Machinist, entitled "A Shop Man's Method of Figuring Change Gears," for the reason that I have myself been in the habit of using this method for many years. I think, however, that Mr. Crommel might have carried the matter a little further and shown how to arrive at the correct position for engaging the split- or half-nut with the leadscrew.

Let us take Problem I: Required, 60 threads in 4 in.; leadscrew 5 per inch. The lead of the thread is 4/60 and the ratio of change wheels 4/60 x 5/1, or 4/60 ÷ 1/5 = 20/60, or 4/12. If we reduce this ratio to its lowest terms we get ⅓. This indicates that the leadscrew makes one revolution to every three of the spindle. In this case we can engage the nut with the leadscrew at any point of the lathe bed and the tool will come into pitch again for each successive cut.

Problem II: Required 27 threads in 5 in.; same leadscrew. The fraction expressing the lead is 5/27. Ratio of change wheels is 25/27; which is the lowest term. The nut can be engaged at every twenty-fifth revolution from the starting position, or, if the spindle and lathe bed have been marked, the nut can be engaged at every fifth inch, or multiples thereof, along the lathe bed.

Problem III: Required 10 threads in 7 in.; leadscrew 2 per inch. Fraction representing the pitch is 7/10. Ratio of change wheels is 14/10, which, reduced to its lowest terms, is 7/5. The half-nut can be engaged at every seven revolutions of the leadscrew or at every 3½ in. or multiples thereof along the bed.

Problem IV: Required 7 threads in 10 in.; same lead. The fraction is now 10/7 and the gear ratio 20/7. The half-nut will engage at every twentieth revolution of the screw or every 10 in. of its length.

Problem V: Required 4 threads in 4¼ in.; lead of screw 2 per inch. The fraction is 4¼/4, and the gear ratio 17/8. The nut will engage at every seventeenth revolution of the screw or every 8½ in. of its length.

I have found this method very useful when working on lathes that were not equipped with a carriage reversing movement.

Putting Limits on All Dimensions

By John Thomas

In the majority of drafting rooms, when dimensioning shop drawings, it is the usual practice to add tolerances only to those dimensions which require comparatively close limits and to give other dimensions merely a flat size such as 2¼ in., 0.750 in., etc. As a matter of fact, such unlimited dimensions mean nothing more than that the work should be made to that size only approximately.

This practice seems to me to be a mistake. Before a piece of work can be made from such a drawing, someone must either decide or find out the leeway allowable on sizes lacking limits. This usually means much time wasted in looking up "how they made them last time," or in discovering someone who will take the responsibility for such a decision. Very often this does not settle the matter, for it all depends on whether the decision is based on a guess or on definite information.

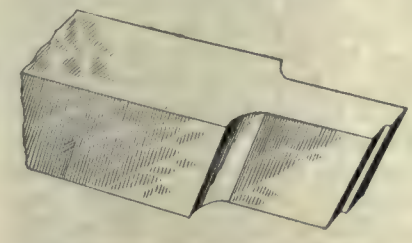
If we insist that our draftsmen limit all dimensions we will eliminate a lot of trouble and lost time in the shop. Often the operator wastes time in making a piece of work much closer to size than is really necessary, while the opposite may also be true. If ± in. more or less can be allowed on the work, the operator should know it definitely instead of being permitted to use his own judgment which probably would not coincide with the ideas of the designer of the piece.

Definite limits will help the operator in every way. He will get started on the job in less time, and will save time wherever possible. Definite limits will give him more confidence and help him produce better work, simply because he will know definitely what is wanted.

Easing the Pressure of the Cutting-Off Tool

By S. J. Morgan

On page 185 of American Machinist, there is an article under the above title, written by Clarence B. Coe, in which he advocates the making of a groove in the upper surface of a cutting-off tool for the purpose of easing the chips so that they will not pack in the cut.



CUTTING-OFF TOOL WITH DOUBLE LIP

The sketch herewith shows the way in which we accomplish the same result. Merely grind back approximately one-half the cutting edge for a distance of a few thousandths, making in effect two cutting lips instead of one. Then when the tool is put to work it will cut off two narrow ribbons of material and there can be no trouble from the jamming or packing of the chips in the cut.

Broaching With a Bearing Ball —Discussion

By James Griffin

On page 419 of American Machinist, Amos Ferber questions the advantage of the ball method of sizing holes, particularly in drawing dies, if the holes are to be lapped after hardening.

If a microscopic study were made of the metal surrounding the holes made by the ball and the reamer methods respectively, the crystalline structure of the metal in the case where the ball was used would be found to be more compact and closer grained than when the hole is reamed. This gives better wearing qualities and, I think, is an advantage.

Cutting Bolt Holes in Shims

By F. W. Cheatham

When you have a number of bolt holes to cut in thin sheet metal or fiber shims, select an ordinary cup-pointed setscrew with the cup of a size that corresponds to the desired hole, place it with the cup end upward in a vise, lay the shim over it and strike with a smooth flat-faced hammer. After the usual experience in cutting holes in shims you will be greatly relieved to find how easy it is to do a good job.

EDITORIALS

A Guiding Hand for Trade Associations

THE dilemma in which trade associations find themselves as the result of the Hardwood decision continues to be the subject of much discussion. The most recent developments include the Hoover Conference at Washington and the introduction, in Congress, of a tentative bill by Senator Edge placing such associations under the Federal Trade Commission; and of a Joint Resolution, fathered by Senator Edge and Representative McArthur, providing for a congressional investigating committee.

"Business is entitled to know in definite terms what it may and may not do," declares the preamble of the proposed joint resolution. This declaration will strike a sympathetic chord in many a weary heart. For fifty years American business has been struggling to attain certainty in its legal status. Ever since the first halting steps in great combination movements legal uncertainty has been an ever-present condition. Under the old common-law doctrines, under the state anti-trust laws and under the federal Sherman Act, business has been operating under the handicap of indefinite and negative restrictions. The process has been one in which business, denied definite positive guidance, has tentatively adopted in its tendency toward combination one legal form after another—the pool, the trust, the holding company, the merger—only to be checked and turned back by the Supreme Court, which has finally evolved that marvel of indefiniteness—the "rule of reason."

The latest decisions have made it clear that combinations in restraint of trade cannot be erected under the guise of open-price associations. One more experiment tried and the check once more applied! Business now asks for a statement of what it can do. It demands an opportunity to submit plans for trade-association activities to the federal trade commission for approval or disapproval before operations are begun.

The uncertainty which has been present has been costly in the past; much more costly than is ordinarily realized. If one were to attempt to devise a plan for dampening business enterprise, it would be difficult to evolve a more efficient implement than a threat of illegality. This type of uncertainty is a perfect wet blanket.

We do not mean to infer that business should be left free to do anything it chooses. So long as competition is the force relied upon to protect consumers from high prices, it will be necessary to prevent by law combinations in restraint in trade. We merely point out that certainty as to what is legal and what is illegal would greatly simplify the problem of the business man. How can one proceed confidently so long as the rules of the game are undetermined and constantly shifting?

In this particular case, moreover, uncertainty is likely to be particularly costly. Unless positive guidance is given, the trade association movement will receive a blow which will prevent, in large measure, the performance of many functions which are highly useful in the economic process and quite free from objection on the grounds of restraint of trade. For the fact-finding function of the trade association is really a risk-elimination function. If a business man can make his plans and decisions on the basis of fact and knowledge rather than guess and speculation, he can price more closely, eliminating the reserves and insurance premiums which inevitably accompany the conduct of business when surrounded by uncertainties. Trade associations now supply much valuable data and can be so developed as to supply much more. Such data are essential to wise business decisions and will result in fewer losses to business men and lower prices to consumers.

The Edge bill may not be perfect. Senator Edge does not pretend that it is. But certainly his proposals are steps in the right direction. It is possible to define fairly precisely the things which trade associations "may and may not do," and Congress owes it to the business community and to the country to make this clear.

Selling the War Surplus

IF WE needed a sidelight as to the cost of war, the sale of surplus materials would afford a good example. Over a billion dollars worth has already been sold and about as much more still remains to be disposed of. Major Glen E. Edgerton, director of sales, is planning an intensive campaign to get the rest of it out of the way. He realizes that, in some cases, it will work a temporary hardship on industry. But it must be sold and he believes that it is better to have the operation over with than to drag along with mere palliatives.

Roughly speaking, one-half the property declared surplus, something over two and a quarter billion dollars, was transferred to other governmental departments. The actual surplus on hand and ready for sale on March 1, represented an original cost to the taxpayers of $190,000,000. Although the most saleable property has already been disposed of, there is much valuable material in what remains. The material still available includes electrical equipment, hand tools, engineering supplies, machine tools, scrap metal, railway material, office supplies and the like.

It is interesting to note that during the first two years the average recovery from sales was 73 per cent of the original cost. The present average recovery rate is 25 per cent. The average for the whole, however, is 48 per cent which, all things considered, is a very high rate.

The lower rate prevailing at this time gives an idea of the relative saleability of the remaining surplus, as well as the lower prices prevailing in the open markets this year.

When the sale is completed the country will be in a more healthy condition, the treasury will be richer, the decks will be cleared for new business and we shall be decidedly nearer normal business in every way. Let all who can, hasten rather than delay the completion of the work which must be done. And let us appreciate the work done by all who have assisted in its doing.

Shop Equipment News

Blanchard High-Power Vertical Surface Grinding Machine

The Blanchard Machine Co., Cambridge, Mass., has added to its line of surface-grinding machines what it believes to be the heaviest and most powerful vertical spindle surface-grinding machine ever built. Fig. 1

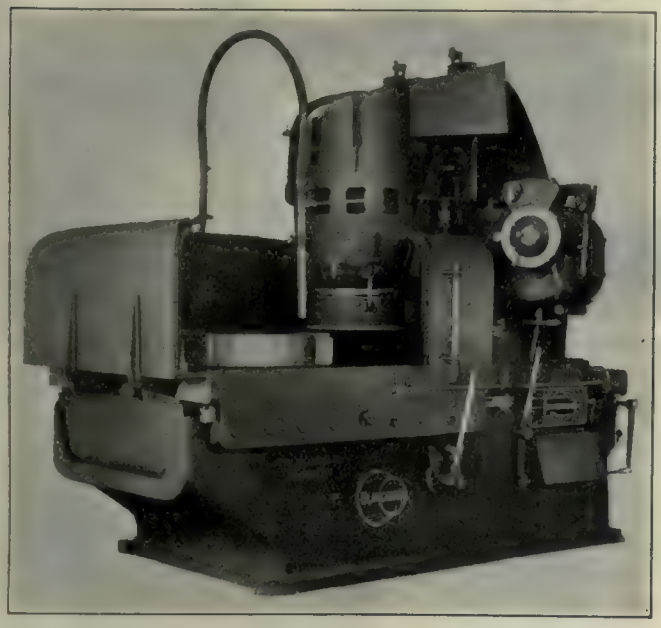


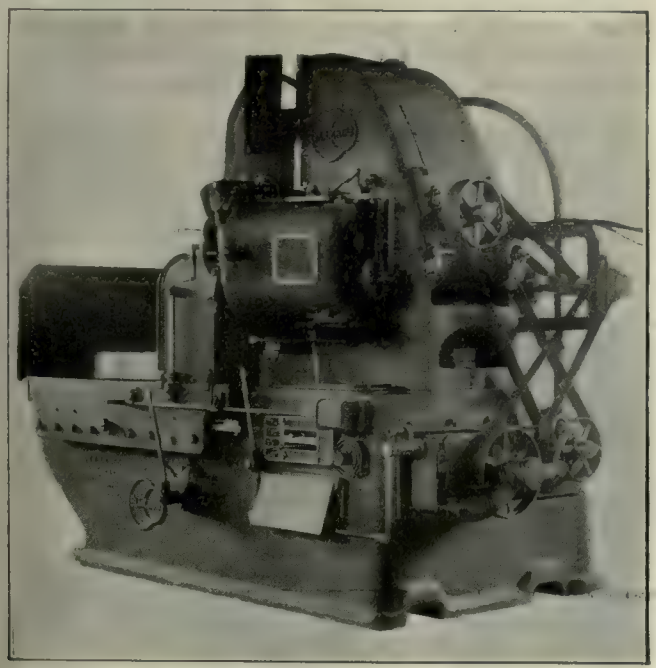
FIG. 1. BLANCHARD HIGH-POWER GRINDING MACHINE

shows the front view of the machine, which is known as the No. 27-R Blanchard high-power vertical surface-grinding machine. Overall dimensions of the machine are 12 ft. 6 in. long, 7 ft. 6 in. wide and 10 ft. high. The total weight is 30,000 lb. Floor space required is 12 ft. 6 in. x 7 ft.

In general arrangement it is similar to the No. 16 Blanchard grinding machine, and it operates in the same way. The work is carried on a rotary magnetic chuck, 48 in. in diameter, which is moved horizontally from the loading to the grinding position, and there rotated continuously while the wheel is gradually fed downward. Owing to its size and weight, the No. 27 chuck and table is traversed by power. In other respects the operation of the No. 27 is like that of the No. 16, although the mechanism is different.

The grinding wheel is 27 in. in diameter, 7 in. deep, with a rim either 2 or 3 in. thick. It is sulphur mounted in a cast-iron retaining ring, attached to the faceplate by six screws, and is wire banded in the same way as the No. 16 Blanchard wheels. The wheelhead weighs 3 tons and has built into it a 60-hp. 600-r.p.m. induction motor which drives the wheel at 580 r.p.m. or 4,170 ft. per minute. The rotor is directly on the wheel spindle, which is 5½ in. in diameter and is carried on two large radio-thrust ball bearings. A spring take-up at the upper end exerts an upward pull on the spindle which exceeds the weight of the rotating parts by 1,000 lb. This initial load on the lower or main thrust bearing eliminates all play or backlash. The main bearing has a thrust capacity of over 25,000 lb.

The wheel safety guard is of ⅛-in. steel plate, carried on three heavy steel rods, and has a convenient rack and pinion mechanism for vertical adjustment. A wheel dresser attached to the head provides for dressing or sharpening the face of the wheel while grinding. There is the usual water supply to the inside of the wheel through a 2-in. pipe, and to the outside nozzle



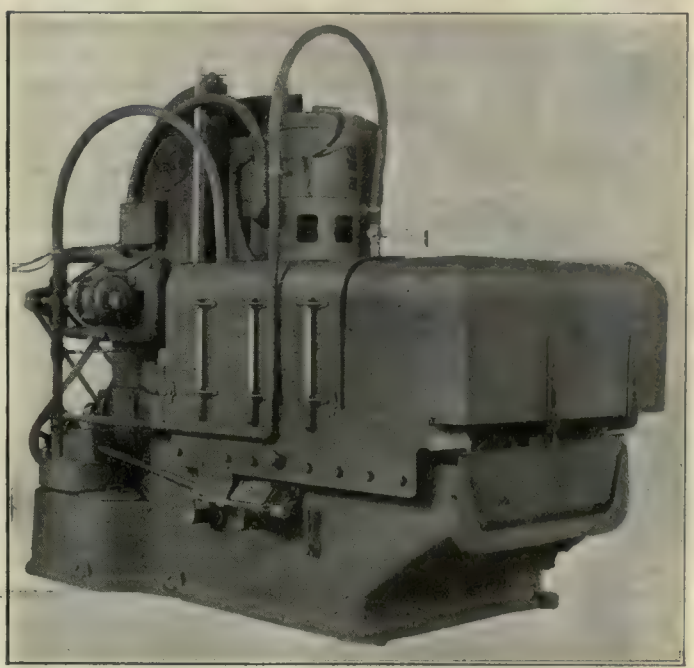


FIG. 2. RIGHT-END FRONT VIEW OF BLANCHARD GRINDING MACHINE. FIG. 3. REAR VIEW

through a [illegible] pipe. Waterguards of 1-in. steel plate, entirely surround the work and wheel.

The head is mounted to slide vertically on a massive column, whose proportions are best seen in Fig. 2. The Blanchard three-point support is used to fasten the column to the base.

The vertical motion of the wheelhead is controlled by a heavy feed screw, 4½ in. in diameter, carried in ball bearings in the column. This screw is driven through a gear box mounted in the column, receiving its power from the upper pulley in Fig. 2. Double friction clutches provide for rapid raising or lowering of the wheelhead. Both hand and power feeds are provided by means of the box on the front of the column. The power feed has an automatic stop, also a convenient adjustment, giving feeds from 0.0005 to 0.005 in. per revolution of the chuck. A single lever controls the engagement of the power feed and of the raising and lowering clutches, and is arranged so that they cannot be simultaneously engaged.

Referring further to Fig. 2, in the lower portion will be seen a large pulley which drives the chuck rotation, and to the left of it, the pulley which drives the water pump and table traverse. The chuck is driven through a four-speed sliding-gear box, with friction clutch for starting and stopping, interlocked with the gear shift. The speeds are 3, 5, 8 and 13 r.p.m. Power for all purposes, except driving the wheel, is supplied by a 5-hp. motor on the farther side of the column, to be seen in Fig. 3. This view also shows the pump and water piping and the box containing the clutches for the traverse motion of the chuck.

The rotary magnetic chuck for holding the work is 18 in. in diameter and is of the Blanchard one-piece steel type. It has closely spaced poles suitable for holding either small or large work. The face is of brass and steel, and is said to be absolutely waterproof so as to prevent damage to the windings.

The chuck is carried on a substantial table, sliding on the base on one flat and one V-way. This table spans the base like a bridge and all water and metal from the work fall directly into the first part of the water tank in the base, where most of the solid material settles to the bottom. From here the water overflows into the rear part, under the column, where any remaining material can settle. The water then flows under a skimmer, which holds back floating dirt, and over another dam into the pump tank. The first part of the main tank is cleaned from the left end, and the second part has a large cleanout opening near the right-hand end on the front. Both parts are so arranged that the entire bottom can be reached with the hoe provided, and an inclined end leading to an overhanging drip edge makes it easy to remove the mud. The pump tank is accessible for cleaning, but rarely requires it. The total water capacity is 42 gallons.

The machine is constructed throughout with a view to durability and low maintenance cost. The lubrication has been carefully studied, and both main gear boxes have pressure feed to every bearing from submerged gear pumps. Other important units have a reservoir of oil with means to circulate or splash onto all bearings. All gearing is of steel and the sliding gears are of heat-treated alloy steel. The protection against dirt and water is complete.

Brown & Sharpe No. 4 Universal and Crankshaft Grinding Machine

For use in motor service shops for grinding automotive parts, the Brown & Sharpe Manufacturing Co., Providence, R. I., has recently added to its line of grinding machines the No. 4 universal and crankshaft grinding machine illustrated in Fig. 1.

The machine is adapted to a large variety of work. It grinds crankshafts, pistons, wristpins, valve seats and stems, in addition to the regular straight and taper grinding of which a universal machine is capable. With an internal grinding attachment and chuck, it does internal and face grinding on such parts as individual cylinders, clutches, and transmission gears. All ordinary parts of motors can be ground in the machine, excepting cylinders *en bloc*. By using a toothrest, it will also grind line reamers, milling cutters, centers, boring bars, and other tools.



FIG. 1. BROWN & SHARPE NO. 4 AUTOMOTIVE GRINDING MACHINE

The throw-blocks are made with tool room accuracy, and their sides are finished to an exact size in relation to the center holes in the sliding blocks. This permits the crankshaft to be readily aligned by placing the blocks on their sides upon a surface plate. Other features of the blocks are the adjustable clamp caps which provide for various diameters of shafts, the three center holes for crankshafts of different throws, the adjustable slide for obtaining a finer adjustment,

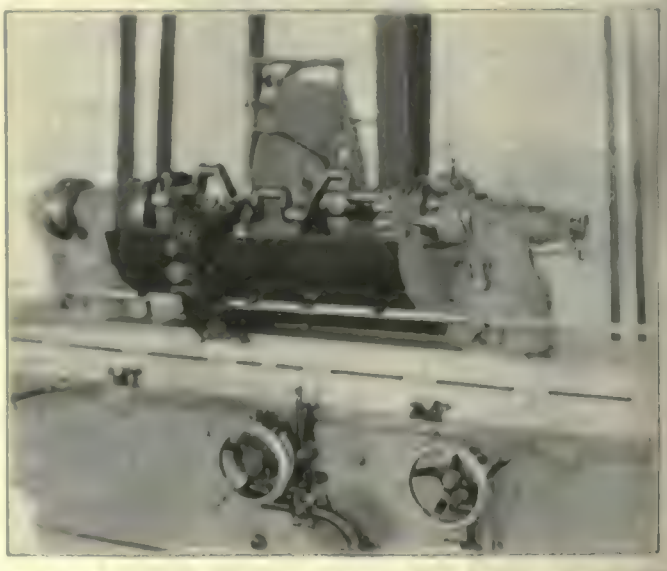


FIG. 2. GRINDING CRANKSHAFT ON B. & S. NO. 4 MACHINE

and the special extension of the slide block used on the headstock end of the crankshaft. This extension, with its recess, provides for grinding flanged crankshafts. A crankshaft in place is shown in Fig. 2.

The piston arbor permits of saving time in mounting pistons. The piston is mounted on dead centers and is also ground upon its own centers, which trues up a seasoned piston concentric with the axis upon which it was first turned. For valve grinding, the wheelslide is set at the desired angle and the corner of the wheel is moved across the valve seat. The table remains stationary and the crossfeed traverses the wheel across the face of the valve seat.

Aside from a few special features necessary to accomplish its particular purpose, the machine is similar in construction to the regular No. 4 Brown & Sharpe universal grinding machine. By removing the raising blocks from under the headstock and footstock, changing the size of the grinding wheel and its guard, and making slight additions to the equipment, the machine can be converted into the No. 4 universal grinding machine. The machine swings 22¾ in. in diameter, 15½ in. over the water guards, and takes 60 in. in length.

The tool steel wheel spindle has hardened bearings, ground and lapped, and running in self-aligning, phosphor-bronze boxes provided with means of compensation for wear. The spindle and boxes can be easily removed

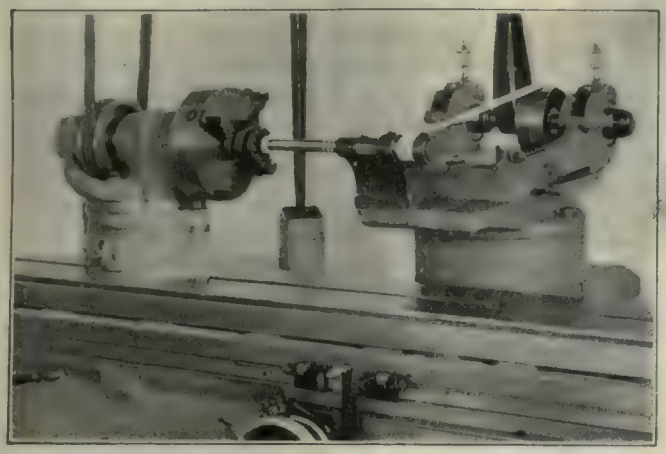


FIG. 3. INTERNAL GRINDING FIXTURES FOR B. & S. NO. 4 MACHINE

to make room for the internal grinding attachment. The automatic crossfeed will move the wheel from 0.00025 to 0.004 in. at each reversal of the table, as desired. It is automatically disengaged when the work is ground to size. The table travel is automatic and is controlled by easily adjustable dogs.

The speeds and feeds of the wheel and work and table are entirely independent of each other. A single lever starts and stops the rotation of the work and the feed of the table. The table reversing mechanism is very accurate, allowing work to be ground close to a shoulder.

The base of the machine rests on the floor at three points. This construction maintains the alignment of the table, and prevents it from being affected by any inaccuracies of the flooring. The box-like construction of the frame with the ample overhang at each end gives firm support for the table, especially at the end of its traverse. Strong ribbing extending the entire length of the table keeps it rigid and prevents it from sagging.

The grinding wheel is 24 in. in diameter, 1 in. thick, and has a 5-in. hole. It is protected by a heavy guard, which helps to confine the spray and particles of abrasive. The footstock carries the holder for the carbon point, and the wheel can be trued without removing the work from the centers.

Included in the equipment are two universal adjustable backrests for supporting slender work or splined shafts. They automatically compensate for the decrease in diameter as the work approaches size. Their use is illustrated in Fig. 2. For wet grinding there is a supply of water furnished by a pump from a tank attached to the rear of the machine. This pump is of simple construction, delivers the water in a steady stream, and requires no packing or priming. The telescopic water guards protect the operator from spray.

The equipment shown in Fig. 1 is included with the machine. Fig. 3 shows the machine set up for internal grinding. The floor space required at right-angles to the spindle is 52 in., and parallel to the spindle 207 in. The hollow base is fitted as a closet to hold small tools and accessories.

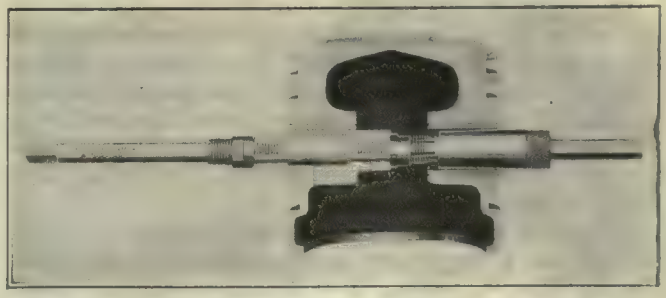
Alvord Piston-Pin Bushing Reamer

The illustration shows the "X-Cel" adjustable piston-pin bushing reamer with pilot, recently introduced by the Alvord Reamer and Tool Co., Millersburg, Pa. The cutter of this tool is very similar to the regular Alvord adjustable reamer and is adjusted in the same manner, but the shank and pilot stem are ground to an accurate sliding fit with the taper plug shown, and are parallel and concentric with the cutting edges.

By passing the pilot stem through the piston-pin bushings and then slipping the taper plug on the pilot and pressing it into the bushing, the reamer is centralized and supported and reams the bushings in correct alignment and with no chatter. With pistons of small diameter and correspondingly short pin lengths it is sometimes necessary to ream first one bushing, and then reverse the reamer and plug and ream the other bushing. In this case, the second reaming operation is centralized from the bushing already reamed.

This tool is simple to operate as there is no adjustment necessary on the taper plug, which fact materially decreases the time necessary to fit a set of pins. The taper of the plug is sufficient to cover the range of adjustment of the reamer, but is gradual enough to align the reamer in place.

The reamers are made in eight different sizes, and cover a range from ⅝ to 1⅛ in. A special set designated as Set No. 503, has been assembled which con-



ALVORD PISTON-PIN BUSHING REAMER

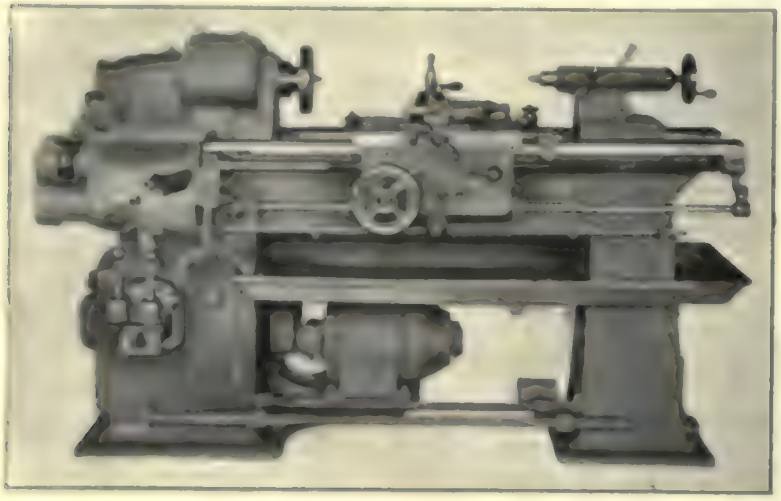
sists of four reamers and which will ream standard and oversize holes for practically all of the leading cars on the market.

Hendey 14-In. Toolroom Lathe

The Hendey Machine Co., Torrington, Conn., has placed on the market recently a motor-driven toolroom lathe that embodies some noteworthy features.

A departure from customary practice is the mounting of the motor on a shelf beneath the oil pan, where it cannot obstruct light or interfere with the vision of the operator. The motor drives the speed-box through an Oldham coupling having no screws or bolts, and may therefore be removed or replaced without preliminaries other than withdrawing the holding-down bolts and disconnecting the wires. The motor pinion, being supported by independent bearings, remains in place in mesh with the second gear.

Within the pedestal an oil-tight change-gear box is so mounted as to swing about the center of the second shaft, and from a pulley on the exterior of this box a belt goes directly to the single driving pulley on the spindle. The weight of the gear box maintains a constant tension on the belt, thus eliminating trouble from stretching of the belt and danger of breakage from possible snagging of the tool in the cut.



HENDEY 14-IN. TOOLROOM LATHE

Nine changes of speed are available by means of the gear box, and are controlled by the position of the two levers on the front of the pedestal. A positive interlock prevents interference of the gears. An easily removable cover on the front of the pedestal gives access to the gear box, while by removing the end plate and disconnecting the control levers, the entire gear box and attached mechanism may be removed without interference with other parts.

The single driving pulley is mounted on a quill extending nearly the full length of the spindle, and ample provision is made for lubrication. The entire top half of the head cover is in the form of light plates that may be lifted off by merely turning the knobs, thus rendering the spindle easily accessible for readjustment. The cone lock is reached by lifting the small swinging cover over the large gear.

The usual form of back gearing, mounted on a quill running on a stationary eccentric shaft, is provided. The operation of putting in or taking out the back gears is performed in the same manner as in the older form of Hendey lathe. The ratio of the back gearing is such that nine additional speeds are available, making eighteen in all.

A complete range of threads and feeds is provided by the two gear boxes controlled by the two upper levers. The small lever on the circular dial at the left of the headstock slides the idler gear into or out of mesh, so that the spindle may be run at high speeds without running the gears.

The spindle conforms to the usual Hendey design, running on tapered bearings that are easily adjustable to compensate for wear. A different method of sustaining the end thrust is introduced, which distributes the load over ample wearing surfaces and makes adjustment easily and quickly possible.

Improvements in the design of the carriage and cross-slide add rigidity and convenience. The ratio between crossfeed and carriage traverse is carefully calculated and intended to give accurate tapers or bevels when the two are used together. In conjunction with the taper attachment, an extremely wide range of tapers is available. The tail spindle is graduated and the footstock provided with an improved form of locking device.

Every moving part except the spindle nose and the lead screw is completely covered, thus minimizing the possibility of accident. The lead screw is provided with the usual reversing lever in the apron, and with a positive knockout in either direction to be used when turning between shoulders. Closing the locknut on the lead screw disconnects the hand wheel from the rack, preventing the possibility of interference.

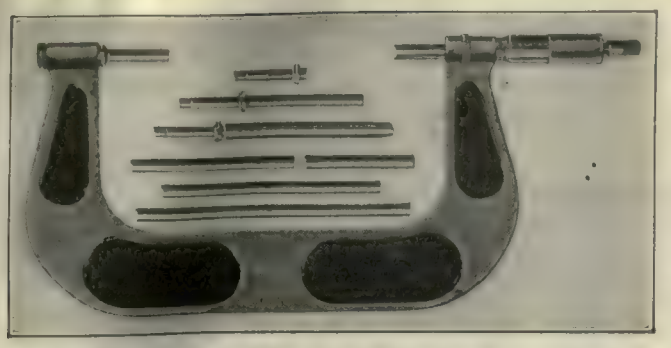
The motor is stopped and started by means of conveniently located pushbuttons. The speed change levers are interlocked with the electric control mechanism, so that the first movement in the act of changing the gear speeds operates to slow down or stop the motor without attention from the operator.

The treadle extending along the front of the base is connected with the swinging gear box so that the operator can, by the pressure of his foot, stop the lathe for the purpose of calipering or inspecting the work without stopping the motor. Depressing the treadle raises the gear box and releases the tension of the belt. The operator is thus enabled to stop the lathe from the extreme end without the necessity for reaching the control buttons. In its lower position the weight of the gear box rests partly on the belt and partly on an adjusting screw, so that the belt tension may be adjusted as the nature of the work may require.

Brown & Sharpe No. 55 Micrometer Caliper

The Brown & Sharpe Manufacturing Co., Providence, R. I., has recently increased the range of its No. 55 micrometer caliper. By means of the four detachable anvils, shown in the illustration, the tool can be adapted to measurements from 2 to 6 in., instead of from 3 to 6 in. as formerly. The anvils can be quickly changed and held securely in place by a knurled nut. One anvil is for measurements from 2 to 3 in., another from 3 to 4 in., and so on.

The tool is especially useful in garages and service stations where small pistons, many under 3 in. in diameter, and also large pistons for trucks and tractors, require accurate measurement. It can measure all



BROWN & SHARPE NO. 55 MICROMETER CALIPER

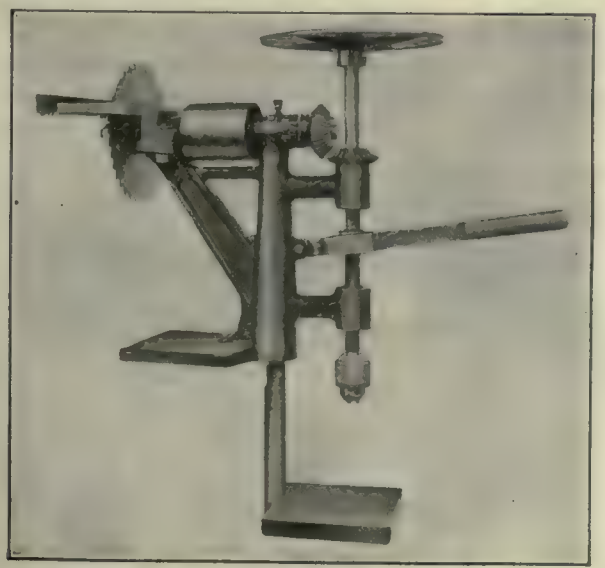
ordinary sizes of pistons and cover the same range of work as three or four ordinary micrometers. In general construction it is similar to other Brown & Sharpe micrometer calipers.

Reeves Combination Bench Machine

The Ster-O-Lock Manufacturing Co., 417 So. Dearborn St., Chicago, Ill., has recently developed the machine shown in the illustration, which is known as the Reeves machine. This machine is a combination tool intended for use in the garage or service station. It is adapted to mounting on a bench.

By employing the various attachments that are supplied, the machine can be used for drilling either wood or metal, for surfacing or sanding, disk grinding, polishing, buffing, rough or tool grinding, or for rip-sawing wood. The table through which the rip-saw protrudes can be removed in order to allow the various attachments to be adjusted, or the table can be tilted, for sawing at an angle. The horizontal disk at the upper end of the spindle is intended to be used for disk grinding or surfacing.

The frame of the machine is cast in one piece, and the spindles are of high-grade carbon steel. The horizontal spindle is connected with the vertical spindle through a positive steel clutch, which can be disengaged when using the horizontal spindle only. Both spindles run in bronze bearings. The vertical spindle has a range of 3½ in. without adjustment, and is supplied with a Jacobs chuck that will take drills up to ⅝ in. The drilling table is adjustable in position.

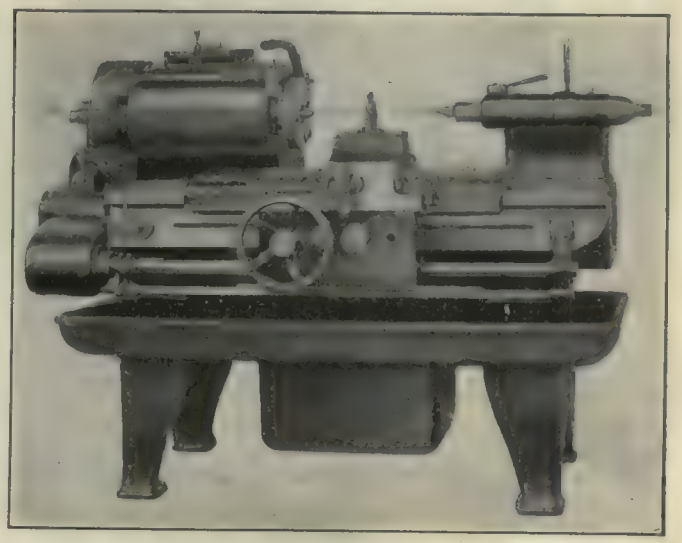


REEVES COMBINATION BENCH MACHINE

Sundstrand 12-In. Manufacturing Lathe

The Rockford Tool Co., Harrison and Eleventh Sts., Rockford, Ill., has recently placed on the market the 12-in. Sundstrand manufacturing lathe shown in the accompanying illustration. The machine is constructed on the same general principle as the 9-in. Sundstrand lathe described on page 1028, Vol. 48, of AMERICAN MACHINIST, with the exception of its greater swing and combining features necessary for a machine of larger range and capacity. In the design of this lathe special attention has been given to obtaining a compact and rigid machine, capable of standing up to the demands of specialized production, yet flexible enough to be used for a great variety of work. It is equipped with cross-feed, quick-change feed and reverse to the carriage, and is adaptable to thread cutting by substituting a lead screw in place of the feed rod.

The headstock gives nine speeds selective. The drive is of the single-pulley type, with a friction clutch in the large driving pulley. The same movement that disengages the clutch automatically applies a brake, which stops the spindle instantly. For attaching air cylinders, draw-in attachments and expansion chucking devices, an extension is provided at the outer end of the spindle.



SUNDSTRAND 12-IN. MANUFACTURING LATHE

Specifications—Swing: over carriage, 12 in.; over cross-slide, 10 in. Distance between centers, 18 in. Hole through spindle, 1⅛ in. Diameter of drive pulley, 12 in. Width of drive belt, 4 in. Speed of drive pulley, 200 r.p.m. Number of feeds, 29. Number of spindle speeds, 9. Toolbit, ⅝ x 1⅝ in. Floor space, 35 x 70 in. Weight: net, 3,130 lb.; domestic shipping, 3,330 lb.; export shipping, 3,500 lb.

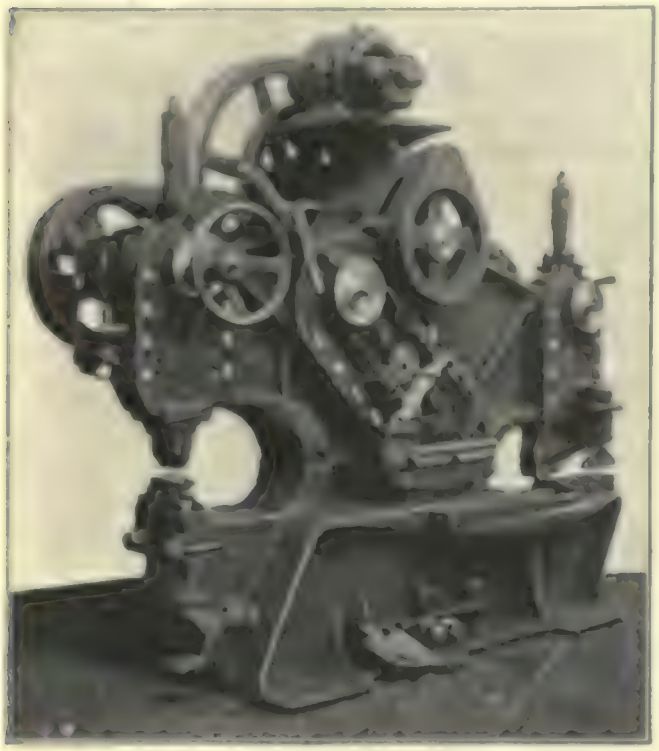
The main spindle taper bearings are made of bronze bearing metal, adjustable for wear.

A special feature on the carriage is the multiple-stop collar, which makes a positive stop for the cross-slide when turning shafts with shoulders and different diameters. The carriage, which has exceptionally long bearing surfaces on the ways and is arranged with a slide block for a taper attachment, has lugs on top that are drilled and tapped to permit the mounting of extra cross-slides or special toolholder blocks.

The apron is of the double-wall type, with a minimum number of working parts and gears. A simple feed reverse box, of bevel-gear and clutch type and having steel gears and bronze shaft bearings, is regularly furnished. A quick-acting tailstock is supplied as standard equipment. Taper attachment, draw-in attachment and rear toolblocks can be furnished.

Ocking Triple Combination Punching and Shearing Machine

The combination punching and shearing machine shown in the accompanying illustration has recently been placed on the market by Amplex, Inc., 6 West 32nd



OCKING PUNCHING AND SHEARING MACHINE

Street, New York, N. Y. The machine is economical in floor space, and can be adapted to different types of work without the necessity of changing tools.

The operator's side of the machine is clear of encumbrances such as flywheels and driving gears, all of which are placed on the opposite side. The machine has a slanting centering slide, so that mitering cuts can be made without lifting the angle bar being cut. The plate shear has longer knives than employed in former models of the shearing machine. The lengths are for the No. 16 machine, 13 in., and for the No. 20 machine, 16 in., against former lengths of 9 and 11 in., respectively. There is ample room behind the knives to avoid binding the plates being cut.

The punch is arranged for punching both webs and flanges of structural shapes, and the height of the throat is designed for handling broad flanged Bethlehem shapes. The punch is provided with lowering devices to ascertain the center mark before punching, and both hand and foot levers are provided to throw the machine into gear. The springs as well as the gears are enclosed, so as to safeguard the operator. The bar and angle cutter cuts any structural shape, but the standard equipment provides for cutting rounds, squares, angles and tees only. The knives can easily be exchanged for cutting beams and channels.

The machine is constructed so as to provide durability. The frame is cast steel. The slides are also made of steel and are adjustable. The covers of the slides are attached to the body by pin bolts, so that they cannot work loose. The bearings have large surfaces; they are bronzed bushed and provided with ring lubrication.

The machines are manufactured in a series of sizes. They are fully standardized and provision has been made to provide cranes, gages and other attachments, which can be furnished with the machine or later when they are needed. The smallest size machine is the No. 13, which will split ½-in. plates and cut 3½-in angles, with a punching capacity of ⅝-in. holes in ½-in. material. The largest size machine is the No. 32, which will split 1¼-in. plates, cut 8 x 8 x ¾-in. angles and punch 1¾-in. holes in 1-in. material.

Marvin & Casler Reamer Holder

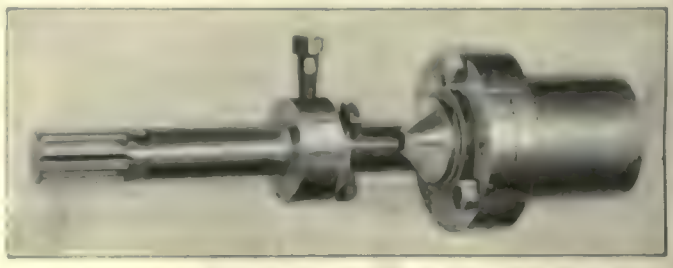
The Marvin & Casler Co., Canastota, N. Y., has recently placed on the market the equipment shown in the accompanying illustration for holding reamers on screw machines or lathes. The holder is not intended to float, but operates on a different principle. In order to ream a straight, true hole it is assumed necessary to hold the rear end of the reamer in line with both the center line of the machine spindle and of the hole to be reamed.

The bushing or adapter sleeve shown at the right of the illustration is suitably mounted on the turret of the lathe on which the holder is employed. The faceplate on the front of the bushing is held by three capscrews. With this equipment on the turret, the work is first bored, then faced a short distance from the hole and the corner chamfered so as to provide the proper bearing for a tapered plug.

The cone-shaped centering plug is placed in the faceplate of the holder and the turret is moved toward the work. As soon as this cone plug enters the bored hole, it brings the faceplate concentric with the spindle of the lathe. While the plug is held tightly against the work, the capscrews are tightened so as to secure the faceplate.

The turret is then backed away, the cone plug removed and the reamer holding sleeve inserted in its place. This sleeve maintains the reamer securely in position and insures that its rear end will be in line with the center line of the work and of the machine spindle. The reamer holder can be disengaged in order to fit it to other reamers. Ordinarily the entire reamer may be passed through the adapter sleeve, so that only that portion of the reamer necessary to make the cut is required to overhang. The reamer shank thus projects into the turret.

The faceplates, the holder sleeves and the center plugs are all interchangeable, and only one plug is ordinarily required for a group of machines. The reamer holding



MARVIN & CASLER CENTERING REAMER HOLDER

sleeves can be supplied in sizes to suit the reamers that are used. Special fittings and the adapters necessary for attaching the holder to different makes of machines can be provided.

Lassiter-Millholland Staybolt Machines

The Dale Machinery Co., Inc., New York, N. Y., has recently placed on the market two horizontal staybolt machines. The machines are manufactured by the Millholland Machine Co., Indianapolis, Ind., and are known as the Style A and Style B, Lassiter-Millholland staybolt machines. The Style B machine, illustrated in Fig. 1, is used for turning simultaneously the taper and straight diameters on radial, button-head and crown staybolt forgings, and for threading both the straight and taper ends, also simultaneously, in uniform pitch and continuous lead.

For turning, the bolt is gripped in a collet with special collet bushings and adjustable stop. The turning feed is then engaged by means of a friction, which is driven by a spline in the feed shaft, and the two Modern turning heads are fed over the portion of bolt to be turned, thus machining both ends at the same time, the chasers in the dieheads having been replaced with cutters, so that the tool acts as a hollow mill. The front head has a taper attachment which can be adjusted to any desired taper. This attachment allows the front diehead to open gradually as the slide moves forward. The cutters in the rear diehead are straight, and those of the front head tapered. Both dieheads are automatically tripped at the end of the cut, and are automatically closed by adjustable cams mounted on a slotted bar on the rear of the machine.

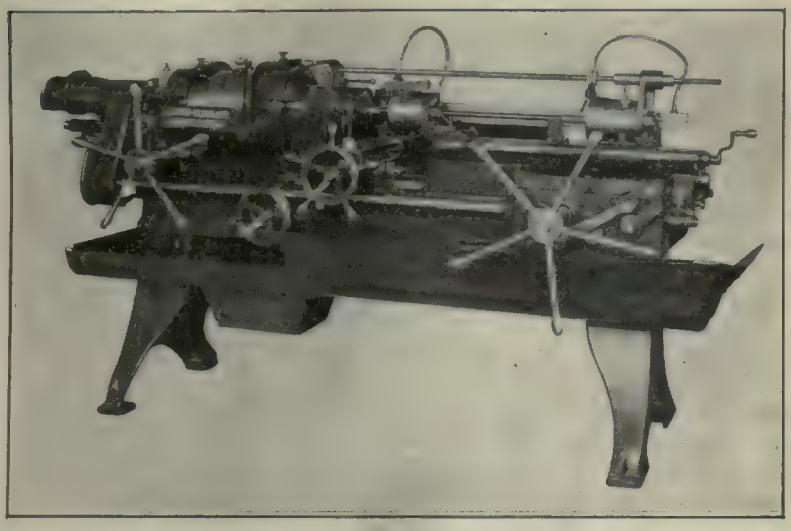


FIG. 1. MODEL B LASSITER-MILLHOLLAND STAYBOLT MACHINE

For threading, the cutters in both heads are replaced with chasers. The heads being closed, the threading feed is engaged by closing two half nuts on the lead screw, which feeds the dieheads at the desired pitch and does not allow creeping or lagging. As the dieheads are held in constant relation on the slide, a bolt of continuous lead and uniform pitch is the result.

To enable the machine to be adjusted to any desired length within its range, the rear diehead carrier is adjustable on the slide by means of a fine-pitch screw. A permanent spacer bar very accurately made is furnished with each machine. This bar has twenty-three holes accurately bored and spaced 1 in. apart, to correspond with the various lengths of bolts. The rear diehead carrier has a pin which when inserted through any of the holes in the bar sets the dieheads in continuous lead without further adjustment.

A cross slide with hand crossfeed and hand longitudinal adjustment is provided for facing and undercutting the button-head bolts. The machine has a capacity for bolts from ¾ to 1½ in. in diameter and 14 to 36 in. long. It is supplied in cone-driven or geared-head design, the latter arranged for single-pulley or motor drive. Seven hundred bolts 28 in. long per day of nine hours have been completed by one operator.



FIG. 2. BOX MILL IN POSITION ON MODEL A LASSITER-MILLHOLLAND STAYBOLT MACHINE

The Style A machine is used to make side stays from the bar of either iron or copper. This machine turns the relieved portion in the center of the bolt and threads both ends in uniform pitch and continuous lead. The machine is rigidly built and is provided with a special feed-box apron, and splined lead screw.

A hexagonal turret is mounted on a slide, which moves directly on the ways of the machine, no saddle being used. Taper gibs are provided where necessary to compensate for wear. A double-plate apron is attached to the slide.

The stock is fed through the spindle and automatic chuck bar by the bar feed, up to a

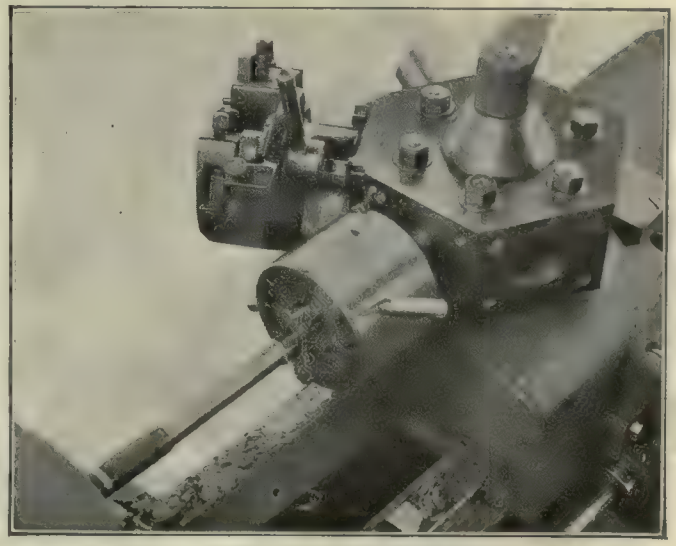


FIG. 3. DIEHEAD IN POSITION

stockstop mounted in the turret. The center portion is then relieved by a box mill of special design, as shown in Fig. 2. The box mill being withdrawn, the diehead indexes into position and is fed onto the work by engaging the half nuts with the lead screw. When the diehead completes the first threaded portion, the machine is speeded up instantly by means of the friction in the headstock, thus passing the diehead quickly over the relieved portion with the lead screw still engaged. The machine is then slowed up to the proper cutting speed, the threading operation completed and the bolt cut off. This produces a bolt with uniform pitch and continuous lead. The Style A machine also is furnished with cone drive or a geared head arranged for single-pulley or motor drive.

In both styles of machines both the turning and threading feeds are automatically tripped. The friction clutch which is used for turning is automatically disengaged, and the half nuts which are used during threading also are tripped at the same instant that the dieheads open. This guards against any possibility of the machine being damaged, should the operator not be in attendance when the threading operation is completed.

A safety device is supplied which allows only one feed to be engaged at a time, and it is impossible to engage both the friction and half nuts at the same time. Modern dieheads are used on both machines.

Lufkin Thickness Gage With Lock

A thickness or feeler gage recently placed on the market by the Lufkin Rule Co., Saginaw, Mich., is provided with a lock by which the blades may be held in any position. This lock consists merely of a knurled-head nut that clamps the leaves tightly together when it is turned a fraction of a revolution.

The gage is adapted particularly to the use of automobile mechanics and repair men. When making adjustments of tappets on motors, the proper leaf can be used at the full length of the tool of 5½ in. In this way, fits can be gaged in places difficult of access.

The gage is made in several styles. The No. 06 carries six leaves having thicknesses of 0.002, 0.003, 0.004, 0.006, 0.010 and 0.015 in. The No. 07 has in addition a 0.0015-in. leaf. The No. 09 has nine leaves 0.0015 to 0.015 in. in thickness. The 0.015 leaf and the nameplate form the case, so that the thinner leaves are well protected when the gage is closed. The No. 109 tool, which is illustrated, is the same as the No. 09, but is provided with a case in which the blades fold.

On all of the gages, the leaves are ½ in. wide and 3 in. long. The removal and insertion of blades is easily accomplished. If two leaves are separated from the others and locked in position, they may be used as the upper and lower limits that are permissible in the fit. The leaves are accurately ground to size, which is marked on each. When the gage is closed and locked, the blades are protected.



LUFKIN THICKNESS GAGE WITH LOCK

Luma Electric Etching Pencil Outfit

The Luma Electric Equipment Co., 405 Spitzer Bldg., Toledo, Ohio, has recently placed on the market the electric etching pencil outfit shown in use in the accompanying illustration. The device consists of two major units, a magnetic table, and the pencil itself. It is adaptable to several uses, the chief of which are etching or writing on hardened steel, demagnetizing steel, annealing and soldering.

By using the magnetic table of the device, work that has been placed on a magnetic chuck can be easily demagnetized. It is merely necessary to pass the piece across the table while the current is turned on, to accomplish this result. Similarly, tools or bars may be magnetized. A file or scribe may thus be employed for removing chips from holes, or for holding small screws and such work in place. It is merely necessary to lay the tool on the table, turn on the switch, then turn off the current and remove the part.

The etching pencil permits of marking sizes, numbers and such inscriptions on tools and hardened steel. The



LUMA ELECTRIC ETCHING PENCIL OUTFIT

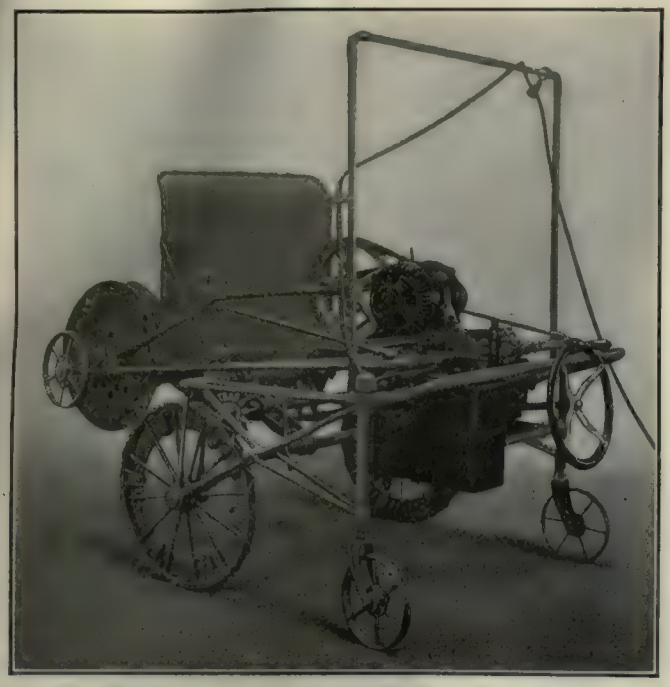
cord of the etching pencil is attached to the table, on which the tool to be marked is laid. When the current is turned on, it is possible to mark the work, with no more pressure than required for ordinary writing.

When used as an annealing point, the cord of the pencil is attached to the top connection on the side of the instrument. The point is then replaced by one made of carbon, and the work is placed on the table of the instrument. When the current is turned on and the carbon point held on the work, the point of contact begins to glow with heat. In this way, a small spot can be heated without affecting the rest of the work.

The carbon point may be employed in the same manner for soldering, being held in contact with the work to heat it and cause the solder to flow. The outfit is operated from an ordinary lighting circuit of 110-volt, 60-cycle, alternating current.

American Foundry Equipment Co. Power Sand-Cutting Machine

The accompanying illustration shows a machine for use in foundries for cutting and tempering sand. It has recently been placed on the market by the American



"AMERICAN" TYPE HP SAND-CUTTING MACHINE

Foundry Equipment Co., 336 Madison Ave., New York, N. Y., and is similar in general construction to the machine described on page 779, Vol. 55, of AMERICAN MACHINIST. The recent model of the machine is equipped with an electric motor for moving it by power, and is designated as the Type HP machine.

The frame is made of seamless steel tubing. The front wheels are of the caster type and mounted on inclined forks. The machine is steered in the same manner as a push cart. Spring mounting of the wheels enables compensation for unevenness in the floor. The drive wheels are of the tractor type, and are driven by a motor through gearing that engages with each wheel. The motor may be run in either direction and has two speeds, the fast one affording a travel of 45 ft. per minute and the slow one of 15 ft. per minute.

The cutting cylinder, shield, motor and transmission are carried upon a frame held in approximate balance. By tilting this frame, the cutting cylinder can be lowered into the sand. This operation is normally performed by means of the handwheel at the front of the machine, although the cylinder may be quickly raised independently of the wheel in case of emergency. The cutting cylinder is driven by a 2-hp. motor. Current is brought to the motors through a flexible cable that may be attached to any convenient plug.

The machine may be employed for mixing core sand and facing sand, as well as molding sand. It performs the entire work of blending, mixing and tempering without the aid of any accessory mechanism, and may be employed to pile the sand or throw it into windrows. The total length of the machine is 91 in., and the width 63 in. The clearance above the floor is 22 in. and that between the wheels 55 in. The length of the cutting cylinder is 44 in. Weight, 1,500 pounds.

Wayne Portable Oil-Burning Forging and Rivet-Heating Furnace

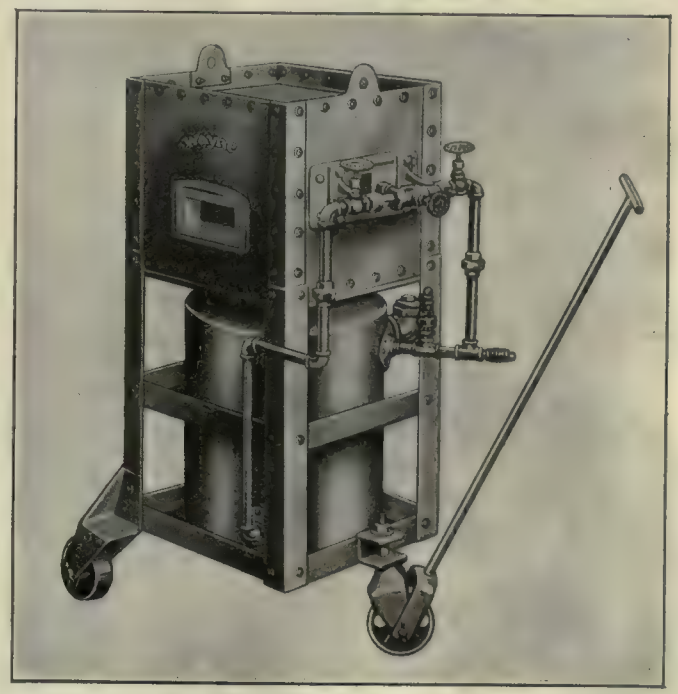
The portable oil-burning forging and welding furnace shown in the illustration has recently been developed by the Wayne Oil Tank and Pump Co., Ft. Wayne, Ind., for shops where it is necessary that the forging or rivet-heating equipment be moved about in order that the work may be more speedily and easily accomplished. The furnace is substantially but lightly made.

The furnace is approximately 51 in. high over-all, 25 in. from front to back, and 31 in. wide. The handle is 40 in. long and attached to the guiding castor. The furnace body is made of 14-gage black iron, held by heavy angles, and is 16 in. high, 18 in. wide and 16½ in. from front to back. The work opening is 6 in. wide, 3 in. high at the edges and 4 in. high in the center. The working space is 9 in. wide and 7 in. deep, exclusive of the tile opening, which is 5¾ in. from front to back.

The supporting frame which surrounds the tank is made of heavy angles. The tank itself, which is flame welded, is constructed of black iron with a ⅜-in. shell and ¼-in. heads. The tank will withstand a working pressure of 100 lb. per square inch. It is 17 in. in diameter and 22 in. long, and has a capacity for 14 gal. of fuel, which is sufficient for 10 hr. of normal operation. The tank is fitted with a safety valve. The 2-in. air-tight filling opening is conveniently located.

The parts of the heater are conveniently arranged, with but few wearing parts to require replacement. Other than the fire-clay combustion chamber there is practically nothing that must be renewed as a result of usage. The fire-clay shapes are simple and may be quickly renewed.

Air pressure is obtained by connecting the furnace to the compressed-air line which supplies the riveting



WAYNE PORTABLE OIL-BURNING FURNACE

hammers. After the burner has been once adjusted to the air pressure used, it will require practically no further attention. The shipping weight of the furnace is 600 lb.

New Jersey Foundry and Machine Co. "Handiman"

The device shown in the accompanying illustration has recently been placed on the market by the New Jersey Foundry and Machine Co., New York, N. Y., for operating hand-power hoists of 5-ton or larger capacity. It is an electrically driven machine that may be suspended in the bight of the operating chain. It has a capacity to overhaul 188 ft. of chain per minute, with a chain pull of 150 lb., thus overhauling the chain about four times as fast as a man can do it.

The machine consists of a cast-iron housing in which is contained a hardened worm and worm gear running in oil and driven by a ½-hp. motor attached to the frame. The worm-wheel shaft carries a grooved sheave with a rubber tread. This tread is V-shaped, will fit any size and pitch of operating chain and gives sufficient tractive effort to prevent slipping. The machine is counter-balanced, so that it hangs with the center of gravity in the plane of the operating chain.

Current may be supplied by a flexible conductor from a convenient lamp socket. Mounted on the machine is a plug socket for attaching the flexible conductor, and a reversing switch that enables the motor to be run in either direction.



"HANDIMAN" CHAIN-HOIST OPERATOR

The machine is intended for use on hand-operated equipment where it is desired to obtain faster and easier operation than is obtainable by hand, and where it would not be worth while to install an electric hoist. The "Handiman" is not a hoist itself, but simply a portable machine that may be carried from place to place and used to operate a number of hand hoists. The machine weighs approximately 165 lb., which is in excess of the hand-chain pull of most hand-operated hoists.

Blount Heavy-Duty Motor Grinder

The J. G. Blount Co., Everett, Mass., has recently added to its line of alternating current ball bearing motor grinders a 5-hp. heavy-duty machine for wheels 18 x 3 x 1½ in. or 16 x 3 x 1½ in. The machine is designed for heavy work and built accordingly. SKF bearings are used throughout and the spindle is of 45-point carbon steel.

The end shields are of cast iron, turned with a recess and bolted directly to the motor frame. They are further secured in position by supports clamped around the end shield hub and then bolted to each side of the head



BLOUNT HEAVY-DUTY GRINDER

casting. The end shield flanges are turned and threaded into the ends of the shields. The flanges are machined all over and recessed on the inside.

Wheel guards are furnished, either plain or of the exhaust type, and are adjustable. Removable covers enclose the sides of wheels, flanges, nuts, etc., for safety protection. The work supports are so mounted that their positions are adjustable.

The starting switch is a Westinghouse No. 815 safety type, mounted within the column on a separate panel, and easily removable from the rear of the machine, without disconnecting the switch. The switch protects both operator and equipment against unexpected restarting and accidental starting of the motor. It cannot be held closed on overload and has a long life under severe operating conditions.

The machine is furnished as follows: 5-hp., 220 or 440 volts, 60 cycle, 2 or 3 phase, or 550 volts, 60 cycle, 3 phase. The weight of this machine is about 1,200 pounds.





NEWS SECTION

Mechanical Engineers at Atlanta Next Month

The spring meeting of the American Society of Mechanical Engineers will be held in Atlanta, Ga., from May 8 to 11, with headquarters at the Piedmont Hotel. The technical program is said to be one of the best ever prepared for such a meeting. Seven of the sessions have been planned by the professional divisions of the society, these sessions to be held on the mornings of each of the convention days.

The textile division and the machine shop practice division have co-operated in two sessions which will deal with textile machinery. The materials handling division will present a paper on material handling equipment as used in the iron and steel industry. This paper will give the results of an intensive study of this subject by a special committee, and will furnish a remarkable opportunity for the discussion of the best methods for handling the many materials used in the steel industry. There will also be sessions on fuels, management, power, welding, and two interesting general sessions. A valuable paper on turning exhaust losses into work in reciprocating engines has been prepared by Dr. Johann Stumpf, who will present it in person. A public hearing will be held on the power test codes, at which a discussion on definitions and values, displacement compressors and blowers will be permitted. The boiler code committee will also hold a meeting.

The usual entertainment features of the spring convention will afford the delegates plenty to do in their leisure moments. Special provisions have been made to entertain the ladies while the men are attending the meetings.

Tap Drill Sizes

Recently a meeting of the National Screw Thread Commission was held at the Bureau of Standards, Washington, D. C., at which consideration was given to the question of tap drill sizes to be recommended for producing holes in conformity with standards adopted by the commission. It was voted to recommend drills of a diameter midway between the maximum and minimum minor diameters of the tapped holes already established. These limits result in a thread in the nut of from 75 to 83⅓ per cent full depth, with a mean value of 79⅓ per cent full thread depth.

Department of Commerce Not to Aid Open-Price Associations

Trade association practices that come under any suspicion whatever constitute such a small percentage of the benefits accruing from the work of these organizations, that there is no justification for the continuance of questionable activities. This point was brought out strongly at the Trade Associations Conference held at the Department of Commerce on April 12. It was shown that only seventy out of 3,000 organizations can be classed as open-price associations. Even among the open-price associations the opinion was expressed that 90 per cent of the benefits to members come from other activities and that these benefits are greatly exaggerated.

While it was brought out clearly at the meeting that the legality of open-price statistics has not been passed upon, and that associations doing such work cannot be denounced as law breakers, particularly when their figures are made public, yet it was made perfectly plain that the Department of Commerce will not co-operate with that type of organization. No one will be surprised if the Department of Justice should institute proceedings against such associations. At any rate, the Department of Commerce is not going to jeopardize its usefulness to other trade associations by co-operating with those who are operating within the twilight zone.

The Department of Commerce has on file a long list of the constructive things which trade associations can do. The list is growing. It is believed that its growth will be accelerated as trade associations realize that they have been covering only a portion of their field. Heretofore, attention has been concentrated largely on matters intended to accelerate production. Very little has been done toward improvement in distribution—an area thought to promise much. Sight also seems to have been lost of the fact that no restraint of trade is involved when buyers and sellers get together. Were trade associations to arrange for committees of buyers to confer with committees of sellers, it is believed that much waste could be eliminated and the spread between the price obtained by the producer and that paid by the ultimate consumer could be narrowed materially.

Trade Excursion to Mexico for Business Men

Business men who are interested in the future development of our trade with Mexico, are being offered an excellent chance to study that subject through a personally conducted tour of the Southern republic under the auspices of the *New York Commercial*. The excursion will leave New York on May 7 and will return on June 2. Stops will be made en route at Atlanta, Ga., New Orleans, La., Houston and Brownsville, Tex.

In Mexico the party will visit all the important industrial centers, to inspect plants, public works, harbors and the oil fields. Extended stops will be made at Monterrey, Tampico, San Luis Potosi, Aguascalientes, Guadalajara, Lake Chapala, Cuernavaca and Puebla.

The expedition will be accompanied by Dr. W. E. Aughinbaugh, well-known authority on foreign trade, and John F. Barry, editor of "Commercial Mexico."

Farm Machinery and Tool Prices Decline

The average of prices for farm equipment was 1.6 per cent lower on Feb. 15, than on Jan. 15, according to a survey made by the United States Department of Agriculture. The decline since Feb. 15, 1921 is 20.2 per cent.

The declines for the month were most pronounced in the case of machinery and tools such as tractors, cream separators, harrows, lumber, mowers, scythes, and wheelbarrows.

Foreign Trade Convention

The revised program for the ninth annual convention of the National Foreign Trade Council, which is to be held in Philadelphia, May 10, 11 and 12, has been received. The group sessions will include topics on advertising, credits, price quoting, protection, exchange losses, ocean transportation and general European conditions. The main theme of the convention will be the financing of foreign trade and a study of the merchant marine problem. The speakers have been selected with great care from among export managers, credit managers, treasurers and advertising executives. The general sessions will be held in the Academy of Music and the group sessions in the Hotel Bellevue-Stratford.

Annual Convention of National Metal Trades Association Features Apprenticeship Program for Industry

The twenty-fourth annual convention of the National Metal Trades Association was held at the Hotel Astor, New York City, on April 19 and 20. About 300 delegates attended. The program for the technical sessions provided a variety of subject matter having an important bearing on industrial conditions of today. Probably the most noteworthy accomplishment of the convention was the presentation of the report on apprenticeship in the metal trades.

This report was prepared by the committee on industrial education, of the association, after an exhaustive and intelligent study of this subject which took them into all phases of the metal-working industry. The committee was headed by Harold C. Smith, president of the Illinois Tool Works. He was assisted by W. M. Taylor, president, Chandler & Taylor Co., and John C. Spence, of the Norton Company. Philip C. Muller, superintendent of the industrial education department of the association also assisted in this work. The report gives a thorough survey of the industrial educational courses provided by the metal-working industries in this country. The good points of each were combined into a comprehensive program of apprentice training, and it is the plan of the association to have this program adopted throughout the industry and in that way develop a standardized system of training which will have a beneficial effect on the industry as a whole. The plan was presented by the committee and discussed at some length, but no final action was taken at this meeting.

One of the most interesting and timely addresses of the whole convention was delivered at the Wednesday afternoon session by Harold G. Moulton, professor of political economy in the University of Chicago. His subject was "American Industry and the Stabilization of Europe." Prof. Moulton presented a study of European conditions and an analysis of their effect on the business of the United States. He dwelt at some length on the Genoa conference and explained what its hopes had been before the discovery of the treaty between Germany and Russia, and the probable effects which that treaty would have on the final outcome of the conference. He said that the signing of this treaty was proof of the suspicions of France that Germany was not conquered, and was a justification of her insistence in being guaranteed protection by the United States and Great Britain. He said that it was the German idea to beat the Allies to it in Russia in case the Genoa conference gets them nothing; that if the conference at Genoa was a failure it would mean a resumption of the race for military supremacy in Europe, and might eventually lead to another conflict such as we have just experienced. He declared that the British policy in handling the German reparations was fundamentally sound in principle, and that it was Great Britain's desire to restore the economic stability of both Germany and Russia. Germany is the economic pivot of continental Europe and has been the leader of the industrial growth on that side of the water. He blamed the industrial stagnation of British industry today on the loss of German markets.

Prof. Moulton then showed the effects of these European conditions on the economic stability of America. He said that our domestic markets were absolutely dependent on our foreign markets, and that we could expect no progress while international markets were disorganized. His audience showed no little surprise when the professor declared that he was in favor of a general cancellation of Europe's war debts to the United States. He said that this was the only way out of the industrial and political chaos of today. He gave three possible remedies for our present industrial ills: a readjustment of exchange rates, abolishment of the too numerous trade regulations and barriers, and a reconsideration of the reparations payments, with a possible cancellation of the war debts.

An interesting presentation of the agricultural situation was given by A. M. Loomis, of the Washington office of the National Grange, whose subject was "The Farmer as a Balance Wheel." Mr. Loomis explained the origin and the growth of the recent farmer movements in this country, including the agricultural bloc in Congress. He pleaded for a greater recognition of the farmer and his problems, and predicted a greater prosperity for the nation when this was brought about.

The banquet on Wednesday evening was well attended. The speakers were: Former United States Senator Charles Thomas, of Colorado; Dr. W. H. E. Faunce, president of Brown University; and Howard E. Coffin, of the Hudson Motor Car Co.

On Thursday only two papers were presented. L. F. Loree, president of the Delaware & Hudson Railroad, addressed the convention on "Relations of the Railroads with Their Patrons." In his remarks the speaker touched on some of the abuses in transportation which he said were helping to keep the railroads from attaining their highest efficiency. He said that 1921 was the worst year in the history of the railroads of the United States. During that year railroad business decreased 30 per cent below the previous year, which was a drop of 20 per cent more than during any other depression. But he predicted that this year business would pick up at least one-half of this loss, though even then it would still be less than other years.

The other address was delivered by E. L. Greever, of Tazewell, Va., who was counsel for the non-union coal operators of West Virginia during the "insurrection" of last September. Mr. Greever gave a first-hand and intimate story of the march of the organized miners on the non-union forces. He characterized this as a "treasonable insurrection" and declared that it was financed and promoted with the knowledge of the officials of the United Mine Workers of America. He decried against the methods used by the labor unions to exact obedience from the union miners, and said that the non-union fields of West Virginia were the greatest bulwark against the encroachment of union domination of the coal industry.

The election of officers for the ensuing year closed the convention. W. W. Coleman, of the Bucyrus Company, was elected president; J. B. Doan, of the American Tool Works, first vice-president; Paul C. DeWolfe, Brown & Sharpe, second vice-president; J. W. O'Leary, Arthur J. O'Leary & Son Co., treasurer. Councilors for two years are: Albert J. Ford, E. J. Miller, A. J. Gifford, J. D. Cox, Jr., W. R. Angell, Jos. F. Cooley, Harold C. Smith and Harold Edwards.

Supreme Court Decides Against Shoe Machinery Company

The Government has won its case against the United Shoe Machinery Corporation. In the Supreme Court on April 17 Justice Day delivered the judgment of the court that the leases executed by that company with users of the machinery contained certain clauses, terms and conditions which were in violation of the Clayton Act of Oct. 15 ,1914. The court affirmed the decree of the District Court of the U. S. for the Eastern District of Missouri, that these leases were violative of the law in that they tended to monopoly.

The Supreme Court in its opinion held that Section 3 of the Clayton Act makes it unlawful for persons engaged in interstate commerce "to lease machinery, supplies or other commodities, whether patented or unpatented, for use, consumption or resale in the U. S., or to fix a price therefor, or to discount from, or rebate upon such price upon the condition agreement or understanding that the lessee shall not use or deal in the machinery, supplies or other commodities of the competitor or competitors of the lessor, where the effect of such lease, agreement or understanding may be to substantially lessen competition or tend to create a monopoly."

The effect of the decision is to enjoin the United Shoe Machinery Co. of Maine, the United Shoe Machinery Corporation and the United Shoe Machinery Co. of New Jersey, from making leases containing certain clauses, terms and conditions requiring the sole use of these machines.

Navy Sending Text Books to Engineering Schools

The bureau of engineering, of the Navy Department, is furnishing the engineering schools of many of the colleges of the country with copies of its general specifications for machinery. These specifications represent modern practice in naval engineering, and with their several appendices describing methods of inspection, etc., are practically textbooks on this highly specialized subject. There are very few colleges that have regular courses in marine engineering, and during the World War special schools were established for the instruction of the personnel required to man the vessels operated by the Navy. As the conditions obtaining on a naval vessel are very different from those found in power plants ashore, the specifications are of considerable value for instruction purposes.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
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The breezes are freshening. The sea is somewhat rougher and the ship of business is commencing to toss a little, although she is moving with greater speed. The barometer is rising, but a gale is possible even with a rising barometer, and the careful navigator will now be ready to shorten sail if it blows too hard.

On the New York Stock Exchange trading has become very active. Two million shares changed hands last Monday, but on Tuesday, when the market seemed strongest, its strength suddenly turned to weakness concurrently with the announcement that the Republican caucus in the Senate had voted to pass some sort of a bonus bill this session.

There may have been no relation of cause and effect between the action of the caucus and the decline in the stock market, but the coincidence shows the need of caution in an excited market, and though much of the decline has been recovered there are a few gathering clouds that should be watched.

One of them is the coal strike. As it continues without any real effort at settlement or conciliation the feeling is becoming more bitter and it may flare up in some attempt at violence that will shock the nation.

Another is the New England textile strike. It is becoming an obstinate and sullen fight that must be causing much loss to capital and great distress to labor.

An Evil Combination

Still another is the treaty between Germany and Soviet Russia which has nearly disrupted the Genoa Conference and has shocked Europe. Taken in conjunction with the report that Germany has agreed to lend Russia the equivalent of 23,800,000 gold dollars to be spent for German goods the treaty is construed as notice of an economic alliance between the two political Ishmaelites of the world whose power for evil in combination is supposed to be great and might have to be restrained by another war which, as Lloyd George says, would leave Europe a heap of ashes.

And finally there is the bonus bill already referred to. In whatever form it becomes law and however it may be sugar-coated it means an increase of taxes or more government loans. As these are the two things that business men are most afraid of it is not surprising that the money market is a little firmer and Liberty Bonds a little weaker. The feeling of apprehension thus reflected has been somewhat intensified by Secretary Mellon's figures indicating a Treasury deficit of $484,000,000 for the fiscal year ending June 30, 1923, but it would be unfair to charge the steadier money market and the decline in Liberty Bonds entirely to the bonus bill. Stock brokers are increasing their loans and their operations are commencing to make some impression upon the loanable surplus of the banks.

As might have been expected under these circumstances the reserve ratio of the Federal Reserve System has declined slightly despite an increase of $5,000,000 in the gold held. It now stands at 77.3 as against 77.7 per cent a week ago. The result is a slight hardening in the rate for commercial paper, which sold as low as 4¼ per cent early in the week when the oversubscription on the 3¾ per cent Treasury certificates was announced.

Money Still Easy

These developments lead me again to advise prospective borrowers to take advantage of the present ease in money to cover their requirements as far ahead as possible. According to the Federal Reserve Bulletin for April $913,303,000 foreign dollar loans were issued in the United States between Jan. 1, 1921 and March 15, 1922. Of this total $263,000,000 was issued this year, and since March 15 a good many more large loans have been floated. The total of the domestic loans concurrently placed. including state and municipal bonds, must be much greater. Some authorities estimate that the aggregate of new and refunding bonds sold in the last fifteen months is over four billions.

A large portion of the money thus raised is still in the banks, but it was borrowed to be spent and when it is in circulation rates will probably be higher. For this reason it is likely that Liberty Bonds are about as high as they will go at present. They sell in direct relation to the money market and when they are at or near par the present Secretary of the Treasury, who is very canny, may postpone further buying for the sinking fund.

There is, in fact, some indication that the whole bond market, including taxables as well as non-taxables and government issues, is in a condition of satiety. It has been the fashion of late to describe it as insatiable, though everyone knows that such a condition can never last very long and that repletion and flatulence often follow overeating. As to stocks it is anyone's guess. Many of the industrials seem high enough but the railroad shares that represent the equity in and control of our transportation system have a strategic as well as an intrinsic value in combination that are not yet fully realized and will not be appreciated until the inevitable consolidations for which the Esch-Cummins bill provides are seriously undertaken. This is, however, a long distance view and the stock market, including railroad shares, will continue to be "fluctious" in the interval and afterward.

Geographically viewed the Pacific Coast States are still the most cheerful part of the country, and Southern California is especially elated by the prediction that a new vessel shortly to be put in service between New York and Los Angeles will make the voyage in eleven days. The railroads are taking notice and are advertising a drastic reduction in transcontinental passenger rates for the summer. The outlook in Canada is also improving and much speculative excitement is reported over the alleged discovery of oil in Alberta.

Of the commodity markets and distributive trade in general there is not much new to say. Wheat futures suddenly jumped up several cents a bushel when the trade became conscious that most of the existing supply had been hedged and that the hedges would have to be bought in as the grain is sold. Cotton has also been firm as the strength of the statistical position became apparent. Coffee has been almost buoyant as the trade and the public have come to an appreciation of the conditions to which attention was drawn in these letters some months ago.

The steel industry is almost booming. Copper is in better demand. Tin is higher and rubber is up about 2¾ cents a pound since attention was first called to its cheapness in this letter. The advance is traceable to the increased demand for tires, which in turn reflects an improvement in the automobile business. Silk is firm and higher. Wool is quiet but firm.

Optimism on Wall Street

In so far as it is communicable it would appear that the optimism which prevails on the Stock Exchange is gradually infecting and affecting business generally. Upon this theory it is to be expected that wholesale and retail merchants will find themselves getting busier as the boom in stocks nears its perihelion. A continuous and general increase in building activity is again reported in nearly every section of the country.

Progress in the reorganization of Mexico's finances is indicated by the reports from the bankers' conference now being held in Paris, and the Greek banks which were closed by the monetary panic in that country have reopened.

Despite the news from Genoa the London Stock Exchange has been "firm on easy money" and foreign exchange is generally higher. Even German marks are slightly higher though the total outstanding is now 131,837,249,000, which is an increase of over a billion for the week ending April 7. As suggesting what may happen unless the German presses printing marks are stopped, attention is called to the situation in Russia, where it takes 75,000 rubles to pay a street car fare and the amount of paper money in circulation runs into the quadrillions.

Industrial Developments in France

BY C. E. CARPENTER
President, C. E. Carpenter Co., Société Anonyme, Paris

Business in France in the metal-working industries continues to show an improvement over 1921, although cases of marked progress are not plentiful. The improvement is confined principally to what is known as the *petite mécanique*, as distinguished from the *grosse mécanique*, among which are classed the blast furnaces, steel mills and the makers of heavy manufactured material. In the *grosse mécanique* the stagnation is reported to be acute, with few or no signs of a possible early amelioration.

Just how much this is due to the reduction in naval armaments it is difficult to state, but one prominent manufacturer recently expressed the opinion that the new policy of reduction in naval armaments will have serious consequences for the metal-working plants in France, which, in the past, have depended to a great extent upon navy orders to keep their plants in operation. As he expressed it, France has always had in course of construction a certain amount of tonnage in battleships, cruisers, destroyers and submarines, and only for her own needs but for those of other countries as well, thus providing a large amount of work for the rolling mills, the engine builders and boilermakers, the electrical shops, boat makers and a score of other industries. As these orders are to be greatly restricted in future, it will be very difficult for the plants that formerly looked to them as their main source of business to find work for the capacity thus released, particularly in the face of the impoverished condition of the world and the active competition of Germany, Belgium, Great Britain and the United States for such foreign business as is offered. The railways cannot well be looked to for the tonnage needed to take the place of the reduced navy purchases, although the electrification plans now well under way will help considerably by distributing orders throughout the country for a large number of electric locomotives, turbines and other equipment.

Big Export Combination Formed

Under the circumstances, therefore, it seems that if France is to keep her mills and great metal-working establishments properly employed, it will be necessary for her manufacturers to take energetic steps to secure a much larger amount of foreign business than they have sought heretofore. That some of the manufacturers realize this is evidenced by the recent formation by the Aciéries de Longwy, together with a group of other mill owners and manufacturers, of an exporting company known as Longwica, Compagnie Industrielle et Commerciale d'Exportation, with a capital of twenty million francs. The headquarters of the new company are in Paris and the subscribers to it are: Electro-Métallurgie de Dives, Ateliers de Construction du Nord de la France (Blanc Misseron), Société Louvroil et Recquignies, Ateliers de Forge et d'Estampage de Vieux-Condé, Société Métallurgique de Gorgy, Aciéries Gorcy de Dieulouard, Renault (the well-known automobile builder) Société Rateau (turbines and pumps), Forges et Ateliers de Commentry-Oissel and Société des Constructions et Grandes Entreprises de France. All of these concerns are leaders in their particular fields and the association of so powerful a group, backed by ample capital and credit facilities, should make it possible for a great French selling organization to be built up throughout the world.

In the *petite mécanique*, in some industries a very considerable improvement is noticeable. In St. Etienne, for example, the manufacture of bicycles is running to capacity, fully employing not only the recognized bicycle plants but practically all the parts makers as well. In all the establishments overtime is the rule, and it is estimated that this year's output of bicycles will exceed the best year yet known. Bicycles are being shipped in large numbers to foreign countries, even Belgium being a heavy buyer of French makes. It is reported also that there is a growing demand for Browning pistols and that the makers of these arms are speeding up their capacity. This, coupled with the manufacture of shot guns and hunting rifles, is an important industry in St. Etienne and a revival in the demand means a substantial reduction in unemployment in that section.

Still Making Firearms

In Paris, it is reported that another branch of the firearms industry has succeeded in closing a substantial foreign contract, the Hotchkiss Company being credited with having received an order from a South American country for machine guns to the value of sixty-five million francs. If the report proves to be correct, and there seems to be no reason to doubt it, the order will provide several years of work. Following the armistice, the Hotchkiss Company, which during the war operated a large plant at Lyons from which it furnished many thousands of machine guns to the A. E. F., acquired the fine new plant in the outskirts of Paris built by Clerget-Blin for the manufacture of aviation motors. The plant has been rapidly converted for the manufacture of machine guns. The running of this plant at full capacity should provide employment for several hundred men now out of work. The operating head of the Hotchkiss Co. is a well-known American engineer, Laurence V. Benét, who is one of the most prominent members of the American colony in France and a founder of the American Chamber of Commerce.

Automobile Business Improves

Another industry that indicates a satisfactory state of improvement is the manufacture of light-weight, low-consumption automobiles. The plant of André Citroen, which will be remembered during the war as a model of efficiency in shell making, is reported to be operating at maximum capacity on the 10 hp. model car, sixty cars per day being regularly turned out, with all cars sold in advance. A smaller car is being brought out by the same firm and will shortly be manufactured in the Clément-Bayard plant at Levallois-Perret, a few miles from Paris, this plant having recently been acquired for this purpose. The new car is a 5 hp. model and it is stated that the Citroen interests have already in hand orders amounting to approximately two hundred million francs for this model alone. Other car builders have likewise lately placed on the market new models of light weight cars and judging from the increasing numbers of these cars seen on the streets and highways the public has opened its purse to the newcomers in a generous fashion. A low-powered small car can now be purchased for 8,500 to 9,500 francs, which brings it within the means of a large section of the population that has since 1914 been deprived of the luxury of an automobile. What is even more important, however, is the fact that the cost of operation of the small car is more within the means of the masses than the cars heretofore built in France. The new models are designed to give approximately 45 miles to the gallon of gasoline on the road and a correspondingly low oil consumption and tire expense. The high cost of these items in France during the past two years has done more than anything else to discourage the public from buying automobiles and to cripple the great French automobile industry.

The reports that are received from the northern part of France indicate that rapid progress in the reconstruction of the manufacturing plants destroyed by the Germans is being made. The great works at Blanc-Misseron, for example, have been almost completely rebuilt and it is expected that before the end of this month the first locomotive built by them since the war will leave the shops. Satisfactory progress is also being made on the construction of the 200,000 hp. electric power station at Comines, which with the exception of the station at Gennevilliers, near Paris, will be the most powerful station in France. It will utilize the coal near the mines and will be of great help to the north in getting under way again.

"Zamium" Plant at Boonton

A suitable plant for the manufacture of Zamium, the metallic alloy invented by Lawrence Zamboni, will be erected at Boonton, N. J. The Zamium Corporation has been organized and incorporated, and production will start as soon as the factory is completed.

This alloy is said to be a reliable and a less expensive substitute for platinum. It is claimed for the alloy that it cannot rust, tarnish or corrode; is non-magnetic; can be cast, rolled or drawn, soldered or welded; is not affected by any kind of acid, alkali or sea water and has a tensile strength of 150,000 lb. per square inch.

The company will market the product in all forms for the manufacture of jewelry, cutlery, surgical instruments, marine hardware and engine and motor parts.

Officers of the corporation are: Lawrence Zamboni, president and treasurer; Ferdinand Rollini, vice-president; A. L. Zamboni, secretary.

The corporation retains a business office at 149 Broadway, New York City.

American Gear Manufacturers' Association in Buffalo—Interesting Reports—Sinram Re-elected President

The spring meeting of the American Gear Manufacturers' Association was held at the Hotel Lafayette, Buffalo, N. Y., on April 20, 21 and 22. The convention was opened by an address entitled "Over the Threshold of a New Era," by President F. W. Sinram. Following this, the usual reports were made by the respective officers and committee chairman.

F. D. Hamlin read the reports of the secretary and treasurer; F. F. Goedke on entertainment; George L. Markland, Jr., on membership; H. E. Eberhardt, on public policy; J. E. Gleason, for the legal committee; J. C. McQuiston, for the publicity committee; L. L. Nicholson, for tariff; and J. B. Foote, on industrial relations. After the reports had been received and acted upon, H. E. Harris read a paper on "Good Hob Practice." He advocated the use of hooked tooth hobs and demonstrated the action of various shapes of cutting edges.

The use of the projection comparator in testing gear teeth was shown by Ralph E. Flanders, a machine being set up in the meeting room and demonstrations made with both gears and gear cutters. This produced a magnification of about 100, and showed very interesting results. Discussion followed on the methods and equipment used.

The reports of the A. G. M. A. sectional committee of the Engineering Standards Committee was presented by the chairman, B. F. Waterman, who is also chairman of the general standardization committee of the association. Both of these reports showed progress along desirable lines. Mr. Waterman pointed out that it might, and probably would, be desirable to reconsider some of the proposed standards in view of suggestions brought out at the committee meetings. He showed the inadvisability of adhering to a proposed standard unless it was of such a nature as to make its adoption by other engineering bodies practical. In conclusion he suggested that whatever standard was finally adopted it should be a real American standard, rather than having various separate bodies establish standards of their own. Other reports were made by the spur gear committee, bevel and spiral bevel committee, herringbone committee, and the committee on gears and pinions for electric railways and mines.

Further proceedings included the reports by chairmen of committees on uniform cost accounting systems, J. H. Dunn; nominating committee, A. C. Gleason; nomenclature, F. E. Eberhardt; worn gears, J. C. O'Brien; inspection, J. C. Eppley; and composition gearing, John Christensen.

At a meeting of the industrial group, George L. Markland, Jr. presided. The topic was "Conditions in the Industry" and the discussion brought out some very favorable comment on present industrial relations. An informal banquet was held on the evening of the twenty-first at which President Sinram was toastmaster, and John C. Bradley, of the Pratt & Letchworth Co., the principal speaker. His topic was "What's Ahead" and was very interesting. After the dinner J. C. McQuiston exhibited a radio telephone and explained its construction and operation.

The program for the last day was of peculiar interest to gear manufacturers. The papers included "Proportions of Industrial Gears," by G. E. Katzenmeyer, of the R. D. Nuttall Co.; "Keyways," by Lars Nilson; "Sprockets," C. R. Weiss; "Metallography," C. B. Hamilton, Jr.; "Transmission," by A. C. Bryan; "Differentials," S. O. White; "Tooth Forms," H. J. Eberhardt. E. W. Baxter rendered a report for the library committee. Another session considered the industrial conditions from the automotive point of view.

In the afternoon the grinding of gear teeth and its future in the industry was discussed by R. S. Drummond of the Gear Grinding Machine Co. The Gleason Works system of bevel gears, which was shown at the meeting in Rochester last October, was further explained in detail by F. C. McMullen and T. M. Durkan. Abstracts of some of these papers will appear in later issues.

DOMESTIC EXPORTS OF METAL-WORKING LATHES, BORING AND DRILLING MACHINES FROM THE UNITED STATES, BY COUNTRIES, DURING FEBRUARY

Countries	Lathes		Boring and Drilling Machines		Planes and Shapers, Slotters		Milling Machines	
	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars
Belgium	..	.....	..	.....	1	4,078	1	381
France	..	.....	1	347	1	750	..	.....
Greece	1	150	..	.....	..	.....	..	.....
Netherlands	..	.....	24	120	..	.....	..	.....
Sweden	1	675	..	.....	..	.....	..	.....
Switzerland	..	.....	12	60	..	.....	..	.....
England	..	.....	28	640	..	.....	6	10,178
Scotland	..	.....	1	1,200	..	.....	..	.....
Canada–Maritime Provinces	2	409	..	.....	..	.....	..	.....
Quebec and Ontario	22	9,210	21	2,786	4	3,519	8	2,375
Prairie Province	2	13	..	.....	..	.....	..	.....
Canada–Br. Columbia and Yukon	1	1,850	..	.....	..	.....	1	200
Salvador	..	.....	1	40	..	.....	..	.....
Mexico	4	602	3	6,622	..	.....	6	30
Cuba	1	1,740	..	.....	..	.....	..	.....
Dominican Republic	1	3,907	..	.....	..	.....	..	.....
Argentine	..	.....	21	546	..	.....	..	.....
Brazil	1	9,120	..	.....	..	.....	..	.....
Chile	3	2,021	..	.....	..	.....	..	.....
Colombia	..	.....	1	4,461	..	.....	..	.....
Peru	..	.....	2	535	..	.....	..	.....
British India	..	.....	..	.....	..	.....	1	3,049
China	1	17	..	.....	..	.....	..	.....
Hongkong	1	651	2	315	2	1,022	1	1,376
Japan	3	5,156	9	18,167	2	2,704	3	6,202
New Zealand	..	.....	1	373	..	.....	..	.....
Total	44	35,521	127	36,212	10	12,073	27	23,791

Obituary

LEROY S. STARRETT, founder and president of the L. S. Starrett Tool Co., of Athol, Mass., died on April 23 at his winter home in St. Petersburg, Fla. He was 84 years old. Mr. Starrett was the inventor of many types of measuring tools and gages, and was known for his benefactions in the interests of his employees, with whom he maintained a close relationship.

WILLIAM A. GREAVES, SR., a founder of the firm of Greaves & Klusman, machine tool manufacturers of Cincinnati, Ohio, died at his home in Hyde Park on April 19. He was 60 years old. A few years ago Mr. Greaves, with his two sons, organized the Greaves Machine Tool Co., in Cincinnati, and he was its president at the time of his death.

CHARLES THOMPSON, drop forge manufacturer, died at his home in Fremont, Ohio, recently.

ELLIS M. BURR, president of the Burr Company, of Champaign, Ill., died in that city on April 3.

CURTIS B. HATHAWAY, one of the organizers of the General Motors and Chevrolet Corporations, died at Pinehurst, N. C., on April 5. He was 63 years old.

Peter Lowe, of Kempsmith Company, Dead

Peter Lowe, assistant secretary of the Kempsmith Manufacturing Co., Milwaukee, Wis., died April 13 at his home in Garrett, Ind. He had retired from active association with the company's sales department some time ago, due to failing health. He was 45 years old.

Mr. Lowe started his career in the machinery field as a machinist with the Gisholt and with the Nordyke & Marmon companies. In 1906 he entered the



PETER LOWE

employ of the Kempsmith company as head of the cost department. He was transferred to the sales department in 1911 and a few years later was appointed assistant secretary.

As a machine tool salesman Mr. Lowe enjoyed a wide acquaintanceship among machinery builders, who were deeply grieved on hearing of his death.

The Trend of Business Improvement—Plants Resuming

The American Locomotive Co. is arranging for immediate increase in operations at its Richmond, Va., plant, which has been running on a curtailed schedule for about a year past. The working force will be brought up to close to 1,000 men at an early date. The company has received an order from the Southern Railway for thirty locomotives of Mikado type, with cost to approximate $1,100,000.

The Columbia Motor Co., Detroit, Mich., has adopted a capacity operating schedule at its plant, and will increase production each month for the next quarter-year. During April the works will produce 600 cars; in May, 1,200 cars; and in June, 1,500 cars. It is expected to maintain the latter basis of operation thereafter.

The Fisher Body Co. is operating at full capacity at its plants at Detroit, Mich., with regular working quota, and has adopted a similar basis of operation at its Ohio works. At Cleveland the company has acquired a small body plant and will place it in service on a capacity basis at once.

The American Car and Foundry Co. is arranging for immediate increase in the working force at its plant at Buffalo, N. Y., and proposes to more than double the present number of men within sixty days. Orders for freight and other cars received by the company during the past few months totals 7,000 cars, of which 2,000 will be constructed at the Buffalo works. An order has just been booked for 1,000 freight and refrigerator cars for the Northern Pacific Railroad, to cost about $2,500,000.

The Atchison, Topeka & Santa Fe Railway Co. is increasing the working force at its shops at Temple, Tex., and will soon be operating at close to normal.

Following an increase in production at the plant of the Saxon Motor Car Co., Detroit, Mich., arrangements are being perfected for the operation of a new works at Ypsilanti, Mich., where the plant of the Apex Motor Co. has been leased for a period of three years. The initial production will be on a basis of fifteen automobiles per day, giving employment to approximately 200 men.

The Colorado & Southern Railroad, Denver, Colo., is planning for the purchase of 200 new refrigerator cars and 1,000 steel gondola coal cars, to cost $1,425,000. The company is increasing operations at its shops for locomotive and car repair work. A large portion of the new shops to be constructed at Denver, by the Chicago, Burlington & Quincy Railroad, Chicago, Ill., the parent organization, will be used for Colorado & Southern work. The plant will consist of a number of one-story buildings, comprising machine shops, locomotive repair shops, wheel works, car and boiler works, estimated to cost close to $1,500,000, including equipment. Erection will be commenced at an early date.

The American Bearing Corporation, Indianapolis, Ind., is arranging for immediate increase in manufacture of automobile bearings, and will occupy a one-story plant on Tenth St., recently acquired. The works will be equipped at once, and the present factory at 212 West McCarty St., discontinued. The company comprises a reorganization of the American Bearing and Die Casting Corporation; Arthur Dixon is president.

The American Cast Iron Pipe Co., Birmingham, Ala., has developed production to a point of close to normal, with full working force. The National Cast Iron Pipe Co., in this same district, has also increased operations to capacity.

The Glasgow Iron Co., Pottstown, Pa., has resumed production at its local mill, following a shut down for many months past. The local puddling furnaces of the company have also been started up.

The Texas & Pacific Railroad Co. will increase operations to capacity at its shops at Marshall, Tex., for the rebuilding of a large number of freight cars.

The Stewart-Warner Speedometer Corporation, Chicago, Ill., has increased production at its plant from 4,200 speedometers to 5,700 units per day, or more than six times the low record output in 1921. In the tank department, operations have been advanced from 4,000 to 4,800 units daily.

The Lima Locomotive Co., Lima, Ohio, has received orders for forty locomotives from the New York Central Railroad, and for thirty locomotives from the Mobile & Ohio Railroad. The company has contracts on hand to insure capacity production for a number of months to come.

The Reynolds Spring Co., Jackson, Mich., is planning for extensive increase in production, and during the next sixty days will add about 500 men to the working force, increasing plant facilities to provide for the expansion. The company has received an order from the DeForest Radio Telephone & Telegraph Co., New York, for radio equipment to an amount of about $5,000,000. Expenditures for raw and finished materials for manufacture will approximate about $190,000, during the coming month.

The Durant Motor Co. of Michigan, Lansing, is arranging for an immediate increase of about 60 per cent in its working force, for the production of the Durant and Star automobiles. Work will be commenced at once on the erection of two additions to the plant, to provide for double the present capacity. Upon completion, production will be on a basis of 600 cars a day of both types.

The J. G. Brill Co., Philadelphia, Pa., has received a contract from the Boston Elevated Railway Co., Boston, Mass., for 100 steel passenger cars. The company has also take an order for fifteen traction cars for the South Bend, Ind., Railway.

The McClintic-Marshall Co. is increasing production at its structural steel works at Pottstown, Pa., and a number of additional employees will be added to the working force. The Shoemaker-Satterthwait Co., operating a similar local plant, is also increasing its production schedule.

The Pennsylvania Railroad Co. has increased the working force at its Altoona, Pa., car shops to a point of close to normal, and a double-shift operating schedule has been adopted in the steel car shops.

The Spicer Manufacturing Co., South Plainfield, N. J., manufacturer of automobile axles, universal joints, etc., has increased its working force to about 1,000 men at its local plant. The company has reopened its branch plant at Pottstown, Pa., which has been closed for about six months past.

The Jordan Motor Car Co., Cleveland, Ohio, now operating on a basis of forty cars per day, is arranging for a production increase early in May, to continue for an indefinite period.

Following the purchase of the plant of the A. W. Case & Son Manufacturing Co., Kensington Ave., Buffalo, N. Y., by the Richardson & Boynton Co., Dover, N. J., manufacturer of stoves, ranges, etc., the new owner has plans under way for a large increase in production. New buildings will be erected and equipped for the manufacture of stoves flanges, fittings, etc. Present operations, in the meantime, will be on a capacity basis. The Case company, manufacturer of a kindred line of stove parts, will remove the Kensington Ave. works to its other plant in the city.

The Middletown Car Co., Middletown, Pa., a branch of the Standard Steel Car Co., Pittsburgh, Pa., is increasing operations at its plant, and will soon develop capacity on an order for the Philadelphia & Reading Railroad Co., for 500 steel hopper cars.

The Deister Machine Co., Fort Wayne, Ind., reports that it has received more orders during the past few weeks, than in the entire year of 1921. The company manufactures mining machinery.

Car Surplus, Shortage and Freight Loadings

Reports of the car service division of the American Railway Association show that revenue freight loaded for the week ending April 1, 1922, totaled 827,011 cars a decrease of 19,024 cars from the preceding week, but 163,840 cars more than were loaded in the corresponding week of 1921. Compared with 1920, the report shows 31,816 cars less.

Grain, grain products, live stock and forest products all show some reduction in loadings compared with the previous week. Coal loading, which includes that loaded on the first day of the miners' strike, shows a decline of 19,634 cars, but is far in excess of the figures for the same period in the two previous years. Coke and ore show small increases; merchandise shows a gain of 1,911 cars, and miscellaneous 667 cars, the smallest gains made in these two classifications for some weeks past. All districts contributed to the decrease in loading compared with the week ending March 25 with the exception of the Pocahontas and the Northwestern districts. The slight gain in the Pocahontas district is largely in miscellaneous, while in the Northwestern district coal, forest products and miscellaneous show moderate increases.

Serviceable surplus cars totaled 206,746 for the week ending April 1, or 12,737 cars less than for the week ending March 23. Of these, 88,491 were box cars, 72,566 gondolas and the balance miscellaneous. Compared with the previous week box cars increased 1,038, while gondolas decreased 13,198.

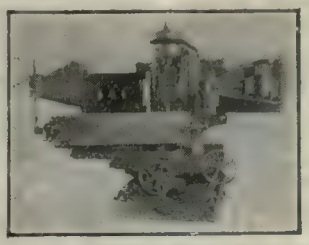
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Die-Sinking Machine

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Jan. 5, 1922



By the "Bayrer's compensating arms," a die weighing 4 tons may be suspended on elevating screws, swiveled, tilted or turned on edge. There is a rapid traverse for the quick adjustment of the head. Speed and feed changes are made by levers in front. Hand and power feeds are provided for both the longitudinal and crossfeeds of the table and a rapid power traverse for all table movements. A cherrying attachment may be applied to the cutter head, driven through gearing to the nose of the cutter spindle. Table, 22 x 48 in. Longitudinal feed, 48 in. Crossfeed, 17 in. Vertical feed, 15 in. Vertical feed of cutter head, 12 in. Spindle speeds, twelve from 27 to 790 r.p.m. Floor space, 10 x 10 ft. Height, 9 ft. Weight, 15,000 lb.

Drilling Machine, Multiple, Rail-Type, No. 19

Edwin Harrington, Son & Co., Philadelphia, Pa.

"American Machinist," Jan. 5, 1922

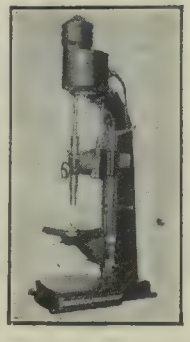


The chief feature of the machine is the in-and-out movement provided for each spindle for drilling irregular patterns. Four spindles are ordinarily furnished. The driving pulleys transmit 25 hp. By a clutch on the driving gear, any spindle may be stopped independently of the others. The feed may be operated universally for all spindles from the right-hand end of the machine, or separately for each spindle at the end of each arm. A handwheel on each head moves the spindles independently and sets them at the proper height when universal feed is used. Automatic stops disengage each spindle at any predetermined point. Floor space without a table, 17 ft. 10 in. x 7 ft. Height, 10 ft. 2 in. Weight with belt drive, 14,850 lb.

Drilling Machine, Vertical, 32-In.

Prentice Conradson, Green Bay, Wis.

"American Machinist," Jan. 5, 1922

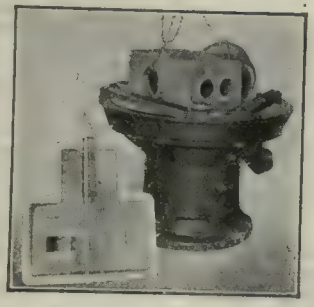


The machine has a swing of 32 in., but can be built in 25- and 36-in. sizes. The headstock, column and base are cast in one piece. Rectangular and sliding tables can be supplied. The driving motor is so mounted as to eliminate all moving parts possible. There are nine spindle speeds ranging from 34 to 500 r.p.m. Six feeds are provided ranging from 0.006 to 0.035 in per spindle revolution. Hand traverse, hand feed, stop and depth gage are provided. A no-load protection is also included. A 3-hp. motor running at 1,200 r.p.m. is used, but for extra heavy work a 5-hp. motor running at 1,800 r.p.m. can be employed. Floor space, 30 x 54 in. Height, 11 ft. 8 in. Weight, 3,700 lb. Export box, 135 cu.ft.

Grinding Machine, Disk, Vertical Spindle

Badger Tool Co., Beloit, Wis.

"American Machinist," Jan. 5, 1922



The steel disk wheel is 42 in. in diameter and is faced with a layer of abrasive material $\frac{1}{2}$ in. thick molded on it. Direct drive is secured by using the motor shaft as the wheel spindle. The end yokes are dust proof and rigid. Positive forced-feed lubrication is supplied to both the radial and thrust ball bearings. A circular dust channel surrounds the wheel periphery and terminates in two openings to which the dust exhaust system is attached. The open construction makes it possible for more than one operator to work at the machine at a time. A 20-hp. motor running at 600 r.p.m. is used. Stop bars prevent the work from rotating with the wheel. Weight, 3,800 lb.

Drilling Machine, Automatic

Sellew Machine Tool Co., Pawtucket, R. I.

"American Machinist," Jan. 5, 1922



The machine is for production work on parts requiring multiple drilling on opposite sides. Work is changed in one arm of the work holder at the front of the machine while the work between the heads is being drilled. Both heads move forward simultaneously. The drills run at speeds proportionate to their diameters, each kind of work requiring different heads. The drill is slowed at its entrance into the work and when it breaks through. The heads have a quick return. Length 10 ft.; weight 5,000 lb.

Chuck, Quick-Change, "Wonder"

Collis Co., Clinton, Iowa

"American Machinist," Jan. 5, 1922



The chuck is adapted to use on drilling machines, lathes, screw machines, and other machines with revolving spindles, and allows rapid change of tools without stopping the spindle rotation. The collets have taper shanks and can be inserted without touching the chuck. Collets for holding different tools, such as taper-shank and straight-shank drills and hand taps, can be furnished. A special collet is provided for drills with twisted tangs or broken shanks. The chucks are made in six sizes, with standard taper shanks from Nos. 1 to 6, and outside diameters from $1\frac{1}{16}$ to $5\frac{1}{4}$ in. Collets are also made in a range of sizes to fit the chucks, and to hold drills and tools of different sizes.

Grinding Attachment, P. & W. Curvex Cutter

R. K. Le Blond Machine Tool Co., Cincinnati, Ohio

"American Machinist," Jan. 5, 1922

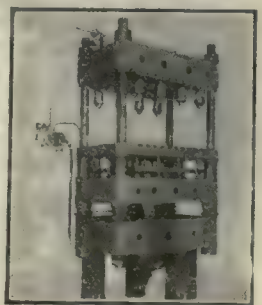


The maximum travel of the atachment is $8\frac{3}{4}$ in. The cutters can be ground in diameters up to $5\frac{1}{2}$ in. and lengths up to $7\frac{1}{4}$ in. Since the flutes of the Curvex cutters are helical, the attachment is arranged to grind leads of from $9\frac{13}{16}$ to 172 in. per revolution. As the table of the grinder is fed horizontally, the cutter spindle is automatically revolved in proper relation to the lead and helical angle. The cutter is indexed by the plunger and index plate at the left of the arbor. The work is fed vertically to the wheel to the entire depth of the tooth. The grinding plane is always on a true radial line of the cutter, and the wheel clears itself in the work. Weight: for hobs only, 90 lb.; complete attachment, 110 lb.

Press, Hydraulic, Automobile Body

Southwark Foundry and Machine Co., Philadelphia, Pa.

"American Machinist," Jan. 5, 1922



The press has a capacity of 450 tons. One clamping platen and one stripper platen are provided. The stripper platen carries four hydraulic cylinders acting upon a forged steel plate, which in turn carries sixty stripper pins $1\frac{1}{2}$ in. in diameter. The adjustable top platen carries eight hydraulic jacks used for clamping, each having a 5-in. ram and 5-in. stroke. The press is controlled by a single lever-operated valve. The automatically controlled clamping cylinders are capable of standing an hydraulic pressure of 5,000 lb. per square inch. Die space, 7 x 5 ft. Vertical opening between the platens: minimum, 18 in.; maximum, 4 ft.

Personals

WILLIAM B. GIVEN JR., vice-president of the American Brake Shoe and Foundry Co., has accepted the chairmanship of a committee co-operating with the Salvation Army in its appeal for $500,000 to carry on welfare work in the machinery industry in Greater New York.

C. J. HOECK has been appointed foundry superintendent of the Hess-Snyder Co., Massillon, Ohio. He was formerly connected with the malleable plant of the Timken Detroit Axle Co., Canton, and previous to that time was with the Vulcan Iron Works, at Denver, Col.

H. E. HARVEY, for the past five years assistant works manager for the Remington Arms Co., Bridgeport, Conn., has become superintendent of the Elyria Iron and Steel Co., Elyria, Ohio.

WILLIAM OCHASE, formerly sales representative of Manning, Maxwell & Moore, Inc., at Chicago, has been made efficiency engineer of the Ohio Machine Tool Co., at Kenton, Ohio.

J. R. DANGLER, formerly assistant to the president of the Central Steel Co., Massillon, Ohio, has been appointed secretary and treasurer of the Vacuumeter Manufacturing Corporation, Cleveland, Ohio.

FRED HEIMER has been appointed foundry superintendent of the malleable department of the Superior Steel Castings Co., Benton Harbor, Mich. He was formerly in charge of the malleable foundry of the Timken Detroit Axle Co., Canton, Ohio.

LOUIS S. JONES, one of the best known men in the machinery field, has resigned as general sales manager of the Lumen Bearing Company, of Buffalo, N. Y., to take effect July 1. Mr. Jones will retain his stock interest in the Buffalo and Youngstown plants of the Lumen Bearing Company and will also remain a director of the Youngstown plant of that company. He has not decided on his future plans.

WILLIAM L. COLT, for five years manager of Willys-Overland, Inc., in the Eastern district, with headquarters at New York, has resigned to become the president and active head of the Overland-Providence Co., Willys-Overland distributors for Rhode Island, which concern he established and financed about a year ago. Carl P. Spiegelberg, who organized the Overland-Providence Co., under the supervision of Mr. Colt, will continue to operate the business as vice-president and general manager.

GEORGE M. BARNETT, of the firm of Johnson & Barnett, manufacturers of wood spinning machinery, Worcester, Mass., has been elected president of the Worcester Mechanics Savings Bank, that city, succeeding John H. Coes, deceased.

EDMUND C. MAYO, president of the American Tube and Stamping Co., Bridgeport, Conn., has been appointed a trustee of the large Municipal Garage building, Bridgeport, by Mayor Fred Atwater.

WILLIAM R. WEBSTER, vice-president of the Bridgeport Brass Co., Bridgeport, Conn., was elected a director of the American Tube and Stamping Co. at the recent annual meeting of the company.

JAMES C. POTTER, president of the Potter & Johnson Machine Co., machine tool manufacturers, Pawtucket, R. I., was chosen a director of the Slater Trust Co. at the recent annual meeting of that organization.

FREDERICK J. KINGSBURY, president of the Automatic Machine Co., Bridgeport, Conn., has been elected a director of the American Tube and Stamping Co.

Business Items

The Ready Tool Co., of Bridgeport, Conn., has discontinued its representation through the Mayhew Steel Products Co., and in the future will handle its sales through the Bridgeport office.

The Meldrum-Gabrielson Corporation has opened its new factory at West Fayette and Niagara Sts., Syracuse, N. Y. This addition will be used for the manufacture of milling machine, gages, wood and metal patterns and small tools.

The J. M. Purves Tool Co. has been incorporated at Syracuse, N. Y., to manufacture and sell machine tools and appliances. The concern is capitalized at $150,000. Directors are J. M. Purves, W. A. Meyers, F. E. Friedman and J. A. Purves.

The James N. Kemp Machine Works, of Albany, N. Y., has been incorporated with a capital stock of $250,000. Directors are J. N. Kemp, M. L. Kemp, and W. C. Marron, all of Albany.

The Simmons Machine Co., Albany, N. Y., has opened a machinery warehouse at 182 Lafayette St., New York City. Machine tools which have been rebuilt at the Albany plant will be stored in this warehouse.

The Detroit office of the Taft-Pierce Manufacturing Co. has been moved from the Majestic Bldg., to 2230 First National Bank Bldg.

The Max Ams Machine Co. has opened new offices at 705 Commerce Bldg., Rochester, N. Y. H. S. Freeman is in charge.

At a meeting of directors of the Burr Company, machinery builders, of Champaign, Ill., the following officers were elected: Alvin Huckins, president; Marford Savage, vice-president; N. G. Burr, treasurer; W. S. Redhed, secretary.

The National Scale Co., Chicopee, Mass., recently filed papers of incorporation under the laws of Massachusetts to manufacture scales. The capital stock is $70,000, and the officers are: Frank D. Howard, president; Charles H. Leonard, 41 Arlington St., Chicopee Falls, treasurer; and Lewis I. Howard.

The Penn Seaboard Steel Co. has acquired the Titusville Forge Co. and the Rockaway Rolling Mills.

The Chicago branch of the Driver-Harris Company, of Harrison, N. J., has been moved to larger quarters at 562 West Randolph Street.

Trade Catalogs

"Union" Tooth Cutters. Union Twist Drill Co., Athol, Mass. A twelve-page catalog describing the high power undercut tooth cutters with the latest developments and improvements. The illustrations show a variety of cutters for use on high power milling machines. Space is devoted to side and face mills, helical cutters and twist drills.

Control Handbook: The Electric Power Club, 1017 Olive St., St. Louis, Mo. A thirty-page booklet containing simple descriptions of controllers for electric motors and definitions of the terms used in that connection. It is an excellent aid to those using electrical control apparatus as it gives information which all those engaged in that industry should know. The handbook is sold for twenty-five cents and can be obtained from the Secretary of the Club, S. N. Clarkson.

Brown Pyrometers. The Brown Instrument Co., Philadelphia, Pa. A circular describing some installations of Brown pyrometer controls in steel mills.

Brass Rod. Bridgeport Brass Company, Bridgeport, Conn. A circular describing the all Ledrite brass rod, chamfered on both ends.

Low-pressure Gas Inspirators. The Surface Combustion Co., New York City, N. Y. Catalog No. 3-D describing and illustrating, with complete specifications, a line of low-pressure gas inspirators, claimed to be applicable to any make of gas furnace.

Evaporator Systems. The Griscom-Russell Co., New York City, N. Y. Bulletin No. 360 describing the G-R evaporator systems for the economical production of distilled boiler feed water.

Forthcoming Meetings

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Welding Society: Annual meeting, Engineering Societies Building, New York City, April 26 to 29.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

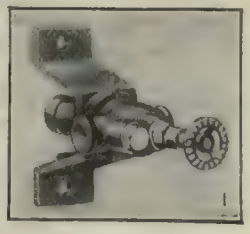
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Burners, Gas, Furnace, Industrial
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The high-pressure burner illustrated is operated by air at a pressure of 10 lb. per square inch or over, or by dry steam at a pressure of 25 lb. per square inch. A combination high- and low-pressure burner is furnished for operation with compressed air at the same pressures and with blast air at from 4 to 6 oz. pressure. Only sufficient compressed air to atomize the oil is used, while the remaining air for combustion is supplied by a fan at low pressure. An intermediate pressure burner is also furnished for operation with air at from 1½ to 2 lb. pressure per square inch, supplied from a positive-pressure blower.



Furnace, Tempering, Oil, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This oil-fired furnace is intended for tempering dies, tools, punches and knives. The oil bath is headted slowly to a temperature of not more than 700 deg. F., and then is allowed to cool down rapidly to permit the addition of a new charge. The furnace is made in five sizes. Gas can be used as fuel. The weight varies from 355 to 1,550 pounds.



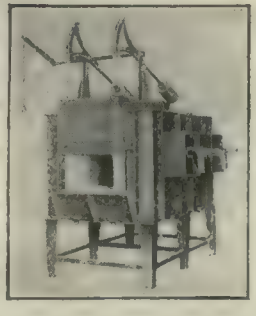
Forge, Gas or Oil, Stewart, No. 1
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is used in welding and in miscellaneous forging work, as well as for heating rods and bolts prior to upsetting. Combustion occurs both beneath and at the sides of the opening, the flame striking the work directly. It is said that high heats are obtainable with economy of fuel, either gas or oil being employed. Opening, 12 x 2 in. Inside depth, 8 in. Floor space, 32 x 24 in. Weight, 800 pounds.



Forge, Hammer, Large, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The furnace handles large forging work and is equipped with large burners to give high welding heat, and with provision for running off the slag at the rear. Doors may be provided at each end. Either oil or gas may be burned. The furnace is made in a range of sizes, and the smaller ones are mounted on legs. The larger sizes are of the iron-plate and fire-brick type, and are built on brick foundations. This form of furnace is adaptable to heating forging and welding work for steam hammers. Chamber: smallest size, 27 in. wide, 36 in. deep; largest size, double-door type, 99 in. wide and 63 in. deep. Sill height, 27 in.



Forge, Rivet, Oil, Portable, Stewart, No. ■
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is for use on either machine or hand work, burns oil, and employs compressed air for atomization. The oil is forced to the burner and atomized by the compressed air from the shop line, reduced to 20 lb. per square inch pressure by a regulating valve. An asbestos flame shield and blast pipe protect the operator. If desired, the forge may be mounted on a truck. Chamber of furnace: 12 in. wide, 12 in. deep; opening, 3 in. high, 7 in. wide. Height from floor to top of sill, 40 in. Oil capacity, 30 gallons.



Furnace, Crucible, Stewart, No. 200
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This crucible furnace is for use in lead or cyanide hardening, soft-metal melting, tinning and galvanizing. It is stated that the position of the burner gives the flame a rotary motion that results in a uniform distribution of heat around the pot. The pressed-steel pot is 14 in. in diameter and 14 in. deep. A No. 5 blower is required. Either gas or oil may be used as fuel. Floor space, 36 x 36 in. Weight, 1,300 pounds.



Furnace, Gas, High-Speed Steel, Double-Deck
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The upper chamber of the furnace is used for preheating, and is heated by the waste gases from the lower chamber. The lower chamber is fitted with carbofrax slabs to withstand the high temperature. Combustion takes place under the floor. Linings are 4½ in. thick, with special insulation 1 in. thick. The furnace is made in five sizes, with openings varying from 5 x 9 to 6 x 12 in. Floor space: smallest size, 28 x 30 in.; largest size, 36 x 40 inches.



Press, Hydraulic, Forcing, Reversed Cylinder
Watson-Stillman Co., 50 Church St., New York, N. Y.
"American Machinist," January 12, 1922

The machine is intended especially for pressing in and out locomotive driving-box brasses or pressing on and off gear or disks in railroad and other machine shops. A power-driven pump applies the pressure and a handwheel controls the motion of the ram. A jib is furnished with a trolley for attaching a chain hoist. Drive may be by belt or by direct-connected constant-speed motor. A gage indicates pressure on the ram in pounds per square inch, and also the total pressure in tons. The pump used is of the two-plunger type, and the entire control of the press is through a single valve. Capacity, 75 tons. Ram movement, 21 in. Bottom platen, 72 in. long.



The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Steel shapes, plates and mild steel bars quoted at $1.60 per 100 lb., Pittsburgh. Orders where specifications are especially attractive to makers and buyers are not particular as to deliveries, represent the only quotations remaining at $1.50. Advancing fuel costs causing firmness in pig iron at Pittsburgh; demand for basic iron keen in Youngstown and price advance anticipated in Birmingham. Bolts and nuts advanced 10 per cent at Pittsburgh mill; steel sheets firmer.

Tin quoted at 32½c. as against 31c.; lead, 5½c. advanced from 5¼c. and antimony 5½c. as compared with 5¼c. per lb. in New York warehouses. Cleveland quotes antimony at 6¼c. as against 6½c. per lb.

Raw linseed oil at 89c. in New York as compared with 94c. per gal. (5 bbl. lots) one week ago.

No Declines—Copper quiet; zinc showing better demand with prices unchanged.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.00
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Gray Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	10.0	6.0	4.0
Philadelphia	8.0	5.0	2.65
Atlanta	5.5	4.5	4.0
Boston	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill.

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
Nos. 10	2.40	3.26	3.10	3.38
Nos. 12	2.45	3.33	3.15	3.43
Nos. 14	2.50	3.38	3.20	3.48
Nos. 16	2.70	3.48	3.30	3.58
Black				
Nos. 17 and 21	3.00	4.05	3.55	4.10
Nos. 22 and 24	3.05	4.10	3.60	4.15
Nos. 25 and 26	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.75	4.30
Galvanized steel sheets:				
Nos. 10 and 11	3.15	4.25	3.75	4.30
Nos. 12 and 14	3.25	4.35	3.85	4.40
Nos. 17 and 21	3.55	4.65	4.15	4.70
Nos. 22 and 24	3.70	4.80	4.30	4.85
No. 26	3.85	4.95	4.55	5.00
No. 28	4.15	5.25	4.75	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	⅜ to 1¼	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1¼	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	63	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings, Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	60%	53%	60&10%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58&10%	44½%	59½%	45½%

Malleable fittings, Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
½	8.00		12@13
⅜	6.50		11@12
⅛ to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.27½; New York	5.62½
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plat			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.89	.95	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Mobile—The Alabama Drydock Co., Port of Mobile, is in the market for two 24 in. Lodge and Shipley or No. 4 Leblond pulley machines as published in our issue of March 31.

Conn., Stratford—J. G. Robson—No. 3 Bardons and Oliver nurse machine (used), also No. 1, No. 3 and No. 4 forging machines.

Ill., Chicago—The Anthony Trucks & Parts Co. I. E., 60 East Jackson Blvd., M. J. Cahan, Purch. Agt.—one 4 spindle combined turning and threading machine; one angle iron bending roll 3 in. x 1 in. x ¼ in.; one splitting shear heavy duty type up to 1½ in.; one gate shear 14 ft. long, 20 in. throat, ¾ in. capacity; one 6 ft. radial drill; one 12 in. squaring shear, ¾ in. capacity; two 20 in. drills, motor and geared; one flat nose heavy duty type power feed for cutting locomotive T bars.

Ill., Chicago—A. Hess, 1119 South Western Ave.—one No. 20 punch press weight about 1,400 lb. also one small flue spindle flat drill and one small power square shears.

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave., Purch. Dept.—one steam hammer, 4,000 lb. (used).

Ill., Chicago—The Printing Machine Co., 1st Power Bldg., Van Buren and Desplaines Sts., H. T. Simpson, Purch. Agt.—duplex milling machine.

Ind., LaPorte—The L. A. Althoff Mfg. Co., Inc., of LaPorte has taken over assets and liabilities of the L. A. Althoff Co. of Chicago and will install few machine tools and other equipment.

Ind., Marion—The Allmeer Mfg. Co., manufacturer stamped metal stove, L. L. Kimmel, Purch. Agt.—No. 0 compound punch press or its equivalent.

Mass., Springfield—F. S. Stauffer & Son, 67 Sycamore St., manufacturer of sheet metal stamping equipment—20 in. back geared drill press.

Mich., Detroit—W. L. Haworth, 4121 Trumbull Ave.—No. 1 or No. 0 Toledo geared press or its equivalent.

Mich., Detroit—J. F. Lamb Co., 1918 Wyoming St.—miscellaneous machine shop equipment including motors, ½ to ¾ hp., 110 volt, 60 cycle, single phase.

Mich., Halfway—C. F. Kaiser—complete equipment for repair shop, including blacksmith tools and equipment, drill press, etc., (used).

Mich., Northville—E. E. Perkins, Route 2—bench press, combination hand, rib and nail-off wire clinching lockers; one direct current, 2 hp. motor, also a complete set blacksmith's tools.

Mich., Wyandotte—The 47-Metal Products Co., Labadie St.—one Niagara presses Nos. 3, 4 and 5 and one Van Norman milling machine No. 2.

Minn., Minneapolis—The Armstrong Transfer & Storage Co., 325 7th St. S. E., F. H. Armstrong, Pres.—power machine tools for auto repair shop.

Minn., Minneapolis—J. M. Nelson, 44 Western Ave.—machine tools equipment for auto repair shop at 317 6th St. S.

Mo., Joplin—E. Cox & Son, 211 East 3rd St., E. Cox, Purch. Agt.—power lathe.

Mo., Joplin—The Johnson Auto Repair Co., 211 Virginia Ave., M. Johnson, Purch. Agt.—drill press and lathe for power.

Mo., Kansas City—The Johnson Furnace Co., J. J. Johnson, Purch. Agt.—Cleaver tools including square shears and bending press.

Mo., St. Louis—The Natl. Lead Co., 722 Chestnut St., W. M. Lowry, Purch. Agt.—punch press to punch ¾ in. diameter hole in ¾ in. plate or heavier; one forming roll to handle ¾ in. plate, also 100 ft. steel head frame; one shear with 24 in. throat or larger to cut ¾ in. plate; one 250-350 cu. ft. air compressor, 100 lb. pressure, motor or belt driven, A.C. direct connected preferred.

Neb., Lincoln—The Holland Furnace Co., 941 O St., E. Van Lente, Purch. Agt.—small sheet metal stamping machine.

Neb., Lincoln—The Ideal Auto Tinners (Stanton and Derrick), 918 N St., B. Derrick, Purch. Agt.—one 30 in. folder and one 40 in. square shear.

Neb., Sidney—J. Treinan—lathe about 16 in. x 10 ft. bed, (used).

N. J., Newark—Kreuter & Co., 571-585 18th Ave., manufacturers of mechanics tools, W. H. Hall, Purch. Agt.—No. 14 mariner grinder complete with counter shaft, water pumps, etc.

N. Y., Adams Center—Williams Garage Co., Main St., C. Williams, Purch. Agt.—exhaust driven blower; forge parts and castings for built in forge; small high speed upright drill for electric drive, (new or used).

N. Y., Binghamton—F. Sprout, Collier and State Sts.—complete equipment for automobile and engine repair.

N. Y., Buffalo—W. G. Day, 2120 Fillmore Ave.—machinery and equipment for radiator and auto repair station.

N. Y., Buffalo—H. R. Sontag, 1896 Niagara St.—equipment for automobile and machine repair shop.

N. Y., Buffalo—M. M. Swerdloff, 424 Prudential Bldg.—tools and equipment for repairing automobiles.

N. Y., Buffalo—R. B. Williams, 809 Iroquois Bldg., (contractor)—machinery for the manufacture of light metal and woodwork.

N. Y., Farnham—Ingraham & Pizzolanti—machinery and equipment for garage now in course of construction.

N. Y., Rochester—The North East Electric Co., 348 Whitney St., A. M. Anderson, Purch. Agt.—one 2 spindle No. ½ bench type Avey drill; one No. 2 Avey tool room drill; one No. ½ Avey single spindle column type drill; one 2 spindle No. ½ Avey column type drill and one 2 spindle No. 1 Avey drill.

N. Y., Utica—E. Steinhorst Co., Mohawk and Eagle Sts., E. Steinhorst, Purch. Agt.—power driven sheet metal working tools and equipment.

N. Y., Vernon—Uebler Mfg. Co., manufacturer milking machines, J. S. Ferris, Secy. and Treas.—power punch press.

N. Y., Watertown—The Gould & Gould Mfg. Co., 732 Cooper St., R. D. Gould, Purch. Agt.—small machine tools and special equipment for the manufacture of jewelry.

O., Cincinnati—The Jones Machine Tool Co., 635 East Pearl St., W. F. Jones, Purch. Agt.—one 42 in. x 18 ft. center lathe for stone cutting; No. 23 New Britain automatic; one 1½ in. bolt cutter; one open back inclinable stamping press plain or geared weighing 2,500 to 7,000 lb. with stroke from 3 to 4 in.; one 48 in. x 20 ft. lathe; 48 in. x 16 ft. modern planer, motor driven, D.C. current, 220 volts.

O., Cincinnati—The Pollack Steel Co., Carthage Ave., G. J. Myers, Purch. Agt.—Massmann No. 5 trimming press, 16½ in. die space, etc., or its equivalent.

O., Cleveland—The Central Brass Mfg. Co., 42nd Cedar Ave.—manufacturer drinking fountains, faucets, valves, etc., L. S. Fisher, Purch. Agt.—No. 33 New Britain standard chucking machine.

O., Cleveland—The Economy Plumbing & Heating Co., 12302 St. Clair St.—wood turning or machine bench lathe about 9 in. swing and 3 ft. bed.

O., Cleveland—The K. W. Ignition Co., Chester and East 30th Sts., A. Barr, Purch. Agt.—one 50 ton power press with 4 in. stroke.

O., Cleveland—Parish & Bingham Co., Madison and West 106th Sts.—one No. 1½ commercial press.

O., Columbus—E. H. Huffman & Sons, 241 South 4th St., E. H. Huffman, Pres.—general service station machinery including drill presses, small lathe and grinding machine.

Pa., Cherry Tree—The Cherry Tree Machine Co., J. L. Stiffler, Purch. Agt.—One No. 62 Pollows gear shaper with standard change gears.

One horizontal boring mill with 3 ft. x 5 ft. table, 30 in. traverse of bar, etc.

One 20 in. engine lathe capable of taking 6 in. between centers.

One Hexagonal turret lathe.

One 2 head wheel turning lathe capable of swinging 24 in. and approximately 40 in. to 60 in. between centers.

One Centerless grinder for grinding axels, etc., to take shafts 1 in. to 4 in. diameter.

One drill grinder for drills up to 1½ in.

Two wheel grinders.

One 24 in. shaper.

One Universal milling machine.

One 4 ft. to 5 ft. Universal or semi Universal radial drill.

One 2 or 3 spindle sensitive drill press capable of driving ½ in. diameter drills.

One 200 ton capacity hydraulic wheel press.

Pa., Erie—H. C. Cowley, 1139 East 28th St.—one 14 in. or 16 in. lathe and small grinder.

Pa., Phila.—The Art Furniture Mfg. Co., 835 Race St.—one 16 in. swing wood turning lathe.

Pa., Phila.—B. Luberman, 20th St. and Allegheny Ave.—equipment for machine shop.

Pa., Phila.—The Ritter Can & Specialty Co., 1026 Sedgeley Ave.—equipment for the manufacture of metal working machinery, including shears (Bench & Circle), furnaces, brakes, etc.

Pa., Rockview (Lemont P. O.)—The Western Pennsylvania Penitentiary—lathe, floor grinder, drill press, pipe machine, and a 48 in. power grindstone.

Pa., Troy—The Bailey & Powers Co.—complete machine tool equipment for gas engine repair.

Va., Richmond—Anderson & McMullen, 2047 West Broad St.—small lathe and a drill press for auto repair shop.

Va., Richmond—The Anderson Motor & Sales Corp., 1815 West Broad St.—lathe, drill press buffing machine and bench tools for auto repair work.

Va., Richmond—F. L. Benton, 1649 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—The Bitner Motor Corp., 201 North Gilmore St.—cylinder grinding machine and small lathe.

Va., Richmond—C. E. Booth, Jr., 916 West Broad St.—lathes, drill press and bench tools for auto repair work.

Va., Richmond—A. I. Fleming, 1623 West Broad St.—lathes and a drill press, (used).

Va., Richmond—Fulton & Barnes, 1643 West Broad St.—cylinder grinder.

Va., Richmond—Gann, Barlow & Crow, 335 Mumford St., A. Gann, Purch. Agt.—drill press and lathe.

Va., Richmond—The Owens Motor Co., 2100 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—J. K. Bohannon, 732 West Broad St.—drill press.

Va., Richmond—Shinaults Bicycle Shop, 506 West Broad St.—small lathe and buffing machine.

Va., Richmond—Stuart-Warner Service Co., 1615 West Broad St.—power grinder, bench drill.

W. Va., Charleston—The State Rd. Comm.—one power shear 96 in. blade; power punch press 40 ton capacity; one air compressor.

W. Va., Wheeling—The Dillon Bros. Machine Co., 8 South Huron St.—forging hammers and other tools for new shop at Bridgeport, O.

Wis., Appleton—The Gibson Auto Exchange Co., College Ave.—auto repair shop equipment for proposed garage and repair shop on College Ave.

Wis., Beaver Dam—H. Brueckner—auto repair equipment and machinery for proposed garage and repair shop on Main St.

Wis., Beloit—J. Terwilliger, 318 Broad St.—equipment for auto repair shop including air compressor, 1 ton press, etc.

Wis., Cudahy—F. Barnhardt, 919 Packard Ave.—sheet metal working machinery.

Wis., Kenosha—The Krisor Bros., 772 Milwaukee Ave.—air compressor, gas storage tank and pump and bench tools for proposed garage on Milwaukee Ave.

Wis., Milwaukee—The Bd. Educ., 10th and Prairie Sts.—one 14 in. x 6 ft. Hamilton tool room lathe; No. 2 Arbor press; No. 2 Brown & Sharpe surface grinder; six 11 in. x 4 ft. and six 13 in. x 6 ft. engine lathes, also various other equipment.

Wis., Milwaukee—E. Meister, 501 Harmon St. (garage)—repair shop equipment including drill press.

Wis., Sturgeon Bay—The Sturgeon Bay Garage, M. Peterson, Purch. Agt.—drill press, air compressor, lathe, gas storage tank with pump jacks.

Ont., Ridgetown—H. E. Cavell—equipment for small general repair shop at Listowel, including lathe, planer, shaper and drill press.

Ont., Walkerville—The Gotfredson-Joyce Corp., Ltd.—machinery for proposed garage on Spadina Ave., Toronto.

Machinery Wanted

Conn., Shelton—Sidney Blumenthal & Co., Inc., manufacturer of pile fabrics, O. J. Bell, Purch. Agt.—Davis & Furber 82 in. brass plate warp reels with single beamers complete.

Fla., Tampa—The City, A. W. D. Hall, Mgr.—freight handling machinery, electric trucks, etc. for modern ship terminals.

Fla., West Palm Beach—The Palm Beach Creamery Co., A. F. Neilson, Pres.—dairy and ice cream manufacturing equipment.

Ia., Ft. Dodge—The Fort Dodge Culvert & Steel Co., manufacturer of bars, shapes, culvert pipe, etc., R. M. Stevens, Secy.-Treas.—roughing mill 18, 20 or 22 in. of one, two or three stands with usual equipment, also steam engine to operate above mill and a present 10 in. mill besides.

Ill., Chicago—The Chicago Pump Co., 2336 Wolfram St.—planer-type milling machine with adjustable rail having two vertical heads and one or two horizontal heads with table 36 in. wide and 10 ft. or longer, Ingersoll or Newton make preferred.

Ill., East Peoria—(Peoria P. O.)—The Crown Fdry. Co.—complete equipment for the manufacture of gray iron, chilled and semi-steel castings.

Ill., Rochelle—The Caron Spinning Co., Inc., manufacturer of yarns—one single apron wool dryer similar to Sargents, capacity 2,000-3,000 lb. daily.

Ind., Alexandria—The Ziegler Mfg. Co., metal stampings and screw machine products, L. A. Ziegler, Purch. Agt.—rotary annealing furnace, similar to the Rockwell 153.

Mich., Detroit—The Adams Lithograph Co., 307 West Congress St.—lithographing machinery and equipment.

Mich., Detroit—P. Kirschbaum & Son, 3776 Woodward Ave.—Eastman cloth cutting machine with straight blade.

Mich., Detroit—The Peninsular Paper Can Co., 1725 Hastings St.—stencil cutting machines.

Mich., Detroit—J. B. Warren, 337 Bagley Ave., printers and printers supplies—14 x 22 in. job press.

Mich., Highland Park (Detroit P. O.)—S. J. Howe, 200 McLean Ave.—complete equipment for the manufacture of paint.

Mo., Joplin—G. B. Bartlett, 1204 Illinois St., (printer)—10 x 15 printing press.

Mo., Joplin—The Joplin Store Fixture Exchange, 713 Bway., R. Gilstrah, Purch. Agt.—power buffing and polishing machinery.

Mo., Joplin—A. E. Maitland, 301 Virginia Ave.—mining machinery and belting.

Mo., Joplin—The Williams Sash & Door Wks., 514 North Main St., J. P. Williams, Purch. Agt.—dove tail machine for making boxes.

Neb., Lincoln—The Lincoln Traction Co., Terminal Bldg., A. G. McMaster, Purch. Agt.—air compressor, 50 cu.ft., (used).

N. J., Newark—The Newark Billiard Table Co., 478 Market St.—leather splitting machine about 18 in. cutter.

N. Y., Bath—The Bath Roller Mills, J. Faucett, Prop.—machinery and equipment for roller mill.

N. Y., Binghamton—The Binghamton Glass Wks., 28 Crandell St.—glass furnace to replace one recently destroyed by explosion.

N. Y., Buffalo—The Bd. Educ., D. J. Sweeney, Secy.—receive bids until April 30, for furnishing the manual training departments with brads, screws and small supplies for year ending Apr. 30, 1923.

N. Y., Buffalo—The Buffalo City Hospital, 462 Grider St., G. S. Staniland, Secy.—receive bids until May 8 for refrigeration and ice making machinery.

N. Y., Buffalo—The Interstate Paint & Supplies Co., Inc., address M. A. Harrington—machinery, tools and equipment for use in manufacture of chemicals and paints.

N. Y., Buffalo—D. Kern, 83 Roesch St.—bakeshop equipment.

N. Y., Buffalo—The Queen City Plating Wks., 103 Sycamore St.—machinery for proposed plating and buffing factory at 566 Michigan Ave.

N. Y., Buffalo—J. Schaaf, Miller Ave. and West Shore R.R.—machinery for proposed shoe factory on Northampton St.

N. Y., Buffalo—Walton & Hoffman, 648 Ellicott St.—machinery for peeling, slicing, sacking and canning potatoes for potatoe chips. Proposed factory at 85 Demond Pl.

N. Y., Gouverneur—The Gouverneur Marble Quarries, J. H. O'Brien, Purch. Agt.—hoisting machinery and marble sawing equipment.

N. Y., Naples—The New York Pea Packers Inc., J. F. Connor, Mount Morris, Purch. Agt.—special machinery and equipment for canning fresh vegetables and fruits. (For several plants.)

N. Y., Olean—W. F. Foss & Son—machinery and equipment for bakery.

N. Y., Syracuse—The Syracuse Boys Club, 436 East Jefferson St., F. K. Zerbee, Secy.—$1,000 worth of woodworking machinery, including a band saw and planer.

N. Y., Watertown—D. C. Hunt Co., 534 Mill St.—bread and pastry mixing and baking machinery and equipment, complete outfit.

N. Y., Watertown—Smith Bros. Constr. Co., Cleveland Bldg., S. D. Smith, Purch. Agt.—complete outfit and equipment for field blacksmith shop.

O., Cincinnati—The W. T. Johnston Co., 3rd and Vine Sts., J. M. Howard, Purch. Agt.—one 7 in. x 10 in. D. D. D. C. hoisting engine; one 8 in. x 10 in. double drum, double cylinder hoisting engine and a jaw stone crusher.

O., Cleveland—F. J. Albany, Sweeney Ave. and East 55th St.—machinery and equipment for the manufacture of concrete laundry tubs.

O., Cleveland—The Fanner Mfg. Co., Brookside Park, J. E. O'Brien, Purch. Agt.—one 661 Toledo embossing press for foundry.

O., Cleveland—The Sanitary Wet Wash Laundry Co., East 93rd St.—laundry machinery and equipment.

Okla., Picher—The Fischer Harness Co., 400 Connell Ave., L. C. Fischer, Purch. Agt. leather working machinery.

Pa., Butler—The Standard Steel Car Co.—one 3-ton hand power crane for foreign shipment.

Pa., Clifton Heights—The Kent Mfg. Co., manufacturer of yarns—carders, twisters, dryers, etc.

Pa., Erie—The Erie Metal Furniture Co., Inc., E. Bauschard, Secy.—machinery for proposed metal furniture plant.

Pa., Girardville—C. H. Hein—knitting machinery for new addition to mill.

Pa., Phila.—The Berkley Knitting Co., 1326 Vine St.—machines of various styles: knitting machines and Rachel machines will also use electric power.

Pa., Phila.—Bla-Shone Hosiery Corp., Allegheny Ave. and Hancock St., M. Schoneman, Purch. Agt.—automatic hosiery machines and finishing machines.

Pa., Phila.—City Dept. of Highways, City Hall, F. C. Dunlap, Chief—Shone-Duplex ejector system for sewerage, 2 units, capacity 200 gal. per minute, to be installed complete.

Pa., Phila.—G. S. Cox & Bros., Inc., Cambria and Ormes St., haircloth manufacturers—revolving flat cords, drawing frames, improved twisters, etc., for new building.

Pa., Phila.—The Darlney Bros., Chester Ave. and Boynton St.—spinning machines, looms, carders, belting, shafters, etc., also machinery for repair shop.

Pa., Phila.—Dept. Pub. Wks., City Hall, F. Caven, Dir.—2 horizontal crank and flywheel double acting air compressors, 12 in. diameter cylinders, 10 in. stroke, 250 lb. per minute.

Pa., Phila.—T. Develin, Jr., Lehigh Ave. and Hancock St.—addition machinery for new carpet mills.

Pa., Phila.—G. Esslinger & Sons, 10th and Callowhill Sts.—conveyors and additional bottling machinery for brewery.

Pa., Phila.—R. Hirsh & Sons, 2720 North Hope St., S. Hirsh, Purch. Agt.—additional machinery for the manufacture of upholstering fabrics.

Pa., Phila.—Penn Screw Machine Wks., 712 Cherry St.—colletts and feeding fingers for No. O, B and S automatics.

Pa., Phila.—The Peerless Paper Box Mfg. Co., 1432 North Randolph St.—folders, cutters, saws, etc., also printing presses for new addition.

Pa., Phila.—The Roosevelt Worsted Co., 20th and Naudain St.—carders, looms, dryers and spinning machines.

Pa., West Chester—Hoopes Bros. & Thompson—one electric air pump and compressor for garage.

Tenn., Jellico—The Diamond Hosiery Mills—300-320 needle ribbing machines, Wildman or equal.

Tenn., Knoxville—The Duncan Mchy. Co., Dempster Bldg., 721 North Central St.—well machines without power, (new or used), No. 5 Gates gyratory crusher, manganese lining, (used), saw mills, portable engines, etc.

Wis., Antigo—The Mattefs Bros. Co., G. Mattefs, Pres.—woodworking machinery including saws, etc., for proposed saw mill on Main St.

Wis., Appleton—The Northern Boiler Structural Iron Co., Mills St.—special equipment for boiler plant including several tubular boilers and two traveling cranes.

Wis., Chippewa Falls—The Enterprise Oil Co., 401 Bay St.—pumps and filling station equipment for garage at Eau Claire.

Wis., Fairwater—O. H. Riant—complete equipment for blacksmith shop and for repairing wagons, etc.

Wis., Holmen—The Holmen Creamery Assn., V. S. Keppel, Mgr.—modern equipment for proposed dairy.

Wis., LaCrosse—The Vocational School Bd., 60 Vine St., J. D. Coleman, Dir.—equipment for vocational school, incl. woodworking machinery, etc. Estimated cost, $2,000.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann—refrigerating machinery for proposed ice cream factory.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow—equipment for auto repair shop including air compressor and a 1 ton press.

Wis., Milwaukee—A. J. Pietsch, 539 31st St.—additional woodworking machinery.

Wis., New London—Hamilton & Sons Canning Co.—special canning and power machinery.

Wis., Oshkosh—The Gibson Auto Co., 7 Church St.—auto repair equipment and small power unit machinery for garage and repair shop at Appleton.

Wis., Park Falls—The Flambeau Paper Co., G. Waldo, Mgr.—machinery and equipment for proposed paper mill.

Ont., Guelph—The Bd. Educ., H. J. Leadlay, Secy.—machinery, tools and equipment for general technical school work also physics and laboratory equipment.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave. N.—motors and bakery equipment.

Ont., Staples—Hillman & Dalton—equipment for the manufacture of drain tile.

Ont., Wallaceburg—The Prestolock Co. of Canada, E. E. Theis, Mgr.—special machinery and equipment for the manufacture of radio equipment.

Metal Working Shops

Cal., Burlingame—H. C. Vielbaum, c/o J. W. F. Ryan, Engr., 1202 Bway., has awarded the contract for the construction of a 1 story garage on San Mateo Dr. near Howard Ave. Estimated cost, $40,000.

Cal., San Francisco—The Magnolia Metal Co., Pacific Bldg., has awarded the contract for the construction of a 1 story, 45 x 100 ft. metal plant on Bryant and Sterling Sts. Estimated cost, $10,000. Noted April 20.

Cal., San Francisco—The Wellman-Peck Co., 311 Embarcadero St., has awarded the contract for the construction of a 3 story addition to its garage and loft building on Embarcadero and Jackson Sts. Estimated cost, $40,000.

Conn., Wallingford—The International Silver Co., Meriden, has awarded the contract for the construction of a 1 and 2 story, 45 x 130 ft. and 30 x 30 ft. additions to its factory on Center St. here. Estimated cost, $30,000.

D. C., Langdon—The Fleischmann Co. has had plans prepared for altering and building an addition to its fermenter house here. Estimated cost, between $25,000 and $30,000. Milburn, Heister & Co., Union Savings Bank Bldg., Wash., D. C., Archts.

Ill., East Peoria—(Peoria, P. O.)—The Crown Fdry Co. recently incorporated, is building a plant for the manufacture of gray iron, chilled and semi-steel castings.

Ia., Paris—H. Link is having plans prepared for the construction of a 1 story, 75 x 100 ft. garage. Estimated cost, $15,000. C. E. Hyde & Bro., 410 Temple Bldg., Des Moines, Archts.

Ill., Peoria—C. Wahl, 119 Hamilton St., is having plans prepared for the construction of a 1 story, 75 x 150 ft. garage. Estimated cost, $15,000. Noted March 21.

Ill., Riverdale—The Riverdale Bedding Mill Co. has awarded the contract for the construction of a 1 story, 60 x 140 ft. addition to its plant. Estimated cost, $25,000.

Mass., Medford—The Avery Boiler & Repairing Co. plans to build a 1 story, 40 x 100 ft. addition to its plant. Estimated cost between $15,000 and $20,000. Private plans.

Mass., Whitinsville—The Whitin Machine Works has awarded the contract for the construction of a 3 and 4 story factory, a 1 story garage and fire station and a 2 story storage. Estimated cost, $500,000. Noted March 21.

Me., Augusta—The Waterville Motor Co., Waterville, is having plans prepared for the construction of a 2 story, 50 x 70 ft. garage and repair shop on Bangor St., here. Estimated cost, $40,000. H. T. Mosely, 173 Main St., Waterville, Archt.

Minn., Minneapolis—C. P. Haglin & Sons, 510 Lumber Exchange Bldg., will build a 1 story, 101 x 165 ft. garage at 317 5th St. S. Estimated cost, $40,000. O. M. Nelson, 61 Western Ave., owner.

Minn., Minneapolis—A. Hansen and M. C. Nelson, 641 Metropolis Bank Bldg. have awarded the contract for the construction of a 2 story, 50 x 100 ft. garage and engine room at 2014 E. Lowry Ave., S. E. Estimated cost, $15,000.

Mo., St. Louis—P. L. Cornwall, LaSalle Bldg., will build a 1 and 2 story, 100 x 140 ft. and 50 x 140 ft. service building on Sarah St. and Forest Park Blvd. Estimated cost, $75,000.

Neb., Havelock—Schmidt Bros. are having plans prepared for the construction of a 50 x 140 ft. garage. J. Tyler, 415 Richards Bldg., Lincoln, Archt.

N. Y., Binghamton—F. Sweet plans to build a 2 story repair shop and garage on Hawley St. and Culver Ave. Estimated cost, $40,000.

N. Y., Louville—The G. A. Smith Co. plans to build a 1 story garage and machine shop on State and Jackson Sts. Estimated cost between $25,000 and $40,000.

N. Y., Watertown—The Watertown Garage Corp. plans to build a garage on State St. Estimated cost between $70,000 and $80,000. Address A. F. Lansing, Sherman Bldg.

O., Cincinnati—L. P. Hazen & associates, Court House, plan to build a 12 story garage on 200 x 140 site on 8th St. Estimated cost, $1,000,000. Architect not selected.

O., Cleveland—F. A. Maher, Wilton and Superior Aves., has awarded the contract for the construction of a 1 story, 39 x 114 ft. garage at 2180 Lee Rd. Estimated cost, $40,000.

O., Cleveland—The Superior East 49th Co., c/o C. Dan, 611 Fidelity Mortgage Bldg., plans to build 1 and 2 story garage and commercial building on East 49th St. and Superior Ave. Estimated cost, $25,000. J. F. Sullivan, 611 Fidelity Mortgage Bldg., Archt.

O., Dayton—The Bd. Educ. plans to build a 2 story, 60 x 200 ft. high school to include machine and wood working shops. Estimated cost, $150,000. Schenck & Williams Mutual Home Bldg., Archts.

O., East Cleveland (Cleveland P. O.)—W. P. McCarty, 11112 Euclid Ave., has had plans prepared for the construction of a 1 story, 50 x 132 ft. garage and commercial building on Euclid Ave. here. Estimated cost, $40,000. Private plans.

O., Euclid—D. R. Blossom of the W. Bingham Co., West 9th St., Cleveland, has had plans prepared for the construction of a 2 story, 40 x 70 ft. garage and stable on Euclid Ave. here. Estimated cost, $40,000. A. Garfield, Hoyt City Bldg., Cleveland, Archt.

Pa., Butler—The Butler Brick Co. has awarded the contract for the construction of a 1 story, 60 x 110 ft. garage and service room on Main St. Estimated cost, $150,000. Noted Feb. 21.

Pa., Phila.—H. Norman, c/o J. H. Waddington, Land Title Bldg., has awarded the contract for the construction of a 1 story, 100 x 150 ft. garage on Frankford and Lehigh Ave.

Wis., Appleton—The Gibson Auto Co., 7 Church St., Neenah, is receiving bids for the construction of a 2 story, 40 x 100 ft. garage and repair shop on College St., here. Estimated cost, $40,000. C. B. Meyer & Sons Co., 52 State St., Oshkosh, Archts.

Wis., Appleton—The Northern Butler Structural Iron Co., Mills St., is having plans prepared for the construction of a plate fabricating plant. Estimated cost, $70,000. E. Kottke, care of owner, Engr.

Wis., Beaver Dam—H. Brueckner is having plans prepared for the construction of a 1 story, 40 x 50 ft. garage on Main St. Estimated cost $40,000. W. F. Baumann, Beaver Dam, Archt.

Wis., Beloit—J. Terwilliger, 318 Broad St., plans to build a 1 story, 73 x 120 ft. garage on Broad St. Estimated cost, $55,000. Architect not selected.

Wis., Eau Claire—The Enterprise Oil Co., 201 Bay St., Chippewa Falls, has awarded the contract for the construction of a 1 story, 60 x 70 ft. garage, etc., here. Estimated cost, $40,000.

Wis., Kenosha—J. Lindl, Archt., 309 Wisconsin St., is receiving bids for the construction of a 1 and 2 story, 60 x 100 ft. garage on Milwaukee Ave., for Krisor Bros., 772 Milwaukee Ave. Estimated cost, $41,000.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow, has awarded the contract for the construction of a 1 story, 82 x 120 ft. garage on 1st St. Estimated cost, $40,000.

Wis., New London—F. Schoenrock is having plans prepared for the construction of a 1 story, 60 x 100 ft. garage on Main St. Estimated cost, $45,000. Private plans.

Wis., Sheboygan—A. Locke, 1819 Calumet Rd., has awarded the contract for the construction of a 1 story, 46 x 142 ft. scrap iron factory on Calumet Rd. Estimated cost, $6,500.

Ont., Guelph—The Bd. Educ. has awarded the contract for the construction of a 2 story, 100 x 285 ft. technical school on Paisley St. Estimated cost, $262,500. H. J. Leadley, Secy.

Ont., Listowel—H. E. Cavell, Ridgetown, plans to build a machine and general repair shop, here. Estimated cost, $5,000.

Ont., Port Colburne—The International Nickle Co. plans to build a 90 x 140 ft. addition to its factory, to be used for refining nickel and platinum. Architect not announced.

Ont., Toronto — The Gottfredson-Joyce Corp., Ltd., Walkerville, has awarded the contract for the construction of a 2 story, 51 x 210 ft. garage and service station on Spadina Ave., here. Estimated cost, $91,000. W. H. Leishman, 106 Jarvis St., Toronto, Mgr. Noted Nov. 24.

General Manufacturing

Cal., Sacramento—The State is having revised plans prepared for the construction of a printing plant on 11th and O Sts. Estimated cost, $140,000. W. F. McClure, Forum Bldg., State Archt.

Fla., West Palm Beach—The Palm Beach Creamery Co., plans to build a 2 story dairy and ice cream manufacturing plant, to consist of several units, on Okeechobee St. Estimated cost, $50,000. O. J. Williams, West Palm Beach, Archt.

Ia., Muscatine—The Muscatine Packing Co. has awarded the contract for the construction of a 5 story 100 x 200 ft. cold storage building; a 5 story, 50 x 100 ft. packing plant; a 5 story, 70 x 85 ft. abattoir and a 1 story, 50 x 100 ft. power house. Estimated cost, $200,000.

Ill., Chicago—The Atwell Printing & Binding Co., Sherman and Polk Sts., has awarded the contract for the construction of a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St. Estimated cost, $700,000. Noted April 13.

Mich., Detroit—The Mills Baking Co., 3165 4th Ave., has awarded the contract for the construction of a 3 story bakery plant on 4th Ave. Estimated cost, $40,000. Noted April 6.

Minn., Mankato—The Mankato Co-operative Dairy Assn., will receive bids until May 1 for the construction of a 2 story, 52 x 122 ft. creamery. Estimated cost, $40,000. Schippel & Schmidt, Mankato, Engrs.

Minn., Minneapolis—The Strutwear Knitting Co., 731 East 14th St., has awarded the contract for the construction of a 2 story, 80 x 82 ft. factory on 6th St. and 11th Ave., S. Estimated cost, $50,000. W. A. Struthers, Secy. Noted Oct. 20.

N. Y., Binghamton—W. P. Hollingshead Co., 148 Oak St., plans to build a 3 story, 80 x 330 ft. chemical plant on Walnut St.

N. Y., Brooklyn—The General Bakmor Co., 343 Madison Ave., New York, has awarded the contract for the construction of a 2 story, 163 x 200 ft. bakery and a 2 story, 59 x 62 ft. stable on 149th St. and Girard Ave. here.

N. Y., Rochester—The Yawman Erbe Co., 424 St. Paul St., plans to build a 3 story factory for the manufacture of office furniture. Estimated cost, $100,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Mich., Archts.

N. Y., Rome—F. W. Kirkland, Archt., 103 West Dominick St., will receive bids until May 1 for the construction of a 2 story, 40 x 90 ft. milk pasteurization and bottling plant for the Rome Milk Corp. Estimated cost, $50,000.

O., Dayton—J. Newbauer Sanitary Milk Co., 18 Maryland Ave., has awarded the contract for the construction of a 2 story milk bottling and butter making plant on Herman and Maryland Aves. Estimated cost, $50,000.

Pa., Phila.—The Pearless Paper Box Co. has awarded the contract for the construction of a 3 story, 54 x 84 ft. addition to its factory at 1432 North Randolph St. Estimated cost, $50,000.

Pa., Pittsburgh—The St. Louis Independent Packing Co., 6349 Station St., is receiving bids for the construction of a 2 story, 106 x 109 ft. cooler building on Hamilton Ave. Private plans.

Tenn., Jacksonville — The Nashville Paper & Pulp Co. recently organized and chartered with $1,000,000 has leased several buildings and will erect several units for the manufacture of paper and pulp, at the Old Hickory Powder plant. R. G. Cullem, Engr. and Genl. Mgr.

Tenn., West Nashville—(Nashville P. O.)—Colyar Reese & Co., Memphis, plans to build a wholesale oil distribution depot here. Estimated cost, $100,000. Above company transferring from Memphis to West Nashville and will be operated here as Southern Oil Marketing Co.

Wis., Antigo—The Mattefs Bros. Co. is having plans prepared for the construction of a 1 story, 60 x 120 ft. saw mill on Main St. Estimated cost, $50,000. G. Mattefs, Pres. Private plans.

Wis., Blair—The Blair Canning Co., c/o A. J. Bee, is receiving bids for the construction of a 2 story, 50 x 70 ft. canning factory on Main St. Estimated cost, $25,000. Private plans.

Wis., Holmen—The Holmen Creamery Assn. is receiving bids for the construction of a 1 story, 72 x 72 ft. dairy. Estimated cost, $30,000. V. S. Keppel, Mgr. Private plans.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, has awarded the contract for the construction of a 2 story ice cream factory. Estimated cost, $10,000.

Wis., Manitowoc—The Manitowoc Products Co., 1008 Washington St., has awarded the contract for the construction of a 3 story, 50 x 70 ft. ice cream factory on Washington St. Estimated cost, $10,000.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St., has awarded the contract for the construction of a 2 story, 40 x 80 ft. dairy on Burleigh St. Estimated cost, $20,000. Noted April 6.

Wis., New London—Hamilton & Sons Canning Co. plans to build a 2 story, 50 x 75 ft. cannery. Estimated cost, $50,000. Architect not selected.

Wis., Park Falls—The Flambeau Paper Co. has awarded the contract for the construction of a 75 x 110 ft. paper mill. Estimated cost, $100,000. G. Waldo, Mgr. Noted April 6.

Ont., Acton—Beardmore & Co., 37 Front St., E., Toronto, is having plans prepared for the construction of a 2 story, 80 x 100 ft. tannery, here. Estimated cost, $100,000. Private plans.

Ont., Brantford—F. C. Bodley, Archt., Commercial Chambers, is receiving bids for the construction of a 2 story, 50 x 140 ft. dress goods factory, for the Dominion Dress Goods Co., 179 Dalhousie St. Estimated cost, $75,000.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave., N., is having plans prepared for the construction of a 2 story, 80 x 400 ft. bakery. Estimated cost, $200,000. B. H. Prack, 1 Main St., E., Archt.

Ont., Niagara Falls—The Brant Creameries Co. is receiving bids for the construction of a 2 story, 40 x 80 ft. plant on Simcoe St. Estimated cost, $50,000. Architect not announced. Noted March 30.

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Factory Storekeeping and Material Control

The First Article—How Material Control Is Related to Production—The Ideal Material System—Losses from Excessive or Deficient Supply

By HENRY H. FARQUHAR

A MANUFACTURING establishment, as the name implies, exists primarily for the purpose of turning out a product for sale at a profit. This fact curiously enough seems sometimes to be overlooked. Activities, other than production proper, are of course necessary in order that the main purpose for which the plant exists may be accomplished and it is necessary, in order to avoid an unevenness in management, that each activity be seen in true perspective to every other activity without misleading lights and shadows.

The main functions in the administration of any manufacturing undertaking are:

The financing and accounting, or the raising and regulation of funds by which the business is carried on.

The engineering or technical which determines the design and composition of the product.

Selling which creates a demand for and disposes of what is manufactured.

Personnel which has to do with the policies and practices grouping themselves about the human element.

All minor activities of the plant may be grouped under one or another of these broad major functions, and all, it must be remembered, spring from and must primarily serve production since this is the activity for which the whole establishment was founded. Looking at the matter in this light, the production function really embraces finance, engineering, selling and personnel. But it may in turn be subdivided into those activities with which it is more specifically concerned in turning out a product through the use of land and buildings, equipment, layout, organization, materials, production cost systems, and so on.

Now, if we have learned anything from the great amount of careful work which has been done in an attempt to reduce the management of industry to less of an art and more of a science, it is that the control of one of these variables with which the manager must deal is just as necessary as the control of any other and that the business must be looked upon as an organic whole and not as a series of disjointed and unrelated activities. This viewpoint brings home at once the fact that none of these production activities can continue unless selling provides a market, that machines are useless unless power is available to drive them, that men are useless unless they be provided with work to do and with facilities to do it, and that in turn all of these activities must cease unless materials are supplied as needed. The function of material supply, instead of being relegated to the background and considered as a necessary evil, must thus take its place alongside of those activities ordinarily given greater consideration. Only by so doing may a balanced management be brought about. Only when material regulation has been standardized may it be pushed to the background to make room for some of its brothers which are less amenable to control. One of the major activities of production, then, is to provide its needs in materials. It is only through the conduct of manufacturing operations that the material problem in the strictly manufacturing business originates. Eliminate the production activity and the need of materials, aside from miscellaneous office supplies and the like, disappears.

From a material standpoint the fundamental idea upon which war is conducted is so to organize and manage that the man at the front is enabled to keep his mind continuously on his main duty—the defeat of the enemy—without being handicapped with questions of supplies of any kind. He should absolutely forget the material. Ideally and actually he should be able to reach his hand behind him at any time and receive exactly what he needs—no more, no less—at the moment. An oversupply will impede his actions, consume his time and attention and result in waste. A deficiency will render him helpless. That is the basis upon which the supply service of the army is organized. Material and ration supply should be automatic and governed absolutely by current needs.

For the man at the front substitute the man at the machine, and the above ideal becomes that of the supply service in the factory for the same reasons, and to be attained through the same considerations.

THIS is the first of a series of seven articles. It shows the dependence of production upon material regulation.

The next three installments will deal with the personnel, organization and location of departments, the balance sheets and the purchasing department, as related to material control.

The last three installments will take up storeroom layout, equipment, stowage and protection, and maintenance stores.

Material control is a production function and should be governed by requirements for production during reasonable future periods.

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Now, to make this supply automatic in either case, we must first know the requirements. We must know the original outfit that a man needs when he takes up his work and the probable rate of use of each article while on the job. Then, if we are to send forward the right quantity of the right materials to him at just the right time, many other things are necessary. We must know how long it takes to secure the goods from our supplier and how long it takes us to forward them from ourselves to the man who is to use them. We must know how much of the goods we have on hand in our storeroom, how much we have ordered to be shipped to us, how much has been promised for specific uses and therefore will not be available for filling subsequent requests, and we must know from this how much is still available for future demands. Besides these things, to make the supply reliable we must have a definite location for each article of goods in stock, to know exactly where and how much of each is on hand, and to be able to get them in and out quickly.

This requires that means be taken to safeguard materials in storage and to keep accurate records of amounts. We must have accuracy in handling, have all items checked all the way down the line as much as we possibly can consistent with speed and with the men with whom we work. Theoretically no goods may pass out of one's hands without a receipt. This is not always possible in war, or necessary in war or industry. But we must have efficient transportation and sufficient checks at each stage of our transportation. We must, therefore, have proper identification of the goods so as to enable anyone into whose hands they pass, to know what the goods are and for whom they are intended.

In addition to all these considerations of quantity and time, we also have both in war and in industry considerations of quality, and in addition to this in industry we have the further consideration of cost. By this is meant not simply the original purchase cost, but the final use or time cost considering the effectiveness and durability of the particular item in actual use.

These are a few of the many details to be brought under control in well-regulated material handling. They are not matters to be looked after by an inexperienced clerk, nor left to the supervision of otherwise preoccupied officials or those who, because their duties do not bring them face to face daily with production troubles, may not realize the vital dependence of manufacturing efficiency upon material control.

There is, strictly speaking, no such thing as a material function in itself in the manufacturing business. Those manufacturers who, in addition to producing, deliberately indulge in the buying of materials for resale and playing the market are by so much engaging in a separate line of business as distinct as possible from that for which presumably their investment in plant and equipment was made. It is a dangerous speculative business in which, in many cases, it is better not to indulge. Even though a conscious buying for resale be not permitted, there are many plants which are in even a worse condition, because, lacking this definite speculative policy, they have failed to substitute the proper one of governing purchase from the standpoint of manufacturing needs.

The tendency in the best plants today is to look upon the control of material as a production function and to govern the replenishment of materials by the requirements for production during a reasonable future period. One of the oldest, largest, and most progressive metal-working plants in this country adheres steadfastly to this policy, and has done so for a number of years.

The vital dependence of manufacturing efficiency on the strict regulation of materials is most realized by those closest to and responsible for production. Although a blunder on the part of the purchasing agent, for example, may result in just censure of that individual, it is after all production which has to bear the cost of the blunder. The cost of what he buys, as well as the cost of his failure to buy when he should, alike must eventually be borne by the cost of the product turned out. This is regardless of the cost methods used. Even where a so-called standard or predetermined cost of material entering the product is used, and where any excess over this cost is charged to profit and loss, the balance sheet must yet show that articles produced are sold at more than all costs of producing them, blunders included, or the business must eventually discontinue. We only obscure the approach of the evil by absorbing such losses in a separate account.

> ALL COSTS are the costs of production. The only economic justification for storing materials in quantity is that through this reservoir production may be regularized and cheapened.
>
> Excessive supply means loss in interest and insurance, excess storage space rent, deterioration, reduced stock turnover, additional handling and confusion.
>
> Deficient supply stops production. One occurrence may offset many times the cost of excessive supply.

Production must, therefore, suffer, in addition to leaks, any evils of over- or under-stocking. Curiously enough both of these losses are most often encountered in the same plant simply because insufficient attention is paid to material problems in general.

The only economic justification for storing materials in quantity is that through this reservoir production may be regularized and thus cheapened. It therefore follows that the cost of the product must not be unduly increased through storing too much nor through failure to store enough. In either event, production is not securing the benefit of storage to which it is entitled. There are but two ways in which materials may be sold at a profit. They may be resold in the condition in which they were bought at higher than the purchase price, or they may be processed to a finished or partly finished state and sold for more than the cost of raw material plus manufacture. Obviously excess materials cannot be processed, which leaves us only the first alternative of resale, as before stated a questionable policy for a manufacturing concern.

The now classic case of a government establishment may be recalled in this regard. There was here, of course, no element of speculation, but the loose methods of regulating materials then prevalent and still common, were in use. Upon the initiation of changed methods of management, the stores situation was thoroughly

overhauled. Among other things which came to light was a supply of materials above current needs amounting to over $122,000. This occurred in a government institution, however, for which allowances must be made.

Let us look at some happenings in private plants. I can personally vouch for the accuracy of these stories, although, of course, names cannot be mentioned. In a machine shop, upon a similar round-up forty tons of idle stock were unearthed from around the machines, under the benches, and on the floor of one department. This consisted of raw stock cached by the workmen, excessive amounts delivered to the machine and not disposed of, partly worked parts sidetracked for "rush" jobs, and so on. There was no speaking acquaintance between material regulation, either purchasing or issuing, and production needs.

Buying For Current Needs

In one plant I was informed that the purchasing agent bought only for current needs as judged from comparison of reports of materials on hand and sales orders which were furnished him. Because the responsibility for such matters was so placed and because of the methods used, his ability to buy for current needs was questioned although he surpassed the average purchasing agent in capability. An actual investigation showed over $50,000 worth of excess miscellaneous items on hand. Any of these items could have been secured in three weeks, and some were on hand in sufficient quantities to last ten years. The intent was good in this case, but human limitations and faulty details made its accomplishment an impossibility.

The purchaser for one medium-size factory was a bargain hunter, one of the most costly and tenacious diseases to which purchasing agents' flesh is heir. Responsibility for designation of how much to buy had, up to this time, never been clearly defined, and was usually exercised by the purchasing agent alone who originated and approved replenishment orders unless some special occurrence made consultation necessary. I remember very vividly how one morning he beamed into the office with the news that there had just been delivered 18 months' supply of a certain item which he had obtained at an "exceptional reduction in price." The works manager replied that they had just discontinued the use of that particular item altogether. In this case the material was immediately resold at a lower price than was paid for it. Such bargains often form very considerable portions of the excess supplies shown up when materials on hand are measured against requirements.

A somewhat elaborate stores system had been installed for keeping track of partly worked parts in another factory. Due to a multiplicity of detail whereby the main requirements of successful stores management, however, had been missed, the difference in inventory as shown on three supposedly accurate interlocking records was surprising. Material worth $15,000, as per the book records under the control of the cost department, could not be physically located or otherwise accounted for. Those entrusted with the work of record-keeping did not realize the importance of it and had no particular incentive to keep it accurately. The cost man regretted that it was necessary to write off such a loss, but otherwise attached no particular significance to the matter.

Akin to this is the case in another plant where, so far as I know to this day, the works manager in all important cases must send a personal representative to the storeroom to check the accuracy of the book balance reported to him from the balance sheets. These are under the control of the cost office.

Another case came to light in an otherwise exceptionally progressive factory. Because of fairly uniform production requirements, it was thought to be unnecessary to apportion, or reserve on the books, material for each manufacturing order in advance of its disbursement. Instead, the average consumption over a period of weeks was determined, to which was added a liberal factor for safety and the resulting quantity was specified as the minimum below which goods on hand should not be allowed to fall without issuing a replenishment order. This minimum was entered on the balance sheet for the item and book balances were carefully checked with bin contents from time to time. To give added assurance, over the minimum quantity in the bin was placed a red cloth as a signal to the storekeeper, before touching the minimum stock, to remind the balance clerk to issue a replenishment order.

This procedure seemed to be watertight, but after a few months' operation a costly shortage occurred on the item. Upon investigation it was found that recent demands had so far exceeded average demands upon which the minimum was based, that the stock became exhausted. Rather than increase the minimum limit to cover such exceptional demands and thereby increase the inventory of idle material during all times of normal consumption, the firm was persuaded to adopt the common-sense policy of looking ahead in these matters and apportioning all such material immediately the need became known.

No, efficiency in production cannot be obtained under such handicaps. Money is carefully guarded and checked to the penny. Materials are potentially of far greater importance to the manufacturing business than an equivalent amount of money. They should be as carefully guarded and controlled.

Losses from Excessive Supply

Excess materials undisposed of, cause any one or all of the following losses:

(1) Loss of interest on investment. The money which is spent for material in excess of what is needed for production during a reasonable period might otherwise be loaned at interest or reinvested profitably in the business, and might thus produce more money. Or it may be used to obviate the necessity of borrowing, and thus produce a direct saving. Invested in idle material, however, it adds a cost of doing business, the cost of the loss of interest on money needlessly spent.

(2) Loss of insurance on goods. A heavy inventory imposes a heavy insurance cost, or a heavy loss in case of fire, usually both.

(3) Excess storage space. Every cubic foot of storage space has a rental value. Taxes, insurance, depreciation and repairs on the building, interest on investment, heat, light, cleaning, all such costs for any space throughout the plant must be charged against what occupies that space, be it an operating machine or dead stock. This charge must eventually appear against the cost of the product which the space is supposed to benefit. In the former case, the product of the machine may offset, or more than offset, these rental charges. In the latter case the charges swell expenses which ordinarily cannot be returned by the

excess materials themselves and which therefore add to the burden which must otherwise be shouldered.

(4) Deterioration. In but few cases do materials of any kind retain their original quality during the passage of time. Deterioration, depreciation or obsolescence will sooner or later cause a loss in idle stock.

(5) Reduced stock turnover. During normal times of the buying and selling market the ideal condition as regards storage in the manufacturing business would be where no storage whatever is necessary. Imagine a factory where immediately upon receipt, raw material is delivered to the machine, processed at once and immediately shipped upon completion. Such a factory would have a stock turnover limited only by the time necessary for the longest operation on the product. The cost of material entering into the product under such conditions would obviously be less than where storage is necessary. In storing we have the costs mentioned previously, the cost of added delivery, handling and transportation charges, and possibly deterioration or obsolescence in the materials themselves.

No matter for how short a period we store, therefore, the cost of the stored article issued to the shop is actually greater, whether it shows on cost records or not, than is the cost of a non-stored article. The profit on the finished product is therefore less; or, if the same, that part of it which pertains to the materials occurs fewer times per year. It is more profitable to make 2 per cent per transaction six times a year than it is to make 13 per cent only once a year. This is a point overlooked in innumerable manufacturing and other concerns.

(6) Additional handling and confusion. Except under fortunate conditions of ample and well-arranged storage space, a supply of material in excess of normal needs almost inevitably results in shifting locations, additional piling, unpiling and transporting, additional record-keeping, lack of definite identification and consequent confusion and difficulty in finding materials quickly.

The losses which may and do result from a failure to have on hand just the article desired in sufficient quantity when needed are too frequent and obvious to merit rehearsal. A warning may be thrown in here, furthermore, to the effect that when a policy of governing materials strictly by production needs is determined upon, ample safeguards are necessary to insure against a shortage. One such occurrence may offset many times the cost of an excessive supply.

Material losses are also due to misplaced responsibility and faulty routine. Some typical instances of such losses were given in preceding paragraphs, and since the causes may be innumerable no summary will be attempted. It is largely the petty annoyances and little leaks, however, which in themselves are often insignificant, but which in the aggregate amount to infinitely more than it would cost to remedy them.

Progress of S. A. E. Standards Adoption in the Tractor Industry

The accompanying chart was exhibited at the recent National Tractor Show, at Minneapolis, by the Society of Automotive Engineers. It is based on replies to a questionnaire sent by the society to more than 100 tractor makers. On it are the names and symbols of the respective standards applicable to the tractor, and opposite each the number of tractor builders, as shown by the black spaces and expressed in per cent of the total number of replies to the questionnaire, who are employing them.

It is worthy of note by builders of other kinds of machinery that encouraging progress has been made by the tractor people in the adoption of standards that would be equally useful for other machinery. See, for example, the relatively large per cent of tractor builders who have adopted standard screw threads, lock washers, cotter pins, pipe threads, pipe fittings, grease cups, drain cocks, iron and steel specifications and annular ball-bearings.



CHART SHOWING THE RELATIVE NUMBER OF TRACTOR BUILDERS USING THE SEVENTY S. A. E. STANDARDS APPLICABLE TO TRACTOR CONSTRUCTION

Methods of Machine Tool Design

Second Article—Making a Schedule for a Machine to Be Designed—Checking Each Step in the Design Before Proceeding

By A. L. De LEEUW

THE first step in the design of a machine tool is to go carefully over its requirements and make a schedule. In the case of a commercial machine this schedule takes the form of a set of specifications. In the case of a special machine it takes the form of a schedule of consecutive operations to be performed by or with the machine.

Taking for example the machine for finishing the part shown in Fig. 1, and which has been analyzed to a certain extent, the schedule should be something like this:

(1) Chuck piece.
(2) Mill top and pass cutter completely over work, bringing the cutter slide against a stop.
(3) Drill three holes.
(4) Return drills to starting position.
(5) Return cutter slide to starting position.
(6) Loosen clamp and remove piece.

Select a proper arrangement for each of the functions. In this case there can be but little doubt. We may not be sure as to the detail arrangement of the drill spindles, but we *do* know that drill heads are needed for the drilling operation, and a vertical spindle for milling (making a note that we will investigate the horizontal milling spindles later on). Our machine, then, consists of:

(1) Combined mill and drill head.
(2) Drill heads.
(3) Means for clamping.
(4) Mechanism for driving.
(5) Mechanism for feeding.
(6) Framework for supporting these items.

We now make a sketch of the arrangement like that in Fig. 4.

We then analyze each of these elements as far as we can without getting into interference with another element. It seems at first glance that the means for clamping the piece can be arranged without such interference.

As this is a special machine and special machines are not made except as a matter of economy, we will naturally develop some system of clamping which requires a minimum of time and of effort on the part of the operator.

One single movement for the purpose of clamping should be our ideal. If we do not succeed with this, then we should try two or three. We assume that the bottom and sides have been milled so that it will be possible to push the piece with its gage points against two stops. This locates the piece. Fig. 5 shows a tentative arrangement of the clamps.

A and *A* are the clamps which are parts of bell cranks, fulcrumed on *B* and *B*. The long arms *C* and *C* are operated by the toggles D_1 and D_2. The foot lever *E*, fulcrumed on *F*, operates these toggles.

Having this first conception of the clamping mechanism we check it up to see if it will act properly, and find right away that depressing *E* will move D_1 to the right and D_2 also to the right, so that one clamp would close and the other open. This brings before us the necessity of moving the point *G* in a vertical line. We can do this in various ways: For instance, by a rack guided in a vertical direction and moved by a pinion or gear sector, centered on the fulcrum of the foot lever. However, should we do so, both levers *C* would get an equal amount of movement and, as the clamps bear on rough surfaces, only one of them would act. To overcome this, in other words, to equalize the clamps, we introduce link *H* and place the foot lever in position *I*. This will effectively equalize the pressure of the two clamps *A* and *A*. We now check the mechanism to see if there remains anything needing attention. We notice that the point *G* must never get above the lower joint of lever *C-C*. In other words, the toggle must never get over the center; and, as the amount of movement is rather uncertain, due to the fact that the clamps bear on rough surfaces, it may well be that the point *G* remains quite low when the clamps are down. If this should happen, there would be nothing to keep the clamps from opening.

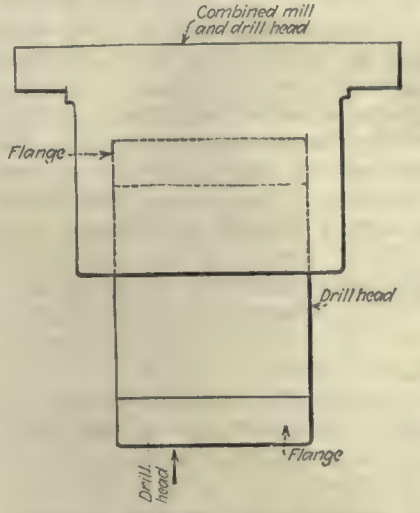


FIG. 4. SKETCH OF MACHINE ELEMENTS

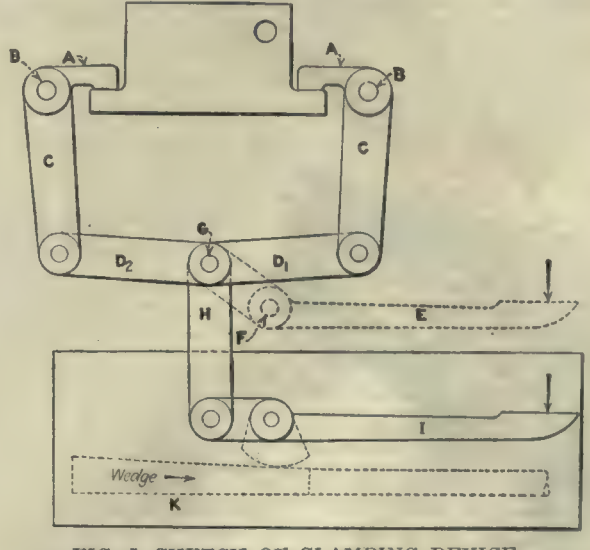


FIG. 5. SKETCH OF CLAMPING DEVICE

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Our next problem, then, is to make some provision for holding the clamps after the foot is removed from the foot lever. This could be accomplished in a number of ways. As a first attempt we will provide a wedge *K* bearing against a projection of foot lever *I*. The wedge *K* will be moved by means of a hand lever, so that the



FIGS. 6 AND 7. ARRANGEMENT OF DRILL AND SLIDE

clamping operation will consist of bringing down foot lever *I* and then pulling the hand lever. We sketch this out, as shown in Fig. 5, but, when checking it up, we find that the wedge placed as shown would have a tendency to push the foot lever back again and so open the clamps. We therefore reverse the wedge and operate it in the reverse direction from that shown. We would naturally correct our sketch, but will not show it here to save space.

The important thing to remember is to check up carefully each new step. As this checking up is perhaps the most frequent operation in the design of a machine, a few extra words may be timely.

In checking up the function of a mechanism we should let the operation of the various parts pass in our minds at a very low rate of speed, and imagine them to stop the moment a slightly different action takes place. In our case of the wedge, we would imagine it to be so far to the left that it does not yet touch the projection of foot lever *I*. We move it slowly to the right until it touches this projection. We move it a little bit further to the right, keeping our eye on this point of contact. We will watch what will happen and see, of course, that, there being considerable friction between wedge and projection, the wedge is liable to take the projection with it, and we notice that this will move the foot lever in the direction for opening the clamps.

This slow checking up of the functions of a machine should never be forgotten. It may take considerable time when the mechanism is complicated, but it pays to do it. There would be a great many other ways of accomplishing the purpose of holding the clamps in position. We will always find that there is more than one way of accomplishing whatever purpose we have in mind, and it is well to sketch out, or at least keep in mind, a few varieties and compare them after we have each one worked out to a point where comparison becomes possible. However, for the purpose of this treatise, and considering the amount of space available for it, we will confine ourselves to one single example.

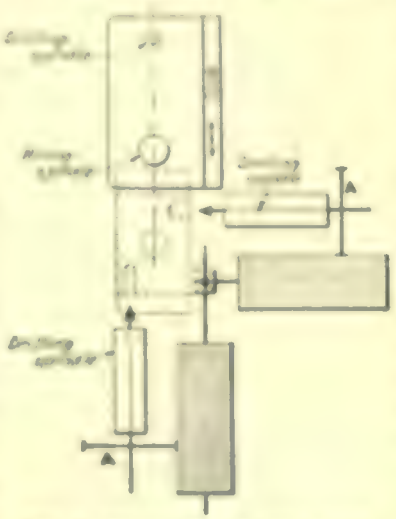


FIG. 8. PROGRESS DIAGRAM OF MECHANISM

The fact that we had to do something to keep the clamps in their working position brings up to us the desirability of finding some construction which would not require such a secondary operation; something which in itself would make the unclamping impossible. Of course, the only way which would be absolutely certain would be to keep our foot on the treadle with the full pressure exerted for the clamping operation. This, however, would be uncomfortable for the operator and would prevent him from moving away from his working position. However, any other means which will keep the link *H* under its initial pressure will be equally good and we naturally think of an air cylinder or hydraulic cylinder or of some other mechanical means for exerting pressure to take the place of the foot lever. And so we might remove that portion which is blocked out in the sketch and substitute for it a double-acting air cylinder of which the piston rod is connected to link *H*. What this example shows so far is the possibility of working out a more or less complicated problem without ever considering more than one thing at a time. And this is perhaps the most essential point in the method of designing machinery. So far we have paid no attention to sizes, proportions, locations, or anything else which would make our mechanism directly applicable to the machine we designed, but we will not go into this matter just now, rather taking up the other elements of the machine and bringing them to the same point of completion.

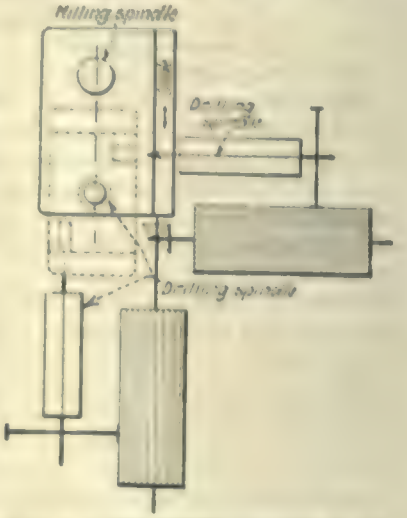


FIG. 9. CORRECTED DIAGRAM OF MECHANISM

Analyzing the requirements of the drill heads we find that each head must be capable of drilling one hole to a certain depth and return, and further that each head must be adjustable to make up for various lengths of drills. As only one size hole needs to be drilled, only one speed is required, and though the speeds of the two drill heads may be different yet both heads may be similar in construction and possibly may be exactly alike. If, for instance, one hole should be $\frac{3}{4}$ in. and the other 1 in., we would probably have to make two different sizes of drill heads; but if the one hole were $\frac{3}{4}$ in. and the other $\frac{1}{2}$ in., there would not seem to be any reason why we should not make both heads the same. Assuming that in our case the two holes are of near enough equal size to permit of the use of the same drill head, we will now investigate the construction of this head.

We will put the drill spindle in a simple slide and key a gear to the end of the spindle for its drive. As the depth of hole to be drilled is always the same we do not need a complicated mechanism for feeding it in to the required depth but can use a simple cam, and we will provide this slide with a roller upon which a cam can work. See Fig. 6.

This arrangement seems to fulfill all the requirements

of the drill head, except that it has no adjustment for various lengths of drills. There are quite a number of ways in which we could take care of this adjustment. For instance, by putting the drill in a chuck or holder which is adjustable in the spindle. Such a construction is often used. Another construction for the same purpose would be to put the drill spindle in a sleeve and make the sleeve adjustable in a longitudinal direction. Still another construction is to make the position of the cam roller adjustable in the drill head. We will assume that conditions are such as to make the last mentioned construction the most attractive. Fig. 7 is a sketch which we will make of this selected construction. A roller is attached to some piece or slide which is adjustable by means of a screw and, of course, must be clamped in the drill head. We are not at all sure yet as to what exact form we will give to this slide, and this is not yet necessary. It is better not to have very definite ideas as to the form and details of a construction too early.

The drill head as we now have it meets all conditions. It has a spindle, a drive for the spindle, it is guided in a slide—not shown in the sketch—there is a cam and roller for the feed, and there is means for adjustment.

Analysis of Construction

We should now analyze this construction and see if we are liable to get into trouble at any point. It is easy to carry out all the details of the construction, but there seems to be one point where we have missed connection. We have a driving gear at the end of the spindle but we have no means of operating it. This seems, then, to be the next item of which we should take care. And so we produce the sketch in Fig. 8 which shows the two drill heads in diagrammatic form and also the double drilling and milling head. Realizing that the gear *A* moves in the direction of the spindle, either on account of the feed or on account of the adjustment, we see that we must drive it either from a sliding gear or from a long pinion. Which of these two we will prefer will probably depend on the amount of movement. If this amount is relatively small the long pinion will be a simple construction, but if it is great we will probably have to use the sliding gear construction. We will make our sketch with the long pinion and make a mental note of the alternative construction.

Seeing the relative position of the two drill heads makes us automatically think of the way of driving these two heads from one source, and the construction shown in the diagram looks natural to us, though we realize that the location of the parts may make it necessary to modify this construction somewhat.

We now check this latest addition to the construction of the machine. If the two drills are to run at the same speed we will be able to use the same gearing on both drill heads and miter gears at the junction. If there is a relatively small difference in their speeds we will make up this difference by substituting bevel gears for miters, and as we have assumed that the two drills are of very nearly the same size, we do not need to look further into this matter. We have taken care of the common drive and the relative speeds. We must now check up the directions. We notice that if one of the two drill spindles turns in a right-hand direction the other drill spindle will turn left-hand which, of course, is not permissible. We can correct this by adding an idler to one of the two drill heads, but as we wish to make the drill head serve in both cases this solution is not desirable. Another way of meeting the problem is to change the relative location of the bevel gears as indicated by the dotted lines.

We must now consider the combined milling and drilling head. Our first conception of this device is shown in Fig. 8. The direction of the slide is such that we can use a small cutter. If we had placed this combination opposite the other drill head a larger cutter would have been necessary. Of course, our first consideration is to use such a cutter as will produce the piece in the least amount of time. At a first glance it might seem that the larger cutter will give this result, because the distance to be traveled is less. However, it is not possible to say with certainty which way will give the greatest economy of time unless we know the dimensions of the piece we mill. For the sake of clearing this matter up somewhat we will assume that the dimensions of our piece are 2 x 4 in., and that we will use a 2½-in. cutter going the long way and a 5-in. cutter the short way.

If we use a 2½-in. cutter and we must traverse a piece 4 in. long (and being a rough casting it may be a shade longer), we should allow for the length of the piece plus the diameter of the cutter and a little for clearance—say altogether 6¾ in., and if we should mill the other way, 2 in. plus 5 in.—say 7¼ in. It is obvious that feeding in the direction of the length of the piece is more economical because we have a smaller cutter traveling a shorter distance.

The writer, being in possession of all the facts, may just as well divulge the secret now; it will save him reopening this subject later. We will find that it is not necessary to have the cutter travel farther than needed to bring its center over the far edge of the piece. In that case the small cutter would travel 5½ in. and the large cutter 4¾ in. On the other hand, the speed of the small cutter, meaning the number of revolutions per minute, may be twice as much as that of the large cutter; and as the length to be traversed by the small cutter is not nearly twice as much as that to be traversed by the large one, it is evident that the arrangement as shown on the sketch is the more economical.

We have arbitrarily assumed, at least in the sketch, that the milling spindle leads. So far we have no reason to take for granted that this will make the best arrangement, and therefore, before we look into the details of either the milling or the drilling spindle, we will determine what is the most economical way of placing them.

If the relation is such as shown in Fig. 8 the milling spindle must advance not less than 6¾ in. before the drill spindle can begin to work, because we would not dare to leave the milling cutter over the work while the drill spindle is drilling. This also means that we must feed not less than 6¾ in. Anything we can do to reduce this amount of feed will speed up the operation and will make a number of the elements of the machine, such as cams, of smaller dimensions. If, on the other hand, we should make the drill spindle the leading one, and if the position of the rest of the combination slide were such that the drill spindle is immediately over the hole to be drilled, as shown in Fig. 9, the amount of feed we would need would be the radius of the cutter plus the length of the piece. After milling, the slide would return to its original position and the drill spindle would begin to work. This amount would be 5½ in. which is considerably better than 6¾ in. For this reason we will change the proposed construction to that shown in Fig. 9.

(*Continued in next week's issue*)

Economic Aspects of Standardization

Mass Production and High Wages Impossible Without Some Standardization—Technical Excellence of One Standard May Be Out-weighed by Economic Value of Another

By E. F. DuBRUL

SINCE the discovery of the great inventions and the beginning of the industrial revolution that was going on about the time of the American Revolution, modern industrial processes have developed more and more through the division of labor. The individual workman is no longer producing the whole product that the consumer finally gets, but almost every article that is used anywhere is the work of many hands.

In the United States, with relatively high labor costs, mechanical processes have developed to the fullest extent the general system known as "mass production." This means that industries as a whole are not self-sufficient, but are interdependent, depending for their supply of materials and parts on some elements, and for their demand on entirely different elements of our people. This very fact requires standardization, so that the buyer of supplies can know when he buys from several sources, as he should for his own protection, that the pieces bought from the different sources will equally serve his purposes; that means that they are standard, as far as he is concerned.

But other reasons exist why the same pieces should and do become standard for their users. These reasons also are reasons of cost, which, by mass production, is greatly reduced, as every one knows. Cheap production depends on quantity production. Quantity production makes possible the gathering together of engineering and supervisory talent, and it better organizes and directs a given body of men. It also permits better training of men in certain operations, and the raising of the standard of skill by specialization. In addition, it permits the production of goods of better quality, due to the fact that besides making the individual workman more skillful on specialized operations, it permits the design and production of machinery and appliances into which is fixed, once for all, the skill of the most expert workmen. This principle is known as the transference of skill and the transference of thought from men to machines. The automatic screw machine is of course a leading example of the embodiment of this principle.

Commercially, in addition to cheapness, it makes for a wider market; and there is the element of prompt delivery. The manufacturer of a standardized product can better afford to keep in stock large quantities of such product than he could products that are not standardized and whose demand may therefore be entirely eliminated by some change in taste or desire. This risk must form an additional element in the cost of the manufacture of goods that are not standardized.

Mass production of standardized parts not only reduces the direct cost, but the overhead costs as well, such as engineering and designing of the special tools and machinery that are used to make the standardized product. It reduces the cost per unit of office help and supervision all along the line; and this, in turn, becomes reflected in the lower price. Standardization reduces the amount of capital required to operate the business using standardized parts, because one sure effect of standardization is to reduce a large variety of pieces to a few fixed kinds.

In one industry, where ninety-six different kinds of certain parts were found to be produced, these have been reduced to nine. The producers of the ninety-six no longer have to have the special appliances, no longer have to carry stocks and care for those stocks at great expense for storeroom labor in order to supply demands that, in many cases, were mere whims of the designers of the machines in which these parts were used. The nine standard parts could be produced in larger quantities and the prices of the nine standard parts soon fell to one-third of the former prices charged for any one of the ninety-six similar parts before standardization. Another effect is that increased accuracy of the standardized parts is obtainable with less expense than the inaccuracy of the unstandardized parts. This reason again lies in the principle of the transference of skill, because more accurate duplication and better interchangeability can be obtained, the larger the quantity to be produced; this again being due to the fact that with the larger quantity to be made greater investment is justified, in special machinery of a better character, such as is needed to produce the better accuracy.

The agricultural machinery manufacturers, in surveying their own situation, found many kinds of cast-iron seats used on agricultural implements. The mere disclosure of this situation was sufficient to demonstrate that it should be changed. This situation had grown

STANDARDIZATION and simplification are the order of the day. Long a desirable development from the competitive scramble where differences between various allied products scarcely merited the name of distinctions, they are coming to be recognized as essential to our existence.

It will be the engineer's job to suggest the models and types on which to concentrate but the economist's task to select the best from the viewpoint of securing the greatest good for the greatest number. Many pet preferences must be swallowed or compromised before the desired end is achieved, but if it is possible for the statesmen of the great powers to agree on such points as distinguished the recent disarmament conference, it should certainly be possible for manufacturers and users of paving bricks or machine tools to get together on matters of far less import.

so that even in the same company, a mowing machine had one kind of seat, a hay tedder, that was used a few hours afterwards, had a different seat, and the hay rake had still a different one. Perhaps even now, the manufacture of seats may be taken out of the agricultural implement concern's own foundry and someone will specialize on those, selling the product to all manufacturers of agricultural implements, at a price cheaper than they could afford to make them themselves. The adoption of standardized usable parts on different machines, as in this case, greatly reduces the number and kinds of parts within the industry. The more standards are adopted that fit diverse industries, the more will the benefit of standardization percolate through our whole industrial system.

Standardization makes for interchangeability of repair parts and better service to the consumer. The automobile industry has demonstrated this in many ways. The automobile supply house now carries standard parts of many kinds that, with a very few sizes, enables the user of automobiles to procure certain repairs almost anywhere. If the same methods were adopted, for instance, in the agricultural implement line, much good would result to farmers. Instead of waiting for some part to come from the factory, because it is special to the extent of a slight variation in dimension from another part, the hardware store could act as a service station for all sorts of implements and carry stocks of standardized parts, as the automobile supply houses do.

The determination of standards is a matter that requires the best thought, because as standards are adopted and come into common use a change becomes exceedingly difficult. Therefore, before adoption, careful study should be made of the proposed standards that they may be the best that it is possible to obtain for the purpose intended. This requires, in some cases, quite extensive research on seemingly simple things. At times it requires a compromise, because situations are found that, while one thing is the best, another thing somewhat less desirable has come into such general use that the cost of change would be prohibitive and would greatly exceed any benefit that the better standard would present over the poorer one. It is a matter of relative worth of one to the other, balanced against the cost of the change.

Arguments Against Standardization

At times some men raise the question that standardization is disadvantageous because standardization fixes practice in certain grooves and this prevents progress because the designer of the improved machine, or what not, is closely confined to the adopted standards.

This argument is very likely to be over-done. If any material progress is possible by deviation from a previously adopted standard, the newer and better standard would and should displace the older and less adequate. The passion for self-expression in design is not always true progress. Slight variations are frequently confused with improvement. They look large in the eyes of the salesman who wants a "talking point," to show the ill-informed buyer wherein his machine is different from the others; but the same salesmen will not be able to demonstrate wherein his mere variation is any better than others. Such variation is, of course, not true progress. Even so, true progress, unless very radical and decidedly advanced, may cost too much in obsolescence of fairly adequate standard devices, including obsolescence of all the special machinery and appliances used to produce the previous standard articles. On the whole, the general experience of industry does not prove that the benefit of so-called progress is sufficient to overcome the benefit gained by the reduction in cost of standardized products through mass production.

Standardization in Machine Tools

As all interested in the machine-tool industry, either as users or producers, consider the questions of standardization, they will find many things in which standardization is desired.

First, there is the elimination of unnecessary sizes. It is said that lathes, for instance, can be bought from some maker or other in any interval of swing from 9 to 36 in., progressing by 1-in. steps. Certainly, no good purpose can be served by any such variety. This variety has come about through competitive conditions. Some buyers perhaps thought they wanted a lathe of 19-in. swing because an 18-in. was just a trifle too small for their work, and some lathe builder, hungry for orders, stood ready to supply the 19-in. machine at a few dollars less than his previous standard 20-in. machine. So another size was added to his line. Or else there was some new competitor who thought to slip between the previously established intervals and gain trade from both, and rather than make two designs, one for 18-in. and one for 20-in. swing, made only one design for 19-in. Then the old competitor perhaps raised his head and tailstocks only 1 in. and he too offered his 18-in. machine to swing 19 in. So it went, until today the usual designations of lathes mean very little. Eighteen-inch lathes do not generally swing 18 in., but considerably more. This makes the problem of purchasing that much more complicated. It does not affect the small jobbing shop which can use a second-hand lathe, many years old. The difference in price between an 18- and a 22-in. lathe would be very slight on the second-hand market. But it does prevent the standardization of equipment in manufacturing shops, working themselves on mass production.

We saw the results of this during the war. Unable to get machines of the same make to the fullest extent required in a given shop, the buyer had to take the nearest thing he could get, and what he finally got was a collection that, for variety of sizes, might be the fair beginnings of a museum. This one element of variation in size could have been largely avoided had recognized standard sizes been accepted and adopted.

So it went through many other lines of machine tools. No study had ever been made to determine the actual preference of users as disclosed by sales. If such information had been available, the machine-tool industry, in co-operation with the users, could have laid down certain standard sizes in as great variety as were economically demanded; and these, when accepted as standard sizes, would have controlled that situation. Today, the demands of users can be made manifest through the American Engineering Standards Committee. After investigation that will disclose what the user has preferred to purchase, and also after investigation of what variation in sizes is actually desirable, the unnecessary sizes can be discouraged, much to the benefit of both producers and users. As a class, the users eventually pay for all the waste that arises from unnecessary multiplication of sizes. If they did not, the producers could not long exist. If this waste is saved,

its amount can be diverted to the production of other commodities.

American industry can retain its relatively high wages only with relatively high production per dollar of wages. This, in turn, can be obtained only through greater standardization to make mass production possible. Therefore, standardization has a decided interest for the consuming elements, who, in number and in amount of wages, form our greatest market.

If the product of the world is increased, the same percentages of the increased product going to wages and capital and management means a greater amount for all. We are like a family who has an apple tree in the yard of its house. Given the same climatic conditions, that apple tree will produce more and more apples as it grows older and larger, and each member of the family will have more apples, on whatever basis of division the family has adopted. But if the apple tree is stunted in its growth, or disease attacks it, or the frost in some years kills the crop, then the members of the family each have fewer apples.

Standardization is one way to increase the industrial crop of products. We cannot get more products for consumption, unless the world produces more products. If less effort were put to fighting about the division of a small crop of industrial products, and more were put to producing a larger crop, the world would certainly be better off; and each member of the world family would have more goods to consume. Standardization is one way of increasing the crop, and a very effective way, as has been shown wherever it was tried.

Putting Industrial Cripples Back to Work

By Dr. W. Gilman Thompson

Railroad men, both executives and trainmen, are viewing with increasing interest and approval the development of means for the rehabilitation of industrial casualties and treatment of industrial injuries so as to put the man back on his job again with the least possible loss to himself and his industry.

Industrial hazards naturally have been reduced materially by safety devices and compensation laws that make safeguarding of life and limb compulsory. But the volume of non-fatal accidents among employees of railroads is tremendous nevertheless, and will continue to be. Having done nearly all that intelligence can suggest to reduce accident frequency the condition still persists that when an injured man is discharged from a hospital with his wound healed or his fracture mended he is in many cases far from able to work again. In some cases he will never regain use of hand or foot or nervous control sufficient to go back to his trade.

This situation, so serious industrially as well as from the human side, is being met by the Reconstruction Hospital, 100th Street and Central Park West, New York City, in a way that is arousing national interest.

As an example of what industry has to gain from such a hospital and its complete equipment for physiotherapy, there is the case of an employee of the New York Central R.R. who fell and broke both bones in one of his legs. He was treated at a general hospital and the bones set properly. But after four and a half months' treatment he was still wearing the plaster cast, unable to put his foot to the ground. The bones had knit perfectly and there the usual hospital treatment ended. The man went to the Reconstruction Hospital and received a thorough diagnosis by the complete staff of specialists. It was discovered that the trouble was not in the broken bones but in the lost functions of the stiffened joints of ankle and knee. He was given treatment, electrical and massage, and on the re-educational machines in the gymnasium. In ten days he walked; in two weeks he left on foot with his smiling wife; inside of six weeks he was back at work.

An employee of the Ontario & Western R.R. is being treated. He got his hand caught in a machine and it was mangled badly. The general hospital sewed up the cuts, bound his hand and arm to his side and gave him treatment that cured his hand in eight months. They were then through. But the man was left with a crooked, distorted and useless hand, and from long disuse, an arm and shoulder incapable of movement and very painful. He has been receiving re-educational treatment at the Reconstruction Hospital for two months now. His shoulder is limber enough so that he can throw a ball, which in fact is one of his exercises. All but one finger on his hand are under his control again. Without the rehabilitation treatment with its massage, electrical treatment and mechanical exercises on machines peculiarly fitted for the purpose, he might never have regained the use of his hand and his shoulder would have grown worse instead of better.

This sort of treatment, an outgrowth of the reconstruction needs of the armies during the war, demands a special sort of hospital with electro-therapy and hydro-therapy equipment not possessed by many general hospitals, as well as a staff of surgeons and diagnosticians peculiarly fitted for their work. But in the spread of such hospitals lies a new hope for men engaged in hazardous industries and a new opportunity for the industries themselves to bring their trained and trusted employees back again after accidents.

The aim of the directors of the Reconstruction Hospital is to make it an institution upon which other similar hospitals all over the country can be modeled, and to give instruction to students and graduates in the modern science of industrial medicine and surgery as well as training nurses for service in industrial plants.



A Dual Reduction Rear Axle

Interesting Cutting-off, Drilling, Boring and Milling Methods on a Forged Axle—Fixtures Which Facilitate Easy Handling

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE making of the dual reduction axle for the Mack truck, involves some interesting machining operations, as will be seen from the following illustrations. These axles are made at the Allentown, Pa., plant of the International Motor Company, this being a new plant and one which is modern in every particular, both as to building and equipment.

The first operation is sawing the forgings to length

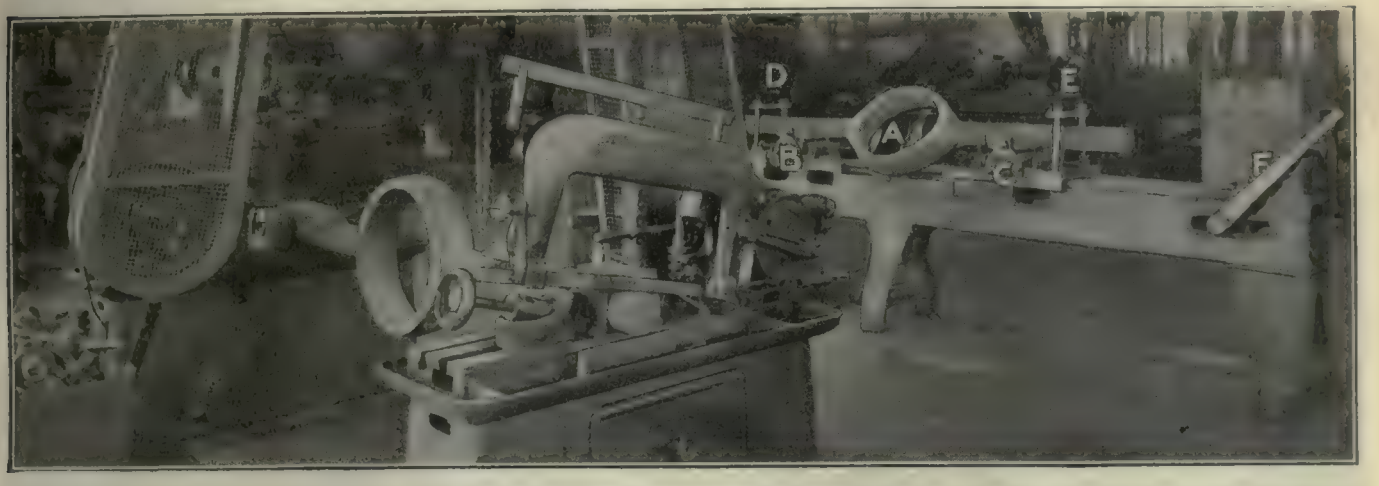
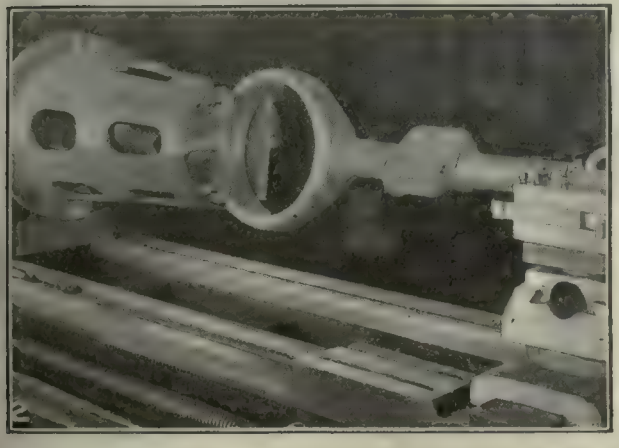


FIG. 1. CUTTING OFF AND CENTERING AXLES



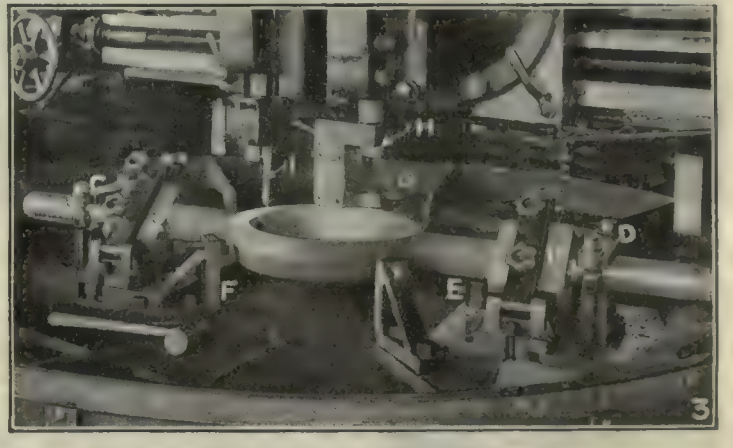


FIG. 2. ROUGH-TURNING THE ENDS. FIG. 3. ROUGH-BORING AND FACING THE BANJO

(70¾ in.) on the two Racine power hacksaws, shown in the foreground of Fig. 1. These hacksaws are located at the proper distance apart so that both ends of the axle can be sawed at the same time with a minimum of attention on the part of the operator. A "Little David" air hoist, mounted on a light overhead traveling crane which serves this and the following operation, makes it easy to handle the forgings from the floor to the cutting off machine and from here to the centering lathe shown in the rear. In both of these operations the axles are located by the spring pads which are forged integral with the axle itself and which are located at an angle with the center opening or banjo if we use the terminology adopted in the shop.

In locating the axle for centering, the banjo rests on the inclined bar *A*, while the spring pads are centered and held at *B* and *C*. The screws *D* and *E* prevent the axle shifting during the centering operation. Centering heads are provided at each end of the machine, these being belt driven and moved to the work by the handle *F*. This is a special machine and the holding fixtures have been so designed as to check the forging dimensions so as to insure cleaning up at all points.

The axles then go to lathes equipped with special chucks, as shown in Fig. 2, which rough-turn the ends to 3⅛ in. diameter, a tolerance of 0.002 in. being maintained on this operation. This turns the axle between centers and at the same time supports the banjo and utilizes it for driving the axle during the rough-turning.

The rough-boring and facing of the banjo follows, this being performed on a specially equipped Bullard boring mill as shown in Fig. 3. Here again, the axle



FIG. 4. DRILLING THE ENDS.



FIG. 5. HEAT-TREATING THE ENDS

is located by the spring pads which fit into the holding fixtures at *A* and *B*. These locate the pads at the proper angle while clamps *C* and *D* center and hold the axle so that the banjo will be bored and faced square with the two ends. Supporting jacks are provided under each end, one being shown at *E*, while the banjo itself is centered and supported on the outside by four angular clamps as at *F*.

The arrangement of the tools in the two heads can be plainly seen. The tool *G* takes a roughing cut through the hole and after it has reached the proper depth it is fed sideways along the rail so that tools *G* and *H* face both sides at the same time and the correct distance apart. The tool *I* takes a smoothing cut through the bore but the finishing is left to a future operation.

Next comes the boring of a 2⅛-in. hole for the driving axle, the forging being reversed and the holes drilled



FIG. 6. THE METHOD OF QUENCHING.



FIG. 7. STRAIGHTENING AFTER HEAT-TREATMENT

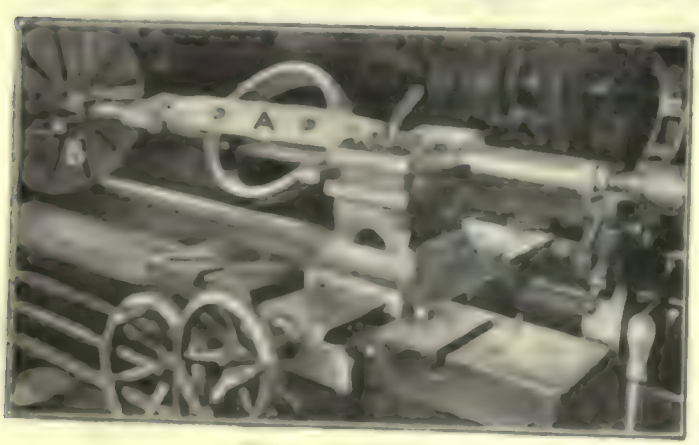


FIG. 8. FINISH-TURNING THE ENDS.

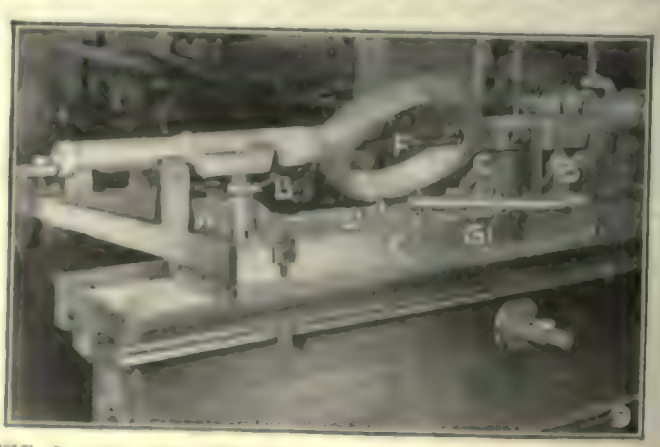


FIG. 9. MILLING THE SPRING PAD

from each end. This is done on a standard 22-in. Lodge & Shipley lathe which is specially equipped with the boring bar shown, and uses a heavy oil pressure to remove the chips. A type of gun drill is used which has proved very satisfactory. It will be noted that two cross-slide and crossfeed screws have been removed to make room for the head which carries the boring tool.

Heat-Treating the Axles

The axles then go to the heat-treating department where the ends are heated in the specially equipped furnace shown in Fig. 5. The special door allows the ends of five axles to be heated at once and eventually prevents the heating of the banjo. The axles are then quenched as shown in Fig. 6, this showing the convenient method of supporting them while being dipped by means of the yoke *A* and the removable pin *B*. The axle ends are then reheated and drawn to 270 Brinell harness. Then the axles are tested for straightness and if necessary, straightened in the 150-ton hydraulic press shown in Fig. 7. The form of the bed and the substantial supporting block require no further description.

The ends of the axles are then finish-turned as shown in Fig. 8. Supplementary centers are used and it will also be noted that a special supporting clamp *A* covers the banjo and reaches to the spring pad. The two sides of the clamps are held together by through bolts in the banjo hole. The setscrews at the end aid in stiffening the whole piece and effectually preventing its springing during the turning operation. The clamp for driving is shown at *B*.

Milling the Spring Pads

A special fixture is provided for milling the spring pads, as shown in Fig. 9, this operation being performed on a Pratt & Whitney duplex milling machine. The turned portions of the axle are supported at the ends, as at *A* and easily operated screw jacks *B* come up under the spring pad and take the downward thrust of the milling cutter. The pad is located endwise by the screw stop *C*. Stops *D* and *E* locate the angle of the banjo.

The method of handling these axles by the overhead air hoist is interesting, both from the viewpoint of convenience and facing. The lifter *E* with its projecting pins, can easily be slid into place and used in lifting the load, the pins effectually prevent any side slipping. The lifting bar can remain in the axle during the operation or can be removed at will. Another lifting bar is shown at *G* simply to show just exactly how it is made.

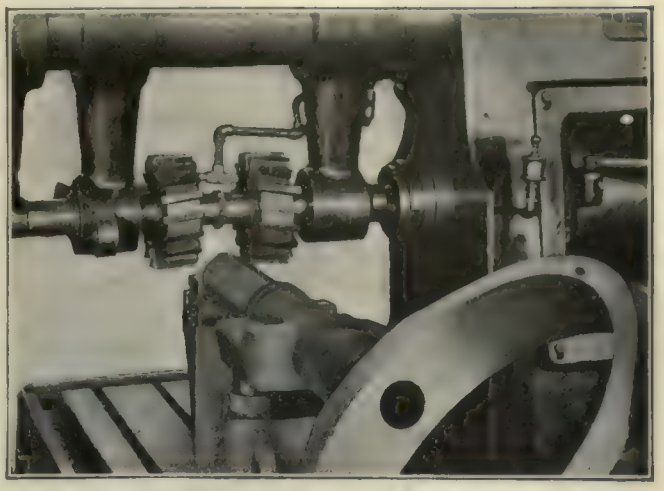


FIG. 10. MILLING THE KEYWAYS

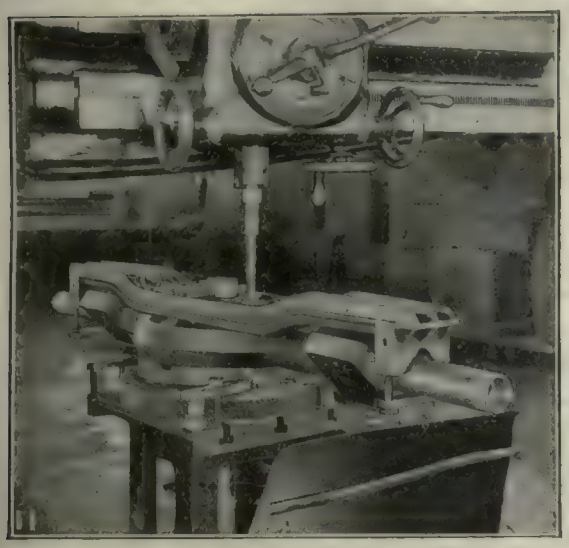


FIG. 11. DRILLING AND TAPPING BANJO HOLES.

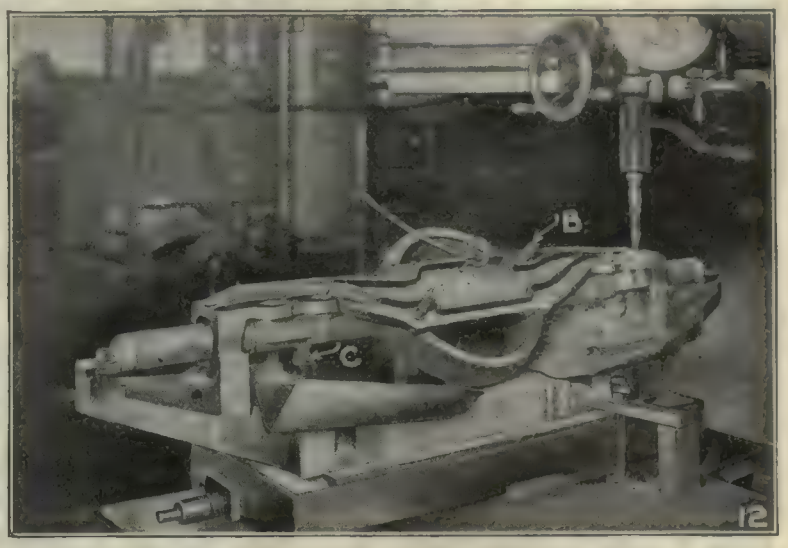


FIG. 12. DRILLING PADS FOR SPRING BOLTS

A similar fixture is also used on the No. 5 Cincinnati machine shown in Fig. 10, which is used in milling the keyways for the stop collar at the end of the axle. The large milling cutters can also be used in machining the spring pads as supplementing the other machine.

The four bolt holes are next drilled through the rim of the banjo by means of the portable fixtures shown in Fig. 11. This positions the holes lengthwise with reference to the axle shoulders and centers them by the axle ends themselves. Quick-acting clamps fasten the drilling fixture firmly in position, under the American radial drilling machine shown.

The last machining operation is shown in Fig. 12, where the spring bolt holes are being drilled through the spring pads. Here the holes are located from those previously drilled and tapped in the rim of the banjo, by the plugs *A* and *B*. Screw jacks support the spring pads so as to allow a heavy feed to be taken in the drilling operation. Then come the boring and final inspection, after which the axles are ready for assembly.

Strength and Proportion of Industrial Gears

Charts for Determining Strength of Industrial Gears—The Formulas and Symbols Used—Practical Examples

By G. E. KATZENMEYER
R. D. Nuttall Co

TO determine the proper size and to calculate the strength of gears, it is necessary to know one of the following:

(a) Horsepower of drive and r.p.m. of shafts or velocity and diameter of gears. (b) Kilowatts consumed and r.p.m. of shafts or velocity and diameter of gears. (c) Torque in shafts in inch lb. and r.p.m.

STRENGTH FACTOR—Y

Number of Teeth	P.D. 20° Involute Spur	Standard 20° Involute	Standard 14½° Involute
12	0.245	0.210	0.154
13	0.261	0.223	0.167
14	0.277	0.236	0.179
15	0.290	0.246	0.191
16	0.296	0.255	0.197
17	0.303	0.261	0.204
18	0.309	0.270	0.210
19	0.314	0.277	0.216
20	0.322	0.283	0.223
21	0.328	0.289	0.229
22	0.331	0.292	0.235
23	0.337	0.296	0.241
24	0.340	0.298	0.244
25	0.346	0.302	0.248
26	0.352	0.308	0.254
27	0.355	0.311	0.257
28	0.358	0.314	0.260
29	0.361	0.317	0.264
30	0.364	0.320	0.267
31-11	0.367	0.323	0.270
12	0.370	0.326	0.273
13	0.373	0.329	0.276
14	0.376	0.330	0.279
15	0.377	0.332	0.282
16	0.379	0.333	0.283
17	0.380	0.336	0.286
18	0.383	0.339	0.289
19	0.386	0.342	0.292
20	0.389	0.345	0.295

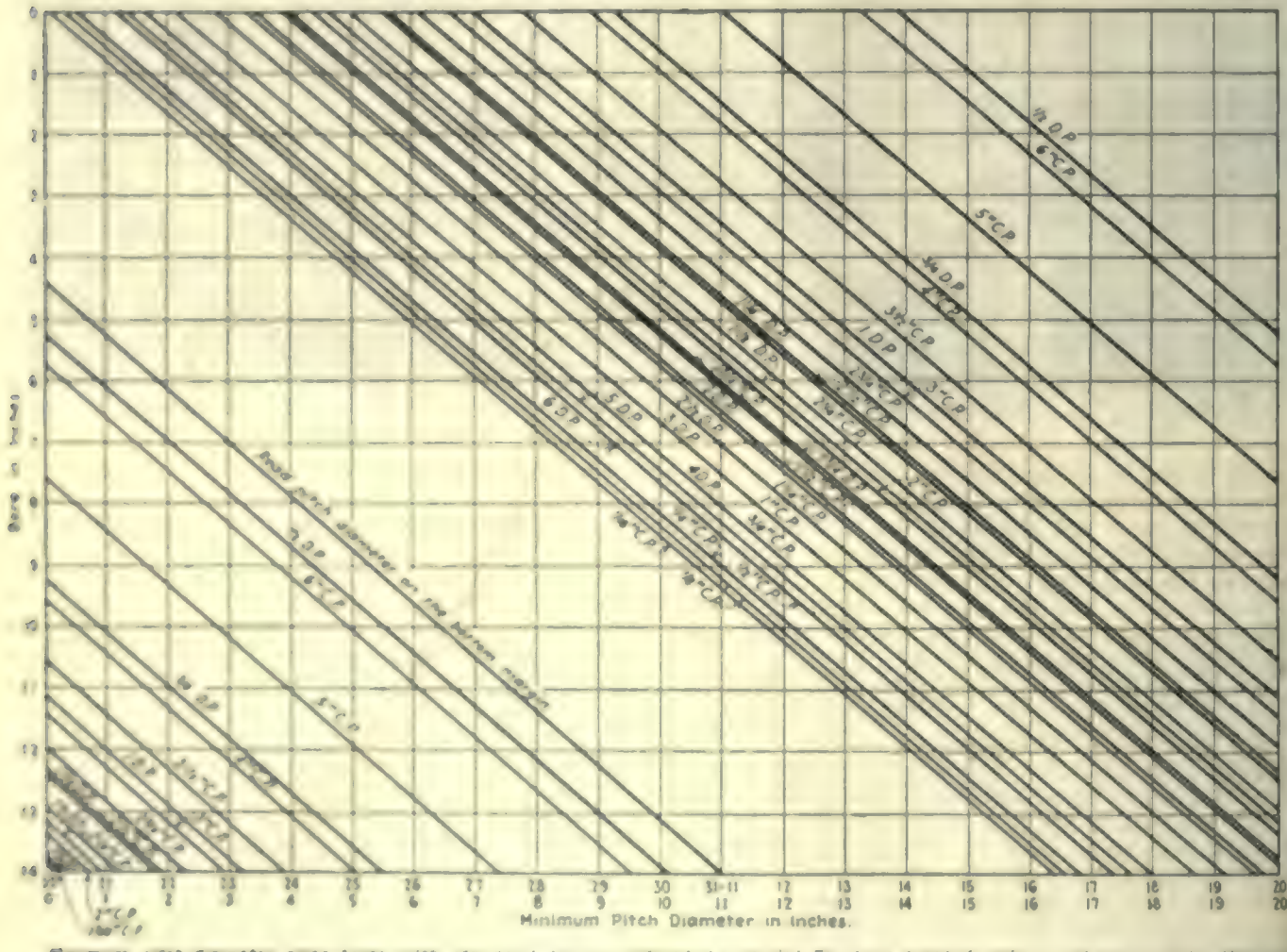
(d) Load or weight lifted, the diameter of drum, the velocity of the lift and r.p.m. of driving member (for hoists).

(e) Diameter of shaft and r.p.m.

In addition to one of the above the working condition and service should be taken into consideration.

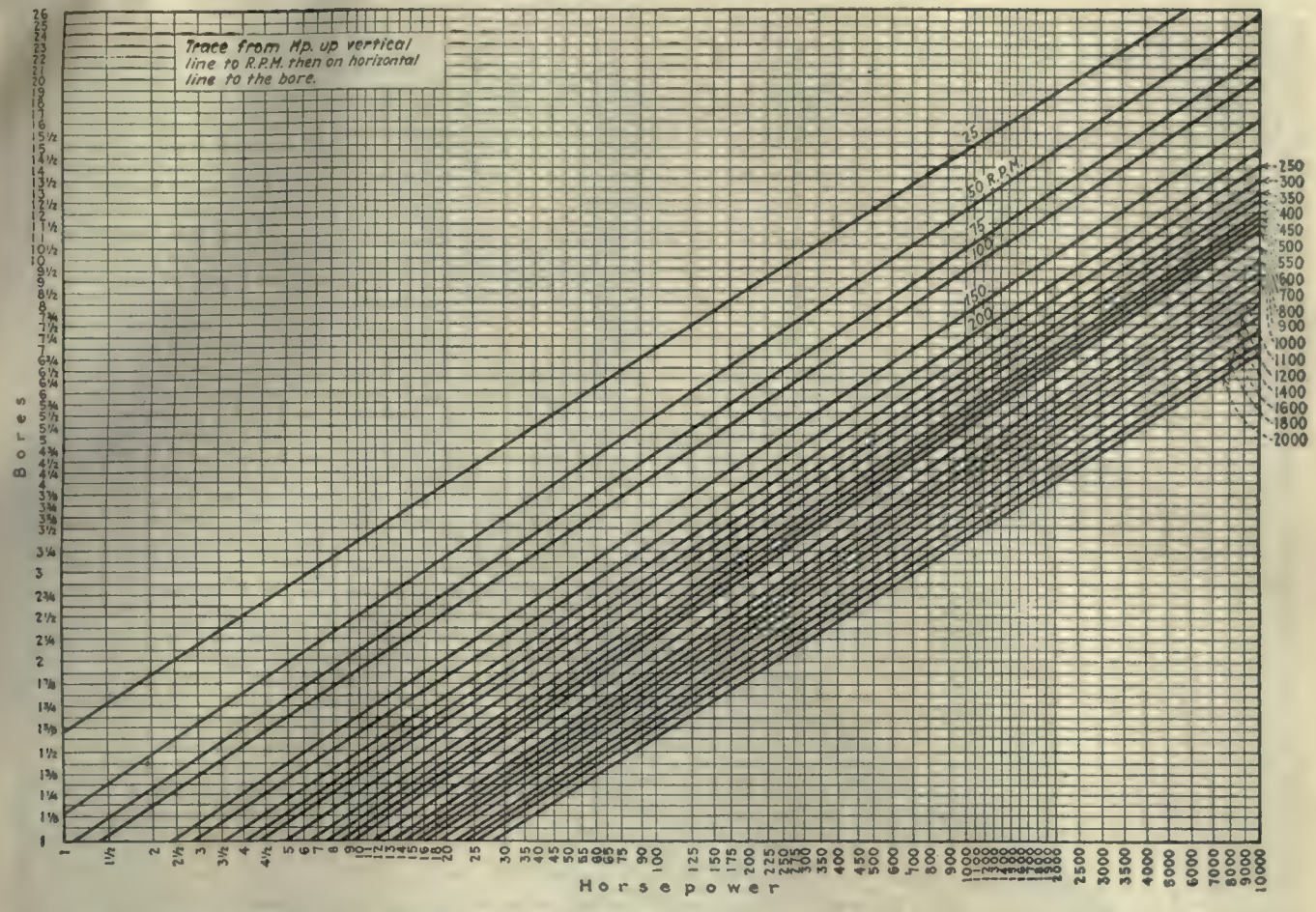
These symbols will be used in the equations which follow:

hp. = Horsepower.
W = Load at pitch line.
V = Velocity in feet per minute.
kw. = Kilowatts.
r.p.m. = Revolutions per minute.
Te = Traction effect at car wheel.
M = Miles per hour.
R = Ratio of gear to car wheel.
S = Working Stress of material from chart No. 4.



Minimum pitch diameter given bores with standard keyway, untreated material. For heat treated pinions and gears make the minimum thickness between root diameter and (bore $+\sqrt{\frac{W}{F_b}}$), keyway or counterbore equal to $\sqrt{\frac{W}{F_b}}$. From bore trace along horizontal line to pitch, then on vertical line to minimum pitch diameter.

TABLE (ABOVE). STRENGTH FACTORS FOR LEWIS FORMULA. FIG. 2 (BELOW). CHART FOR MINIMUM PITCH DIAMETERS



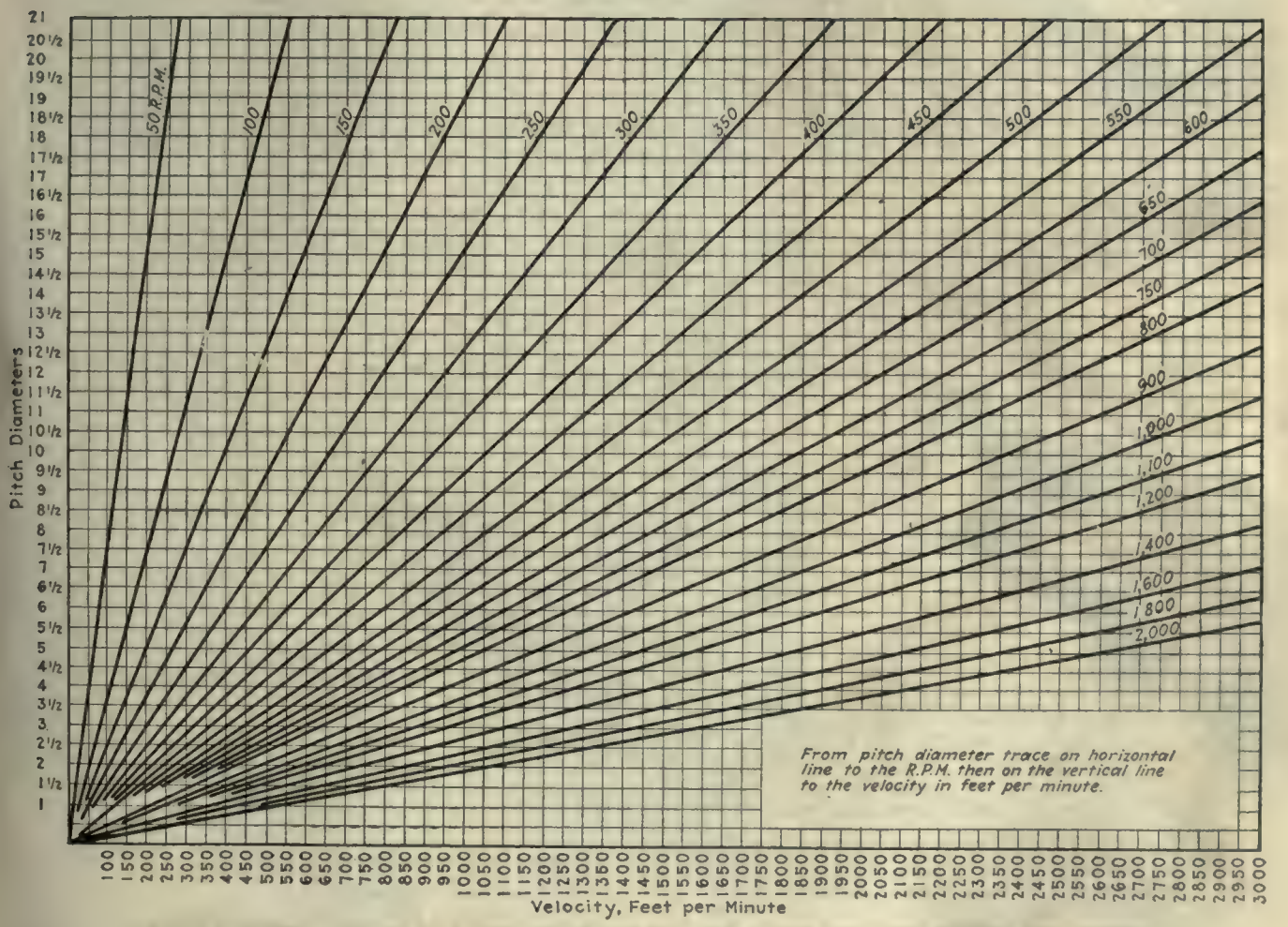


FIG. 1 (ABOVE). CHART FOR OBTAINING BORES. FIG. 3 (BELOW). CHART FOR VELOCITIES

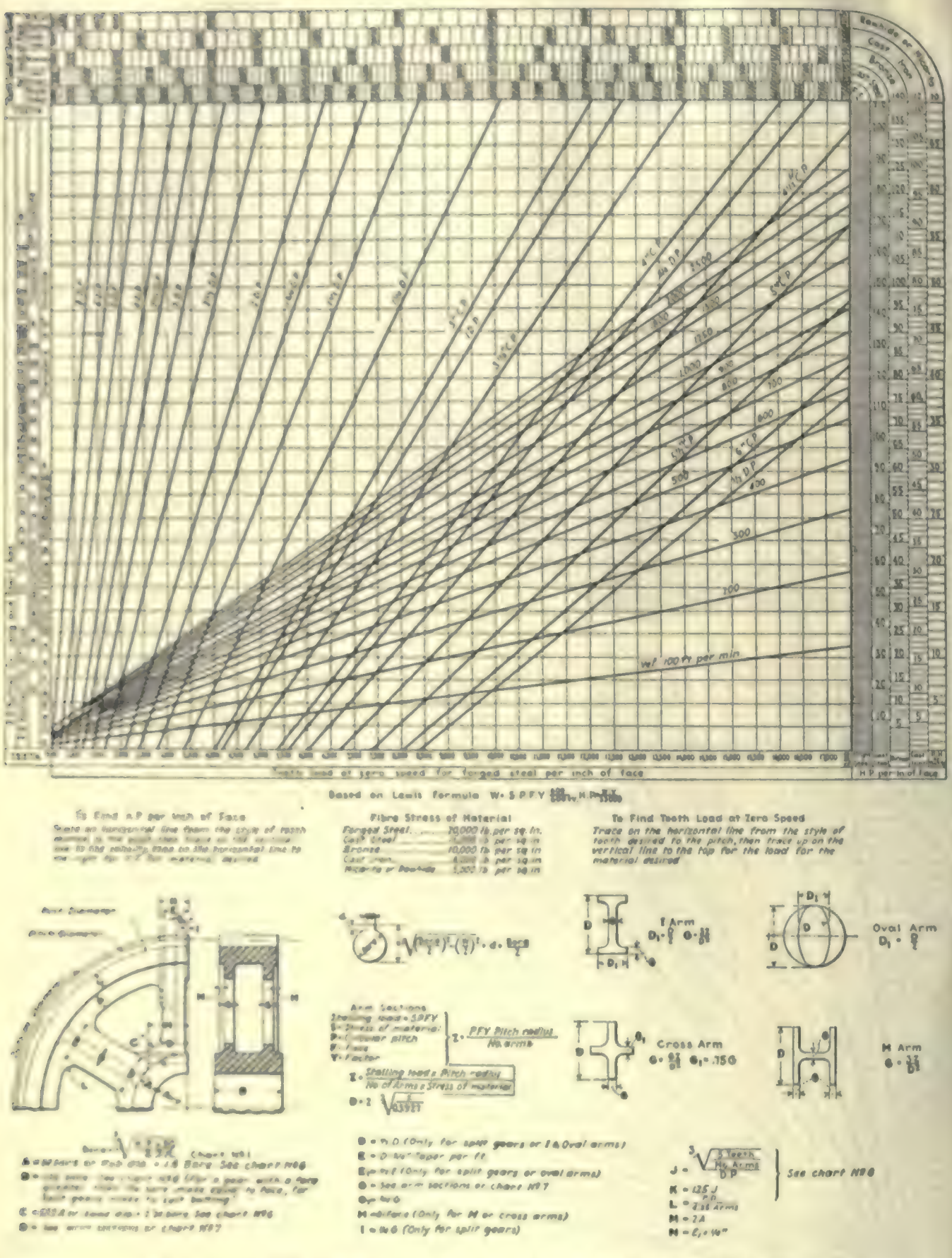


FIG. 1. CHART FOR DETERMINING HORSEPOWER AND STANDARD GEAR PARTS

P = Circular Pitch.
$D.P.$ = Diametral Pitch.
F = Face of gear.
Y = Tooth Factor from table No. 1.
$P.D.$ = Pitch Diameter.
T = Torque of Shaft in inch-pounds.

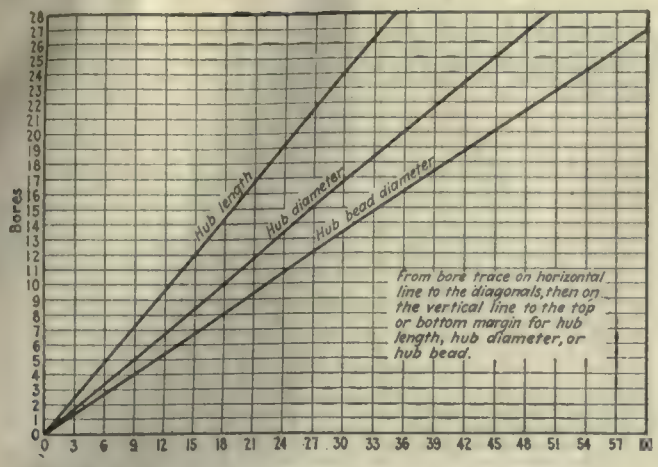


FIG. 5. HUB DIAMETER, LENGTH AND BEAD

D = Diameter of shaft or bore of gear.

$$hp. = \frac{WV}{33{,}000} = \frac{TeM}{0.375} = \frac{T \times r.p.m.}{63{,}025} =$$

$$0.746\ kw. = \frac{D^3 \times r.p.m.}{80}$$

$$T = \frac{63{,}025 \times hp.}{r.p.m.}$$

$$kw. = 1.34\ hp.$$

$$W = \frac{hp. \times 33{,}000}{V} = \frac{kw. \times 44{,}102}{V}$$

$$\frac{63{,}025 \times hp.}{r.p.m. \times PITCH\ Rad.} =$$

$$SPFY \left[\frac{600}{600 + V}\right]$$

$$Te = \frac{W}{R} =$$

$$\frac{Teeth\ in\ gear \times 24 \times Gear\ Efficiency \times Torque\ of\ Motor}{M \times dia.\ of\ car\ wheel}$$

$$V = P.D. \times 0.262 \times r.p.m.;$$

$$P.D. = \frac{V}{0.262\ r.p.m.};\ r.p.m. = \frac{V}{0.262\ P.D.}$$

$$D = \sqrt[3]{\frac{hp. \times 80}{r.p.m.}}$$

Face of Spurs = 3 to 4 times circular pitch.
Minimum face of Helicals = 4 times circular pitch.
Minimum face of Herringbone = 6 times circular pitch.

To reduce the work involved to calculate a set of gears use the charts in the following order:

To Find Horsepower of Pinion

Chart No. 1 for bore.
Chart No. 2 for minimum pitch diameter of pinion for a certain pitch.
Chart No. 3 for velocity.
Chart No. 4 for horsepower.

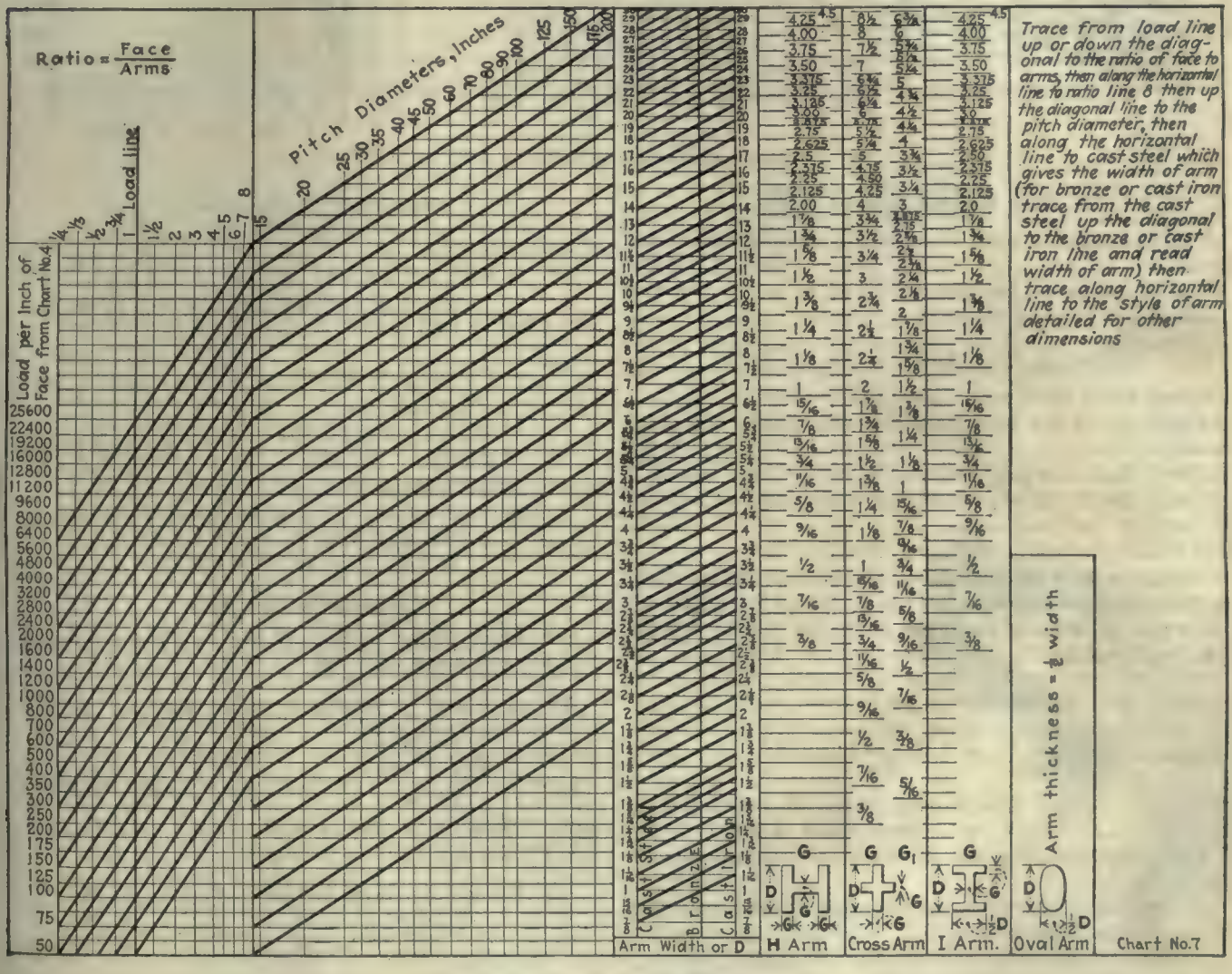


FIG. 6. CHART FOR ARM SECTIONS

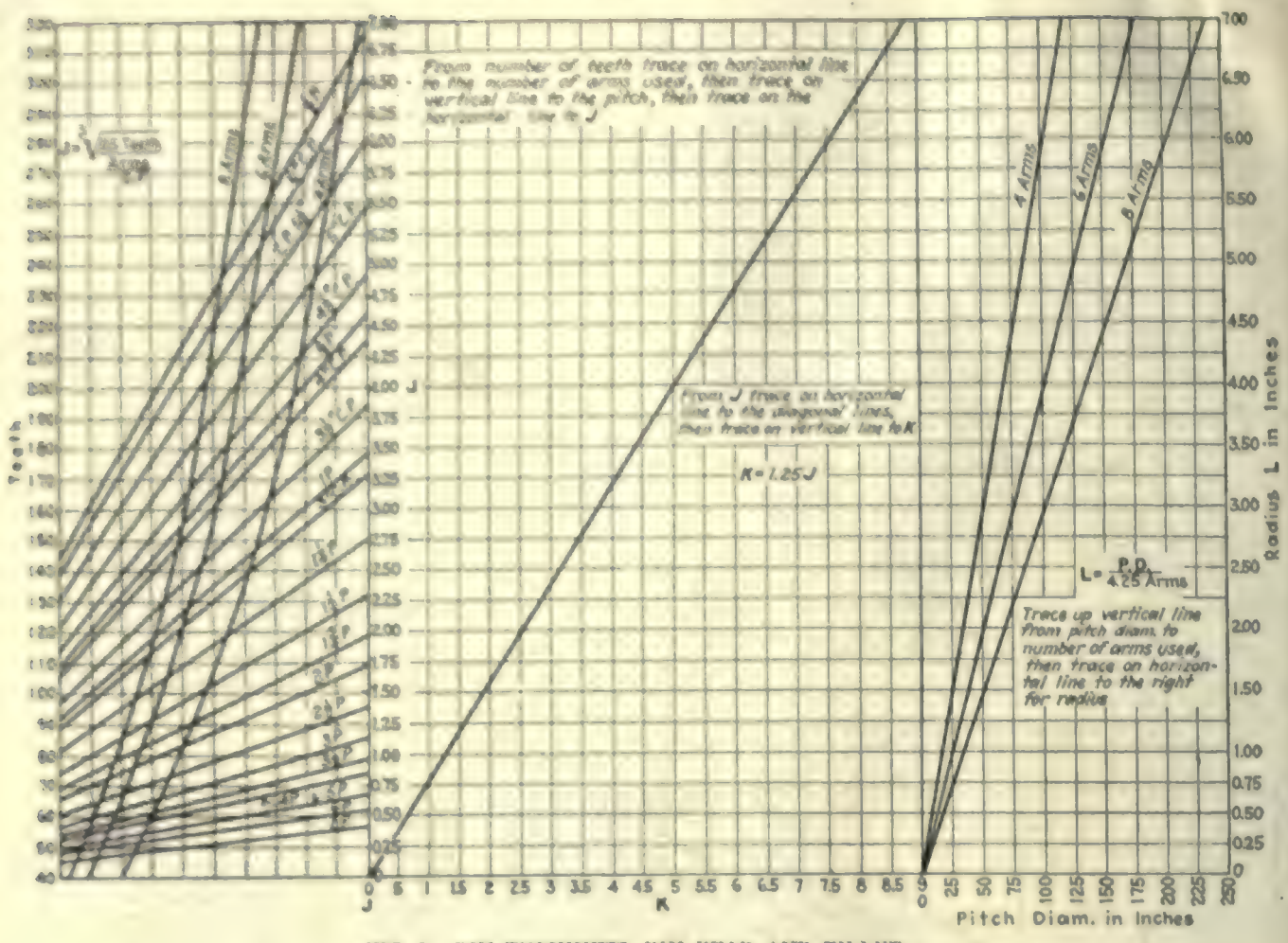


FIG. 7. RIM THICKNESS, RIM BEAD AND FILLET

To Find Horsepower of Gear

Teeth in gear = teeth in pinion × ratio of reduction desired.

Velocity same as for pinion.

Chart No. 4 for horsepower.

To Design Gear Refer to Chart No. 4

Chart No. 1 for bore.

Chart No. 5 for hub diameter, hub length and hub bead.

Chart No. 6 for arm section.

Chart No. 7 for rim thickness, rim bead and radius connecting bead and arm.

EXAMPLE:

Wanted a pair of spur gears to transmit 30 hp., the driving shaft to run at 1,000 r.p.m. and driven shaft at 100 r.p.m. Pinion to be forged steel and gear cast steel 14½ deg. involute.

Horsepower of Pinion

$$\text{Bore} = \sqrt[3]{\frac{h.p. \times 80}{r.p.m.}} = \sqrt[3]{\frac{30 \times 80}{1{,}000}} =$$

1.34 in. say 1½ in. or take reading from chart No. 1.

For approximate pitch diameter of pinion consult chart No. 2.

From 1½-in. bore trace to the 4-pitch line and read 2¾-in. pitch diameter.

3¼-in. pitch diameter × 4-pitch = 13 teeth.

$V = P.D. \times 0.262 \times r.p.m. = 3\frac{1}{4}$ in. × 0.262 × 1,000 = 851 ft. per minute.

or take reading from chart No. 3.

WF = load per inch of face $= SPY\left[\frac{600}{600 + V}\right]$;

$4\ D.P. = 0.7854$ in. P; Y for 13 teeth = 0.70.

$$WF = 20{,}000 \times 0.7854 \text{ in.} \times 0.070 \times \left[\frac{600}{600 + 851}\right] = 454 \text{ lb.}$$

$$hp. = \frac{WFV}{33{,}000} = \frac{454 \times 851}{33{,}000} = 11.7 \text{ hp. per inch of face}$$

or take reading from chart No. 4.

Face of spur = 3 or 4 times circular pitch.

0.7854 in. × 3½ in. = 2¾ in. face

11.7 hp. × 2¾ in. = 32.17 hp.

Horsepower of Gear

13 teeth in pinion × ratio 16 to 1 = 130 teeth in gear

Y for 130 teeth = 0.119.

$$WF = 15{,}000 \times 0.7854 \times 0.119 \left[\frac{600}{600 + 851}\right] = 579 \text{ lb.}$$

$$hp. = \frac{579 \times 851}{33{,}000} = 14.94 \text{ hp. per inch of face or}$$

take reading from chart No. 4

14.94 hp. × 2.75 in. = 41 hp.

Design of Gear, Refer to Chart No. 4

$$\text{Bore} = \sqrt[3]{\frac{30 \times 80}{100}} = 2.9, \text{ say 3 in., or take reading}$$

from chart No. 1.

Hub diameter = bore $\times$ 1.8 = 3 in. $\times$ 1.8 = 5.4 in., say 5⅜ in., or take reading from chart No. 5.

Hub length = bore $\times$ 1¼ = 3 $\times$ 1¼ in. = 3¾ in., or take reading from chart No. 5.

Hub bead diameter = bore $\times$ 2.24 = 3 $\times$ 2.24 in., = 6.72 in. say 6¾ in. or take reading from chart No. 5.

D = arm width; D_1 = arm thickness; $P.D. = \frac{130}{4} =$ 32.5 in.

$$Z = \frac{PFY \text{ pitch rad}}{\text{No. of arms}} = \frac{0.7854 \text{ in.} \times 2.75 \times 0.119 \times 16.25 \text{ in}}{6} = 0.695 \text{ in.}$$

$$D = 2\sqrt[3]{\frac{Z}{0.3927}} = 2\sqrt[3]{\frac{0.695 \text{ in.}}{0.3927}} =$$

$2\sqrt[3]{1.77} = 2 \times 1.21$ in. = 2.42 in. say 2½ in.

$D_1 = \frac{1}{2} D = 1\frac{1}{4}$ in., or consult chart No. 4 for load of 130 teeth, 4 P, 14½ involute and read, 1,700 lb. Then from chart No. 6 take reading of oval arm section of 2 ½ in. for D and $\frac{1}{2} D = 1\frac{1}{2}$ in. for D_1.

$E = D -$ ¾ in. per foot $\times$ length of arm from hub diameter to rim

$$= D - \left(\frac{\text{Rim dia.} - \text{Hub dia.} \times \frac{3}{4} \text{ in. per foot}}{2}\right)$$

$$= 2\tfrac{1}{2} \text{ in.} - \left(\frac{30\tfrac{7}{8} \text{ in.} - 5\tfrac{3}{8} \text{ in.} \times \frac{3}{4}}{2 \times 12}\right) =$$

2.50 — 0.80 = 1.70 in. or 1¾ in.

$$E_1 = \frac{1.75 \text{ in.}}{2} = \tfrac{7}{8} \text{ in.}$$

$$J = \frac{\sqrt[3]{\frac{0.5 \text{ teeth}}{\text{arms}}}}{D.P.} = \frac{\sqrt[3]{\frac{0.5 \times 130}{6}}}{4} = 0.55 \text{ in., or take reading from chart No. 7.}$$

$K = 1\frac{1}{4} J = 1\frac{1}{4} \times 0.55$ in. = 0.6875 in., or take reading from chart No. 7.

$$L = \frac{P.D.}{4\frac{1}{4} \text{ arms}} = \frac{32.5 \text{ in.}}{4\frac{1}{4} \times 6} = 1.27 \text{ in., say } 1\tfrac{1}{4} \text{ in., or take reading from chart No. 7.}$$

Elimination of Unnecessary Lines

The Fabricated Production Department of the Chamber of Commerce of the United States gives the following example of what can be accomplished in the elimination of unnecessary lines. A manufacturer of pipe and fittings tells the story of what was accomplished in his plant on standardization of product. His experience should prove of value to other branches of industry.

"The manner in which this problem of excess variety came to our attention was through the fact that, although we had large inventories in the aggregate, we also had huge shortages in many lines. Evidently, we had considerable dead stock on our hands. We were unable to give our customers the best service. We had large sums frozen in slowly moving merchandise inventories and were, consequently, losing profits.

"We catalogued some 17,000 different items of our own manufacture, but a most casual glance through our stores records indicated that there were hundreds, if not thousands, of these items in the slowly moving class. We decided, therefore, to determine which were the 500 fastest moving or most significant items. In order to do this, we tabulated by pieces and by weight our yearly sales, in terms of orders received at the factories, for a period of five years, and determined the yearly averages over this period. We found it expedient to expand our list so as to include 610 items.

"What did this simple analysis reveal? It showed us, much to our surprise that between 60 and 65 per cent of our tonnage output is represented by these 610 items. The answer was obvious. Thousands of the other items are, no doubt, very essential to the community, but there are also thousands of the other items for which standard material can be substituted. Our thought is to increase the size of our list of fast moving items, so as to embrace all items which we would stock. All other material would be considered as special and made on order only.

"By co-ordinating our production with the demand for these important items so as to always have them in stock, we hope to persuade the trade to take the standard material, and receive immediate delivery, rather than to wait for a somewhat modified pattern. The co-ordination of our sales and production is the extremely important consideration, as this will enable us always to supply our customers; it will allow us to maintain our inventories at the minimum, giving us a maximum turnover, and tying up a minimum of investment in merchandise."

Orders and Acknowledgments

By L. G. Stebbins

Nearly every purchasing agent has some method or system of insuring the prompt acknowledgment of orders. This is a very important part of the purchasing agent's work, as from a legal standpoint it is desirable, and in many cases necessary, to obtain a written acknowledgment of an order, so that evidence of a complete contract may exist if a suit at law becomes necessary. A simple system for handling this matter is described in the following paragraphs.

A carbon copy of each order is made out and kept on the desk of the purchasing agent, or his assistant. These copies are referred to daily, properly marked with the date acknowledgment is received and the carbon copy filed alphabetically to await receipt of the goods.

If no acknowledgment or invoice is received after a reasonable length of time, a short letter is written to the concern with which the order was placed, asking for an acknowledgment of the order. There should, however, be close co-operation between the various departments so that a letter will not be sent out asking for an acknowledgment when an invoice for the goods has already been received. Some large concerns have printed forms asking for acknowledgments; these are sent out with orders.

It is better to write an original letter asking for acknowledgment, when necessary, rather than to send out a printed form which is not likely to get prompt attention.

The acknowledgments as received are kept in a special desk file, and when the goods have been received and the transaction closed, the acknowledgments are destroyed.

Machine Tool Builders Hold Spring Meeting

Optimistic Gathering Devotes Itself Strictly to Business—New Constitution Adopted After Careful Consideration—Joint Standards Committee Gets Under Way

THE most noticeable feature of the semi-annual meeting of the National Machine Tool Builders Association was the general air of optimism and confidence in the future that was evident on all sides. Compared to the deep blue tinge of the previous meeting in New York and the gloom of a year ago the change was pronounced.

The convention was held at the Hotel Traymore in Atlantic City and was not so well attended as usual, which is not surprising in view of the depth of the depression through which the industry has been passing. No outside speakers were present and only one open session was held, on Tuesday morning, April 25, at which the reports of the officers were presented. In the afternoon an executive session went over the new constitution, as presented by O. B. Iles of the International Machine Tool Co., article by article, and adopted it almost without question.

Wednesday was devoted to meetings of the members of the different group committees and the convention broke up on Thursday.

Important Meeting on Standardization

Probably the most important action taken at the convention, aside from the adoption of the new constitution, was the standardization meeting. General Manager DuBrul and eight or ten of the members met with a committee of the American Society of Mechanical Engineers to formulate plans of organization for a joint committee on the standardization of machine tool elements to sponsor standards of this sort under the American Engineering Standards Committee. C. B. LePage, assistant Secretary of the A. S. M. E. in charge of standards work, was present and told of the methods of establishing standards under the direction of the A. E. S. C. The members of the committee present were H. E. Harris of the H. E. Harris Engineering Co. of Bridgeport, Conn., E. R. Norris of the Westinghouse Electric & Manufacturing Co., F. H. Colvin of AMERICAN MACHINIST and F. O. Hoagland of the Reed-Prentice Machine Tool Company.

It was finally decided to appoint a kind of steering committee to be composed of the five members from the A. S. M. E. representing engineers and users of machine tools, and five members of the National Machine Tool Builders Association to represent the producers, one for machines using revolving tools, one for machines where the work revolves, one for machines with reciprocating tools such as planers and shapers, one for grinding machines and one for presses and forging machines. The actual work of investigating and recommending standards will be done by subcommittees of the different groups of machine tool builders sitting with representatives of the users and engineers. Their findings will be cleared through the main committee.

It is a matter for congratulation that steps have finally been taken to start the work of standardization in the machine tool industry, so much needed for many years. Present plans call for consideration of very few elements at the beginning, dimensions of T-slots being the first on the list. The progress of the work will be closely followed by AMERICAN MACHINIST as a development which has long been advocated editorially.

High Spots in President Tuechter's Address

Some of the salient points in President A. H. Tuechter's address follow:

As I look back on the last eighteen months, it saddens me to think of what the machine tool business has gone through, and of the unnecessary, avoidable losses it has suffered. For, as I look about, I see other industries that are much better off because they were ready for the slump—good association work warned them of what was coming. How much loss our industry could have been saved if, before 1920, we had developed the constructive service, such as we have been developing by the last sixteen months' work!

The Bible tells us that "He who perseveres to the end shall be saved." Surely those lacking in perseverance are out of place in the machine tool business. From the high peak of war in 1917 or 1918, machine tool demand has dropped to the worst condition any of us have ever seen, and probably relatively the worst the industry has ever known. But are we down-hearted? No! Emphatically no! Serious, we are, of course; who wouldn't be serious in times like this, with orders dragging bottom for nearly two years past? The slow recovery of the world from its war debauch affords good reasons for us to take a serious view of life just now. But are we supine? Crushed? Far from it. Every well run shop in the industry has been overhauled; its equipment is put in tip-top shape, ready to go when the world gives the word. The drafting room of every well run shop is busy on improvements. When the world again needs new machine tools, we will be there with tools so good that the world will have to throw its old ones on the scrap heap. Preseverance and courage have always marked this industry in every depression, and they mark it now, as always before.

Value of Better Statistics

Many of us must make machines in advance of demand, and have them ready when the demand comes on us. Through lack of definite information on machine tool demand, some of us over-estimated our demand and thereby caused ourselves large losses. We had no lookout to warn us of the dead calm into which we were heading and in which we have been wallowing for months.

Some members now feel that the calm will be so dead for months or years to come that we don't need a lookout. All signs are now against that short-sighted attitude. Mr. DuBrul has pointed out that in times past, before we got orders, the world had to save up funds to buy machinery, and only after those funds were at hand, did our orders come on. Watching the situation as to available capital will enable us to forecast the right time and the wrong time to lay in the stocks we need. If our various groups will only help to make our statistics more complete, we need not repeat our old mistakes. Without them we will still have only rumors and hunches by which to guide ourselves. On the revival we might easily wait too long before starting up our idle shops. When demand again becomes strong enough to support us, we do not want to find our stockrooms bare, when we should have stocks on hand. We do not want to find ourselves trying to reorganize our forces after the labor market has been swept clean. A strong demand could easily creep upon us unawares, just as our overstocking came about, unless we have an observer who can read the business weather signs that indicate the return of demand.

If Europe settles down to work instead of waste, the endless wants of the world may create demand faster than we now think. We surely do not wish to be caught napping again, and we need not be, with a wide-awake lookout to give us warning that the wind is freshening off in the distance. This industry certainly needs someone whose duty it is to note the shadows that coming events may be

casting, unobserved by the busy executive who has many things to do. This industry needs the best service of this sort that it is possible to get, because we have so many complicated problems to solve, particularly in this excessive depression. I am convinced that we have just the sort of lookout we need.

The industry should not falter in the work it has started, and by which it can again put itself in a healthy condition.

Today we have progressed far, but much more remains to be done. Standardization and statistics are the two big things ahead of us. Statistical reports have been valuable to a few groups who have started them. They become more valuable as time goes on. We ought to make our statistical work cover every branch of the industry. That work repays active co-operation of the members in each group. As more groups join in, we can construct that reliable, trustworthy barometer that our manager has been so anxious to give us.

The wide variety in outlet, size and cost of the various machines made by our members, makes it possible for us to get a more reliable forecast than almost any other. Piecing our own information with that of other industries is the job that must go along with the betterment of our own statistics.

Demand for heavy machinery is preceded by abundance of long time investment funds, which is gaged by bond yields. Demand for light machinery is preceded by abundance of short time funds, gaged by commercial paper rates. Dr. Whaling, of Cincinnati, predicts the demand for iron and steel for some producers several months ahead with uncanny accuracy. We are learning how demand for our various types of machines tie in with iron and steel. If a few representative concerns will give our manager the figures on the past, as to orders and shipments, he can work out the past, and from that we can make better estimates on the future. Then, we will be able to tell better how to steer our businesses. Nothing but good can result from that sort of work. It is worth far more than the little trouble it takes to dig back into old records to work this out. Let us dig out our old mistakes and let our newer knowledge help us to avoid repeating them.

Importance of Standardization

Our industry has been backward in standardization, but we are now able to report definite progress. The American Engineering Standards Committee has invited us to accept joint sponsorship with the American Society of Mechanical Engineers on the project of standardization of small tools and machine tool elements.

The first project to be considered is T-slots. This element is common to all machine tools, but when gone into, is found to have some decidedly important features.

It must be confessed that the machine tool industry has no definite standards that have been duly accepted and promulgated as such.

Our customers are demanding standardization. Only recently, a builder of a certain type of machines was requested to make a certain minor change in his machine that only involved boring a hole to one dimension, rather than the dimension used by the builder. The user had over $5,000 worth of equipment which he was using on a machine of another make, which would have been useless unless the hole were bored to the proper dimensions on the machine he was then buying. Standardization of one hole saved $5,000 to that customer.

In England, the Machine Tool Builders Association has arrived at a standard for milling machine spindles, so that in the future, every milling machine build in England will be able to use the same face mills, arbors, etc., that are used on every other English milling machine. It is understood that the English standard is based on some American practice.

If men think that there is not much to standardize, let them think only of those two instances and they will surely recognize that we are lax in our attitude, if we do not actively engage in this sort of work. Not only will we be lax in our attitude, but we shall lose money by losing orders, unless we enter into it.

Report of General Manager DuBrul

The world has been going through the worst depression it has ever known. The machine tool industry, that in its very nature must have deeper depressions than other industries, has not been able to escape the general conditions.

An association, to be successful, must essentially be an information bureau. Valuable information about any industry can only be gathered from the members of the industry. Much of that information lies useless simply because it is scattered and not co-ordinated. Gathered together in one place and pieced together in a systematic, co-ordinated whole, each fragment of information becomes more valuable to the man who contributed it than it was by itself in his sole possession.

To gather and co-ordinate information requires two things: the first being the spirit of co-operation. Industries that have developed this spirit to the greatest extent have made the greatest progress as industries; and the individual firms who are the best co-operators eventually make the greatest individual progress in these progressive industries. The second requirement is money to support the co-operative work. Industries that spend money freely but judiciously on their associations get the most information per dollar spent.

Information Worthless If Not Used

But merely collecting this valuable information is not enough. The members must learn how to use it, and must use it, if they are to get their money's worth. No man's business stands alone. Every business is merely a part of the huge co-operative system by which the world's wants are supplied from day to day. Inside your plants you are successful because you organize co-operation of producing elements. You must have co-operation of your suppliers to get your materials at the right time and the right price. Your customers must have your co-operation to get your products. Whole industries co-operate with other industries, in the last analysis, and information exchanged between industries is wonderfully helpful. If the blast furnaces as a whole had information as to foundry activity as a whole, they could produce in advance of the actual orders for iron, and the consumers would not suffer the present swift movements of prices caused by shortage of supply, which is due to ignorance of the course of demand for foundry products. Instances of this kind can be multiplied without end. But the information must be used by the individual in his own business, or it will be a childish expense to gather it. An association is not only a means of gathering information, but is a means of spreading knowledge of how to use the information. It is the post-graduate school in the University of Hard Knocks. Those who look on it in that light gain benefits far more than proportional to their expenditure of dues. No other university can recruit a faculty of so many experts who are, as a body, able to throw light on such a variety of problems as any first-class trade association has among its members.

Business Conditions in the Industry

From the figures we have, it is safe to judge that since the month of July, the shipments and orders of machine tools have been gradually increasing. The increase is slow, but it is encouraging to note that there is an increase. It would probably be imprudent for machine tool builders to count on a very fast increase. Just now optimism is spreading through the country, and yet this optimism may be premature for the machine tool trade. There are many conditions operative in the business world that make a swift recovery extremely improbable, and only if it is slow will it be a sound recovery.

One encouraging thing is that more and more members of this association are giving serious study to the necessary cycles in which this industry is bound to run, and are basing their policies for the future on that study. Some of our members have learned the hard lesson that it costs too much to depend on blind guess work and mere hunch playing in laying out their business policies. Every week the office gets a number of letters asking very keen questions in connection with different cyclical phases of the machine tool business. These questions show that some of our members are giving serious study to the fundamental factors and conditions of business in general, as these affect the machine tool business.

The last two years have seen some remarkable changes in the business policy of large concerns. Banks, merchandising and manufacturing concerns have seen the wisdom of employing economists as a part of their organization. The modern development of trade associations is along the very same lines. Only if operated according to economic and statute law can any trade association survive.

As a result of this depression, the business world is getting to realize that statistics are not merely a lot of dry figures that have no interest to anyone but a delver in the past. More and more large business organizations and trade associations are spending money on statistical work that will be a guide to their future policies. The profession of consulting economist is growing in the estimation of business men. Just as they consult engineers on many questions, they now call for interpretation and correlation of economic

facts. More and more, as time goes on, will statistical compilations be taken by business men to consulting economists for individual, private interpretation.

Regional Meetings on Amortization

In the Revenue Law of 1921 there is a provision limiting the time during which amortization claims may be filed to March 15, 1922. Probably every member is entitled to some amortization deduction—many of the members overlooked this matter of relief from excessive taxation. Every dollar recovered will be a larger dollar than it was when paid. The dollars paid in were small dollars as measured by the amount of product sold at the high prices and large volume of 1918. The same dollar, if gotten back now, has a larger purchasing power, and it would take considerably more production, sold with more effort, at today's lower prices, with a smaller margin of profit, to get an equivalent purchasing power back into the manufacturer's cash account.

It was evident that we could render service to those members of our association who had utterly neglected amortization as a means of relief. To call it to their attention as well as we could, we not only sent out bulletins and prepared an article for AMERICAN MACHINIST, but also had a series of regional meetings to discuss this question. It was very encouraging to find that our campaign bore very rich fruit. At every one of these regional meetings there was someone who had been neglecting amortization, and who perhaps might have continued to neglect it, except for the association's campaign on that subject. The claims filed as a result of this campaign are claims for money which the law allows the machine builder to deduct, or to have refunded if he has paid it. Many members who have had only small amounts allowed could and should now revise their old claims and claim much larger amounts.

Many otherwise valid claims have been thrown out by the Amortization Section of the Income Tax Unit, merely because of improper presentation. When such claims have been properly revised they have frequently been allowed for much greater amounts than those that were originally rejected because of poor presentation.

The Amortization Section seems inclined to fix a basis below which they consider the price of machine tools abnormal, and they may attempt to settle amortization claims on this arbitrary basis. Your general manager contends that the proper price for the taxpayer to take, both as salvage and as value in use, is the price that a second-hand dealer will pay the taxpayer for the tools on which amortization is claimed. If surplus equipment is sold, a claim is settled on that sale price as a closed transaction, and there is no question of its fairness.

Now, it is an unchangeable principle of economic law that no commodity can have two prices at the same time in the same market; and in accordance with this law of single price, the same basis should be taken for valuing amortizable equipment that may be retained in use. It cannot have a greater value in use than it has on the market. Whether the Tax Unit will accept this point of view or not remains to be seen; but whether accepted or not, it is the only logical basis that can be taken, in justice and with common sense.

Washington Trade Association Conference

Secretary Hoover called a conference of trade association representatives, which was held on April 12. This conference was called to show the trade associations how the department can be of assistance to business, and to explain the sort of information that the department would like to gather, in co-operation with the associations. Your general manager attended this conference. It was a very large and representative gathering, comprised of between 500 and 600 associations' representatives. The conference took all day, and was opened with a very good talk by Secretary Hoover, who outlined the attitude of the department very clearly.

After the presentation of various views on the part of the government officials, trade association executives were called on by Secretary Hoover, who was presiding, to indicate the sort of co-operation that appeared to them to be desirable. Among those called on was your general manager.

It was evident that the minds of many of the executives present were relieved of the fear that may have haunted them that the Department of Commerce was going to try to impose anything on the associations. They were relieved to know that the conference was called in the spirit of co-operative helpfulness, and all were imbued with the desirability of co-operation in every way that would be possible.

It may well be said that one of the constructive results of this conference will be that many more statistics of different industries will be made available, and as a consequence, business men, statisticians and students of business will better be able to fit together many of the pieces of the Chinese puzzle they are confronted with in studying the business cycles, and in studying how one industry affects another, and how the demand comes on for some products before others—in other words, the whole interdependence of industry.

Cost Work

It was unfortunate, both for the members and for Scovell, Wellington & Co., our consulting accountants, that the industrial depression discouraged the cost work begun last year, and carried to the point of establishing a set of uniform principles, on which members are recommended to base their cost finding systems. It is very desirable that those who can possibly afford it, revamp their cost systems to put them in accord with these principles. This is the very best time to make changes in methods. If members wait until faced with a rush of business, they will be unable to do good revision work on cost systems. It is best done when the organization is able to give the question proper thought.

Now is precisely the time when members should be using the over-earned and un-earned burden accounts that were recommended in our cost plan. The man who divides his total expenditure for a month by the number of hours, or other divisor used to arrive at a burden rate, now gets such a ridiculously high figure that his good sense rebels. He simply casts it aside and gets no benefit out of the labor expended on it. Such a method has been described as giving merely an exercise in long division, but not giving costs. If, on the other hand, a concern has established a normal burden rate, its costs continue comparable during this sort of period. The difference between abnormal rate and the actual expenditure is taken into the unearned burden account.

As was pointed out in the cost conferences, the use of the un-earned and over-earned burden accounts enables the executive to determine the cost of necessary idleness, which must be recouped in his sales if his company is to prosper. True, the covering of these idleness costs can be done only when business is active. The standard or normal burden rate will show up higher than the actual month's expenditures during the period of activity, and will make a much saner basis of prices than the fictitiously low rate obtained by the long division method. It therefore affords a much saner basis for prices at all times, and permits executives to formulate their policies with knowledge.

Improvement of Our Own Statistics

As stated at the October meeting, it is perfectly possible for this association to construct a first-class business barometer for the industry. The sole requisite is that the members furnish the information.

To get a really worth while barometer, we should classify orders and shipments in groups covering all classes of machines according to their prices. The following classes were suggested:

(a)	$250 and less			
(b)	Over $250	up	to	$500.
(c)	" 500	"	"	1,000.
(d)	" 1,000	"	"	2,000.
(e)	" 2,000	"	"	4,000.
(f)	" 4,000.			

Such a tabulation of orders each month, covering all kinds of machines coming within those price classes, would give a valuable picture of the progress of demand for the whole industry. About 100 members faithfully contribute to our present barometer, but it is deceptive, because it is based on the high prices ruling in the first quarter of 1920. Price reductions since that time make it impossible to judge the unit movement now going on, compared with the first quarter of 1920. Then too, the present curve is merely an average of various percentages that have no common base. Large and small machines are all lumped together. It would be much more worth while to note the movement of the different price classes, and be able to tell what is really going on. It would take very little work in the offices of the members to classify orders and shipments according to the price classes mentioned.

It appears reasonably certain that in the past, demand for small machines has revived before demand for large ones; and that conversely, demand for large machines fell off before orders for smaller machines went off. If we could get these data from the membership and put them together, many a manager could be helped in laying his plans for future production. At present he can only guess—and that means being wrong most of the time.

Ideas from Practical Men

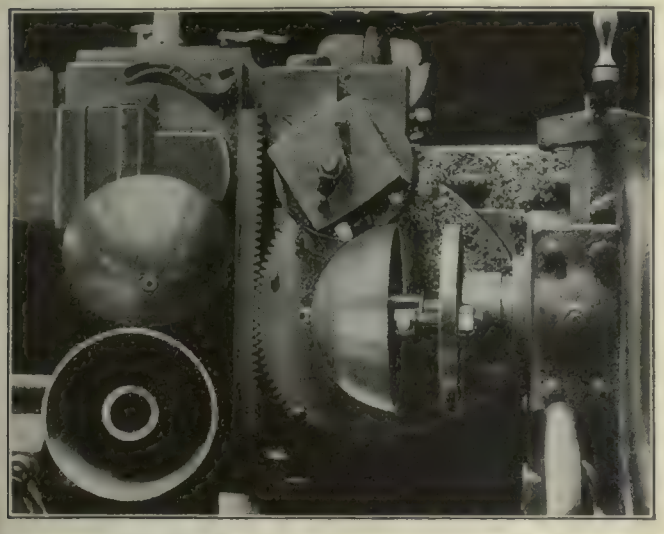
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Turning a Hemispherical Casting

BY S. J. MORGAN

The photograph reproduced herewith was made by securing the camera in a vertical position directly over the lathe and looking down upon the work. It shows a radius turning device used in finishing the hemispherical surfaces of the frictions of toolroom drill presses that are a part of our regular line of manufacture.

The hemisphere is of cast iron and is bored, reamed and faced in a screw machine. It is then mounted upon the arbor of a special holding and driving device in the lathe and turned in the manner shown. The base of the fixture is bolted to the wings of the lathe carriage and the turning movement is imparted to it by means of a rack, attached to the cross-slide, meshing with the teeth



DEVICE FOR TURNING A HEMISPHERE

cut in the periphery of the circular member. The feed is driven by the crossfeed of the lathe.

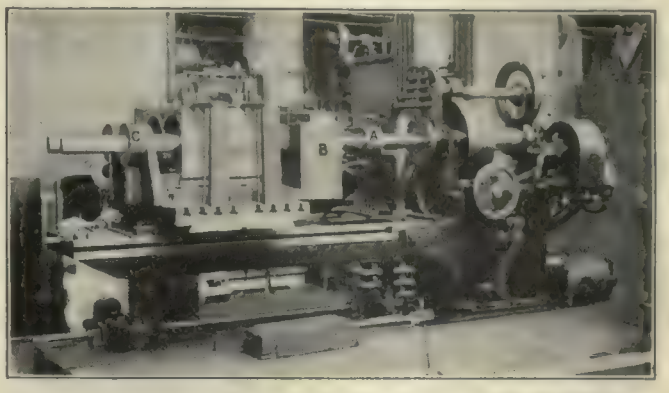
The operator polishes and balances each hemisphere before removing the casting from the arbor and the time for the complete operation averages 52 minutes.

Converting a Single-Spindle to a Double-Spindle Boring Machine

BY J. M. HENRY

At the plant of the Sullivan Machinery Co., Claremont, N. H. (manufacturer of mining machinery), there is an old model Niles boring machine that has been converted from a single- to a double-spindle machine by an ingenious arrangement. The machine is used for boring out twin-cylinder air compressors, one of which is shown in the illustration mounted on the table.

The regular spindle revolves and feeds in the usual



IMPROVISED TWO-SPINDLE BORING MACHINE

manner, but at *A* is shown the link which provides for mounting the two boring bars that actually do the work. This link is bronze bushed and collars on either side secured to and revolving with the bars, provide the means of feeding in and backing out.

The body of the fixture consists of a single casting, allowing for a locating surface for the work, a gear box *B* and supports for the two bars at *C*. The regular spindle extends through the link *A* and enters the gear box to provide the driving power. If the cover at the top were lifted off it would be seen that the gear box contains three spur gears, one for each spindle, splined to their respective shafts to take care of the endwise movements. The variations in speeds and feeds is controlled through the regular spindle movements.

Before this fixture was installed trouble was experienced with the single boring bar, as the pressure of the cutting tool had a tendency to break down the thin wall between the cylinders. With the two-spindle machine the cutters are so arranged that the pressure is equalized and no breakage is experienced.

Straightening Small Drill Rod

BY C. B. COE

Small wires, such as the smaller drill gage sizes of drill rod, sometimes becomes bent to such an extent that they may perhaps find their way to the scrap box. I have discovered a simple and effective way to straighten such wires, which has proved valuable to me, and it requires no special tools.

I grip one end of the wire in a drill chuck in the lathe and, with the lathe running at a fair rate of speed, rest the rod across the little finger and index finger of the right hand with the thumb pressing upon the wire between them. Starting at the chuck end, the hand is then passed slowly toward the outer end of the wire with the thumb exerting sufficient pressure upon the wire to bend it appreciably.

The rod may not be entirely straight after the first pass, but repeated trials will soon bring any but the most badly bent into shape.

Drill Press Converted to Automatic Nut Countersinking Machine

By Charles Kotersall

The device outlined in the accompanying drawings was attached to a 21-in. Barnes drill press, without elaborate alteration of the latter, for the purpose of countersinking automatically the under face of hexagon nuts of various sizes from ¾ up to 1¼ in. across the flats. The object of the device is to eliminate the necessity for the countersinking operation on the automatic screw machine and thus enable the latter to turn out four nuts per cycle instead of one.

The device is shown in projection in the three views; Figs. 1, 2 and 3 being respectively plan, front and side elevations. Like letters, so far as they appear, represent like parts in all views.

The baseplate of the device is bolted to the table of the drill press in such a position that the intersection of the two center lines *AA* and *BB* coincide with the vertical axis of the drill press spindle. Guides *CC* form

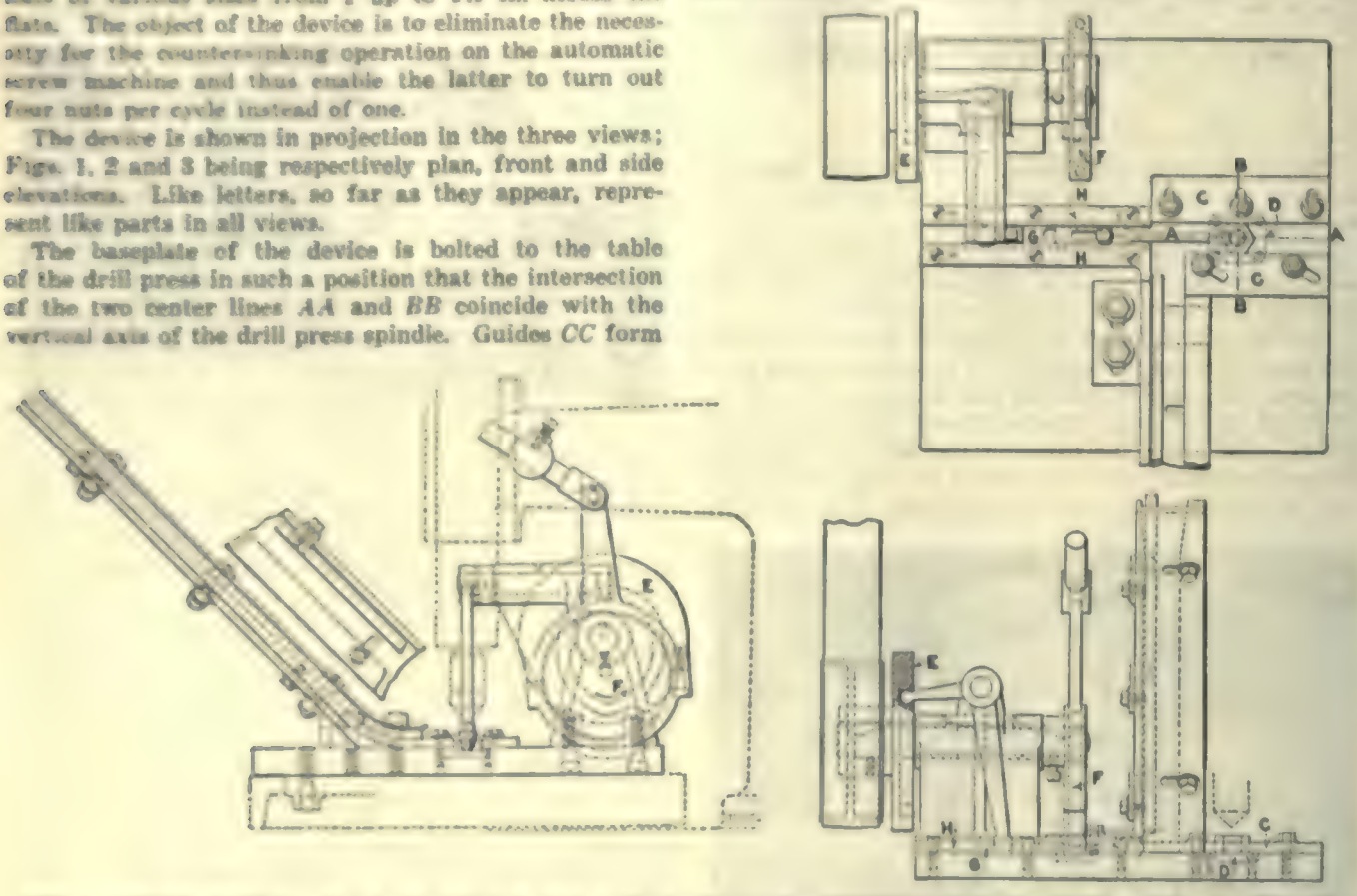


FIG. 1 (ABOVE, RIGHT). PLAN OF DEVICE FOR AUTOMATICALLY COUNTERSINKING NUTS. FIG. 2 (BELOW, RIGHT). FRONT ELEVATION OF DEVICE. FIG. 3 (LEFT). SIDE ELEVATION OF DEVICE

a track in which the nuts may travel and are adjustable to and from each other to accommodate the different sizes of nuts within the range noted. The guides also prevent turning of the nuts under the countersink.

A hardened steel plate *D* is let into the cast-iron base at the intersection of the center lines to keep the nuts from wearing the cast iron rapidly at the place where the work is done.

A nut-chute, shown to better advantage in Figs. 2 and 3, was taken from an Acme six-spindle nut-tapping machine and fastened to the base of this device with capscrews in such a manner that it is readily adjustable to accommodate the different sizes of nuts.

At the rear of the fixture is a bracket carrying a short horizontal shaft to which is keyed a driving pulley, the face cam *E* and the eccentric *F*. A lever having a ball end is operated by the face cam and imparts a rocking motion to a transverse shaft, to the other end of which is pinned an arm that moves the slide *G* between the guides *H*. The slide *G* at each forward movement pushes a nut before it to the countersinking position and upon each withdrawal another nut enters the runway from the chute. The slide *G* is also made adjustable to suit the nuts.

The eccentric *F* through its connections operates the pinion lever of the drill press and thus imparts a vertical reciprocating movement to the spindle. The face cam *E* and the eccentric *F* are so timed with relation to each other that the countersink is at the bottom of its stroke at the same time that the feed slide is withdrawn to allow another nut to enter the runway. As the countersink always stops at the same height on each stroke, the adjustment for depth of cut as well as for different thicknesses of nut is accomplished by raising or lowering the table of the drill press.

The feed from the chute is by gravity only and all the operator is called upon to do is to keep the chute full. A nut therefore passes into the transverse runway by reason of the pressure of the work from above, every time the feed slide is withdrawn.

Use Paper Between Faceplate and Work

By Ernest E. Zeller

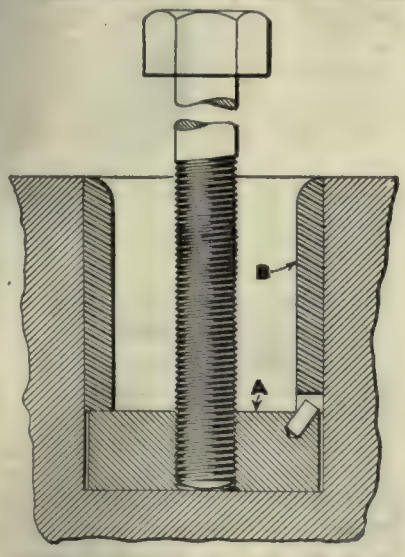
There is one thing that I think every machinist should be reminded of once in so often. It is to put a piece of paper between the faceplate and the piece to be clamped against it, and to use wooden blocks to support the clamps. Almost all machinists know that paper should be used in the manner described, but why do they not practice it? Apparently they think that they do not have time to do so, until someone gets his work, blocks and clamps all tangled up with his ears. That as a rule helps for a week or two and then it is forgotten. More work is spoiled and more accidents happen through this negligence than through any other cause.

Removing a Bushing from a Blind Hole

By W. H. Storey

On page 978, Vol. 55, of American Machinist, Charles Reimschissel describes a method of bushing a blind hole so that the bush can be readily extracted for replacement purposes.

A firm for which I worked many years ago used this method, but it caused considerable trouble because the screwed nut or bush at the bottom used to rotate with the stud and so become ineffective. Also, considerable time was wasted in searching for the large washer and the large bush necessary to use this device.



THE BUSHING AND THE KEYED NUT

I therefore adopted the idea shown in the illustration. It will be observed that a small pin is driven into the nut *A* which fits in a groove ground into the bush *B* and so prevents the former from rotating when the screw is turned.

To extract this bush no equipment is necessary other than a standard ½-in. bolt.

Wood Plugs in Pulley Bushings

By J. A. Raught

Regarding the use of wood as a bearing material, several times mentioned in recent numbers of American Machinist, I will give a few instances from my own experience.

In the planetary transmission of the Knox automobile built in 1904, there were wooden keystone-shaped plugs in the friction plates, and as I used this car myself, I know they gave satisfaction, although some one who had previously owned this car had removed several of the plugs, evidently to reduce friction.

The tumbling rod bearings on the old-time horse-power-driven threshing machine were wooden blocks, pinned to the ground with iron stakes; also the last joint of the tumbling rod which went from the separator to the ground was made of wood.

The step bearings of vertical waterwheels were made of wood. I know of one case where such a wheel was dismantled after 40 years of service and the lignum-vitae step bearing was found to be in good shape. Although thoroughly oil soaked it whittled more like soft brick than like wood.

The teeth in the bevel gears of waterwheels were, and I think are still, made of hard maple and are easily replaced. I think the reason for the wood teeth is to eliminate noise. The shaft bearings on some of the older waterpower plants were also made of wood. Some of those old plants are in existence today.

My father had a large weight-driven clock of Seth Thomas make, all gears of which were made of wood. The only metal part in the movement was the escapement.

The old-time farm wagon, although made nearly the same as it is today, was minus the cast-iron skein. The axles were wood (burr oak, I think) the ends of which served as bearings.

Although I am not an advocate of wooden bearings for all purposes, I think there are many places where they may be used to better advantage than metal.

Match Plate Pattern for Small Castings

By E. F. Oakford

After reading E. A. Dixie's article on the above subject on page 809, Vol. 55, of American Machinist, and tabulating the numerous operations described I brought the article to the notice of the foundry committee, which meets daily to discuss matters of interest regarding foundry work in the plant in which I am employed. The consensus of opinion was that a good deal of the work described by Mr. Dixie was unnecessary, and that a much simpler method of making the match plate could have been adopted.

Some time ago the writer contracted to supply four thousand iron castings somewhat similar to those described by Mr. Dixie—and owing to extreme urgency, delivery was promised in one week. One hardwood pattern with a short print at one end to support the center core as shown in the shaded portion in Fig. 1 was sent with the order.

The job was started at once, one patternmaker drilled the holes, 1 to 24, in the match board Fig. 2, while another turned up twenty-four solid patterns from a length of square sectioned hardwood, in a hollow spindle pattern-shop lathe. Allowance for draft was provided and the shanks of the patterns were increased in length equal to the thickness of the matchboard, as shown in Fig. 3. The twenty-four holes in the matchboard were drilled to the diameter of the pattern shanks. As soon as the plate was drilled the patterns were inserted in their respective holes, as in Fig. 3, fixed in position and the necessary gates shown in dotted lines in Fig. 1, fastened in place. A small hole for the runner stick was drilled at point 25. Two coats of varnish were applied, and the completed match plate was ready for use.

Owing to the free venting nature of our sand, it was not necessary to provide risers from any of the castings for such small work.

Twenty-four castings were made per flask and an output of between 50 and 60 flasks per day was secured, so that practically all the castings were delivered within the scheduled time.

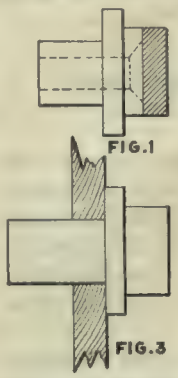

FIG. 1

FIG. 3

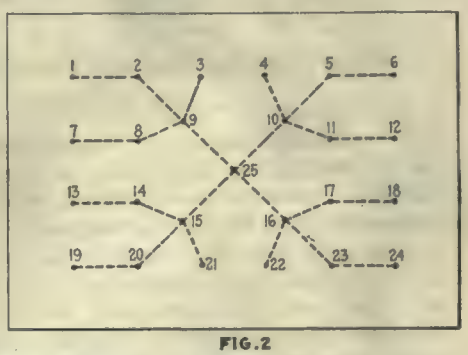


FIG. 2

FIG. 1. PATTERN SENT WITH THE ORDER. FIG. 2. PLAN OF THE MATCH PLATE. FIG. 3. SECTION OF MATCH PLATE WITH PATTERN IN PLACE

A Shop Man's Method of Figuring Change Gears—Discussion

By W. G. Andrews

On page 78 of American Machinist, under the above title, J. Cronnell gives a method of figuring change gears which is very good as far as it goes, but I think the hardest part has been left out (that is the hardest part for most men I have met), that of figuring compound gearing where finer or coarser threads are to be cut.

I will submit a method I use which is simplicity in itself.

As the pitch of the lead screw is to the pitch of the screw to be cut, so is the number of teeth in the wheel on the mandrel to the number of teeth in the wheel on the lead screw.

To calculate compound gearing proceed as follows:

Lead screw, 4. Thread to be cut, 40. Proportion, $\frac{4}{40}$. Factoring we have $\frac{4}{40} = \frac{2 \times 2}{5 \times 8}$. Multiplying by ten we get $\frac{20 \times 20, \text{ driving gears}}{50 \times 80, \text{ driven gears}}$. These wheels are always mounted as follows:

Driving wheel on mandrel × Driving wheel on stud
Driven wheel on stud × Driven wheel on lead screw

Another example:

Lead screw, 2. Thread to be cut, 25. Factoring we have, $\frac{2}{25} = \frac{2 \times 1}{5 \times 5}$

As it is only necessary to multiply each pair of factors by the same number, we will multiply the first pair by 10 and the second pair by 20. Result $\frac{20 \times 20}{50 \times 100}$.

If any doubt exists as to the correctness of the calculation, the result may be easily tested as follows: Multiply the number of teeth in the driving wheels together, place these in fractional form and reduce to lowest terms. The figures obtained should be the ratio of the lead screw to the screw to be cut as expressed in lowest terms.

The proportions in the first example are 4 40 and the gears found were $\frac{20 \times 20}{50 \times 80} = \frac{\text{driving gears}}{\text{driven gears}} = \frac{400}{4,000}$.

By cancellation we have $\frac{400}{4,000} = 4\ 40$, the original ratio of the pitch of the lead screw and the thread to be cut.

This method of figuring gears proved valuable to me many times and it is very easy to remember.

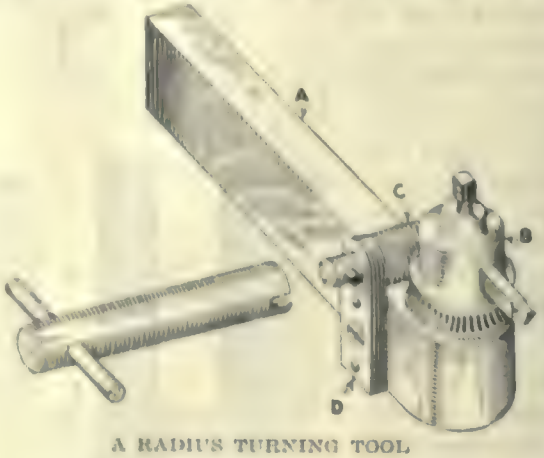
Home-made Radius Turning Tool

By K. A. Munson

The radius tool shown in the accompany sketch was made up for turning large fillets of 1 and 1¼ in. radius on a lot of valves to be machined from brass castings. As the shape had to be fairly accurate and the castings were not stiff enough to permit the use of a flat form tool, this radius tool, which took only a few hours to make, was used with very good results.

The toolholder support *A* was shaped down to standard ¾ x 1 in. tool size to fit toolpost in lathe. A head was left on one end of this toolholder support in which was bored a hole to receive the shank of the swinging toolholder *B*. The toolholder was made a nice turning fit in the support and secured by means of a washer and nut on the under side. A hole was broached in the toolholder to receive a ⅜ in. square toolbit, and a setscrew provided for clamping it.

The toolholder *B* was turned up similar to a small worm wheel blank, as shown, and the teeth in it were



A RADIUS TURNING TOOL

cut by assembling the toolholder and support and clamping them at the proper height in the toolpost. A ½-in.-13 U. S. S. tap was dogged between centers in the lathe, and by feeding in the toolholder slowly and using the tap as a hob, the teeth were very quickly cut without the necessity of gashing.

The worm *C* was a ½ in.-13 stud turned down at both ends for the side plates *D*. Both worm and toolholder were cyanided to give as much life to the teeth as possible

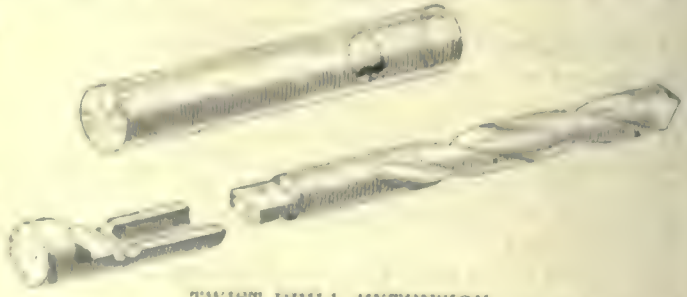
Extension for Small Twist Drills

By F. R. McCurdy

A quickly and easily made extension for small twist drills is shown in the cut herewith.

Take a pice of cold-rolled rod somewhat larger in diameter than the drill it is desired to extend and, at a safe distance from the end, drill a crosshole smaller in diameter than the drill. Plug this hole and then drill a second hole to cut into the first one as shown.

Now knock out the remains of the plug and, with the drill it is desired to extend, drill a hole into the end of the rod as far as the crossholes. Next file flats upon the end of the drill shank to match the diameter of the



TWIST DRILL EXTENSION

crossholes, and drive the drill into the end of the rod so that the flatted end enters the slot made by the two crossholes.

The writer has drills and taps extended in this way that have been in service for ten years.

Editorial

Are We Downhearted?

THE beginning of President A. H. Tuechter's address to the Machine Tool Builders at Atlantic City has in it this question, "Are we downhearted?" He answered it with an emphatic no and his sentiments were those of the great majority of members present. And with good reason.

Some saw the new radio industry absorbing all their stocks of certain models and crying for more, most of them had taken on men, all of them had more inquiries and generally better business in April than in many months. One manufacturer was heard to say that if the remaining months of the year were as good as April he would have nothing left to ask for.

The report of the association's general manager told of a slow improvement in business trend since July, 1921. A warning not to expect anything startling in the way of rapid recovery was also included but the substantial nature of what is going on is further indicated by the fact that the figures, being on a dollar basis, do not reflect the real improvement. Not only is the dollar of 1922 more valuable in purchasing power than that of a year ago but machine tool prices are considerably lower and consequently there would be a much more evident increase in shipments if tons or number of machines were the units used.

Sentiment is a big factor in the business world and has much to do with the fluctuations which make up the business cycle. When it is optimistic and has the backing of the cold figures of the economic statistician to back it up, we may well take heart. The year 1922 may not prove to be a very profitable one for machine tool men but it is starting out with a promise far beyond expectations.

Machine Tool Standardization

A STEP that means much to the men who use machine tools was taken at the spring convention of the National Machine Tool Builders Association. By invitation of the American Engineering Standards Committee the association becomes joint sponsor with the American Society of Mechanical Engineers for standards for machine tool elements.

As told in the report of the meeting on another page the A. S. M. E. committee has been appointed and an organization meeting with machine tool men has taken place. Perhaps too much emphasis should not be placed on the preliminary steps in the attempt to secure machine tool standardization. Other committees have been appointed and have accomplished little.

We must confess, however, to a feeling of confidence that something will be accomplished by the new committee. The user is becoming wide awake to the meeting of standardization in dollars and cents and his voice is being listened to with flattering attention by the manufacturer at the present time. According to the present arrangement he is to have a voice in this standardization movement through the A. S. M. E. representation on the committee. When the work gets down to brass tacks he will have a further chance to say what he thinks should be done and he will have only himself to blame if the standards that are finally adopted do not meet his requirements.

Standardization has also a direct money-saving appeal to the manufacturer. Simplification of product and elimination of unnecessary sizes can accomplish wonders in the machinery industry as they have in other industries. Personal preferences in minor matters may have to go by the board for the general good but even though such action hurts at first, it is soon forgotten. Does anyone look back with much envy to the days when there were no screw thread standards?

A Question of Prices

ONCE in a while we find a buyer of machine tools who appreciates their value and also the question of price. One such buyer made ice cream freezers for hotels. He had bought a boring machine and as the maker happened to be in town shortly afterward he dropped in to see how things were going.

"Fine machine you sold me," said the buyer. "Does my work well—does it quickly, does it accurately. But if you'll pardon my apparent rudeness I'll say you were a d—— fool to sell it to me for two thousand dollars.

"That machine will bore more ice cream freezers than I can ever sell. I'll never have to buy another. You've made your only profit on me and I'm making mine on you every day. My ice cream freezer isn't half so much of a machine as yours. Its rough and crude in comparison. Yet I get as much money for it as you asked me for your high-grade, accurate machine. My machine lasts for years also, so I charge a high price for it as the user gets his profit out of it for years and years. You ought to do the same."

Opportunities for New Machine Operations

A RECENT incident may point out a lesson with great possibilities. A machine builder and a "five and ten" merchant were recently traveling together, and the subject of bent-end curtain rods came up. It developed that, in spite of being sold in the ten-cent stores, the rods were all bent by hand.

The machine builder got buzy and designed a machine for the job. Then he got the name of the maker from the "five and ten" merchant and promptly sold him several machines.

This is another example of the point brought out by Mr. Berry, of the Warner & Swasey Company, some time ago in these columns. They found that by careful study and intensive work 60 per cent of their sales were to lines which had not previously been considered as possible customers.

If ten-cent curtain rods are being built by hand, how many other articles are equally susceptible of cost reduction by machine methods? What better work for a live trade association than searching for outlets in new fields, for the products of its manufacturers?

Shop Equipment News

Cross Gear-Tooth Rounding Machine

The Cross Gear and Engine Co., Detroit, Mich., has recently re-designed its gear-tooth rounding machine, which was described on page 488, Vol. 46, of AMERICAN MACHINIST. The machine, shown in Fig. 1, is intended for accurately rounding at high speed the corners on the ends of gear teeth. This action can be performed on spur gears of both the straight-tooth and the helical type, as well as on both the inside and outside edges of spiral bevel gears and pinions.



FIG. 1. CROSS GEAR-TOOTH ROUNDING MACHINE

Gears of any pitch within the capacity can be finished with but minor adjustments of the machine. Stem gears, cluster gears, gears integral with the shaft and those cut close to a shoulder can be finished. The operation is performed at high speed, so that the machine can be employed for large-scale production. The construction of the machine and the method of locking the gear in position provide rigidity. A production of 40 to 45 teeth per minute on certain classes of work is stated to be maintained continuously. Due to the fact that the machine is entirely automatic in operation, no particular degree of skill is required by the operator. A smooth finish is obtained and cutter breakage is very slight.



FIG. 2. HEAD FOR HOLDING SPIRAL BEVEL GEARS

The cutter is rotated at high speed by a belt on the pulley at the rear of the head. The cutter spindle runs on ball bearings mounted in a housing that is set eccentrically in a quill in the head of the machine. The amount of eccentricity can be varied to suit the thickness of the tooth being rounded. The spindle thus oscillates through a semi-circle, traveling across from one side to the other of the tooth profile. The quill is mounted in adjustable taper bearings to give compensation for wear. The adjusting nut is at the rear of the head. The screws for adjusting the eccentricity pass through the taper bearings. A gear on the back taper bearing engages with gearing driven from a vertically oscillating rack operated by mechanism in the column.

The gear is held in position on a table in front of the head. A stop immediately below the cutter fits in the space between the gear teeth, so that the tooth is held rigidly in place while being finished. It is not necessary to center the gear accurately, as the stop itself holds each tooth in the proper position for cutting. When the cut is complete on one tooth, the work table slides forward and the work indexes. The same mechanism that sets the eccentricity of the cutter spindle automatically adjusts the indexing for any number of teeth of the required pitch.

The machine can be furnished with special heads for carrying the gears. A large head is used for heavy gears, such as those on the rims of flywheels. For gears mounted on shafts, provision is made to extend the shaft through the table. Bevel gears are mounted at an angle, so as to bring the edge of the tooth in the same position as that ordinarily occupied by a spur gear tooth. In Fig. 2 can be seen an indexing head for holding spiral bevel gears. Other attachments suited to special work can be furnished.

The machine can be equipped for motor drive, the motor being placed on a separate base at the rear, and belted through a countershaft to overhead pulleys carried at the back of the machine. An oil pump, piping and guards, as well as a cutter, arbor and gear-holding head, are furnished with the machine.

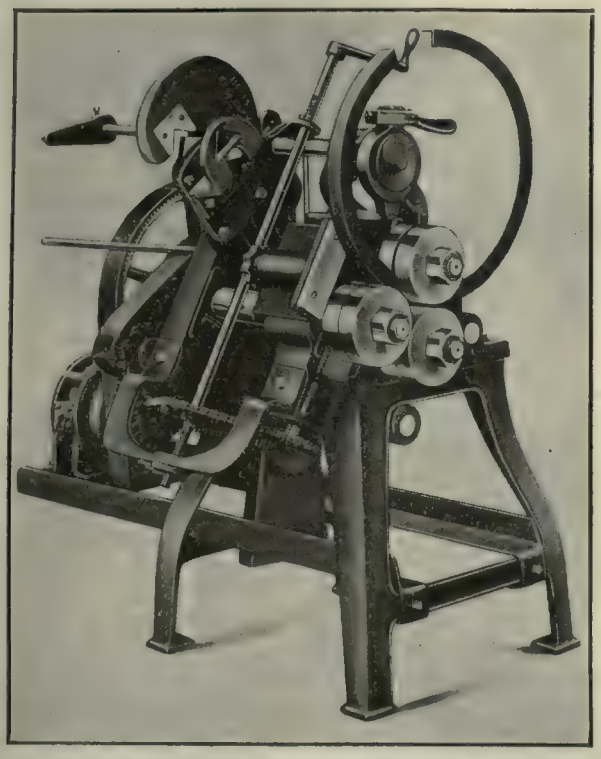
The machine is made in three sizes. The No. 1 has a capacity up to 24 in. in diameter on gears of 4-pitch or finer and of 16 in. on gears up to 2-pitch. It occupies a floor space of 3 x 4 ft. and has a weight of 1,700 lb. The No. 2 machine can handle gears up to 4-pitch 36-in. in diameter, and up to 2-pitch 30 in. in diameter. The floor space is 3 x 5 ft. and the weight 2,100 lb. The No. 3 machine handles gears of 1 to 4 pitch up to 60 in. in diameter. It requires a floor space of 4 x 7 ft. and weighs 4,200 pounds.

Excelsior No. 14 Angle-Bending Machine

The machine shown in the accompanying illustration is intended for bending angle iron into circular form. It has recently been placed on the market by the Excelsior Tool and Machine Co., East St. Louis, Ill., and is designated as the No. 14 machine. It will cut to length and bend angle iron up to 2 x 2 x ¼ in. in size, and a true circle can be formed without twisting or defacing the angles. Bar iron and T-iron can also be formed with the same rolls, which are adjustable in position to suit the requirements. Special rolls are required for pipe and channel iron or other unusual shapes.

All three roll shafts are driven, so that small circles can be rolled by one pass through the machine with the ends actually closing together. There are two rolls on each shaft, and steel washers are placed between each pair of rolls to allow for the insertion of one leg of the angle. Each roll has one straight and one rounded edge. This equipment permits of rolling circles with the flange to either the inside or the outside. A guide insures that the angle iron takes the proper path and is not distorted. On angle iron 1½ x 1½ x ⅜ in. in size, circles as small as 14 in. in diameter can be formed by two passes through the machine.

The machine is equipped with a friction clutch, and can be adapted to either belt or motor drive. It can be started or stopped with the work under pressure. The frame is semi-steel, and the rolls are made from



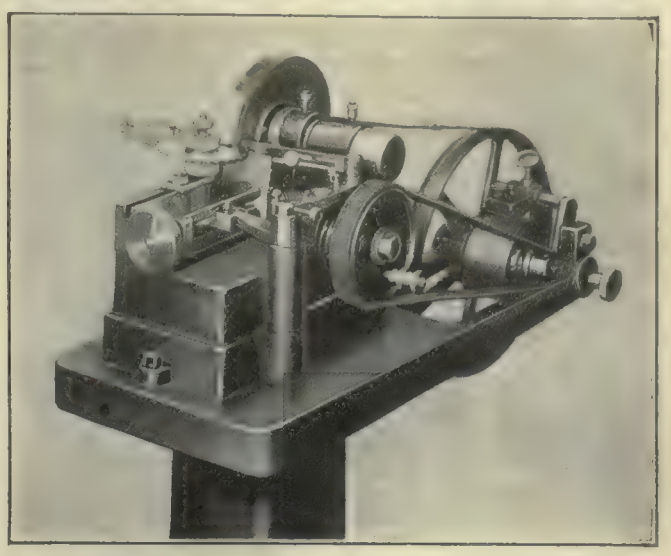
EXCELSIOR NO. 14 ANGLE BENDING MACHINE

forged and hardened tool steel. They are driven by gears with a 14:1 ratio from the driving pulley. This pulley ordinarily rotates at 200 r.p.m., and 3 hp. is required to operate the machine.

The machine may be furnished either with or without the cutting attachment or the motor drive. It has a height of 5 ft. and requires a floor space of 4 x 5 ft. It weighs 1,800 lb. without the motor and shearing attachment, the weight of the latter being 200 pounds.

Scherr Automatic Saw Sharpening Machine

George Scherr, 126 Liberty St., New York, N. Y., has recently added a No. 2 size to his line of automatic saw sharpening machines. The machine is larger than the



SCHERR NO. 2 SAW SHARPENING MACHINE

No. 1 model, and intended for sharpening circular saws from 1½ to 8 in. in diameter. It is used on all types of circular metal saws, screw slotting cutters and jewelers' and slitting saws. The machine, as shown in the accompanying illustration, is self contained and mounted on a cast-iron column.

Saws up to ⅝ in. thick and having holes from ⅜ to 1 in. can be handled. Indexing is done by means of the saw being sharpened, so that variations in distance from tooth to tooth cause no difficulty. The machine will feed saws with teeth broken out, so that damaged cutters can be re-conditioned.

The machine carries a wheel 4½ x ⅜ in. in size, the bearings of the grinding spindle being tapered so that adjustment for wear can be made. The tight and loose pulleys are 3 in. in diameter and ordinarily run at 650 r.p.m. The machine measures 12 x 24 x 36 in., the column being 30 in. high. The net weight is 135 pounds.

Marvin & Casler Jack, Blocks and T-Slot Nut

The Marvin & Casler Co., Canastota, N. Y., has recently brought out some equipment for use on the tables of machine tools when setting up work. The T-slot nut shown at the right of Fig. 1 is intended particularly to permit of putting additional clamps on work secured to a machine table, although it can, of course, be employed when the work is first clamped down. If an additional bolt is needed on the set-up, the nut can be slid in position from the end of the T-slot and the stud or bolt with its clamp can be inserted from above. In this way, it is frequently possible to avoid resetting the work, as would be necessary to add T-head bolts of the ordinary type.

There is no danger of the nut injuring the T-slot, as happens with a T-head bolt which is permitted to turn in the slot and damage the edges. The nut presents a large wearing surface to the slot. Its use permits of a reduction in the cost of clamping equipment, as studs of all lengths can be employed with it. The nut can

be furnished with threads from ¾ to 1 in. in diameter. The widths of the heads vary from 1¼ to 2 in. and the lengths from 1½ to 3 inches.

On the left of Fig. 1 the top illustrations show jacks that are for use on machine tables when leveling the work. The jack screw has a point at one end and a flat

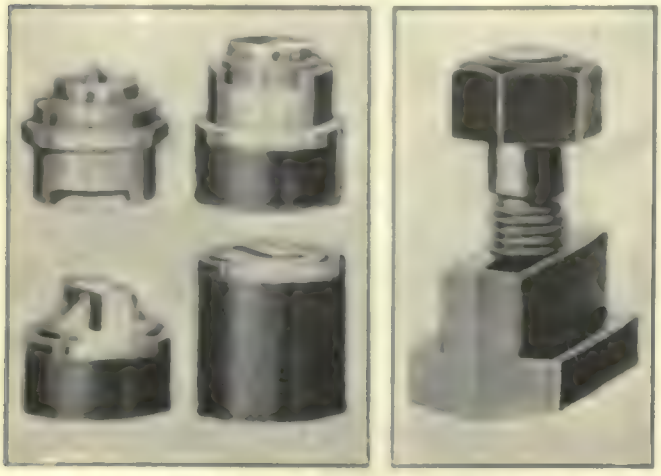


FIG. 1 MARVIN & CASLER T-SLOT NUT, JACKS AND EXTENSION BLOCKS

surface on the other. Thus, either end of the screw can be brought in contact with the work by merely reversing the position of the jack. The screw has an extension of ¼ in., and its pitch is fine enough to prevent it from running down while the cut is being made. For small heights, the jack may be placed directly on the table of the machine, its minimum height being 1¼ in. to the top of the point and 1½ in. to the top of the flat surface.

When desired to increase the height of the jack, tubular extension blocks are placed under it. The blocks fit around the jack, the flange of which bears on the top of them. Several extensions can be placed on top of each other, so as to provide a block of any height necessary. Two of the extensions are shown at the bottom on the left-hand side of Fig. 1. It will be noted that there are blocks on top of each extension; they are employed both as bearing surfaces for the work and as locators to use between sections of the extensions.

The extension or tubing is about 2¾ in. in outside diameter and made up in lengths of 1, 2½, 4¾ and 9½ in. Fig. 2 shows a large aluminum casting clamped to the table of the machine and supported by the jacks and



FIG. 2 WORK SET UP ON JACKS AND EXTENSION BLOCKS

extension blocks. The flexibility of the arrangement should be noted, as it is possible to quickly obtain the exact height necessary under any part of the work.

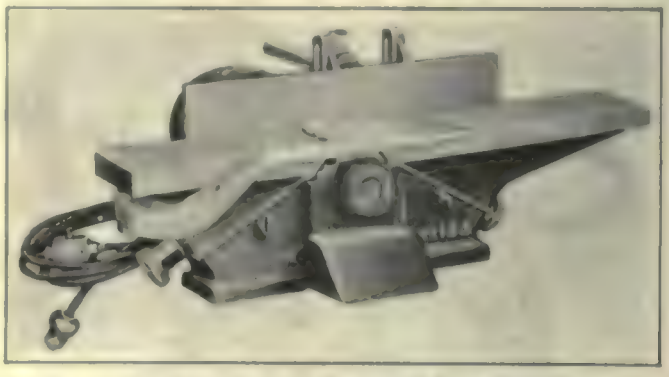
Oliver No. 133 Hand Planer and Jointer

A portable, ball bearing, motor-driven hand planer and jointer that is intended for mounting on a bench has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine is designated as the No. 133, and is made in 4- and 6-in. sizes. The 6-in. machine planes 6½ in. wide, and the 4-in. machine 4½ in. wide. Both sizes rabbet up to ½ in. The machine is intended for replacing the hand plane when jointing and fitting wood.

The base is a one-piece casting, and carries all of the parts of the machine, so that the whole unit may be easily moved from one place to another. The tables are mounted on inclined dovetailed ways, and are raised and lowered by means of handwheels and screws. Each table has a steel lip next to the throat opening. The full height of the table is 6 inches.

The fence can be quickly adjusted to any position on the tables, and tilted and locked. When not in use, it may be moved back and swung out of the way. An aluminum safety guard that operates automatically is provided on the table. It keeps the unused portion of the knives covered, and yet does not interfere with the operation of the machine.

The cutter head is fitted with three tungsten-chromium steel knives, each ⅛ in. thick and 1 in. wide. The cutting diameter is 3½ in. The head runs on self-aligning, inclosed ball bearings, and is directly con-



OLIVER PORTABLE PLANER AND JOINTER

nected to the electric motor by means of a universal flexible coupling. Thus, no belts, pulleys or countershafts are necessary, and the machine may be set up wherever desired without reference to a line shaft.

The motor is fully inclosed, ventilated and fitted with ball bearings. It operates at 3,600 r.p.m. on either alternating or direct current of 110 or 220 volts. It may thus be run from an electric lighting circuit, so that the machine may draw current from any convenient socket. The 6-in. machine has a ½-hp. motor, and the 4-in. machine a ⅓-hp. motor. The flexible electric cord with plug and switch are furnished with the machine. A rotary snap switch is provided when an alternating current motor is used.

An attachment may be furnished for setting and sharpening the knives, so that they all cut uniformly. A cast-iron column for supporting the machine from the floor can also be provided. The bench space required by the 4-in. machine is 26 x 16 in., and by the 6-in. machine 32 x 18 in. The machines weigh 130 and 160 lb., respectively, when crated, and 165 and 200 lb. when boxed. The contents of the export boxes are 3 and 4 cu.ft. respectively.

Eureka Demountable Steel Trestle

Reinhold Bettermann, Johnstown, Pa., has recently placed on the market a demountable trestle or "horse" for use in an industrial plant to support work. The



EUREKA DEMOUNTABLE STEEL TRESTLE

principal feature of the device is that it is made entirely of steel.

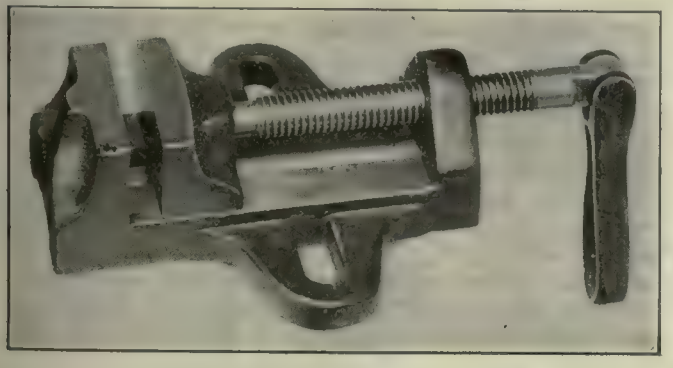
The stools have four legs each, and are of pyramid form. They are heavily braced so as to provide rigid support. They can be used individually for supporting automobile rear axles and such work, being particularly applicable in a garage. The stools are also made with a special slot at the top, for use under axles fitted with truss rods.

To form the trestle, two stools support the T-bar. Notches in the bar permit of varying the distance between the stools. Because of the fact that the device can be readily dis-sembled, the horse can be easily stored, and takes up but a small amount of space. The stools may be stacked one on top of the other. Because of the construction, their life should be practically unlimited. They are made in heights from 13½ to 30 in., the weights varying from 11 to 30 pounds.

Steel trestles with the legs riveted to the T-bar can also be supplied, when it is not necessary to have the device demountable. The standard size is 30 in. height and 42 in. length.

Austin Drilling Machine Vise

The J. L. Austin Manufacturing Co., 419 Van Buren St., Milwaukee, Wis., has recently brought out the vise shown in the accompanying illustration for use on drilling machines. The vise is intended for quickly securing small parts requiring drilling, so that such pieces are not held in place by hand. Special jigs and fixtures are not necessary for many drilling operations, because the parts can be securely held by means of the vise.



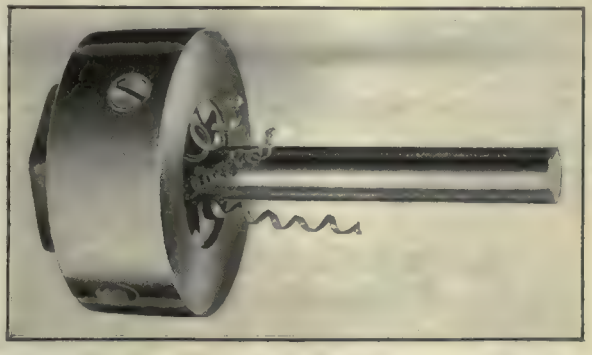
AUSTIN DRILLING MACHINE VISE

The vise is made of cast iron and intended to withstand hard usage. Two flanges on the base permit of attachment to the table of the drilling machine. The handle is so secured to the end of the operating screw that it can be swiveled to permit of operation in cramped positions. The jaws are 3 in. wide and 1½ in. deep; they open 4 in. The ¾-in. screw has an Acme thread. The weight complete is 10 pounds.

Conant & Donelson Screw Cutting Die

An addition to the line of "Reliable" two-part screw cutting dies made by Conant & Donelson, Conway, Mass., is shown in the illustration. It is made in all commercial sizes from ⅞ in. upward and fits the same collets as corresponding sizes of the regular product.

The feature of the new die is the way in which the face is ground to curl the chips ahead of itself instead of allowing them to fill and clog the clearance spaces. The manner in which this object is accomplished is by undercutting the edges in a sharp diagonal, following the principle that was long ago applied to the com-



CONANT & DONELSON SCREW CUTTING DIE

paratively well-known "gun" tap to secure the same effect when cutting internal threads.

The advantage claimed for this die is that it is a free cutting tool with less likelihood of being broken by reason of chips becoming wedged in the clearances.

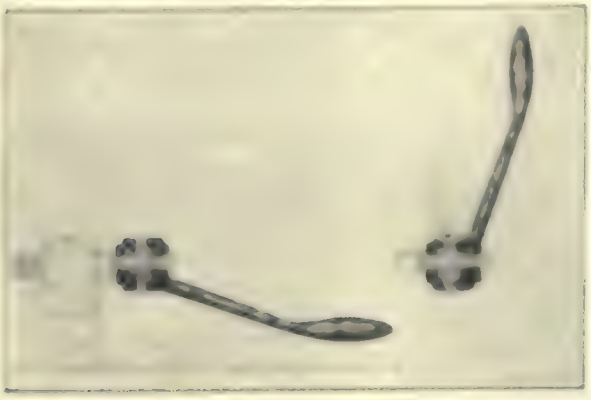
Bentley & Holmgren Vise Handle

In order to permit of quick operation in positioning the movable jaw of a screw-type milling machine vise, the B. & H. vise handle has recently been brought out by Bentley & Holmgren, 406 Court Exchange Bldg., Bridgeport, Conn. The ordinary handle placed at right-angles to the screw does not permit of quick operation, and frequently interferes with the table or some part of the setting, so that it is necessary to turn it through only a portion of a turn and then remove and replace it for the next twist. Also, it very frequently happens that the handle is permitted to strike the table at the completion of each twist, so that injury is done to the machine itself.

The B. & H. handle is a one-piece drop forging, and casehardened. It has two square holes at right-angles to each other in the boss. The handle is so positioned in relation to the boss that when it is applied in one position, as shown at the left of the accompanying illustration, it swings clear of the table and can be rapidly revolved. Applied in the other position, as shown at the right, it gives a long lever that permits of tightening the screw.

It is stated that an adjustment of 2 in. of the vise

jaw that may normally require 40 sec. with a handle at right angles to the screw can be performed in 3 sec. When the handle is not in use, it is fastened in the first-mentioned position, so that there is no danger of



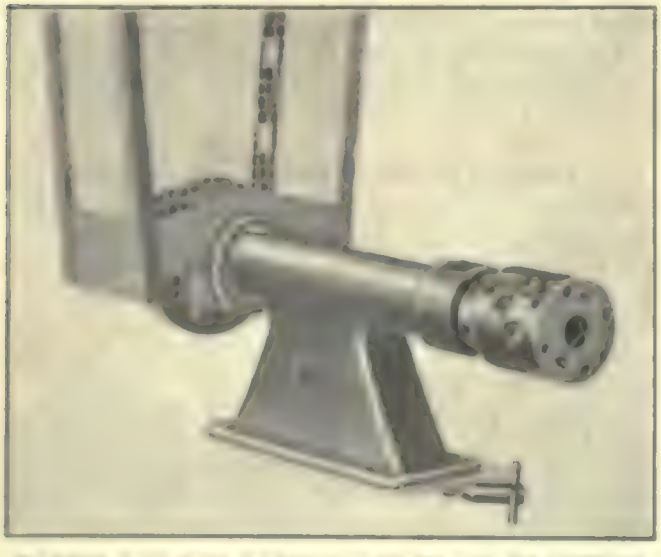
BENTLEY & HOLMGREN VISE HANDLE

its interfering with the cutter or the movements of the machine.

The handle is made in a range of sizes having holes from ½ to ¾ in., the length of the hubs varying from 1¼ to 2¼ in. The smallest handle has a clearance with the short leverage of 1¼ in., and of 5 in. with the long leverage. The largest handle has clearances of 2¼ and 9¼ in., respectively.

Marvin & Casler Lapping and Filing Headstock

A lathe headstock for use when lapping and filing small parts has recently been brought out by the Marvin & Casler Co., Canastota, N. Y. The accompanying



MARVIN & CASLER LAPPING AND FILING HEADSTOCK

illustration shows the device equipped with a guard for the driving belt.

The tool is fitted with ball bearings at each end of the spindle. It is intended for use in lapping small holes, so as to take the work from a more expensive lathe. It may be equipped either with a twin-screw drill chuck or a three-jaw chuck. The base of the headstock is 10⅞ in. long, and the distance from the pulley to the drill chuck is 14¾ inches.

Pocket-Knife Standardization

What has been done toward standardization of designs in the pocket-knife industry is shown by the following paragraphs from a report of a trade association in that industry. The saving effected might well influence other industries to follow the example particularly in lines that are as many and varied as pocket knives.

"When our industry was called on by the War Board to eliminate all unnecessary patterns and reduce our line to a minimum, a committee was selected from our industry to adopt a certain number of standard patterns and request all manufacturers to discontinue the producing of anything other than these standard patterns.

"We found when we came to get into this work that some factories were producing as high as a thousand to fifteen hundred distinct styles of pocket knives. This number was reduced to one hundred basic patterns, with about three hundred styles being produced from them. This included different coverings, handles, blades, etc.

"The number of basic patterns in the American pocket-knife industry varied in the different factories from two hundred to five hundred, from which were developed styles ranging anywhere from five hundred to twenty-five hundred. This number of basic patterns has been reduced, not to exceed one hundred and not to be developed beyond three hundred. Possibly some manufacturers today are developing as high as three hundred patterns, but you can see that this is a tremendous reduction in basic patterns, as well as the number of styles developed from them."

Variations in Machinery Exports

The value of our exports of passenger automobiles dropped from $2,356,699 in 1920 to $32,803 in 1921, partly because the market was saturated, and because the total absence of good roads between the large cities confines the use of cars to the streets of a few commercial centers. Competition from Germany and other countries was largely responsible for the decrease in our exports of dyestuffs from $6,309,168 in 1920 to $763,427 in 1921, although even this figure is gratifying when we consider that we sent practically no dyestuffs to China in 1913-14.

The marked increase both in number and value in shipments of locomotives from 20, valued at $328,629, in 1913-14, to 86, valued at $3,370,510, in 1920, and to 104, worth $5,119,837, in 1921, has been the result of American selling enterprise and of the need of first-class motive power on the Chinese railways. This is only one feature in the general increase of our exports of industrial machinery to China, for which the full American figures are not yet available, but which in 1920 were about three times as great as in 1913. Still more gratifying is the fact that in 1920 we furnished 54 per cent of the total amount of industrial machinery purchased by China, while in 1911 we shipped only 9 per cent. Our exports in 1920 of textile machinery to China were more than 50 per cent of the total, about louble the shipments from the United Kingdom, and more than three times as great as those of Japan. Our exports to China in 1920 of machinery, excluding agricultural, embroidering, knitting, and sewing machinery, were more than half the total, more than twice as large as the shipments of the United Kingdom, and more than three times as great as those of Japan. —*Commerce Reports.*

News Section

Price of Farm Implements Not Advancing

In a statement as to farm implements, Chairman Anderson of the Congressional Agricultural Commission which is investigating agricultural conditions says:

"We have found that the weighted average of farm implements' factory price, exclusive of power equipment and twine, shows that price to be 41 per cent above 1913; inclusive of power equipment and twine, these prices are now approximately 20 per cent above 1913. It would appear that the factory price of agricultural implements does not show price advances to such a marked degree as other commodities and that they are rapidly receding to a lower price level. In 1914 the transportation charge on agricultural implements was about 11 per cent of the selling price to the farmer, including the freight on raw material entering into the manufacture, and in 1921, it increased to 15 per cent. A reduction in freight rates on each basic commodity, such as pig iron, steel, coal coke and lumber, would assist in reducing the farmer's expense for farm implements."

Tests for Toolbits

The Bureau of Standards of the Department of Commerce has completed a series of sixty tests of one-half inch toolbits made of several grades of high-speed steel which had been subjected to various heat-treatments. The steel used was the same for each test, containing 62 per cent carbon, 3.5 per cent chromium, 15.5 per cent tungsten, and 1.6 per cent vanadium. Results, in pounds of metal cut away, are shown in the following table:

Preheating (Time for Cut 20 Min.)	Hardening (Time for Cut 5 Min.)	Lb. of Metal Cut Per Tool (4 Tools Tested.)
1,400 deg. F.	2,417 deg. F-oil	9.1
1,500 deg. F.	2,417 deg. F-oil	10.1
1,600 deg. F.	2,417 deg. F-oil	5.1
1,600 deg. F.	2,417 deg. F-water	5.1

All testing conditions were the same. The results obtained when using water as the quenching medium are about the same as when using oil for this particular case.

House Drops Dahlgren Naval Station

During consideration of the naval appropriation bill by the House, Maryland representatives were successful in eliminating appropriations, other than those for maintenance in a closed down condition, for the naval proving ground at Dahlgren, Va. The House eliminated the appropriations by a vote of 106 to 67. Maryland representatives contended that as it was a war emergency plant it should be abolished.

Sinram Re-elected

At the annual meeting of the American Gear Manufacturers' Association, held recently at Buffalo, F. W. Sinram, president of the Van Dorn & Dutton Co., of Cleveland, Ohio, was re-elected president for the ensuing year. The vice-presidents chosen are Ray Johnson and D. F. Waterman. F. D. Hamlin was re-elected secretary-treasurer. Four new members of the executive committee were elected; they are J. B. Foote, E. E. Frost, D. F. Goedke and W. H. Phillips.

International Chamber in Italy Next Year

The next general meeting of the International Chamber of Commerce will be held in Rome, Italy, the week of March 19, 1923, it was announced last week by the American section of that body. In arriving at this decision the board of directors of the International Chamber which just met in Paris, was influenced to a great extent by the possibilities of the Genoa conference.

The next meeting of the executive committee of the International Chamber will be held in Paris on May 26 and will be followed by a meeting of the board of directors on July 10. At that time it is expected that the results of the Genoa Conference will be fairly definite and plans will then be made for the next general meeting of the chamber.

Motion Pictures in Development of Foreign Trade

At a conference of manufacturers with various government representatives last week, the value of motion pictures in industry was discussed. Director Klein, of the Department of Commerce, said that 17 per cent of American manufactured mechanical machinery was exported and that motion pictures were valuable in the development of foreign trade. Director Bain, of the Bureau of Mines, spoke of the valuable results obtained by that Bureau with motion pictures in promoting safety in mining operations. A board of review was established by the two bureaus to aid manufacturers in preparing and distributing films for use in foreign markets. This board will supervise film production and advise manufacturers as to the needs of the various foreign fields.

The Patent Convention

After having reviewed the arguments for and against the revival of the Patent Convention with Germany, the State Department is understood to be inclined to revive the treaty under the authority conferred by the Senate.

Some Machine Tool Manufacturing Statistics

When the 1919 census was taken, there were 403 establishments in the United States engaged in the manufacture of machine tools. The aggregate horsepower employed in this industry is given in a special report by the Bureau of the Census, made for the Senate Finance Committee, as being 100,433. These plants employ 132 steam engines developing 20,305 hp.; 17 steam turbines, developing 6,650 hp.; 55 internal combustion engines, developing 2,249 hp.; 16 water wheels, developing 1,033 hp.; 11,408 electric motors, developing 98,817 hp.

The capital employed by concerns engaged in the manufacture of machine tools is given as being $231,039,843. Salary and wage payments in 1919 totaled $84,216,825. The value of products was $212,400,158. There were 8,519 officers, superintendents, managers and other salaried employees. The average number of wage earners employed was 53,111.

Compulsory Patent Bill To Be Re-Drafted

Such determination against compulsory working of patents was brought forward at the initial hearing on that subject that Senator Stanley determined to re-draft his bill. He expects to eliminate the five- and two-year limitations and change his bill so as to prescribe that patents shall be worked within a reasonable time, to be determined by the Commissioner of Patents.

Thomas E. Robertson, commissioner of patents, declared his unalterable opposition to a working clause, because he believes it is imperative that the patentee have a monopoly. It is necessary, he said, to encourage invention and also is necessary to make the patent readily saleable. A working clause, he declared, would discriminate greatly against the small inventor. He pointed out that the term of patents was changed from fourteen to seventeen years because it was shown that profits accrued mainly in the latter part of the term.

It was pointed out at the hearing that a large number of patents are taken out for protective purposes only during the research period. For that reason, it was held that compulsory production would have the effect of giving a body blow to all research.

Frederick P. Fish, widely known patent attorney, of Boston, and A. C. Oliphant, of the Federated American Engineering Societies, were among those who appeared against the bill.

The position of the Secretary of War and of the Ordnance Department was that the national defense is involved in the matter of patents, particularly when foreigners are not required to manufacture in this country.

The Trend of Business Improvement—Plants Resuming

The Motor Wheel Corporation has increased production to capacity at its pressed steel wheel plant at Lansing, Mich., with the adoption of night shifts in several departments at the main works. The Gier plant of the company is operating at full capacity for the first time in the past eighteen months.

The Ford Motor Co. has resumed operations at its branch plant at Atlanta, Ga., following an idle period of about a year. Employment is being given to 300 men, and this force will be increased at an early date.

The Virginia Bridge and Iron Works, Roanoke, Va., is arranging for the immediate reopening of the plant of the Birmingham Steel Corporation, Birmingham, Ala., recently purchased at a Federal receiver's sale. Different departments will be remodeled and improved, and necessary equipment installed. A large portion of the works will be adapted to railroad car repair work, and the remainder given over to structural steel fabrication for buildings and bridges.

The Lansing Foundry Co., Lansing, Mich., has adopted a full time, full production schedule, with employment of additional men. A large order has been secured for parts for the Maxwell automobile, as well as for castings for the Ford Motor Co., Saginaw, Mich.

The American Bridge Co. has resumed operations at its plant at Trenton, N. J., which has practically been closed for the past year. Employment is being given to about 200 men, and this force will be increased to a quota of from 400 to 450 by the close of May.

The Ryan-Bohn Foundry Co., Lansing, Mich., is increasing its working force of coremakers and molders, and has adopted a capacity operating schedule. The company has secured large orders for automobile engine castings for the Continental Motors Corporation.

The East Penn Foundry Co., Macungie, Pa., has increased the wages of coremakers, molders and other foundrymen, 10 per cent. Full production is being maintained under regular operating schedule.

The New York Central Railroad Co. has reopened its locomotive and car repair shops at West Albany, N. Y., Avis, Pa., and Collinwood, Ohio, giving employment to about 775 men on a piecework basis, under increased wage scale of 25 per cent. The West Albany shops will operate with 500 men, the Avis shops with 175, and the Collinwood shops with 100 men.

The Western Maryland Railway Co. is arranging for the immediate resumption of operations at its Ridgeley, W. Va., shops. Work will be devoted to the repair of steel cars. The shops at Fairfax and Elkins, Md., will also be operated.

The Atlas Drop Forge Co., Lansing, Mich., has adopted an overtime schedule in a number of departments at its plant. Operations are on a capacity basis throughout the works, and orders on hand insure production at this rate for a number of months to come.

The Ames Shovel and Tool Co. has resumed operations at its Elwood, Ind., plant, giving employment to about 300 men.

The Willys-Overland Co., Toledo, Ohio, has increased production at its plant, with operations on a basis of 500 automobiles a day. April sales have broken previous records.

The Galveston, Harrisburg & San Antonio Railroad Co. is increasing operations at its car and locomotive shops at El Paso, Tex., and has authorized an immediate call for bids for the construction of a new machine shop at this works, to cost about $200,000, including equipment.

The Hayes-Ionia Co., Ionia, Mich., manufacturer of automobile bodies, has reopened its plant for the manufacture of bodies for the Olds and Reo automobiles, following a shut down for several months past. Employment will be given to about 300 men.

The Hendee Manufacturing Co., Springfield, Mass., manufacturer of motorcycles, has adopted an overtime schedule in two departments, and is increasing the working force throughout the plant. April production ran to 1,400 machines, or more than double the output of January and February.

For several weeks past the Stewart-Warner Speedometer Corporation, Chicago, Ill., has added to its working force at the rate of from 250 to 300 employees a week. Operations have been increased over 300 per cent as compared with this time a year ago. Manufacture is commencing on a number of new automobile specialties, including spotlights and gasoline meters.

The Continental Motors Corporation has adopted a night shift of 500 men at its plant at Muskegon, Mich., working on a large order for motors for the Durant Motor Co. Operations are being advanced at the Detroit plant, which is now giving employment to 1,800 men, or 50 per cent more than at this same time a year ago.

The McCord Manufacturing Co., Chicago, Ill., manufacturer of automobile radiators, gaskets, etc., is increasing production at its Racine, Wis., plant, and will place a full time, full capacity schedule in operation early in May. Manufacture is also being advanced at other plants of the company.

The American Car and Foundry Co. is advancing the production schedule and increasing the working force at its plant at Jeffersonville, Ind. Orders on hand insure continuous operation for the balance of the year. Recent assignments for the plant include 24 cars for the Louisville & Nashville Railroad; 15 cars for the Interstate Public Service Co., Indianapolis; 50 cars for the Chicago & Northwestern Railroad; and repairs to 25 passenger cars for the New York Central Lines.

The Duplex Printing Press Co., Battle Creek, Mich., is increasing operations at its plant and plans for early enlargements for greater capacity. It is proposed to double the present facilities of the foundry and machine shop, and about $750,000 will be expended for buildings and equipment. The line of production will be extended to include printing presses and parts for catalog and magazine work.

C. A. McCune New President of Welding Society

The annual meeting of the American Welding Society was held in the Engineering Societies Building, New York City, from April 26 to 29. The program included the reading of papers on welding and related subjects, and a series of discussions on the adoption of standard specifications and codes. At the technical session of the meeting three interesting papers were read. They were: "Welding of Heavy Copper Plate," by A. S. Kinsey; "Electric Welding of Dredge Pipes," by J. H. Nead and R. L. Kenyon; "Thermit Welding," by J. H. Deppeler. Separate sessions were held on electric-arc and gas welding. The committee on training of operators reported considerable progress along these lines and was authorized to continue its work during the next year.

The election of officers resulted in the selection of Charles A. McCune, of the Page Steel and Wire Co., Bridgeport, Conn., as president; W. H. Namack, of Ballston Spa., N. Y., vice-president for the New York and New England district; T. T. Oechsle, Philadelphia, Pa., vice-president for the middle Eastern district; W. A. Slack, Chicago, vice-president for the middle Western district. Directors elected were: James Burke, Erie, Pa.; Herman Lemp, Erie, Pa.; H. I. Walsh, Newport News, Va.; A. F. Jenkins, Baltimore, Md.

In recognition of his services to the welding industry and to the society, the members elected Comfort A. Adams to honorary membership in the American Welding Society. Mr. Adams was the founder of this society and has been instrumental in bringing it to its present state of success. The society also conferred this honor upon Edmond Fouché, of Paris, who is credited with being the first to see the possibilities of gas-torch welding.

N. Y. State Scholarships for Technologists

The University of the State of New York is offering twenty-five scholarships to trade and technically trained persons who desire to prepare themselves for teaching. Persons selected to hold these scholarships, who satisfactorily complete the prescribed one-year industrial teacher training course, are licensed for life to teach their specific occupations in the vocational schools of the State. The salaries range from $1,800 to $3,500 per year. Applications can be obtained from the Division of Vocational and Extension Education, State Department of Education, Albany, N. Y.

Applicants for appointment to the industrial teachers' scholarship must possess some of the following qualifications: Trade, industrial or technical experience; a good general education; must be of good moral character, possess good health, and be a citizen of the United States.

The twenty-five scholarships which will be awarded to qualified persons in 1922 are distributed among the electrical, machine shop, automobile repairing, machine drafting and designing, architectural drafting, printing, textile working and a few other trades.

Business Conditions in England

BY OUR LONDON CORRESPONDENT

Were it not for the unfortunate dispute between employer and employed in the engineering industry, it would be possible to report a marked improvement in conditions economic and industrial. During the past few weeks London has been steadily growing more cheerful, and such headings as "industrials firm," "rubber brighter," "oils rising," "mines more active," and so on, have been fairly common in the financial journals. Money is plentiful and gilt-edged securities have appreciated markedly. To take an outstanding example, the 5 per cent war loan, issued at 95 and for a long time well below that figure, has lately risen to 100. Of course there is a reverse side, as cheaper money suggests bad trade and consequent restriction of the ordinary avenues of investment. Anyway, money is cheaper and this fact and the reduction offered during the course of months in the floating debt have caused the value of gilt-edged securities to rise. It was anticipated with confidence a week or two ago that the bank rate would be lowered to 4 per cent; even now it is held that the reduction is merely postponed for a short time. But in this matter New York sets the fashion and the bank rate here follows.

Imports and Exports Gain

The returns of overseas trading during March showed in imports (total £87,879,424) an increase of 18½ million pounds as compared with the previous month, though more than 5¾ millions less than March of last year. Similarly, British and Irish exports (total £64,580,793) showed an increase of about 6¼ millions over the previous month, but about 2¾ million pounds less than March, 1921. Re-exported goods (total £10,153,612) were at about the same value as the previous month, and about 1¼ millions more than in March, 1921.

That conditions are improving is shown by the steady decline in the numbers of unemployed officially registered. The fall is more than 192,000 in the last twelve weeks. But here the engineering dispute is beginning to have effect, though the men locked out are not registered as unemployed or they would swamp the improvement. We still have some 1,742,517 persons officially known to be out of work, excluding work-people on short time. Lancashire has been negotiating for some time over a reduction in wages and meanwhile reports less unemployment than for months, while generally speaking the business outlook is regarded as brighter. More people are being employed in coal mining; here the unemployed percentage is among the lowest in the manufacturing and producing industries. In the iron and steel trades the engineering dispute blocks progress where a steady expansion had been anticipated. It is to be understood that in engineering generally not all the shops are closed; those firms that are outside the employers federation are still running, and in the others, pending negotiations, the lockout notices to semi- and un-skilled workers are postponed.

The electrical side of engineering remains fairly well employed, and this is true of textile machinists, though in the process of time the pressure has eased somewhat. The locomotive shops are dull, but, while orders for British lines are still in abeyance, it is publicly stated that contracts with Roumania to the extent of £5,000,000 are being negotiated, though how the financial problems attendant are to be solved has not been made clear. As to motor car firms, those on the light side remain the better employed, in fact the popularity of the light car increases.

The flying machine side of affairs has lately been given an impetus by the increase in the commercial services, particularly between London and Paris. But the unfortunate collision in France has acted as a damper. To revive our spirits and increase confidence we are being reminded that from the beginning of civil aviation in 1919 to the end of last September, according to the Air Ministry, only twelve persons were killed out of 142,241 passengers carried by air; in fact until this last accident there has been no injury in the British services for more than twelve months.

Llyod's Register returns for the last quarter show that we have about 2,236,000 tons of shipping under construction; a reduction in the quarter of about 404,000 tons: deducting vessels on which work has been suspended, apart from the shipbuilding workers' wage dispute, the tonnage actually under construction amounts to about 1,443,000 tons, the decrease applying to most countries.

At the final accounting the national revenue for the year ending with March last showed a balance over expenditure of about 46 million pounds, the revenue amounting to £1,124,879,873 and expenditure to £1,079,186 637. The surplus was considerably below the sum estimated originally, expenditure having been swollen in various supplementary ways, not foreseen when the budget was introduced. Again, the surplus is not entirely due to taxation, for the special receipts amount to more than 170 millions, partly received from Germany on account of the army of occupation and largely arising from the sale of government stores, which, even if properly regarded as revenue, which is doubtful, cannot be repeated next year.

Electric Industry Booming

The war undoubtedly set a number of engineering concerns on their feet again, this applying to mechanical engineers who were able to adapt themselves to the requirements of the moment. The effect on the heavier electrical side was very evident. Here Great Britian had a considerable number of firms none of whom were able to pay large profits, at any rate before the war. Now most of them appear to be in a stable condition, with credits beyond anything they were accustomed to in the past. Thus the Brush Electrical Engineering Co., which has of late been a good customer to machine tool firms for fairly heavy tools needed in the construction of the Ljungstrom steam turbine, at its latest meeting reported a profit, after deducting debenture interest, management expenses and maintenance but not depreciation of £230,557, an increase on the year of about £41,500. Metropolitan-Vickers Electrical Co., formerly known as the British Westinghouse Co., made a profit of £440,300, or about $38,000 greater than was reported for the last year. Stock of materials in hand, work, etc. in progress (less receipts on account) are estimated at just short of two million pounds, comparing with more than 2¾ millions in 1920.

The 1921 outputs were records, both for the Brush and the Metropolitan-Vickers Co. The Edinburgh firm of Bruce, Peebles & Co. paid 15 per cent, and Mather & Platt, Ltd., which is concerned with machinery for the textile industry, paid the same dividend as a year ago but carried forward a larger sum. Other electrical concerns might be noted as paying good dividends, and the cable companies have done well. But there is one marked exception in the electrical field, namely the Edison-Swan Co., which reports a loss of £344,730, for which the coal strike last year is held to be largely responsible. It may be added that £346,445 has been written off for depreciation of stock, and this item in itself more than accounts for the loss.

Some Profits Lower

Turning to the larger mechanical engineering firms, the balance sheet of Cammell, Laird & Co., Birkenhead, Sheffield, etc., indicates a net profit for last year of £170,487; this is more than £90,000 lower than the net profit for the year previous and about £132,500 less than the net profit for 1919. According to the present balance sheet the stock in trade and work in progress are valued at £1,691,148, or not much more than half the corresponding figure at the end of 1920. Armstrong, Whitworth & Co., Ltd., paid 5 per cent on last year's business compared with 10 per cent the year previous; and Craven Bros., South Reddish, makers of machine tools and cranes, paid 7½ per cent on ordinary shares last year.

The prospects of engineering as a sectional interest have certainly been improved as the result of the operations of the Trade Facilities Act, under which the government gives guarantees to enable development schemes to be undertaken. London will benefit by the establishment of a ship-repairing works, etc., on the Thames, by Harland & Wolff, Ltd., nearly 1½ millions having been guaranteed to the firm for this purpose and for certain constructional work in the Glasgow area. Then five millions, repayable as the principal and interest over fifty years, will be devoted to the enlargement of the South London tube, the first of the underground electric railways, and to an extension of another London line. Also 6¼ millions for 25 years will be available for the electrification of suburban sections of one of the main London railway lines. Sums have been made available for an electrical generating plant for India and certain English districts, and shipbuilding, steam engineering, dock and harbor work, sewage systems, quarries and the manufacture of folding boxes, all are to benefit.

Detroit Letter

Unemployment in the industrial plants of Detroit seems to be at an end. The Employers' Association has estimated that 45,000 men have been put back to work since October of last year. The latest returns show that about 4,500 men were re-employed during the week ending April 15. Most of the firms are working on full time. There seems to be a shortage of skilled workmen.

Inquiries of quality are more generally active in this city than they have been for some time past. An encouraging number of orders has been placed and one dealer said that if he does as well during the next three-fourths of 1922 as he has during the first quarter, his sales will equal in volume the best pre-war year. This does not mean, however, that as many machines have been sold, because prices are higher. Nor does it mean that as much profit has been made, because a much larger organization has done the selling. The sales office is larger and expenses are larger in proportion. The outlook is that sales will be even better during the remainder of the year.

Sales now being made indicate that manufacturers are looking for machines that will cut production costs. Standard machines seem to have a better market. Another large manufacturer of machine tools reports that February was better than any one of the fourteen months preceding and that March was better than February. The outlook for April, so far, shows a further increase. In making this statement the manufacturer referred only to small tools and gages, but added that they are a good barometer and presage similar improvement in larger tools. At any rate they show current activities that could not be construed in any but a favorable light.

The stimulating effect of the radio craze during the past three months has been directly productive of sales. Manufacturers of radio apparatus are all working their plants on double shifts and still cannot fill orders which continue to pour in. Detroit seems to have become overnight the hub of radio activities in the United States.

Syracuse and Buffalo Letter

There seems to be no question as to business having turned the corner and being on the up grade. In Syracuse, for example, every machinery man agrees that business is decidedly better than it was. This is not false optimism, but the calm judgment of hard-headed business men who have fought their way through the past two years.

Machine supplies are in greater demand, showing that they are being used up; also that small dealers are replenishing stocks. Machine builders find more demand for repair parts, indicating that machines are being used once more. Each month shows an improvement over the previous one.

One interesting case is that of the Carbart Bros. foundry. This company took hold of a business just as the slump hit its worst blow and many feared disaster. But the firm brought an experience from a bigger business which helped it weather the storm and come through with flying colors.

The managers prepared an advertising campaign in the local papers and stuck to it persistently and continuously. They varied the spaces from a quarter page down, in the best daily—for it is a local business. But every issue kept the users of castings in and around Syracuse informed as to where they could get good castings. And the company got orders. Other methods of publicity were also used and the total net result is to find Carbart Bros. firmly established and looking forward to the gradually improving business conditions with a smile. It is worthing thinking over.

Buffalo has a number of bright spots in the way of business revival. The American Radiator Co. is very busy as a result of building activities. The Federal Telegraph and Telephone Co. is busy in common with other manufacturers of radio apparatus.

Perhaps the best positive proof of improved conditions is the discontinuation of the form of relief known as the bread line—which had been necessary up to the present. Another sure sign is the fact that men are in demand, good tool makers and others being hard to find. The Pierce-Arrow Motor Co. is included in the general improvement, although handicapped by the effects of a recent regime of efficiency management experts who left a trail of heavy deficits for the year 1921.

The industries which have to do with railway equipment are improving decidedly. Pratt & Letchworth and others report more orders and greater efficiency in operation. They are very sanguine as to the future of 1922.

Cincinnati Letter

The machine tool and general machinery business in Cincinnati seems to be looking up. Orders are being received by local plants from all parts of the country. One manufacturer reports that he has received a number of orders by wire, which indicates to him that shops are in need of certain classes of equipment and that they are in a great hurry to supply the demand for their product. A foundry supply concern reports that the business for the first three months of this year was 30 per cent greater than for the same period in 1921. The Fulflo Specialties Co., of Blanchester, reports that business is very good and that it has received an order from a large automobile manufacturer for a quantity of pumps. R. K. LeBlond has become the head of a realty corporation that will finance the construction of buildings for industrial purposes. The organization is capitalized at $1,000,000. Part of the assets will be the land and buildings on Reading Road and Morgan St., which is now occupied in part by the De Haven Ice Cream Co.; another tract will be the holding at Fourth and Sycamore Sts., to be occupied in part by the Southern Railroad Company's offices.

The factories across the river, which have been guarded by troops during the last three months while the strike of employees was in progress, are reporting that they are continually taking on more help and that several new departments have been started. It is intimated that the militia will soon be withdrawn. Employment in the machinery trade is improving, as the daily papers have carried advertisements at various times during the week for machinists and skilled workers.

Chicago Letter

The change that has taken place in the local machine tool market is not merely one of sentiment but a number of orders have actually been booked. It is true that sales are still relatively insignificant and greatly outnumbered by inquiries and this is one of the things which has made the sentiment more optimistic. There is also a feeling that much progress is being made in the direction of an industrial revival, shown strongly in the building industry, and that it is only a question of time when increased shop activities will be felt in purchases of equipment. Many local shops have already increased their working percentage and several of them find a scarcity of labor. This is particularly noticed in the vicinity of steel plants in this district and also in the building industry.

Several of the machine tool dealers report a few fairly good size orders, but in general the orders booked are small, principally for single machines. The demand is widespread and there is a noticeable improvement in collections.

The Santa Fe Railroad has again made additional inquiries and has placed a few orders for new equipment. The other railroads are still among the expectations of the tool dealers. Activities, after a dull period of a few weeks, are again in evidence in the railroad car buying. The Wabash has contracted for approximately $1,000,000 worth of new passenger equipment, including twenty-four all steel passenger cars, the latest type and design, consisting of eight coaches, nine chair cars, four dining cars and two club chair cars. The American Car and Foundry Co. has the contract for the construction of the equipment. It is understood that equipment purchases aggregating approximately $3,250,000 is to be made within the next few weeks by the Northern Pacific Railway Co.

Judge E. H. Gary, chairman of the board of directors of the United States Steel Corporation, recently made an announcement that a $15,000,000 plant for the manufacture of lap and butt weld tubes is to be erected at Gary, Ind., by the National Tube Co., a subsidiary of the steel corporation.

Birmingham Letter

The consensus of opinion among Birmingham manufacturers seems to be that business is improving. The steel plants and other manufacturing establishments are fairly busy, though not running up to capacity. The most important event here during the week was the convention of the Southern Supply and Machinery Dealers Association. Several hundred dealers and manufacturers of mill supplies were in attendance and all expressed optimism in the future of Southern industries.

The Walraven Co., at Atlanta, agents for Brown & Sharpe, Hendey, Bullard, Gray, Heald, and a few others, report business quiet but are making some sales of tools to railroad shops and garages. They report that there is a slight improvement, and that the majority of good second-hand tools has been worked off. The Seeger Machinery Co., Atlanta, reports that its sales are equal to those of 1913-14. This concern is the agent for Cincinnati milling machines and for Landis grinders.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
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Prof. Lionel D. Edie of Colgate University recently published a book called "Principles of the New Economics" that ought to be read by all business men. In the first chapter upon "The Significance of Psychology in Economics" he says, "Men are bundles of tendencies to act. Whether in the banker's office or around the directors' table or on the salesman's route or at the worker's machine, men are aggregates of urges to act in certain directions."

The truth of this statement was aptly exemplified in the financial markets last week. There is hardly a precedent in peace times for the concatenation of disturbing events that business had to face.

With Lloyd George predicting that war might be a consequence, the disruption of the Genoa Conference more than once seemed imminent. A bonus bill that will sooner or later involve the distribution of four or five billion dollars among our ex-soldiers seemed more certain of passage than at any time previously. No progress toward the settlement of the coal strike was made and from New England it was reported that some of the textile strikers were resorting to bomb throwing and sabotage.

In China three military leaders are contending for the mastery of the country and an internecine war is threatening.

Floods in the Mississippi Valley and Texas have already caused much loss and unseasonable weather has delayed agricultural work throughout the country.

Speculation Rife

None of these things nor the warning against the excessive use of credit for speculative purposes, issued by the Comptroller of the Currency, Mr. Crissinger, seem to have had the slightest effect upon the "urge" to invest or buy something by which so many men now seem possessed. On Tuesday last new bond issues amounting to over $186,000,000 were offered and sold in the New York market. They included $45,000,000 New York City bonds which were bought on a 4.12 per cent basis and are being resold to the public at a price which yields only 4.06 per cent.

Total offerings for the week were probably in excess of $300,000,000 and many other large issues are being planned for. Liberty Bonds have moved upward again to a parity with the basis upon which the New York City bonds were sold and most other securities upon which a fixed return is assured have been corespondingly firm.

This extraordinary demand for investments is, of course, primarily due to the ease of money, but it also reflects a widespread confidence in the future that is the more impressive because it refuses to be shaken by untoward developments that would be almost paralizing if the psychological attitude of the community was less stubbornly optimistic than it is.

This being the case it is reasonable to assume that the upward movement will re-assert itself whenever the influences which now restrain it cease to be operative and as strikes must ultimately be settled and order has always been brought out of disorder in the past the probabilities seem to indicate that the "urge" to buy will outweigh the desire to sell for some time yet. The result will be rising prices, for the market tendency is frequently determined by a very slight preponderance of demand or offerings and in the present case it seems likely that with any encouragement the buyers will largely outnumber the sellers.

Gold Reserve Gains

This view is reinforced by the statement of the Federal Reserve System which shows a further addition of $4,300,000 to the gold held and a gain of 1 per cent in the reserve ratio which now stands at 78.3 per cent. This is all the more surprising as most stock brokers are increasing their loans and the only explanation suggested is that merchants are borrowing less because they are allowing their stocks to run down. If this be true the jobbers' trade should soon be better, for the money realized from the tremendous bond issues recently sold must soon find its way into circulation and increase the purchasing power of the wage earners.

From Youngstown, Hammond and other steel manufacturing centers it is reported that "Help Wanted" notices are to be seen for the first time in many months, and except in the coal mines and cotton mills there is certainly less unemployment than there was. In the building trade, which is becoming exceptionally active everywhere, there is a great scarcity of skilled mechanics, and in New York contractors are outbidding the union wage scale.

The commodity markets show but few important changes. Cotton has been somewhat firmer on the flood news but overflow years are not as a rule short crop years and those who were counting upon a comparatively small gain in acreage have been slightly shocked by a private estimate which puts the increase at 19 per cent. Confidence in an enlarged export demand for cotton has also been somewhat disturbed by developments at Genoa. The other textiles, wool, silk, flax and jute, have been firm, though trading is somewhat restrained by tariff uncertainties.

Sterling exchange has been remarkably steady despite the turbulence at Genoa, but francs and lire have been rather easier and marks went back to 35 cents a 100 after having advanced to 43 cents upon the theory that Mr. Morgan's promised attendance at a financial conference to be held in Europe meant that he would undertake to float a German loan here. Such a loan might find a few buyers here but it is to be doubted whether it would be generally taken.

The stock market has not been quite as strong as the bond market and in the industrial department some declines have been registered from time to time, but railroad shares have not yielded appreciably. The Lake Erie & Western Railroad, formerly owned by the New York Central, has been sold to interests which recently purchased the Toledo, St. Louis & Western, and the Interstate Commerce Commission has arranged for an open conference at which the railroad executives will have opportunity to discuss the consolidations for which the Esch-Cummins bill provides. These are but precursors of the many railway combinations that are believed by some to be inevitable and in their consideration many properties are likely to develop elements of value not previously discerned.

Economy Necessary

The result may be a great speculative movement in the railway stocks which represent the control of our greatest industry and if it does the resulting increase in their asset value will so enlarge the basis of credit that a marked expansion of business generally will be almost certain to follow.

But we must not deceive ourselves. It is upon psychological rather than material conditions that we must rely for the stimulated activity that seems to be ahead of us. Real prosperity is the product of hard work and political as well as individual economy. Until Congress appreciates the truth of this aphorism and applies it wise men will watch carefully for any signs of change in the prevailing sentiment.

It is to be admitted that there is but little indication of any change as yet, for the possibilities of "gold inflation" which have been so frequently pointed out in these letters are now beginning to dawn upon the popular mind. As an example of this one financial writer has recently stated that an aggregate expansion of about four billion dollars in the loans and circulation of the Federal Reserve Banks is now possible without reducing the reserve ratio below the 40 per cent which is generally and erroneously assumed to be the legal minimum. The calculation is probably misleading but it has powerfully impressed the public imagination and may ultimately give currency to the idea that credit is inexhaustible, which is one of the dangerous hallucinations by which men become obsessed in times of speculative excitement.

Industrial Engineers Hold Eighth Convention in Detroit

The eighth national convention of the Society of Industrial Engineers was held in the Hotel Statler, Detroit, Mich., April 26 to 28. The major subject of the meeting was "The Influence of Industrial Engineering Upon the Earnings of Capital and Labor." The meetings were held in the afternoons and evenings; the meetings were devoted to inspection trips to several of the large manufacturing plants in Detroit and nearby cities. Some of the plants visited were: Ford Motor Co., Detroit Steel Castings Co., Cadillac Motor Car Co., Detroit Pressed Steel Co., Burroughs Adding Machine Co. and the Hudson Motor Car Co. Joseph W. Roe, president of the society, presided over the technical sessions.

The meeting on Wednesday evening was presided over by Mortimer E. Cooley, president of the F. A. E. S. and Dean of the College of Engineering, University of Michigan. E. W. Hulet, vice-president of the White Motor Co., Cleveland, talked on "How Industrial Engineering May Serve the Executive," and illustrated his remarks with lantern slides.

"How Industrial Engineering Serves the Factory Manager," by Carl Wennerlund, of Detroit, introduced some new phases of industrial management. Mr. Wennerlund traced the development of industrial engineering during the past few years and interpreted its influence on industry. His remarks covered the progress of factory staff duties, tool designing, strengthening of belting and machines, speeding up of line shafts and an increase of bearing areas. In speaking of wage incentives whereby workmen would be promoted in proportion to their productive capacities, he said that it had been found advantageous to handle production so that a workman's efforts would be co-ordinated to the best advantage of all concerned. After much of the purely physical work in factories had been done it was clear that some attention should be paid to the human element. He advocated the selection of employees with some view as to their moral, physical and vocational fitness. The great influence of the industrial engineer lies in the fact that he has taken one subject, thoroughly analyzed it, and has pointed out certain methods of procedure in order that better production could be obtained. This led to the development of that great subject known as "motion study" which has become the basis for setting wage incentives and which has been adopted in principle by manufacturing concerns everywhere. Mr. Wennerlund followed these remarks with a résumé of methods by which every class of work done in the General Motors plants is in charge of an expert, and all these activities are tied together under one staff director, so that all can co-ordinate in and follow the same policy.

Fred M. Sawin, of the Federal Rubber Co., offered some added suggestions to the above remarks. He explained a plan whereby each general foreman, foreman, and assistant foreman receives, in addition to his regular salary, a bonus based on the following factors: percentage of seconds; cost of repairs to product; percentage of waste; departmental unit cost of product; amount of power used and direct overhead cost. He said that in the first year in which this plan was used the saving over the previous year amounted to over $400,000.

At another session Robert B. Locke, director and manager of the Federal Reserve Bank, Detroit, spoke on "The Need of the Hour." In the course of his remarks he said: "No sense of justice can be expected in working men until they are drilled in the fundamental economic principles underlying all business relations. The most drastic statutes will not cure the strike plague, but widespread instruction in economics will. This is an age of propaganda; many of us are unaware of its tendencies or its magnitude. A great deal of it is founded on economic fallacy. Therefore, I repeat that business should take an active interest in the character of today's tidal wave of propaganda.

Progress From Toil

"To stem the tide of discontent there is necessary a campaign of education, which will show the rising generation that America has gained everything that revolution can possibly bring, that there are certain boundaries beyond which the race cannot pass, and immutable laws of economics which no radical upheaval can alter. Neither the idle rich nor the shiftless poor can make secure the future of any state. Progress must come from those who toil intelligently and who receive therefrom character-building development. It is this class that gives to democracy the best guarantee of safety, and this class must not be oppressed either from above or below."

Dr. Yoichi Uyeno, chief director of the Institute of Industrial Psychology, Tokyo, Japan, told of his experience in applying scientific management in the factories of Japan. He said that after thorough research the hours of work were reduced and rest periods made available to the workers in the forenoon and afternoon. Working on the theory that every individual has a natural rate of speed, workers were arranged in groups in which members all worked at approximately the same rate of speed. This developed the instinct of rivalry between groups and resulted in an increased production of 35 per cent.

Henry C. Link, author and employment psychologist, started a heated discussion when he declared that "Judging a man by his face or his handwriting is nonsense." This remark was taken up by Harrington Emerson, of New York, who characterized Mr. Link's remark as "absurd." Mr. Emerson's views were supported by John Calder, superintendent of industrial relations, Swift & Co., Chicago. Mr. Calder went into considerable detail in justifying his stand on the question. He related some of his experiences with help in the packing plants of the Swift company.

Other speakers were: E. T. Miller, United Typothetae of America; W. W. Gilgis, the Palmolive Co.; W. P. Hilton, Willys-Overland Co.; Mathew Woll, vice-president of the American Federation of Labor; L. Morehouse, Detroit Pressed Steel Co.; F. H. Lowe, Ford Motor Co.; A. S. Cunningham, Hadfield-Penfield Steel Co.; Sam Lewisohn, of New York; F. B. Gilbreth, of Montclair, N. J.; N. A. Hawkins, of Detroit; and D. B. Gauschet, of Chicago.

Esthonia a Market for American Agricultural Machinery

Esthonia is a country which is well worth the careful attention of American manufacturers and exporters of agricultural machinery. It is primarily an agricultural country, and over two-thirds of its population are dependent on agriculture for a livelihood. The farmers are generally of a high degree of literacy and intelligent and progressive. There are sixteen agricultural schools in the country, which serve to spread broadcast knowledge and understanding of modern methods of farming. The numerous agricultural societies which exist in Esthonia have also had much to do with spreading the knowledge of modern agriculture possessed by the farmers, and for the past decade, through local farmers' associations, numbering 130, the use of fertilizers, agricultural machinery, and other things of economic value has become general.

A serious lack of agricultural machines exists in the country at the present time. This has resulted from the stoppage of imports during the war and during the period of reorganization following the war.

A. S. M. E. To Consider Power Test Codes

On Tuesday morning of the spring meeting of the American Society of Mechanical Engineers (Atlanta, Ga., May 8 to 12) a public hearing is set for the discussion of the three additional power test codes which have reached this stage of their development during the past year. Last May at Chicago the committee, of which Fred R. Low is chairman, presented codes on general instructions, steam engines, and evaporating apparatus. It now presents codes on definitions and values, displacement compressors and blowers, and hydraulic power plants.

Though these codes have passed six successive revisions in reaching their present form, the committee will welcome a full and frank discussion by the members of the society and others interested in these subjects. Reprints of all three codes, revised to date, have been prepared by the committee and may be obtained by addressing C. B. LePage, secretary, at the society's headquarters.

Adams Demonstration in June

The third annual machinery demonstration by Ogden R. Adams, Central Ave. at St. Paul St., Rochester, N. Y., will be held on Friday and Saturday, June 2 and 3. This year two days will be given to the demonstration which promises to be on a larger and more diversified scale than heretofore. Manufacturers and technical experts from various parts of the country will be present to demonstrate their products. Other unusual and interesting features will be presented to make the two days most helpful and entertaining to all who attend.

Professor Moore Explains Latest Theory on Endurance of Steel

At a meeting of the New York chapter of the American Society for Steel Treating, held in that city on April 25, Prof. F. H. Moore delivered a lecture on the "Fatigue of Metals." The material for the lecture was taken from a bulletin of the Engineering Experiment Station of the University of Illinois, of which Professor Moore is in charge, and was supplemented by some later developments along the lines suggested in the title.

Professor Moore spoke extemporaneously, giving some interesting details of his recent experiments to establish an endurance limit for steel. His conclusions showed there was a very definite endurance limit for different kinds of steel, subject to stresses of varying magnitude applied under certain conditions. The discussion which followed the professor's address brought out some interesting thought. Further developments along these lines are expected at future meetings of the society.

Steel Treaters Spring Meeting in Pittsburgh

The annual spring meeting of the American Society for Steel Treating will be held in Pittsburgh on May 25 and 26. W. J. Merten, chairman of the meetings committee of the Pittsburgh Chapter of the association, is in charge of the arrangements and has announced a tentative program which embodies some very interesting sessions. The papers which will be presented have been selected from a large assortment of subjects pertinent to the steel treating industry. Some of the papers are: "Fiber in Steel and Iron," by Prof. McIntosh, of the Carnegie Institute of Technology; "Mass Influence on Heat-Treating," by W. D. Crowe, of the Carnegie Steel Co.; "Abrasive Qualities of Carbon in Alloy Steels," by Mr. Cox, of the R. D. Nuttall Co.; "The Importance of Properly Heating and Cooling Steel," by J. A. Succop, of the Heppenstall Forge and Knife Co.; "The Manufacture of Springs," by Mr. Smith, of the Union Spring & Manufacturing Co.; "Shrinkage of High Speed Steel," by Mr. Grossman, of the Electric Alloy Steel Company.

At the annual banquet, which will be held on the evening of the twenty-fifth, the toastmaster will be G. H. Neilson, president of the Braeburn Steel Co. The speakers will be Dr. Bowman, of the University of Pittsburgh; Dr. J. A. Matthews, president of the Crucible Steel Company of America; and Prof. F. Crabtree, chairman of the American Institute of Mining and Metallurgical Engineers, Pittsburgh Division. The theme of the speakers at the banquet will be "Mystery of Metallography and the Heat-Treatment of Iron and Steel." A series of expeditions to the various plants in the vicinity of Pittsburgh has been arranged. The delegates will visit the steel mills and manufacturing plants and will be entertained by the management of several plants in the city.

The meetings will be held in the Auditorium of the Bureau of Mines and the headquarters of the convention will be established there. Further particulars regarding the convention can be had from W. H. Eisenman, national secretary of the society at 4600 Prospect Ave., Cleveland, Ohio.

W. A. Greaves, Machine Tool Builder, Dies in Cincinnati

William A. Greaves, Sr., president of the Greaves Machine Tool Co., Cincinnati, Ohio, died in that city on April 19. He was sixty years old. Mr. Greaves was well known in the machinery building industry.

He was born in Cincinnati and obtained his technical education in the Ohio Mechanics Institute. He served



WILLIAM A. GREAVES, SR.

his apprenticeship with the Lomas Forge and Bridge Co., in Cincinnati, and later became a foreman for Lodge, Barker & Co.

In 1889 he formed a partnership with H. H. Klusman, which was known as the Greaves-Klusman Co. His company manufactured lathes and wood-working machinery. In 1914 the company was incorporated as the Greaves-Klusman Tool Co., and took up the manufacture of lathes exclusively. Mr. Greaves sold out his interest in this concern in 1917, and with his two sons formed a partnership which is now known as the Greaves Machine Tool Co. He was also president of the Western Water Motor Co.

Mr. Greaves had a pleasing personality, and his vocal talent made him a welcome visitor in the social and business circles in which he moved.

Office Managers' Conference

The third national conference of the National Association of Office Managers will be held at Washington, D. C., on May 18, 19 and 20. Headquarters will be in the Hotel Raleigh but the meetings will be held in various government buildings. The registration office will be in the auditorium of the District of Columbia Building.

An unusual program of technical sessions, round table discussions and inspection trips has been prepared by a committee of which Herbert D. Brown, chief of the U. S. Bureau of Efficiency, is chairman. The members and their guests will be presented to President Harding and will hear Secretary of Commerce Hoover in an address on office efficiency.

Manufacturers and Supply Men in Convention at Birmingham

The joint convention of the American Supply and Machinery Manufacturers Association with the Southern Supply and Machinery Dealers Association was held in Birmingham, Ala., April 24 to 26. The convention was well attended by several hundred mill supply men from the Southern and Western territories. A general feeling of business optimism pervaded the meetings and predicted a healty growth in the machinery business during the coming months.

One of the most important addresses of the convention was delivered by Col. Peter O. Knight, well-known Southern jurist and counsel for the Southern Hardware Jobbers Association. Col. Knight's subject was "Optimism." He delivered a scathing denunciation of our present legislative organization, and severely criticized the sixteenth, seventeenth, eighteenth and nineteenth amendments to the constitution of the United States, stating that they were against the principles laid down in the original constitution. He also attacked the method of electing representatives and senators to Congress.

C. H. Houston, Assistant Secretary of Commerce, made a brief address in which he called atention to the closer relations existing between his department and the trade associations of the country. He declared that the department wished to have these relations of such a nature as to be of greater service to business. Other speakers were: W. H. Kettig, chairman of the Birmingham Branch of the Federal Reserve Bank; C. W. Beaver of the Yale & Towne Manufacturing Co., and N. A. Gladding, president of the American Association.

Bosch Service Plan

The American Bosch Magneto Corporation has inaugurated a special service plan which is intended to take care of all Bosch electrical equipment through the 500 or more service stations throughout the country. This service includes the registration directly with the company and its official representatives, as soon as the equipment is put in service. When a car, truck, tractor, engine or other product equipped with Bosch electrical apparatus is sold, the dealer fills out a postcard supplied him for that purpose, and mails it to the American Bosch Magneto Corporation, or one of its branches. Upon the receipt of this card, which contains all the information relative to the sale, the Bosch Corporation registers it and furnishes the purchaser with an identification card which entitles him to free service at any Bosch service station during the guarantee period.

The idea of this plan is to keep all genuine Bosch parts in working condition, and to eliminate the trouble often experienced by users of Bosch equipment in securing service repairs and renewal of parts. This service also keeps the company in close touch with the purchaser during the time of its responsibility to him. It also helps to protect the reputation of the company and its products.

Business Items

The Reeves Pulley Co., Columbus, Ind., announces that the manufacture and sale of Reeves centerless roll grinders is now being carried on at the home plant in Columbus. Agency distribution has been discontinued.

The International Blower Co. has been incorporated at Hartford, Conn., with a capital of $50,000. C. H. Keeny is president. The company has purchased the entire business of the Connecticut Blower Co., of Hartford, including the machinery, tools, stock, equipment, etc., and has moved into its own factory at 345 Trumbull St., Hartford.

At the annual meeting of the directors of the Abrasive Company of America, Ltd., Hamilton, Ontario, the following officers were elected: Louis T. Byers, president; J. H. Byers, vice-president and general manager; L. J. Borris, vice president; S. P. Byers, secretary and treasurer; Frederick S. Dickson, chairman of the board.

The Power Plant Equipment Co., of Kansas City, Mo., has been appointed representative for the Combustion Engineering Corporation, of New York.

The Jones & Pinfield Co. has been organized at Joplin, Mo., and has opened a machine shop at 2330 Baxter Ave.

John L. Taylor, of Philadelphia, dealer in power and contracting equipment, iron and wood-working machinery, announces the removal of his business from the Bulletin Bldg. to 211 North Third St. He would like to hear from manufacturers with agencies open in his lines.

The Reliable Machine Works Co., 1150 Main St., Bridgeport, Conn., recently changed the name of the concern to the Wheeler Insulated Wire Co., and will manufacture insulated wire and products.

The New England Tube and Stamping Co., West Haven, Conn., recently incorporated to take over the business of the Coe-Stapley Manufacturing Corporation, was organized at a recent meeting of the stockholders. P. J. Holdsworth, Gramercy Park, New York, has been elected president; J. M. Harding, New Haven, vice-president; Robert R. Adams, of Bridgeport, secretary and treasurer. Messrs. Holdsworth, Harding and Adams, also constitute the board of directors. The company will manufacture tubing, sheet-metal products and automobile accessories.

The Hat City Foundry Co., of Danbury, Conn., has recently filed incorporation papers, to engage in the foundry business. The capital stock is $15,000, and the incorporators are F. A. Shepard, J. P. Fahey and E. S. Ross, all of Danbury, Conn.

The Bridgeport Brass Foundry, Inc., of Bridgeport, Conn., has filed a preliminary certificate of dissolution with the Secretary of the State of Connecticut, and any claims against the company should be sent to Ralph Johnstone, 530 Newfield Ave., Bridgeport.

The Merwin Screw Co., Inc., Bridgeport, Conn., has recently filed papers of incorporation under the laws of Connecticut, to engage in the manufacture of screws, etc. The capital stock is $10,000, and the incorporators are: Fred H. Merwin, E. W. Merwin and Robert C. Mallette, 884 Main St., Bridgeport, Conn.

The International Tool and Gauge Co., 119 Broad St., Bridgeport, Conn., has recently opened a modern tool, die and gauge shop at the above address.

The W. F. Concannon Shear Co., Inc., of Milford, Conn., manufacturer of steel shears and scissors, recently increased the capital stock of the concern from $20,000 to $50,000.

The Lackawanna Tubes Ltd., recently organized, has taken over the properties and holdings of the Welland Machine and Foundries Ltd. The newly formed company has received authorization for a capitalization of $550,000 and will soon let contract for the construction of a new factory building. L. R. Weeks, of New York, is president and general manager of the company.

L. S. Starrett, Prominent Tool Builder, Dead

Leroy S. Starrett, president of the L. S. Starrett Co., tool manufacturers, Athol, Mass., died at his winter home in St. Petersburg, Fla., on April 23. He was born in China, Me., in 1836, and started his first machine shop in Newburyport, Mass., in 1866, after taking out patents on a washing machine, a butter worker and a meat chopper. Two years later he went to Athol and established the Athol Machine Co. He patented other devices, including a shoe hook fastener and a new type of vise. Suffering reverses, he lost control of the company, but soon afterward



LEROY S. STARRETT

started a new concern, and began to produce the line of tools that has met with marked success.

Gradually he built up a large business and in addition to his control of the L. S. Starrett Co., he regained control of the Athol Machine Co., and also held the dominant interest in the Athol Manufacturing Co. and the Metropolitan Air Goods Co. He founded the Union Twist Drill Co. which has grown to be one of Athol's largest industries. He was active in business up to the beginning of the present year.

Personals

R. L. Foster, manager of the New York sales department of the American Steel and Wire Co., has been appointed assistant general sales agent.

Harrison P. Reed, for many years electrical engineer and more recently head of the elevator department of the Cutler-Hammer Manufacturing Co., of Milwaukee, has been appointed general manager of the A. Kieckhefer Elevator Co., Milwaukee. He will assume his new duties on May 1.

George Powers has resigned after 48 years of continuous service with the Ludlow Valve Manufacturing Co., of Troy, N. Y. He will sail soon for a visit to England. For the past thirty years Mr. Powers has been foreman of the brass foundry.

H. R. Peckins, who for the past several years has represented the Utica Drop Forge and Tool Co., Utica, N. Y., is now associated with the Peck, Stow & Wilcox Company with headquarters in Utica.

W. A. Bachman, formerly vice-president of the Hemp Hills Foundries, Pittsburgh, Pa., has been appointed superintendent of foundries of the New York Central Railroad Co., with headquarters in Frankfort, N. Y.

Benjamin B. Gottesberger, of New York, has been appointed professor of mining at Yale University, New Haven, Conn. Mr. Gottesberger has had considerable mining engineering experience.

Francis H. Sherwood has recently joined the sales division of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Sherwood has had 12 years experience in the factory of the company.

Frank L. Eidmann, mechanical engineer of the Barrett-Cravens Co., Chicago, will sail this month for a six-months' business trip through Europe.

J. K. Williams, founder and former president of the Williams Foundry Co., Akron, Ohio, will re-enter the foundry business as vice-president of the Franz Foundry and Machine Co., of Barberton, Ohio.

W. T. Doyle, formerly associated with the S. Freeman Co., boiler manufacturers, of Racine, Wis., is now associated with the Richter Machinery Co., of Milwaukee. He will have charge of the boiler department.

A. S. Duncan, storekeeper at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Co., has been appointed general storekeeper of finished stocks.

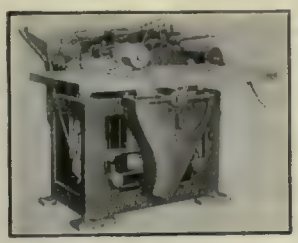
W. H. Miller has been appointed supervisor of tools and gages in the inspection department of the Westinghouse Electric and Manufacturing Co. works at East Pittsburgh, Pa.

E. R. Jackson, who during the war was assistant chief engineer at the Rock Island Arsenal and more recently sales manager for the Helsbels Iowa Co., Davenport, Iowa, has been elected secretary and superintendent of the Square Turn Tractor Co., of Norfolk, Neb.

Condensed-Clipping Index of Equipment

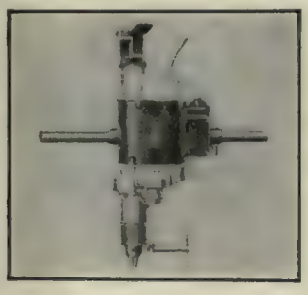
Patented Aug. 20, 1918

Saw, Rip, Wood, Self-Feed, No. 65
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," January 12, 1922



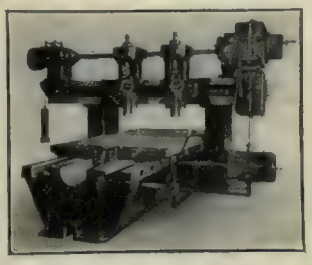
The machine rips all kinds of lumber and handles either rough or finished stock. The in-feed spur roller, either corrugated or smooth, carries the stock across the table top and through the saw. The machine holds saws up to 18 in. in diameter, cuts lumber up to 5 in. thick, and rips up to 24 in. wide. Six saws may be used at one time. There are three rates of feed, 80, 110 and 140 ft. per minute. Equipment: one 16-in. saw, saw guard, feed spur and guard, splitter, one plain and one corrugated sectional out-feed roll, filling collars and sawdust chute. Table 33½ x 56 inches.

Drill, Electric, Portable, Universal, "Super"
Hisey-Wolf Machine Co., Cincinnati, Ohio.
"American Machinist," January 12, 1922



The drill uses either direct- or single-phase alternating current of any frequency from 25 to 60 cycles, and is equipped with ball bearings throughout. It is made in three sizes, with capacities in steel of ⅜, ½ and ⅝ in. It is supplied for 110 or 220 volts, but can be furnished for special voltages up to 250. A Jacobs drill chuck is supplied for holding straight-shank drills. A Morse No. 1 taper socket can be furnished. The drill may be fitted with a screw feed, breast plate, grinding wheel, flexible shaft and a stand. Weight, 18, 22 and 24 lb., respectively.

Milling Machine, Planer-Type, Vertical, Double-spindle
Beaman & Smith Co., Providence, R. I.
"American Machinist," January 19, 1922



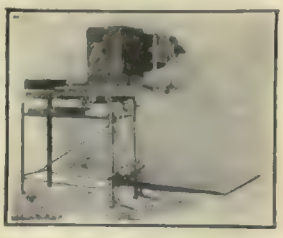
The machine has a fixed cross-rail with two independent heads, each with power feed for separate or simultaneous use. The table has a traverse equal to its length. Power feed from 1 to 8 in. per minute is available for all movements. There is a quick traverse for each movement at constant speed, independent of the feed. Three levers upon the operating side of the machine control all movements. A hand-wheel on each head provides a vertical spindle movement of 12 in. Inserted-tooth cutters 10 in. in diameter are used. Width between housings, 64 in. Table, 60 x 96 in. Weight, 50,000 lb. Floor space, 11 x 16 ft.

Cutting Machine, Oxy-Acetylene, Automatic, "Gewe"
General Welding & Equipment Co., 74 Brookline Ave., Boston, Mass.
"American Machinist," January 19, 1922



The machine cuts metal parts such as dies, cams, crankshafts and drop-forge tools directly from the steel plate. It has two carriages. The upper carriage supports on one side an oxygen-acetylene cutting torch, and on the opposite side the driving and the tracing system. A fiber template with the work outline grooved in it must be used. The speed can be regulated electrically by a rheostat or mechanically by changing the position of the friction wheel on the disk. The torch may be operated on either oxygen and hydrogen, or on oxygen and acetylene. The machine is made in two sizes having capacities of 12 x 12 in. and 24 x 24 in., respectively. Cutting speed, 18 in. per min. for ½-in. stock, to 7 in. per min. for 4-in. stock.

Photostat, All-Steel
Photostat Corporation, 299 State St., Rochester, N. Y.
"American Machinist," January 12, 1922



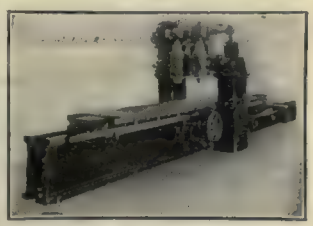
The chief feature of the machine is its all-metal construction. It is made in the same sizes as the former model. Roller bearings are used for the magazine and bellows. The mechanism for elevating and lowering the engineering copyboard or bookholder has been strengthened. A separate developing tank is carried on the side of the machine. All parts of the photostat are protected from splashing chemicals and erosion from the escaping fumes of the chemicals. The knife mechanism for cutting off prints has been strengthened. The adjustable curtain makes the magazine light proof and protects the sensitized paper when the magazine is open.

Indicator, Dial, "Junior"
Atlas Indicator Works, 160 North Wells St., Chicago, Ill.
"American Machinist," January 12, 1922



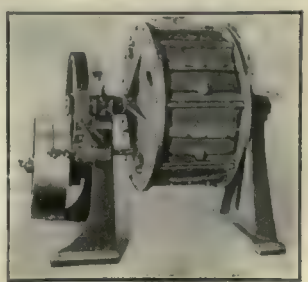
A swiveling clamp mounted on the back of the housing holds the dial in the most convenient position for reading. The indicator dial is graduated to 0.001 in., and has a range of 0.055 in. The position of the contact point can be changed for different sorts of inspecting operations. After adjusting the contact point on the work, the dial may be revolved so as to bring the zero mark in line with the indicator hand.

Milling Machine, Planer-Type, Double-spindle, Intermittent Feed
Beaman & Smith Co., Providence, R. I.
"American Machinist," January 19, 1922



The machine is used for spot milling castings with surfaces in one plane but not continuous. The table power feed covers the full length of travel. The crossrail is fixed and mounted with two vertically adjustable spindles without power movement. The special feature of the machine is the "jump," or intermittent feed controlled by a series of adjustable cam dogs. A gear box provides changes of feed. A pair of three-step cones and belt permits of varying the rate of quick traverse between cuts. The machine can be furnished with dimensions to suit any piece that is to be machined in quantities. Table 24 in. x 14 ft.

Burnishing Machine, Ball
Abbott Ball Co., Hartford, Conn.
"American Machinist," January 19, 1922



The chief feature of the machine is that the work is held stationary on the inside of the barrel body, and as the barrel rotates the parts are carried through the cleaning mixture without striking against one another. The barrel has eight sides, each having a hand hole with a hinged cover. The packing around the edges of the hinged covers makes the barrel watertight. The work fixtures are fastened to the inside of the cover plates. Several sets of cover plates and work fixtures are usually provided for each machine.

M. H. ROBERTS has been appointed vice-president in charge of engineering of the Franklin Railway Supply Co., Inc., New York City. He was previously chief engineer.

J. G. WORKER, vice-president and general manager of the Phoenix Manufacturing Co., Eau Claire, Wis., has become president and directing head of that firm, following the resignation of C. L. Tolles.

W. A. THOMAS, former president of the Brier Hill Steel Co. and now a director of the Mansfield Sheet and Tinplate Co., Mansfield, Ohio, has been elected a director of the General Fireproofing Co., succeeding R. M. Thiel who continues as secretary and treasurer.

HARRY R. JONES, former president of the United Alloy Steel Corporation and now a member of that corporation's executive board, has been named a director in the Dominion Alloy Steel Corporation, a new $15,000,000 concern to be located at Sarnia, Ontario, Canada.

C. C. LYND, who has been in charge of the New Orleans office of the American Rolling Mill Co., Middletown, Ohio, has been placed in charge of the office which has been opened in Houston, Tex.

WALTER F. ROGERS, formerly with the Norton Company, has joined the sales staff of the Reeves Pulley Co., Columbus, Ind.

JOHN A. JOHNSON, of Chicago, has been appointed works manager for the K & F Manufacturing Co., engineers and tool builders, of Kenosha, Wis.

WALDO M. PITKIN, general manager of Albert Baldwin & Co., Ltd., of New Orleans, La., dealer in hardware and machinery, has been re-elected president of the Southern Hardware Jobbers Association, which has just closed its annual convention. John Donner, of Richmond, Va., secretary-treasurer for the past fifteen years, was again chosen for that office.

WILLIAM J. GRIFFIN, treasurer of the Bilton Machine Tool Co., manufacturers of machinery and tools, Bridgeport, Conn., has been chosen treasurer and a director of the Artistic Bronze Co., bronze manufacturers of Bridgeport, Conn.

HARRY HALSALL, of Atkinson, Hamer & Co., distributors of cotton manufacturing machinery, of Boston, and Bradford, Eng., sailed from this country recently for England, where he plans to spend the next two months on business, both in England and on the continent.

MARK A. MILLER, of the New York office of the Yale & Towne Manufacturing Co., Stamford, Conn., has joined the sales force of that company, and will shortly go on the road in the Western territory. Mr. Miller has been with the company since 1919.

PETER H. BULLOCK retired on May 1 as chief engineer of the Massachusetts Reformatory, at Concord Junction, Mass., after serving continuously in that position for 42 years. Mr. Bullock served his apprenticeship in a railroad shop fifty-six years ago. He was a frequent contributor to the columns of AMERICAN MACHINIST, and in 1888 wrote a series of articles on the "Modern Steam Plant and Its Management."

M. D. EBBETS, formerly of the New York branch of the Sloan Valve Co. of Chicago, has been appointed northern New England representative of the company. Mr. Ebbet will be located at 45 Tremont Bldg., Boston, and his territory embraces Maine, New Hampshire, Vermont and eastern Massachusetts.

T. M. RUSSELL, president of the Russell Manufacturing Co., Middletown, Conn., recently returned to this country after an extended trip into Egypt.

Obituary

ROBERT H. ILLINGWORTH, vice-president of the Crucible Steel Co., died on April 23 at his home in Newark, N. J. Mr. Illingworth had been in the steel business for the past forty-two years.

WALTER E. VOIGHT, president of the Mobile Steel Co., Mobile, Ala., died in that city on April 4.

GEORGE R. WALES, of Beverly, Mass., died in Boston on April 14. He was a member of the firm of John Wales & Co., iron and steel producers.

Trade Catalogs

Simplex Tools. Simplex Tool Co., Woonsocket, R. I. A small booklet describing a line of production and inspection tools. Each type is illustrated and specifications and price lists are included.

Toledo Steels. The Toledo Steel Works, Sheffield, England; manufactured by John Hy. Andrew & Co., Ltd., United States branch, Newman-Andrew Co., New York City, N. Y. A catalog describing a line of crucible steels, made to Sheffield practice. Tables of heat-treatment and annealing operations are given for all kinds. Price lists are included.

"Stoever" Pipe Machines. Treadwell Engineering Co., Easton, Pa. Sixteen-page catalog devoted to a description of "Stoever" pipe machines, made by the Treadwell Company. Several sizes and types are shown, details given and parts illustrated.

The Mummert-Dixon Co., Hanover, Pa., patternmakers and oilstone grinders, are distributing a small booklet entitled "Something Interesting About Stars." It contains some very interesting facts on astronomy, a brief study of cosmogony, and descriptive paragraphs on molecules, atoms and electrons.

Book Reviews

Thermal Expansion of Nickel, Monel Metal, Stellite, Stainless Steel and Aluminum. Scientific Paper No. 426, of the Bureau of Standards, Department of Commerce, by Wilmer H. Souder and Peter Hidnert. Complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 10 cents.

The increasing use of nickel and nickel alloy wire in spark plugs; of monel metal for high-pressure steam valves, stems, seats; of stellite for surgical and household uses; of stainless steel for engine valves, pump rods, marine fittings; and of aluminum or its alloys where lightness is necessary—has created a demand for information regarding the thermal expansion of these materials. Data on the thermal expansion of twenty-nine samples of these metals are given in this book together with results obtained by previous observers on the expansion of nickel and aluminum. All of these samples except stainless steel (heated to 900 deg. C.) were examined from room temperature to about 600 deg. C.

The results are presented in the form of tables and curves. Commercial nickel indicated only a slight irregularity at about 350 deg. C., and annealing of hot-rolled samples of nickel caused a slight increase in the coefficients. The expansion curves of monel metal were found to be fairly regular, but for temperature range from 25 to 600 deg. C. the average coefficients of the cast samples were greater than those of hot-rolled alloys. Stellite expansion curves showed irregularities in the region between 300 and 500 deg. C., the sample containing tungsten having the smallest coefficient, while there were indications that hammering may lower the value of the coefficient of expansion. Both annealed and hardened stainless steel curves indicated critical regions from 825 to 855 deg. C., the hardened stainless steel curve being irregular between 200 and 400 deg. C., where strains produced in hardening were released. The coefficients of hardened or annealed stainless steel were less than the coefficients of ordinary iron or steel. Thermal expansion of aluminum was found to be approximately twice as large as that of the other materials.

For the range from room temperature to 100 deg. C., the coefficients of expansion varied from 9.6×10^{-6} for a sample of hardened stainless steel to 23.8×10^{-6} for a sample of exceptionally pure aluminum.

Co-operative Competition. A series of twenty-five articles on trade associations published in the New York *Evening Post* and reprinted in pamphlet form. Copies may be secured from the *Evening Post*, 20 Vesey St., New York. Price 25 cents.

Coming at a time like the present when the activities of trade associations are the center of interest in more places than one, this series of articles on various phases of co-operative competition is decidedly timely. The foreword is by Secretary Hoover and the articles are by leaders in various lines of business, trade association officials, Department of Commerce and Federal Trade Commission experts and others. They are worth reading.

Forthcoming Meetings

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 5 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa. Headquarters will be in the Marlborough-Blenheim Hotel.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Fly-Cutter Holder, Milling Machine

George W. Dover Co., Inc., Providence, R. I.

"American Machinist," January 19, 1922

The holder is used in making small dies and manifold form cutters for screw machines. It fits over the spindle nose of a milling machine and clamps to the face of the column. The inner end of the arbor is tapered to fit the spindle hole, and bears on a bronze sleeve housed in the frame of the device. The arbor may be held stationary with the cutter in any desired position. The casting carrying the bearing sleeve can be swiveled to an angle of 20 deg. either way, and is graduated.



Tractor, Industrial, Electric, Type-K

Mercury Manufacturing Co., 4118 South Halsted St., Chicago, Ill.

"American Machinist," January 19, 1922

The machine is used for light work in close quarters. A General Electric motor operating on 24 volts and 50 amperes at 1,500 r.p.m. is used, the drive being through worm gearing to the rear axle. The drum-type controller gives three speeds forward and one reverse. The brake is of the contracting-drum type and is operated by a foot pedal. The machine has a normal draw-bar pull of 400 lb., with a maximum of 650 lb. The speed when running light is about 6 miles per hour. Width, 29 in. Height, 48 in. Length, 56 in.



Hoist, Triple-Hook

Wright Manufacturing Co., Lisbon, Ohio.

"American Machinist," January 19, 1922

The three hooks are operated simultaneously by one hand chain and are intended for lifting and conveying flexible materials such as bundles of long wires, metal bars, tubes and sheet metal. The hooks are connected by lengths of pipe, and are ordinarily placed 5 ft. apart, although this distance may be varied. The hoist has a capacity of 1 ton, but can be furnished in larger sizes. It is ordinarily suspended from three ½-ton plain trolleys running on an overhead I-beam.



Scleroscope, Portable, "Auto Punch"

Case Hardening Service Co., 2283 Scranton Road, Cleveland, Ohio.

"American Machinist," January 19, 1922

The device is made in two sizes, the 12-in. size for work on steel, iron and hard metals, and the 6-in. size for sheet brass and thin metals. By pressure on the barrel the spring hammer is released and strikes the ball. The resulting depression in the work is then measured, as in the Brinell test. The tested piece must rest on a solid support, but usually can be tested in position. The hardness of steel plate, stampings, forgings and castings, as well as that of case-hardened and heat-treated work, can be determined. A pressure of 850 kg. on a ½-in. ball gives a depression of the same size as that of the 12-in. punch when testing mild steel.



Press, Straightening, Hand, "Production," No. 2P

P. A. Geier Co., Cleveland, Ohio.

"American Machinist," January 19, 1922

The press is adapted to production work on crankshafts. A lever and graduated handwheel apply the driving force. The thrust block of the screw has a range of from 2 to 8 in. distance from the table. The work is straightened without removing it from the centers. A screw is used to adjust the position of the work. A dial indicator having a stroke of ¼ in. shows the eccentricity of the work. Rollers mounted above the center points hold the longer work, and for this an extra pair of thrust blocks is furnished. Maximum distance between center points, 40 in. Bed, 26 in. long. Floor space, 22½ x 82 in. Height, 55½ in. Weight, 500 pounds.



Attachment, Milling, Lathe

George W. Dover Co., Inc., Providence, R. I.

"American Machinist," January 19, 1922

The device can be bolted to the toolblock of an 18-in. engine lathe to do small milling work such as tap and reamer fluting and cutting teeth in small cutters. It is used chiefly in shops where the range of milling work is limited and where no small machine for this work is available. The dividing head is mounted on a graduated swiveling plate that can be set to any angle up to 20 deg. on either side. A set of removable index plates is keyed to the lower end of the spindle. A vise may be mounted in place of the dividing head. A V-block can be attached in any angular position to support slender work. The elevating screw gives vertical adjustments to 0.001 in. The slide may be clamped in any position.



Drill, Electric, Portable, "Buzz"

United States Electrical Tool Co., Cincinnati, Ohio.

"American Machinist," January 19, 1922

The machine is used both for metal drilling and wood boring, and is driven by a universal type motor for both direct or alternating current. The controlling switch is located in the handle. The gears are made of hardened chrome-nickel steel, and run in grease. The spindle is fitted with ball thrust bearings. Spindle speed, 1,100 r.p.m. Weight, 6 pounds.



Hardening Tool, Magnetic, "Temperite"

Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa.

"American Machinist," January 19, 1922

The device is used in determining the proper hardening heat for carbon steel, as ordinary carbon steel attracts a magnet as long as it is under the correct hardening heat, but as soon as this heat is reached the steel has no magnetic attraction. The tool consists of a balanced and insulated magnetic tilting bar mounted on the end of a rod. The bar, made of special steel that enables it to retain its magnetism better than an ordinary magnet, is not affected to any great extent by the heat. The bar will tip when brought near the work, until the correct hardening temperature has been reached, at which point it is no longer affected.



Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Minimum of $1.60 quoted on steel shapes, plates and bars at Pittsburgh mills. Several makers quoting as high as $1.70 per 100 lb. on small tonnages. All semi-finished steel up $2 per ton. Pig iron prices firmer in Pittsburgh and Birmingham. Blue annealed sheets, base nine, up 10c. in New York and 5c. per lb. in Cleveland warehouses. Galvanized sheets also slightly advanced in Cleveland. Structural shapes, bars, tank plates and floor plates up 10c. per lb. in Cleveland and New York warehouses.

Lead quoted in New York at 5¾c. as against 5¾c. per lb.; raw linseed oil at 91c. as compared with 89c. per gal. (5 bbl. lots).

Declines—Tin quoted at 31¾c. as against 32¼c. per lb. in New York. Declines in copper rods, zinc sheets and brass sheets, rods and wire in New York; slight drop in brass rods and copper sheets, wire and rods in Cleveland.

Improvement in electrolytic copper with upward tendency in price, zinc firm.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	20.78
Southern Ohio No. 2	20.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.16
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.34
Virginia No. 2	28.24
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	16.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	21.46
Bessemer	21.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
Nos. 10	2.40	3.38	3.15	3.38
Nos. 12	2.45	3.43	3.20	3.43
Nos. 14	2.50	3.48	3.25	3.48
Nos. 16	2.70	3.58	3.35	3.58
Black				
Nos. 17 and 21	3.00	4.05	3.55	4.10
Nos. 22 and 24	3.05	4.10	3.60	4.15
Nos. 25 and 26	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11	3.15	4.25	3.75	4.30
Nos. 12 and 14	3.25	4.35	3.85	4.40
Nos. 17 and 21	3.55	4.65	4.15	4.70
Nos. 22 and 24	3.70	4.80	4.45	4.85
No. 26	3.85	4.95	4.60	5.00
No. 28	4.15	5.25	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	69	57½	⅜ to 1¼	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings, Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66⅔%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings, Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛"	8.00		12@13
5/32"	6.50		11@12
3/16 to ½	6.25		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	13.62½		
Tin, 5-ton lots, New York	31.75		
Lead (up to carlots), St. Louis, 5.40; New York	5.75		
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½		
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7 25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.91	.95	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–5%	60–10%	60%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50–5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.00
Cone heads, ditto (net)	3.60	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Folger & Co., 1529 West 14th St.—power brake, 5 or 10 ft. long.

Ill., Chicago—The Hess Warming & Ventilating Co., 1219 South Western Ave.—power square shears, (used).

Ill., Oak Park—The Atlas Educational Film Co., 1222 South Blvd.—one engine lathe, 1 x 10 in. swing, short bed, (used).

Kan., Madison—W. J. Turner—centering equipment including 12 x 24 or 30 in. mandrel and table, for machine shop.

Mass., Cambridge—The Boston Structural Steel Co., Inc., 241 Albany St.—one automatic screw machine, No. 2 Brown & Sharpe preferred, (used); one punch press No. 2½ Bliss preferred; one rotary shear and one small hand screw machine.

Me., Acorn—The Aurora Welding Co.—power lathe and drill press.

Mo., Joplin—J. Roller Wks., East 5th St., (sewing machines), J. Schaeffer, Purch. Agt.—power drill press, lathe, belting and shafting and pump making machinery.

Mo., Joplin—Craig & Borchers, Motor A. Co., Utica and Main Sts., H. H. Craig, Purch. Agt.—power drill press and lathe for garage.

Mo., Joplin—The Greenwell Brass Fdry., East 7th St., F. Greenwell, Purch. Agt.—power lathe for brass work.

Mo., Joplin—M. Henson, 2425 Main St., blacksmith—lathe and drill press for power work.

Mo., Joplin—The Joplin Handle & Novelty Co., 2421 Main St., J. C. McDaniel, Purch. Agt.—large wood lathe and wood working machinery.

Mo., Joplin—The Joplin Mchy. Exchange, 211 East 6th St., W. Clark, Purch. Agt.—lathes for machine shop.

Mo., Joplin—The Kennedy Auto Shop, 24th and Main Sts., J. Higginbotham, Purch. Agt.—lathe for power equipment.

Mo., Joplin—L. & O. Garage, 2010 Main St., E. C. Lawson, Purch. Agt.—power lathe and drill press.

Mo., Joplin—The Osage Garage, 110-112 Joplin St., F. Cecil, Purch. Agt.—crank shaft grinder and cylinder grinder.

Mo., Joplin—W. H. Tharp, 2123 Main St., garage—power drill press and lathe.

Mo., Kansas City—The Packard Motor Co. of Missouri, 12th and Mercier Sts., garage and machine shop, T. H. Smith, Purch. Agt.—full machine shop equipment for garage.

Neb., Lincoln—The Kimball Motor Car Co., 1040 O St., C. C. Kimball, Purch. Agt.—pneumatic or electric grinder, also lathe with 4 ft. bed.

Neb., Lincoln—The Nebraska Mchy. and Supply Co., 127 North 9th St., W. H. Bixby, Purch. Agt.—wood band saw, plane table; small light high speed drill press; combination punch and shear (Beaudouine preferred); one ton or 1½ ton Yale or similar chain hoist; power hack saw similar to No. 2 Marvel; 75-150 lb. blacksmith vise; 150-175 lb. anvil, (used).

N. Mex., Albuquerque—The Wood Motor Co., W. H. Wood, Purch. Agt.—$2,500 worth of equipment for machine shop including drill presses, grinding machinery, lathes and small tools.

N. Y., Binghamton—F. H. Wilbur & Son, Wall St., F. H. Wilbur, Purch. Agt.—machine tool equipment for shop specializing in repair work etc.

N. Y., Buffalo—Klein & Shallon, Inc., 420 Babcock St.—packing plant equipment for proposed addition.

N. Y., Buffalo—The Nott Lamp Wks. of the General Electric Co., 1425 Fillmore Ave.—machine shop equipment including lathes, drills etc.

N. Y., Great Bend—The O. L. Steere Co.—woodworking tools and equipment also sheet metal tools for the manufacture of slatted wood and metal garage creepers.

O., Cincinnati—The Clifton-Pratt Co., 1216 West 8th St., A. E. Clifton, Purch. Agt.—one 24 in. New Haven sand blast barrel, (used).

O., Cincinnati—The Eastern Mchy. Co., 685 East Pearl St., A. Smith, Purch. Agt.—three or four spindle drill press, (sensitive).

O., Cleveland—The County Commissioners, C. J. Heiber, Court House—one LeBlonde quick change lathe, 18 ft. x 10 ft. for road repair department.

Pa., Brookville—The Bd. Educ.—equipment for vocational and engineering departments of the Brookville High School.

Pa., Phila.—F. J. Stokes Machine Co., 17th and Cambria Sts., F. J. Stokes, Purch. Agt.—boring machines, lathes, planer, cranes, etc.

Pa., Pittsburgh—The Edgewater Steel Co., P. O. Box 249, W. A. McKean, Purch. Agt.—one wheel boring mill, motor driven and must have automatic chuck, (used); one Ridgeway type hub facing machine for car wheels, motor driven, (used).

Va., Ashland—Fuqua Stone & Co., auto repairs—lathe, press, grinder and bench tools.

Va., Petersburg—The Petersburg Farm Machine Corp., 1009 South Sycamore St., H. L. Smith, Purch. Agt.—complete line of woodworking, machine shop and foundry machinery and equipment. Will consider slightly used.

Va., Richmond—The Auto Electric Repair Co., 532 West Broad St.—emery wheels, lathe, vise and reamer.

Va., Richmond—W. J. Harris, 820 West Broad St.—drill press.

Va., Richmond—F. D. Schluter, 922 West Broad St.—cylinder grinder and crank shaft grinder.

Va., Richmond—The Transportation Motor Co., 1410 West Broad St.—drill press, lathe and cylinder grinder for auto repair work.

Va., Richmond—H. C. Tutwiler, 1019 West Broad St.—flexible buffer, bead cutter, skiver and tread puller.

Va., Richmond—Winn, Mills & Wiler, 1001 West Broad St.—one 20 ton press, Weaver preferred.

Wis., Kaukauna—The School Bd., L. G. Schuxsmann, Supt.—complete equipment for manual training department of proposed high school.

Machinery Wanted

Ala., Birmingham—The Corona Coal Co., First Natl. Bank Bldg., A. Peacock, Purch. Agt.—one 36 in. circular saw mill with tilting tables to be used for mine timbers, etc.

Ala., Birmingham—Birmingham Building Material Co., 1317-21 Ave. E South—one cut off saw 24 in.; one planer; one 7½ hp., dc., 1,000 r.p.m. motor.

Ark., Little Rock—The Machinery Exchange, A. O. U. W. Bldg.—complete ice plant machinery for 10 ton ice plant, also direct connected engine and turbo-generator set of 150 kw. to 200 kw. capacity, 3 phase 60 cycle, 80 per cent power factor, exciter and switchboard complete, also turbo generator set of 500 kw. capacity, 3 phase, 60 cycle, 80 per cent power factor, exciter and switchboard complete.

Fla., Fort Meade—L. A. Morgan—canning machinery and equipment for canning factory.

Fla., West Palm Beach—The Atlantic Fish Co., C. Kennedy, Mgr.—fish canning machinery and equipment.

Ga., Barnesville—Collier Mills, Inc., J. A. Cason, Secy.—Wildman or Scott & Williams, 20 in., 21 in., 22 in., 23 in. underwear knitting machines, 12 cut, also one Payne winding machine.

Ga., Macon—W. E. Dunwoody, P. O. Box 295—one tractor for handling transfer cars.

Ga., Tignall—C. H. Hill—machinery for small broom manufacturing plant.

Ill., Dallas City—The Purity Moulding Sand Co.—one 24 ft. portable belt conveyor for handling sand from dump cart to freight cars.

Ind., Butler—The Higley Printing Co., M. Higley, Purch. Agt.—one 10 x 15 job printing press.

Kan., Galena—The Riceville Mining Co., J. Sparks, Purch. Agt.—belting, shafting and pulleys.

Kan., Parsons—P. Foley—equipment for daily newspaper plant.

Kan., Parsons—The Parsons Daily Sun, L. Combs, Purch. Agt.—newspaper equipment.

La., Monroe—The Southwest Pulp & Paper Co., G. Richter, Light & Power Bldg., Watertown, Purch. Agt.—paper making equipment for paper mill including paper machine, Jordan refining engines, Agitator gears and blade fittings, swng cut-off saw, wood rossers, wood chippers, wood screens, pulp screens, steam and acid digesters, conveying equipment, shafting, belting and miscellaneous transmission equipment, variable and constant speed drive clutches, boilers and engines and special lead and brass piping.

Mass., Clinton—The Roubaix Mills, Inc., 792 Main St.—one 66 in. shear, single or double, for shearing woolens and worsted.

Mich., Detroit—The Auto Collapsible Rim Co., Inc., c/o P. R. Rossello, Archt., 406 Congress Bldg.—machine equipment for the manufacture of metal rims and wheel parts.

Mich., Detroit—The Crating & Woodworking Co., 3652 Hart Ave.—woodworking machinery.

Mich., Detroit—The D. E. Morand Mchy. Co., 87 Quincy Ave.—one 300 or 400 lb. board drop hammer.

Mass., Fall River—The Fyans, Fraser & Blackway Co., 83 Anawan St.—automatic looms, (used).

Mo., Carthage—The Leggett & Platt Bed Spring Co., C. B. Platt, Mgr.—machinery for the manufacture of bed springs for proposed factory on Vine St.

Mo., Joplin—Pitkin, Boyd & Neal Packing Co., 7th St.—refrigeration equipment for remodeled plant.

Mo., Joplin—The Typographical Union, Printers Bulletin, 1621 South Main St., E. L. Bucher, Business Mgr.—newspaper equipment and linotype machine.

Mo., Joplin—The Ward Optical Co., 530½ Main St., G. Ward, Purch. Agt.—lens grinder, power.

Mo., St. Louis—The Mindlin Printing Co., 211 North 7th St.—printing press, 10 x 15 or 12 x 18.

Neb., Lincoln—The Independent Bindery Co., 133 South 12th St., W. K. Pease, Purch. Agt.—punching machine and perforating machine either motor or foot power.

Neb., Lincoln—G. V. Keller, 18th and N Sts.—machinery and equipment for repair shop including bench drill press and a lathe about 18 in. x 10 ft.

Neb., Lincoln—The University of Nebraska, L. F. Seaton, Purch. Agt.—one 3 roller cylinder press about 28 in. x 41 in. with motor, brachet, rollers and book chase; one heavy duty press with rollers, counter and motor; one stitcher; one power cutter; type, and cabinet.

N. J., Kearney—The Greenfield Mchy. Agency, 98 Tappan St.—one 4 ft. and one 6 ft. power brake, both to bend 4 gage sheets to 90 degrees.

N. Y., Binghamton—The LaFlint Battery Corp., J. W. LaDuska, Purch. Agt.—machinery and equipment for charging and repairing storage cells, electric testing equipment.

N. Y., Brooklyn—D. C. Budd, 128 Martense St.—one steam engine slide valve, 50 hp., and one extractor, Tolhurst preferred.

N. Y., Brooklyn—The Estate of A. Starke, Columbia and Sigourney Sts.—one ton electric hoist for a.c. current.

N. Y., Buffalo—W. H. Beale & Son, 171 Hollywood St.—equipment for dairy.

N. Y., Buffalo—The Male Motor Truck Co., 184 Mohawk St.—one 42 in. arbor press.

N. Y., Buffalo—G. Stinson, 474 Swan St.—woodworking machinery.

N. Y., Corning—M. Gorman—equipment for bakeshop at Eustic, Fla.

N. Y., Fredonia—The E. & O. Mfg. Co.—machinery and equipment for factory recently purchased at Kane, Pa., for the manufacture of automobile signal devices, etc.

N. Y., Hamilton—The Madison County Basket Co., Inc.—machines and equipment for the manufacture of baskets, including steeping vats and washers.

N. Y., LeRoy—The LeRoy Lime & Crushed Stone Corp., J. L. Heimlich, Purch. Agt.—stone drilling, quarrying and crushing machinery.

N. Y., Morris—The Chronicle Office, B. F. Waite, Purch. Agt.—printing equipment and printing matrices for newspaper plant.

N. Y., New York—M. Billet, 40 East Houston St.—one No. 1 plain back geared milling machine.

N. Y., New York—The MacGovern Co., 114 Liberty St.—bending roll, 8 ft. long, 9 in. diameter and one bending roll 146 in. long, 20 in. diameter.

N. Y., New York—The Worthington Pump & Mchy. Corp., 115 Bway., C. W. Hodges, Genl. Purch. Agt.—electrically operated crane, 25 ton capacity for its Blake & Knowles Wks. at East Cambridge, Mass.

N. Y., Rochester—The Scott Bros. Constr. Co.—tools, equipment, etc. for blacksmith shop now under construction.

N. Y., Troy—H. S. H. Co., R. C. Hilton, Purch. Agt.—automatic paper punching and cutting equipment to cut bottle caps out of board.

N. Y., Watertown—The Greens Pastry Shoppe, 228 Goodale St., C. E. Green, Purch. Agt.—mixing and baking equipment for bread and pastry, (electricity for power gas fuel).

N. C., Gibsonville — The Gibsonville Hosiery Mills Co., A. B. Owen, Secy.-Treas. —several 200, 220 or 240 needle ribbers any make, 3½ in. or 3¼ in.

N. C., High Point—R. K. Stewart & Son, R. K. Stewart, Purch. Agt.—Lidgerwood or Stroudsburg double drum hoisting engine and 25 hp. boiler.

N. C., Raleigh—Stanton Bros., J. Stanton, Purch. Agt.—machinery and equipment for dairy at Wilmington.

N. C., Wilmington—The Carters Production Wks., 210 South Water St., O. Carter, Purch. Agt.—machinery suitable for grinding and mixing material to make metal polish.

O., Akron—The Natl. Sulphur Co., Inc.—machinery and equipment for use in manufacture of insectide powders, sulphur refining, and sulphur products.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., S. M. Jones, Purch. Agt.—one No. 23 New Brittain automatic, (used).

O., Cincinnati—T. Lee & Sons Co., 128 West 2nd St., R. E. Lee, Purch. Agt.—single end tenoning machine for woodwork, (used).

O., Cleveland—E. G. Bauer, 403 Union Bldg.—small double crank press; small toggle press; thread roller; thread miller (Hobber) about 3 in. x 12 in.; small Landis Universal grinder.

O., Cleveland—The Clinton Co., 6332 Bway.—one overhead bucket type crane conveyor.

O., Columbus—The Central Refractories Co., Ferris Bldg., A. N. Spencer, Vice Pres.—equipment for plant at New Lexington, including dryers, cutters and other brick making machinery.

O., Columbus—The Grandview Lumber Co., Grandview Ave. along the tracks of the Pennsylvania R.R., J. C. McNally, Mgr.—two woodworking machines and planer.

Okla., Hugo—The Hugo Canning & Preserving Co., W. T. Larimore, Secy.—complete line of machinery and equipment for plant for canning tomatoes, also pulping equipment.

Pa., Erie—The Erie Metal Furniture Co. —machinery for proposed factory for the manufacture of metal furniture.

Pa., Hyde Park—The Reading Towel Mfg. Co., Inc., J. R. Geibel, Pres., has purchased the Glasner Hosiery Mills in Reading, will move equipment and will also purchase one hundred looms and minor equipment.

Pa., Koppel—The Koppel Industrial Car & Equipment Co., manufacturers of mine cars and equipment—one 7½ ton crane.

Pa., Mansfield—C. M. Thompson—complete equipment for repair and charging of storage cells for plant at Wellsboro.

Pa., Phila.—The American Dye Wks., Inc., Tulip and Westmoreland Sts.—balling machine suitable for balling hand knitting yarn.

Pa., Phila.—W. Gadke, 2222 West Huntingdon St., (auto business)—one 16 in. shaper in good condition.

Pa., Phila.—The Guarantee Knitting Mills, 514 Market St., automatic knitting machines, carding frames, finishing machines.

Pa., Phila.—The Shingle Leather Co., 315 Vine St.—$50,000 worth of leather working machinery for proposed factory.

Pa., Ridgway—F. K. Brown—complete equipment for bakery to replace that which was destroyed by fire.

S. C., Clinton—The Thornwell Orphanage, L. R. Lynn, Mgr.—complete line of laundry machinery.

S. C., Greenville—The Greenville Plating Wks., T. R. Machen, Pres.—machinery, equipment and supplies for metal plating.

Tenn., Knoxville — The Appalachian Marble Co., Middlebrook Park—air compressor, 300 to 500 cu.ft. capacity, motor or belt driven.

Tex., San Antonio—The Three Rivers Glass Co., Bedell Blvd., C. R. Tips, Secy.-Treas.—automatic glass blowing machinery for use in plant with daily capacity of from 100 to 300 gross bottles.

Tex., Texas City—The Texas City Sun, (Sun Printing Co.)—linotype and intertype for printing plant.

Va., Altavista—Telepost Publishing Co.—W. M. Hundley, Mgr.—complete line of machinery and equipment for proposed newspaper plant.

Va., Radford—The Amer. Steam Laundry Co., W. H. Painter, Pres.—complete line of laundry machinery.

Va., Richmond—The Kimker Service Co., 1205 West Broad St., A. P. Moore, Purch. Agt.—vulcanizing outfit for auto repair shop.

Va., Richmond—The Main St. Auto Supply Co., 1607 West Main St., A. L. Robinson, Purch. Agt.—vulcanizing outfit.

Va., Roanoke—The Liberty Laundry Co. —complete machinery and equipment for laundry.

Va., Roanoke—The White Fdry. Co., 613 10th Ave., H. H. White, Pres. and Mgr.—complete line of foundry machinery and equipment for small foundry.

Va., Smithfield—Sykes & Gwaltney, W. Sykes, Purch. Agt.—oil burning equipment for present planing mill, also miscellaneous woodworking equipment and machinery.

W. Va., Buckhannon—The LaBoard Furniture Co.—Dovetailing machinery for the manufacture of tables.

Wis., Kenosha—The Kenosha Milk Products Co., T. W. Powell, Secy.—refrigeration machinery for proposed milk factory on Bain St.

Wis., Milwaukee—B. Jhlenfeld, 1198 North Pierce St.—one 26 in. to 30 in. band saw.

Wis., Milwaukee—The Milwaukee Bedding Co., 256 South Water St., E. Schilling, Purch. Agt.—special feather renovating machinery and power stitchers.

Wis., Rhinelander—The Oneida Milk & Ice Cream Co., W. Gilley, Purch. Agt.—ice cream making and dairy plant equipment, (power).

Wis., Sheboygan—The city, c/o C. W. Boley, City Hall, City Engr.—manual training equipment for new high school.

Wis., Wausau—H. E. Bonsa—auto repair machinery for proposed garage.

Ont., Hamilton — Townsend, Krug & Greaves, forgings and cutlery, M. J. Krug, Purch. Agt.—forging machinery and equipment for the manufacture of knife and razor blades.

Ont., St. Thomas—D. Barr—materials and equipment for oil and gas drilling.

Ont., Toronto—The Dominion Combing Mills, Ltd., 709 Continental Life Bldg.—machinery for proposed wool combing and washing plant at Trenton.

Ont., Toronto—The Meyers Lumber Co., 15 Toronto St.—planers, saws and woodworking equipment for proposed planing mill on Spadina Rd.

Ont., Welland—The Lackawanna Tubes, Ltd.—machinery for the manufacture of seamless boiler tubes.

Que., Montreal—The Empire Brass Fdry., 128 Wellington St., A. Smith, Purch. Agt.—complete equipment for brass foundry.

Metal Working Shops

Cal., Oakland—The Magnovox Co., 2725 East 14th St., is having plans prepared for the construction of a 2 story, 60 x 200 ft. addition to its factory on East 14th St. for the manufacture of telephones and land speaking devices. Estimated cost, $60,000. B. J. S. Cahill, Easton Bldg., Archt.

Cal., San Francisco—L. H. and E. W. Allyne, 2609 Gough St., have awarded the contract for the construction of a 2 story, 98 x 137 ft. garage on Pine St. near Polk St. Estimated cost, $40,000.

Cal., San Francisco—T. W. Corder, Inc., c/o S. Schell, 180 Jessie St., has awarded the contract for the construction of a 1 story, 25 x 75 ft. addition to his elevator shop on Natoma St. near 7th St. Estimated cost, $5,000.

Cal., San Francisco—W. P. Stoesser, 53 Shotwell St., will build a 1 story, 25 x 122 ft. lock manufacturing plant on Shotwell St. near 14th St. Estimated cost, $5,000.

Col., Denver—The Super Service Motor Co., 410 Colorado Bldg., has awarded the contract for the construction of a 3 story, 115 x 210 ft. service garage on 7th and Speer Blvd. Estimated cost, $300,000.

Ill., Casey—The Western Radiator Corp. has awarded the contract for the construction of a 1 and 2 story, 150 x 260 ft. factory. Estimated cost, $100,000.

Mass., Everett—The Boston Elevated Ry. Co., 108 Massachusetts Ave., Boston, plans to build a repair shop, etc., here. Estimated cost, $750,000. M. L. Fernald, care of owner, Engr.

Mass., Everett—The Cameron Appliance Co., 48 Waters Ave., plans to build a 1 story, 70 x 115 ft. galvanizing factory at plant. Estimated cost, $40,000. MacVaughton & Robinson, 101 Tremont St., Boston, Archts.

Mass., Holyoke—The Magna Auto Co., 2 Division St., has awarded the contract for the construction of a 2 story, 116 x 120 ft. garage and service station on Northampton St. Estimated cost, $40,000.

Mass., Medford—The Amer. Radio & Research Corp. has awarded the contract for the construction of a 2 story, 61 x 120 ft. radio factory. Estimated cost, $50,000. Noted April 27.

Mass., Northampton—P. P. Gleason, Pearl St., will soon award the contract for the construction of a 2 story, 80 x 130 ft. garage and service station on Pleasant St. Estimated cost, $50,000. G. P. B. Alderman & Bro., 318 High St., Holyoke, Archts.

Mass., Willimansett (Holyoke P. O.)—The Palmer Steel Co., 316 High St., Holyoke, will soon award the contract for the construction of a 1 story, 80 x 200 ft. steel fabricating plant along the railroad tracks, here. Estimated cost, $75,000. Private plans.

Mich., Detroit—The Auto Collapsible Rim Co., Inc., c/o P. R. Rossello, Archt., 406 Congress Bldg., is having plans prepared for the construction of an 8 story, 110 x 166 ft. auto rim factory on Bellevue Ave. Estimated cost, $500,000.

Mich., St. Joseph—The Auto Specialty Mfg. Co. will soon award the contract for the construction of a 1 story addition to its factory. Estimated cost, $100,000. Davidson & Weiss, 53 West Jackson Blvd., Chicago, Archts. Noted Feb. 23.

Minn., St. Paul—The Siems-Stembel Co., 2700 Como Ave. W., will build a 1 story, 230 x 750 ft. car repair shop on Como Ave. W. Estimated cost, $75,000.

Mo., Carthage—The Leggett & Platt Bed Spring Co. plans to build a factory on Vine St. for the manufacture of bed springs. Estimated cost, $50,000. C. B. Platt, Mgr. Architect not selected.

N. J., Camden—The Neel Cadillac Co., 525 Market St., is having plans prepared for the construction of a 2 story, 80 x 175 ft. garage and service station on Federal St. Estimated cost, $75,000. Lakey & Hettle, 5 Hudson St., Archts.

N. Y., Brooklyn—The Kroder & Reubel Co., 107 East 17th St., New York City, will soon award the contract for the construction of a 3 story factory on Henry St., for the manufacture of brass goods. Estimated cost, $150,000. R. Berger & Son, 309 Bway., New York City, Archts. and Engrs.

N. Y., Buffalo—The Crane Co., 836 South Michigan Ave., Chicago, Ill., has purchased a site along the Erie Canal at the foot of Church and Genesee Sts., and plans to build a 200 x 222 x 282 ft. plumbing plant, here. Estimated cost, $250,000. F. Zander, 81 Bway., Buffalo, Local Mgr. Architect not announced.

N. Y., Buffalo—The Natl. Lamp Wks. of the General Electric Co., 1495 Fillmore Ave., plans to build a 1 story, 38 x 43 ft. machine shop on Fillmore Ave. Estimated cost, $15,000. Architect not announced.

N. Y., Buffalo—H. Wolcott, 3042 Main St., plans to build a 50 x 100 ft. charging station and small shop on Main St. Estimated cost, $5,000. Architect not announced.

N. Y., Greenwood—The City will receive bids June 11 for two steel underpass bridges and concrete retaining walls on E. Gun Hill Rd. Harry Fine.

N. Y., New York—W. C. Bergen, c/o C. A. Clark, Archt. and Engr., 441 Tremont Ave., Bronx, will build a 2 story garage on Webster Ave., Richmond road, $150,000.

N. Y., New York—M. Kaufman, c/o A. J. Sidlowsky, Archt., 1133 Bway., is having plans prepared for the construction of a 1 story, 50 x 100 ft. garage on 191 St., Nagle Ave. Estimated cost, $150,000.

N. Y., New York—Lampert Estate c/o Ehrlich & Ehrlich, Archts., 194 Sherman Ave., is having plans prepared for the construction of a 1 story, 100 x 100 ft. garage on 169th Ave. Estimated cost, $150,000.

N. Y., Rochester—The Vogt Mfg. Co., 400 St. Paul St., is having plans prepared for the construction of a 60 x 127 ft. factory on Hayward St. for the manufacture of grab and steel specialties. Estimated cost, $18,000. Architect not announced.

N. Y., Utica—E. Steinberg has awarded the contract for the construction of a 1 story, 70 x 142 ft. sheet metal plant at Sunset and Eagle Sts. Estimated cost, $75,000.

O., Euclid—M. Brewer and J. B. Clark, 2180 Abbey Rd., have had plans prepared for the construction of two 1 story garages 48 x 80 ft. and 40 x 50 ft., at Stop 16½ Euclid Ave. Estimated cost, $40,000. Private plans.

O., Marion—The Commercial Steel Castings Co., manufacturers of open hearth steel castings, has awarded the contract for the construction of buildings and additions to present plant.

O., Silica—(Sylvania P. O.)—The Sandusky Cement Co., Engineers Bldg., Cleveland, has awarded the contract for the construction of a 1 story, 40 x 240 ft. office, storage and repair shop. Estimated cost, $113,000.

Pa., Bridgeport—Gabriel Bros. are receiving bids for the construction of a 1 story, 60 x 100 x 200 ft. structural steel fabricating plant. Estimated cost $150,000. Private plans.

Pa., Chester—The Chester Ivory Co. will build a 1 story, 61 x 110 ft. metal works plant on 9th and Hyatt Sts. Estimated cost, $50,000.

Pa., Coopersville—Russell Marshall & Ward Bldg. and Mfg. Co., Port Chester, N. Y., is having plans prepared for the construction of a steel foundry plant along the tracks of the Pennsylvania & Lake Erie R. R. Estimated cost, $75,000. Private plans.

Pa., Erie—The Erie Metal Furniture Co. will soon award the contract for the construction of a 1 story, 150 x 250 ft. metal furniture factory. Estimated cost, $45,000. Architect not announced.

Pa., Erie—The Union Iron Wks., Inc. will build factory for the manufacture of machinery, etc., to replace the one destroyed by fire. Estimated cost, $100,000.

Pa., Phila.—J. J. Greenberg Morris Bldg. is having plans prepared for the construction of a 4 story, 24 x 100 ft. sales and service station at 2440-44 Broad St. Estimated cost, $200,000. L. B. Rothschild, 1335 Belmont St., Archt.

Pa., Phila.—The International Harvester Co. of North Dist. Inc. has awarded the contract for the construction of a 5 story, 100 x 130 ft. warehouse and a 1 story, 44 x 100 x 140 ft. service station on 16th St. and Lehigh Ave. Estimated cost, $300,000. Noted April 13.

Pa., Phila.—L. J. Keith, 16th and Reed Sts., has awarded the contract for the construction of a 1 story garage on Ridge Ave. and Lemon St. Estimated cost, $12,000.

Pa., Phila.—C. H. Gubbins, 31st St. and Susquehanna Ave., has awarded the contract for the construction of a 1 story, 94 x 101 ft. garage on Berks and Melvale Aves. Estimated cost, $10,000.

Pa., Phila.—F. J. Stokes Machine Co., 10th St. and Columbia Ave., will build a 1 story, 91 x 101 ft. machine shop, Tasker Rd. and Perry St. Estimated cost, $12,000.

Va., Norfolk—Lumsden-Condron Corp., 101 Granby St., will soon award the contract for the construction of a 2 story, 91 x 200 ft. garage on Granby and 17th Sts. Estimated cost, $150,000. Calrow & Wilcox, New Monroe Bldg., Archts.

Wis., Madison—A. E. Small, Archt., Dayton Bldg., will open bids about May 15 for the construction of a 1 story, 60 x 100 ft. garage on University St., for W. F. Clark, 2146 Kenwood Ave. Estimated cost, $15,000. Noted April 13.

Wis., Wausau—H. E. Rosen is having plans prepared for the construction of a 1 story, 18 x 25 ft. garage. Estimated cost, $12,000. O. Ziemer & Obel, Spencer Bldg., Archts.

Ont., Wallaceburg—The Prestolock Co., of Canada plans to build a factory for the manufacture of automobile locks and radio hardware. Estimated cost, $250,000. K. M. Wilcox, Pres. Architect not selected.

Ont., Welland—The Lackawanna Tubes, Ltd., plans to build an 80 x 400 ft. addition to its factory for the manufacture of seamless boiler tubes. Architect not announced.

General Manufacturing

Cal., Monte Vista—The Monte Vista Packing Co. has had plans prepared for the construction of a 1 story cannery. Estimated cost, $41,000. W. W. Brelte, Crocker Bldg., San Francisco, Engr. and Construction Mgr.

Cal., Newcastle—The Newcastle Fruit Growers Assn. has awarded the contract for the construction of a 2 story, 90 x 110 ft. packing plant. Estimated cost, $150,000.

Cal., Newman—The Natl. Ice Cream Co., 121 Guerrero St., San Francisco, has awarded the contract for the construction of two additions to ice cream plant here, one 40 x 40 ft. and other 15 x 75 ft. Estimated cost, $37,000. Noted Feb. 9.

Cal., Pittsburg—The California Bean Growers Assn., 130 Battery St., San Francisco, is having plans prepared for the construction of a cannery and warehouse (first unit). Estimated cost, $100,000. MacDonald & Kahn, 149 California St., San Francisco, Engrs.

Cal., San Leandro—Alameda County, Oakland, is having plans prepared for the construction of a 1 story laundry and a 1 story power house, on the County Infirmary site, here. Estimated cost, $60,000. H. H. Meyers, Kohl Bldg., San Francisco, Archt.

Cal., San Francisco—The Bothin Real Estate Co., Atlas Bldg., has awarded the contract for the construction of a 2 story knitting mill on Howard and 8th Sts. Estimated cost, $30,000. Snyder Bros. Knitting Mills, 804 Mission St., Lessee.

Fla., Loughman—The Everglades Cypress Lumber Co. will build lumber mill to replace the one destroyed by fire. Estimated cost, $175,000.

Ill., Chicago—The Baubien Novelty Co., 247 St. Johns St., has awarded the contract for the construction of a 1 story, 28 x 118 ft. factory on St. Johns St. Estimated cost, $10,000.

Mass., Adams—The Berkshire Cotton Mfg. Co. has awarded the contract for the construction of a 1 story, 50 x 170 ft. addition to its mill at plant. Estimated cost, $40,000.

Mass., Boston—The Nash Carriage Co., 941 Massachusetts Ave., Roxbury, plans to build a 1 story, 100 x 114 ft. carriage factory in the Roxbury Section. Estimated cost, $50,000. Architect not selected.

Mass., Clinton—The Bigelow-Hartford Carpet Co., 58 Main St., Thompsonville, Conn., will soon receive bids for the construction of a 1 story, 100 x 275 ft. dyehouse, a 4 story, 100 x 114 ft. headhouse at plant. Estimated cost, $250,000. C. T. Main, Inc., 201 Devonshire St., Boston, Archt. and Engr. Noted April 13.

Mass., North Billerica—The Talbot Mills has awarded the contract for the construction of a 4 story 77 x 210 ft. addition to mills.

Me., Sanford—The Goodall Worsted Co. has awarded the contract for the construction of a plant here, including a storehouse, combing and worsted yarn spinning buildings.

Mich., Sault-Ste-Marie—The Cadillac Lumber & Chemical Co., Cadillac, is having plans prepared for the construction of a 2 story, 35 x 280 ft. and 100 x 114 ft. saw mill with a 32 x 40 ft. engine room and steam power plant. Estimated cost, $200,000. C. Hall, 221 Grand Ave., Milwaukee, Wis., Engr.

Minn., Minneapolis—The North Star Woolen Mills Co., 228 South 2nd St., has awarded the contract for remodeling a 6 story, 44 x 98 ft. factory on 6th Ave., S., between 1st and 2nd Sts. Estimated cost, $60,000.

Mo., Joplin—Pitkin, Boyd & Neal Packing Co., 7th St., is receiving bids for the construction of a 2 story storage and refrigeration plant on 7th St. Estimated cost, $5,000. Private plans.

Mo., St. Louis—The Heil Packing Co., 2216 La Salle St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. and 16 x 17 ft. addition to its packing plant. Estimated cost, $30,000. G. L. Heil, Pres.

N. H., Laconia—The Pitman Mfg. Co. is having plans prepared for improving and building a 3 story, 65 x 100 ft. addition to its factory. Estimated cost, $50,000. Lockwood, Greene & Co., 60 Federal St., Boston, Engrs.

N. J., Gloucester—C. C. Coolbaugh & Sons, 19th and Cambria Sts., Phila., are receiving bids for the construction of a 1 and 2 story lumber mills on Nickolson Rd. Estimated cost, $25,000. Private plans.

N. Y., Buffalo—W. H. Beale & Son, 171 Hollywood St., plans to build a 1 story, 18 x 26 x 70 ft. dairy plant on Hollywood St. Estimated cost between $4,500 and $5,000. Architect not announced.

N. Y., Buffalo—Klink & Shallon, Inc., 620 Babcock St., plans to build an addition to its packing plant on Babcock St. Estimated cost, $19,000. Architect not announced.

N. Y., Franklinville—The Ontario Cutlery Co. plans to build a 4 story, 72 x 200 ft. factory. Estimated cost, between $160,000 and $180,000.

N. Y., Natural Dam—The Aldrich Paper Co., Gouverneur, plans to build paper manufacturing plant to replace the one destroyed by fire several years ago. Estimated cost between $500,000 and $600,000. Address N. R. Caswell, Gouverneur.

O., Silica—(Sylvania P. O.)—The Sandusky Cement Co., Engineers Bldg., Cleveland, has had plans prepared for the construction of a 1 story cement plant here. Estimated cost, $1,000,000. W. B. Rawson, Engineers Bldg., Cleveland, Archt. and Engr.

Pa., Brockwayville—The Brockwayville Macaroni & Supply Co. is having plans prepared for the construction of a 2 story, 48 x 50 ft. factory. Estimated cost, $50,000. Private plans.

Pa., Phila.—Blumenthal Bros. will soon receive bids for the construction of a 4 story, 80 x 250 ft. cocoa factory on Margaret and James Sts. Estimated cost, $180,000. Ballinger & Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—J. Frank & Sons, 32 North 3rd St., are having plans prepared for the construction of a 2 story, 18 x 200 ft. warehouse and hat factory on North 3rd St. Estimated cost, $35,000. B. Brown, Drexel Bldg., Archt.

Pa., Phila.—The Kensington Ice Co. has awarded the contract for the construction of a 2 story, 65 x 112 ft. ice manufacturing plant on Lackawanna and Church Sts. Estimated cost, $15,000.

Pa., Phila.—W. F. Kreiss & Co., 1708 North Front St., has awarded the contract for the construction of a 2 story, 50 x 146 ft. bedding factory on Trenton and Auburn Aves. Estimated cost, $35,000.

Pa., Phila.—S. Weitz, c/o D. D. Weitz, Archt., Real Estate Trust Bldg., has awarded the contract for the construction of a 1 story, 62 x 72 ft. and 1 story, 18 x 91 ft. slaughtering plant and garage at 2838 North 28th St. Estimated cost, $60,000.

Pa., Phoenixville—The Welland Packing Co. will build a 2 story, 52 x 62 ft. and 29 x 78 ft. packing plant. Noted April 20.

Va., Altavista—The Telepost Publishing Co., will receive bids until June 1 for the construction of a 1 story, 40 x 60 ft. newspaper plant. Estimated cost, $16,000. W. M. Hundley, Mgr. G. Stone, Altavista, Archt.

Va., Radford—The Amer. Steam Laundry Co. plans to build a 2 story, 40 x 100 ft. laundry. Estimated cost, $15,000. W. H. Painter, Pres. Architect not selected.

Wis., Kenosha—The Kenosha Milk Products Co., has awarded the contract for the construction of a 1 story, 50 x 75 ft. milk factory on Bain St. Estimated cost, $75,000. T. W. Powell, Secy.

Wyo., Yoder—C. W. Goodrich, Casper, plans to build a brick plant here.

Ont., St. Marys—The Hurlburt Shoe Co. is having plans prepared for the construction of a 2 story, 50 x 60 ft. addition to its shoe factory. Estimated cost $25,000. C. E. Hurlburt, Mgr. Private plans.

Ont., Toronto—The Meyers Lumber Co., 15 Toronto St., will build a planing mill, to consist of a 2 story 70 x 80 ft. lumber mill; 1 story, 28 x 34 ft. office and a 2 story, 28 x 34 ft. stable, on Spadina Rd. Estimated cost, $25,000. Private plans.

Ont., Trenton—The Dominion Combing Mills, Ltd., 709 Continental Life Bldg., Toronto, will soon award the contract for the construction of a wool combing and washing plant here. Estimated cost, $200,000. B. H. Pruck, 50 Bay St., Toronto, Archt.

American Machinist

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Simplification—What Does It Offer in the Machine Industry?

Diversification of Product Causes Many Needless Wastes—Organization in the Department of Commerce to Aid Simplification—How the Work of Simplification Is Conducted

BY WILLIAM A. DURGIN
Department of Commerce

"WE ARE making altogether too many sizes. Week before last all our B automatics ran continuously on one size, and we got very attractive production cost. Last week, we had to alter the set-up on that same group nineteen times to make as many different sizes, and of course production cost went out of sight."

How many manufacturers have you heard say something of that sort these last few months? How many times have you said it yourself? And the jobber or retailer—any representative of the distributing group—will join the chorus with the refrain, "Yes, you are making altogether too many sizes; my shelves are loaded with thousands of items; my investment is extended way beyond my means, and the turnover is so small that I can't find the profits. Even so, I am carrying only part of the line I should have, for when customers come in for replacements or repairs, seems as though I always have to send somewhere to get them."

"That's right," says the user, the third and largest class, "if I invest in any kind of contraption which has to have repairs, or other maintenance, it is just my luck every time to get the one that is eternally different from everything else in town; I always have to wait days or weeks to get any spare part, and often I have to have something made special to fit."

All through the industrial structure this tale of over-diversification, the tremendous waste in making needless varieties, is beginning to be one of the commonplaces of shop talk. Bad enough under boom conditions with universally high demand and prosperous business, it becomes a vital weakness of our American business methods when the cataclysm of war wipes out the buying power of Europe, upsets economic balance throughout the world, and stretches the spread between raw material and finished product so tremendously that our American standard of living is imperiled.

Probably no man sees these conditions more clearly than Secretary Hoover, of the Department of Commerce. To him, elimination of the waste variously estimated at from 25 to 40 per cent of our total industrial effort, is a basic necessity if we are to reduce the spread between raw and finished products, maintain our American standards, and get our full share of world trade.

Prominent among his means for such waste elimination, is simplification, the concentration of effort on the comparatively few sizes of each line which really count in a large way, and the co-ordination of allied lines to secure maximum interchangeability. To carry this movement forward with as much force as possible, the Secretary has organized the "Division of Simplified Practice" of the Department of Commerce, offering the clearing house facilities and adding the moral weight which only a governmental department can give in the highest degree. To some, the Division of Simplified Practice appears the heir and executor of the Conservation Division of the War Industries Board, continuing those reductions of variety and simplifications of procedure which the stress of war made necessary, but which experience proved advantageous to all concerned. To others, the division is most clearly conceived as a liaison group between the Bureau of Standards and the industrial and business interests in carrying forward such standardizations as have direct bearing on waste elimination. While to still another group, it appeals as one of Secretary Hoover's most original contributions, through his conception of the Department of Commerce as the servant and representative of business and industry.

The truth combines all these interpretations and has perhaps a still more fundamental aspect. Excessive diversification was probably foredestined as an inevitable result of our first flounderings with the facilities which machinery, steam and electricity placed in our inexperienced hands. Similarly the corrective, simplification, is just as inevitable if we are to get the full value of these facilities for our daily living. With the

> SIMPLIFIED PRACTICE in any line will result in some or all of the following advantages:
>
> Reduction of stocks and investment, and increase in turnover.
>
> Lower costs to the public through mass production and the intelligent application of the repetitive process.
>
> Lower costs all along the line through quicker deliveries from simplified stocks.
>
> More stable employment by permitting the safe accumulation of standard lines of stock through slack periods.

production of automatic machinery and the release of tremendous stores of natural energy in the form of cheap power. It has been comparatively easy for almost anyone to become a manufacturer. The machines themselves supplied all the intelligence necessary to gain the benefits of the repetitive process and moderately low production costs. The factory once started almost ran itself and the attraction of manufacturing drew many men whose inspiration was profit rather than craftsmanship. Thus production plants have been multiplied often with little basis of improved quality or design of product, much of the output being quite obviously as close a copy of successful lines as was legally possible. When it came to selling these closely similar lines, it proved easiest to make superficial changes in dimensions or finish that could be used by the selling force in their sales talk—and at once we were on a fair way to be swamped with varieties.

Long before the war we had begun to suffer from this saturnalia of diversification. Many of you will remember the remarkable popularity of Wagner's German essay, "The Simple Life," which appeared at the beginning of the century. His objective, of course, was the simplification of daily living, but there is a very definite correlation with our present interest. Even in the prosperity preceding the World War, the extreme diversifications of product were imperiling our commercial stability, dilating the development of product by spreading attention over the unnecessarily wide lines, depreciating quality, and tremendously increasing costs.

Under present conditions, not only are these weaknesses intensified but the new diseases suggested above appear on every hand. Stocks and investment are needlessly extended. Turnover is decreased. Costs of production are run up in each of numberless varieties. Deliveries are delayed in getting the particular item ordered. It is unsafe to accumulate stock during slack periods, for no man can predict just what variety will be demanded when the boom appears. All the wastes attendant on indecision of production in use are prevalent. Selling expense is boosted to a maximum in covering the many varieties. Misunderstandings and misrepresentations are prevalent. There is little fundamental investigation and development of basic lines, as it is so much simpler to change trifling details and start a new variety.

With such conditions, it is little wonder that there is a real demand among manufacturers, distributors and users for reduced varieties, for agreement on certain fundamentals of dimensions and nomenclature which shall simplify and stabilize production, reduce costs and stimulate business. But admitting this demand, you say, and fully realizing the importance of prompt action, why does not the industry carry through itself—what service can Government offer which will be of fundamental importance? Just the service that democratic government can offer in all relations of organized life—the co-ordinating and making effective of the best practice and opinion of our people.

If manufacturers alone start a program of simplification, it is open immediately to suspicion of purely selfish interest; and similar suspicions apply to movements started by distributors, or by users. But if all groups are brought together through a conference of representatives of recognized standing in their respective fields, the joint conference can work out a compromise recommendation which will represent the best available solution of the existing problem. Then the Government can adopt this recommendation as its own and give it formal standing as the recommended practice of the country.

It is exactly along these lines that the Division of Simplified Practice is working. We make no pretense of detailed knowledge in any specific field. We can not say, for example, just the extent of the benefits simplification of machinery will bring to all those interested in its production, distribution and use. If any group in the machinery field, however, believes that the benefits are worth while, the division stands ready to get together all others interested in a general conference which can discuss the whole question and, if it proves desirable, arrive at a definite recommendation for procedure.

As an example of the very obvious advantages which will accrue to all of us from simplification in some lines, the conditions in the bedstead industry may be cited. At present manufacturers of metal beds have agreed upon certain standard dimensions of length and breadth. Manufacturers of wooden beds have also agreed upon their ideas of standards. Makers of metal spring mattresses attempt to conform to the standards established by the two groups of bed manufacturers. Makers of fabric mattresses also attempt to conform; but to date the standardization is largely on paper. The groups have gone ahead separately. Attempts at joint action have proved futile, and the so-called independent manufacturers, not allied with trade associations, have developed as many dimensions as their individual ideas have suggested. Often the chance dimensions of the raw material have fixed those of the finished structure. As a result, when you or I need a spring or mattress,

SOME OTHER advantages obtained by the use of Simplified Practice are:

A marked decrease of present selling expenses, which have been so much increased with tremendously extended varieties; this applying not only to the salesmen themselves, but to their equipment and catalogs and to the general office accounts.

A much better understanding between buyer and seller through their use of a definite vocabulary.

The concentration of thought and effort on the cream of each line, which must result in the best possible product.

Finally the bringing of our production into line for the genuine development of foreign commerce. England, Germany and other countries have vigorous national movements towards standardization which must be met if we are not only to hold our own in foreign markets, but make the notable advances which the war's disturbance of economic balance makes possible.

the dealer has to send a man to measure our bedstead and make something special, so that these industries proceed on a tailoring rather than a manufacturing basis.

The bed business needs the centralization and moral force which can be given by leadership of the Department of Commerce. This particular simplification is well under way, and in the near future the interested groups will unite in a general recommendation of the recognized length for all beds, and widths for double beds, twin beds, cots, and institutional beds, which can be promulgated as the simplified practice of the country. In arriving at these figures full weight will be given to development of the foreign market, and from the simplified recommendation we hope will result such a reduction in production costs, of stocks and selling costs, such an increase in turnover, that employment in the bedstead and allied industries will be stabilized, the business of individual manufacturers secured, and the cost to each of us in our own homes materially reduced.

Artistic License and Simplification

Please notice that in all this there is no question of the art design or finish of the bedstead. The artist is still fully at liberty. Surely he can create just as beautiful a Chippendale if he adheres to an internal length of 6 ft. 3 in., which will accommodate all of us, as if, on the spur of the moment, he adopts 5 ft. 11 in. and so imposes a double reversed curve on the occupant.

Beds are but an example; it is difficult to think of any commodity which the story doesn't fit. But in considering the almost limitless field, please remember, always, that the whole endeavor carefully avoids interference with art or style, and indeed just as carefully avoids interference of any sort.

Probably this example will suggest the necessary procedure to arrive at formal simplification. The first step is to arrange for securing statistics, or other data, which shall show present conditions and indicate the line for action. For the machinery interests, the representative trade associations would appoint a small contact committee to get in touch with Secretary Hoover and the Division of Simplified Practice. After a conference at Washington, this committee would proceed to survey the machinery field for the Department of Commerce, getting figures showing varieties manufactured and the importance of the several items during the last few years. The committee would summarize these data in a report covering present conditions, and would then forward the summary to the Division of Simplified Practice. With this report before it, the division would prepare a tentative list of representatives to the general conference—the personnel of the list being submitted to all trade associations interested, and to the United States Chamber of Commerce, the American Engineering Standards Committee, and other bodies, to insure that every factor in the field was given proper voice. All the representatives included in the final amplified list would then be invited to a conference in Washington, and this conference would proceed to work out such recommendations for simplification as the general discussion should develop. The conference would further decide how frequently similar conferences for revision of the recommendations should be called, and each representative would engage to obtain the approval of his association, firm, or other parent body, to the recommendations as finally adopted. Finally, the Division of Simplified Practice, for the Government, would give national standing and publicity to the action of the conference by issuing the recommendation as one of its official series. This series will be numbered in sequence and will be known as "Simplified Practice Recommendations of the Department of Commerce." As a part of its service the division will obtain a formal letter of acceptance of the recommendation from each of the bodies represented at the conference, and, when necessary, from the individual members of those associations most interested. At regular intervals, statistics from all manufacturers and distributors as to the percentage of business done in the simplified sizes will be requested, and the division will accumulate data on necessary revisions, calling the conferences for such revision at the times originally set by the industry.

Simplifications of Allied Lines Necessary

With movements of this sort now going forward in many industries, it is essential that the simplifications of allied lines properly fit together. Obviously simplification of machinery is very closely allied to simplification of brass and steel shapes and sizes; similarly, simplification of wooden bedsteads is closely related to that of lumber, and so on. Thus there is an additional reason for co-ordinating these movements through a government division.

This function of co-ordination can not be too strongly emphasized. There is no question of imposing simplification, the division being intended simply to function as as centralizing unit for those simplifications of dimensions and nomenclature already demanded by manufacturer, distributor or user. If, in the judgment of any industry, simplification is not suitable to its problem, it need fear no interference, but it had best look to its economic stability as threatened by overdiversification. The benefits of simplification are already so evident to a wide range of industries that the general movement is certain to go forward of its own momentum, and the Division of Simplified Practice hopes to aid in lasting elimination of waste.



Automotive Service Methods and Equipment

IX. Some Unique Service Tools—"Roll Your Own" Fenders—Making Bronze Bushings in the Machine Shop—A Home-made Running-in Stand

By HOWARD CAMPBELL
Western Editor, American Machinist

With the passing of the stage coach and the development of more efficient methods of transportation, the reputation of the express companies for "delivering the goods" has been enhanced by the use of transportation units of the most modern type. The Chicago division of the American Express Co. operates a fleet of motor trucks among which are included both gasoline and electric units, and the equipment for servicing these units includes some pieces that will be interesting to other service managers.

A piece of home-made equipment known as a "spring vise" is shown in Fig. 1. This vise is used for holding springs when it becomes necessary to separate the leaves of the spring for the purpose of cleaning, for replacing broken leaves with new ones, or for putting in new center bolts.

The side frames *A* are made of ½-in. angle steel, and the flat pieces across the bottom of the vise are of ½-in. flat steel. The other sections of angle steel are ¼ in. thick. Some of these sections are riveted so as to form ways as shown at *B*, and steel blocks are welded to the crosspiece of the movable vise jaw as can be



FIG. 1. A HANDY SPRING VISE

seen at *C*, so that the jaw will function properly when the handle *D* is turned.

The operation of this handle turns the screw *E*, which operates through a nut in the movable vise jaw, feeding the jaw in the direction desired. A solid collar is turned on the handle end of this screw, and a movable collar, held by the screw *F*, holds the screw in place while in operation. The feed screw is ¾ in. in diameter, 10 threads to the inch, and works very well.

Making Controller Segments

A fixture for bending copper segments for controllers on electric trucks is shown in Fig. 2. The copper bar from which the segments are made is ½ x ¾ in. The controller segments are from 1 in. to 7 or 8 in. in length, some nearly circling the controller. The tool consists of a round piece of steel *A*, turned to the correct diameter, to which the piece *B* is attached by two bolts and nuts, and the piece *C*, which turns on the pin *D*. The piece *C* is of ¾ x 2-in. stock, and a small piece *E* is attached by a small bolt as shown, to take the wear, and also so that the tool can be used for different thicknesses of stock.

In operation, one end of the copper bar is clamped to the tool by means of the clamp *B*, then the bar *C*

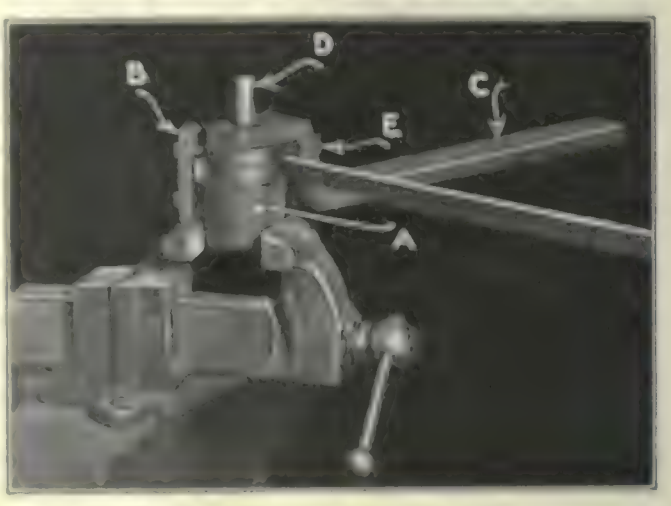


FIG. 2. SEGMENT-BENDING TOOL

is pulled around, bending the copper bar to shape. The segments are then cut off to the desired length, after which they are laid out and drilled. After the segments are attached to the controller, the controller is put into a lathe and the outside is turned to size.

Home-made Truck Fenders

A method of making fenders for trucks is shown in Fig. 3. In actual operation, a truck is used for the job, but as no truck was available at the time the picture was taken, a wheel was used to demonstrate the operation of the tool.

Occasionally a fender has to be replaced, and the



FIG. 3. MAKING A TRUCK FENDER

Express Company has found that time and money can be saved by making its own, and that the home-made ones are just as serviceable. The material for the fender is a piece of ⅛-in. sheet steel, 12 in. wide and

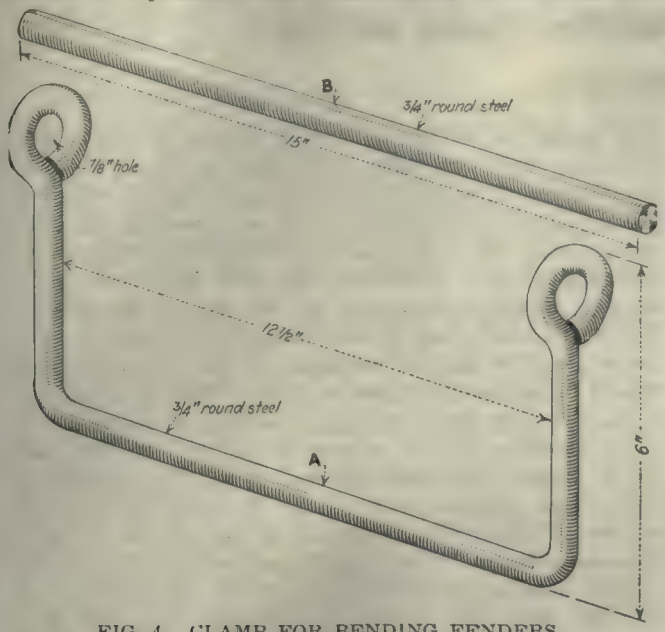


FIG. 4. CLAMP FOR BENDING FENDERS

4 ft. long. The tool is made of ¾-in. round steel, bent as shown in Fig. 4. In operation, the piece marked *A* is put in place around the tire of the wheel, and the piece *B* is slipped through the eyes. Then one end of the piece from which the fender is to be made is slipped through the U-bolt, as shown. The fender is bent to shape by running the truck slowly forward in the direction of the arrow.

The Modern "Putting-on" Tool

A view of an operator using a "putting-on" tool is shown in Fig. 5, the job being that of welding metal on to a worn out torque shaft. This is done when a shaft



FIG. 5. A "PUTTING-ON" TOOL WELDING METAL ON A WORN OUT TORQUE SHAFT

becomes badly worn in one spot, and then the shaft is re-machined. The apparatus is an ordinary acetylene-welding outfit, and the operator is using an Imperial welding torch. By this means many pieces that would otherwise be scrapped are saved and used almost indefinitely at small cost.

An interesting operation with the welding torch is that of welding bronze into clevis holes. Fig. 6 shows a couple of clevises that have been welded in this manner. The faces are now disk-ground to give a smooth bearing surface, then the holes are laid out and drilled and reamed. This method of making bronze bushings is cheap and the bushings are durable.

The Running-in Stand

A home-made running-in stand is seen in Fig. 7. It consists of a motor stand, part of which is shown at the left of the picture, and a rack to which is bolted an old transmission. The motor and the transmission are connected by a universal shaft, and the whole outfit is run by power transmitted from the line shaft through a belt and pulley to the shaft at the right in the picture, which connects with the drive and countershafts in the transmission.

The motor stand is not bolted to the floor, as it has



FIG. 6. BRONZE WELDED INTO CLEVIS HOLES FOR BUSHINGS

to be shifted to accomodate the different kinds of motors. The motor end of the universal shaft is made so that any one of a variety of adapters can be used, ac-

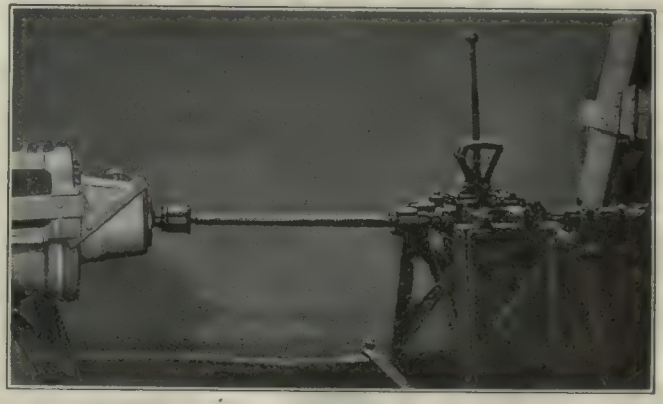


FIG. 7. A HOME-MADE RUNNING-IN STAND

cording to the make of motor, and the transmission makes it possible to run the motor in at all the various speeds for which it is built. The shaft by which the transmission is driven is a section of line shaft, running in an ordinary line shaft bearing. The stands to which the transmission and bearing are bolted are made of sections of ¼-in. angle steel, bolted together. This outfit can be easily built anywhere, and is thoroughly efficient for the job.

The appliances shown indicate very plainly how the repair shop is growing to deserve the name "service station" more and more.

Methods of Machine Tool Design

Concluding the Second Article on the Design of a Special Machine—Effect of Considerations of Tool Wear, Speeds and Feeds

By A. L. DeLEEUW

So far none of the things we have done clash with the original schedule we had laid out, but this latest change does, for our schedule item No. 2 says clearly, "mill top and pass cutter completely over work, bringing the cutter slide against a stop."

In order to meet the new conditions we will have to change the schedule as follows:

(1) Chuck piece.

(2) Mill top, bringing cutter so far that its center will come above the far edge. (The center of the cutter should be over the far edge of the work or a little further if the cutter has the same diameter as the width of the work which, by the way, is never desirable. In our case the cutter is ¼ in. larger than the width of the work, so that it is not necessary to bring the cutter quite up to the far edge of the work. However, for our discussion and especially in the early stages of it, we do not feel the need of extreme accuracy. It is the process which is being presented and not the actual design of a machine.)

(3) Return cutter slide immediately and bring it up against a stop.

(4) Drill all holes.

(5) Loosen clamp and remove piece.

In order to be able to form a rough idea of the construction of the combination slide we make the sketch of Fig. 10, which shows the machine as far as we have it up to the present. It shows some of the features of the combination head, but not all of them. The milling cutter is shown, and the drill spindle is indicated, and it shows further a slideway along which the head can feed, and the stop against which it is to come to rest. We will now investigate what further features this head requires to make it function properly.

There must be a milling spindle with its drive, and this spindle must be adjustable in a vertical direction so as to make up for variations in the cutter. The amount of adjustment will be very small because only a small amount can be taken off the teeth of the cutter before it becomes useless. Probably ¼ in. would be enough, but as it is about as easy to make an adjustment of ½ in. as of ¼ in. we will say, for the present, that we will provide for an adjustment of ½ in. The drill head will be of a construction similar to the other drill heads but as the hole to be drilled is larger than the other holes we have considered so far it is quite possible that a somewhat larger head may be required. Besides, this drill spindle works in a vertical direction and we may find it necessary to change the construction correspondingly. However, the drill head will again have a spindle and a gear at the end of the spindle. There must be a long pinion, or perhaps a sliding gear, there must be a roller attached to the slide, and some means for adjustment just as in the other drill heads.



FIG. 10. PRELIMINARY SKETCH OF MACHINE AS OUTLINED

As the two units of this combination head are so close together (3¾ in. center to center) we will have to be careful and see whether it will be possible to have them so near each other. In order to find this out we will make a cross-section of the two spindle heads to make sure that there is no interference. See Fig. 11.

This sketch would really be drawn up after we are through with the following considerations, but it is shown here at this stage of the game so as to make the description of our process of reasoning easier.

We estimate the milling spindle to be 2 in. in diameter at the large end, to run in a bushing ¼ in. thick and to require not less than ¾ in. metal around the bushing.

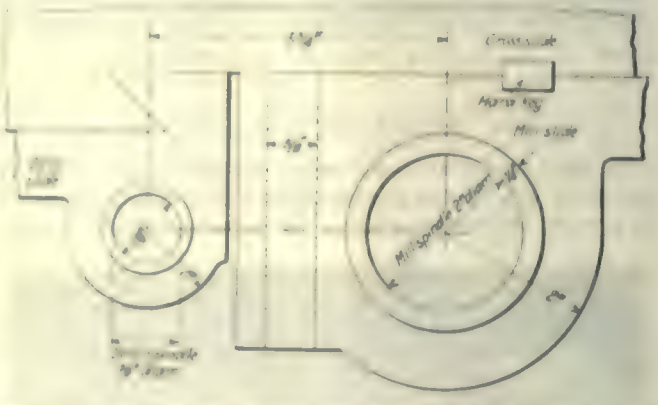


FIG. 11. SCALE DRAWING OF PARTS OF MILLING AND DRILLING HEAD

We would not be willing to get along with less. Similarly we estimate the drill spindle to be ¾ in. in diameter, to run in a bushing ¼ in. thick and to have not less than ⅜ in. metal around it. Doing this we have taken up 3 in. out of 3¾ in. available. Making a preliminary sketch of these figures we notice that we can increase the metal anywhere except on the side where the two heads approach each other.

The milling head has no feed up and down and only a small amount of adjustment. Not being required to feed, we need no slide and can guide the head by a key and keyway; and, the amount of adjustment being small, we can readily accomplish it by having slotted holes for the clamping bolts.

The drill head, on the other hand, requires feed and adjustment so that we will need a slide bearing. These elements are shown in Fig. 11.

As it stands now the milling head can be adjusted

up and down a small amount, it does not interfere with the drill head, and we can give as much metal around both spindles as we wish, being limited only on one side.

Another point where we may expect some trouble is in the drives for the two spindles which are so close together and we will therefore take this matter up as our next step.

As the milling cutter has to work on a rough casting, we should limit the cutting speed to about 70 ft., which means that the spindle must run 107 r.p.m. The drill spindle should run at the highest practical speed, because the time required for the second operation, the drilling of the holes, depends entirely on the time used by this drill; the other drills being smaller and drilling less deeply.

We should therefore run the drill as fast as practical and give it the coarsest practical feed. However, this being an automatic machine in which a number of tools are at work, it is not wise to go with feed and speeds as far as we might go with a hand-controlled machine in which only one tool works at a time, for the delays caused by the breaking down of a single tool are of more importance in this class of machinery. We will, therefore, limit our speed to 100 ft. per minute and our feed to 0.006 in. per revolution. This brings the speed up to 770 r.p.m. Having two spindles so close together it is but natural that we should think of driving both from one common source. Calling the drill spindle *A*, the milling spindle *B* and the common driving source *C*, the question is this: Shall we drive *A* from *C*, and *B* from *A*, or *B* from *C*, and *A* from *B*, or shall we drive both *B* and *A* from *C*?

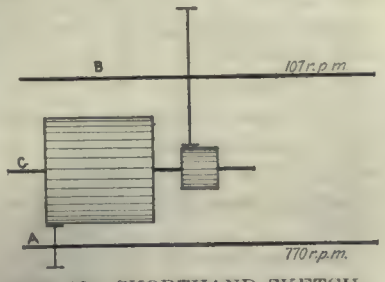


FIG. 12. SHORTHAND SKETCH OF DRIVE

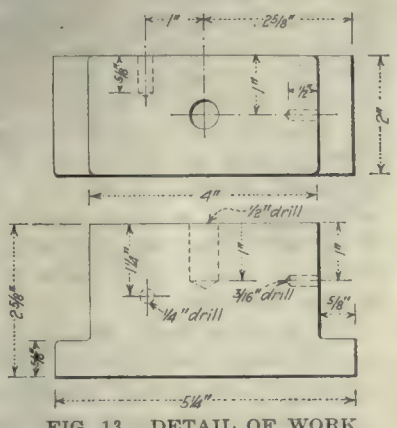


FIG. 13. DETAIL OF WORK

If we follow the first scheme we will have a reduction of about 7½ to 1 between *A* and *B* which is a greater reduction than can be accomplished by one set of gears. If we follow the second scheme, we would have to speed up in ratio of about 7½ to 1 which is entirely undesirable; so that it looks quite natural that, with the given proportion of speeds, we should follow the third scheme. Fig. 12 shows this arrangement sketched out in shorthand. With this arrangement *A* runs 770 r.p.m., *B* 107 r.p.m., and the question is, what will be a good speed for shaft *C*?

The range in speeds is $\frac{770}{107} = 7.2$. As a first possible arrangement we will give shaft *C* a speed of 320 r.p.m., which will give a speeding up from *C* to *A* in ratio of 2.4 to 1, and a slowing down toward *B* of 3 to 1. We may find later that it is desirable to change this speed somewhat, but the speed selected does not require a very large gear on *B* nor does it speed up much toward *A*, while it gives a very moderate shaft speed for *C*.

We now check up this driving arrangement to see if

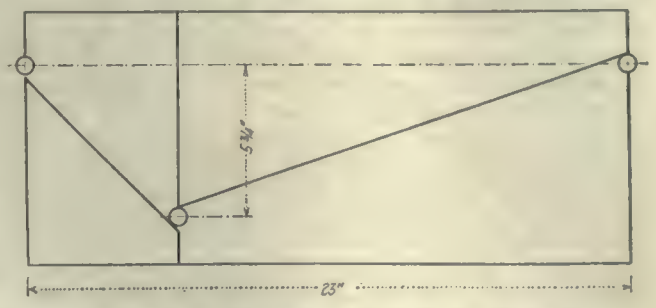


FIG. 14. MILLING HEAD OPERATING CAM

perhaps we have introduced an undesirable element. As no dimension or location has been decided upon and as we are satisfied with the speed for the time being, there is only one thing that can be wrong—the direction. Of course, we can make *A* run in either direction by giving the proper direction to shaft *C*, but we notice that *A* and *B* would necessarily run in the same direction. Is this right?

Looking at Fig. 9 we find that, if the milling spindle runs in a right-hand direction, the cutter will force the work against the stop, which is desirable. We will therefore make the milling cutter run in the right-hand direction which is the same as that for the drill spindle, and therefore the arrangement shown in Fig. 12 is correct in regard to directions.

We cannot very well go further with this arrangement of the drive without determining at the same time the sizes of gears, etc., which many be required, and it is still too early to determine detail sizes for them. As a rule detail sizes should not be determined until we have a complete preliminary idea of the entire machine, and this we have not yet. We said "as a rule" because now and then we will find an exception. If, for instance, we have to design a machine which must do extremely heavy work, then it may well be that the last element of the drive, for instance, the spindle or the last driving gear, is the controlling factor for our considerations. In such a case we should start out with an analysis of that drive, beginning with the heaviest member. But as a rule this condition does not present itself and the drive alone is merely one of the many functions of the machine, all of which should get due consideration before we analyze any of the details. For this reason we will go on to the next item of our general construction, namely the feed.

In Fig. 13 are shown the dimensions of the piece of work. It shows that the length to be milled is 4 in., as we already know; it further shows that the deepest hole to be drilled is 1 in. in depth, so that the distance which the drill spindle must feed is a little less than 1⅜ in. That is to say, if the drill point should touch the finished surface of the work it would have to go down 1⅜ in. to complete the hole. However, if we look at Fig. 9 and at our revised schedule we will see that the drill is over the rough surface of the work while the milling takes place. The amount of finish allowed on the piece is probably ⅛ in., but might be a little more in spots; so that we ought to allow not less than ¼ in. Besides, the drill point is not supposed to touch this surface; it should be a small distance above the work. We will therefore allow for a total amount

of feed for the drill spindle 1¼ in. As to adjustment, we reason this way:

It would be possible to grind a ½-in. drill down for a length of 3 in. before it would have to be scrapped. And so we would have to give 3 in. adjustment to the spindle. The greater the amount of adjustment the larger and clumsier the machine becomes, so that it is very desirable to keep this amount of adjustment down to a minimum. As all the drills we are using are standard sizes, which are always sure to be used in other parts of the shop, we will use up these drills only part way and then use them elsewhere

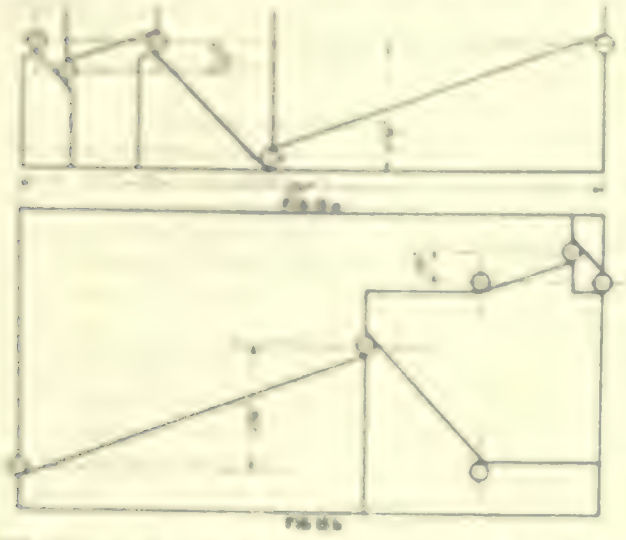


FIG. 15. TWO POSSIBLE ARRANGEMENTS OF CAMS FOR MILLING AND DRILLING

in the shop for some other purpose; and so we decide arbitrarily to limit the adjustment of the drill spindle to 1 inch.

We found that the amount of feed required for the combination head is 5½ in. and the question is now: In what way shall be provide this feed and how shall we provide the necessary feed for the vertical drill spindle?

Here, again, we have the same condition we found with the horizontal drill spindle, namely, that we always have to feed the same amount and always at the same rate, so that a cam would meet our conditions very well. Besides, the fact that we have already decided to use cams for the horizontal drill spindles makes it probable that at least a part of the feed arrangements for these spindles can also be used for the vertical drill spindle and the milling spindle. Following our system of taking up only one thing at a time, we will first consider the conditions of the cam to be used for the milling spindle.

The amount of feed is 5½ in. and so is the amount of return. There is no rapid advance. If we should use a drum cam for this feed and make the slope for the strip which does the feeding 1 in 3 and the return cam with an angle of 45 deg., we would obtain a cam represented by Fig. 14. We would find that the circumference of this cam, measured on the pitch line, would be about 23 in.; and its diameter about 7⅜ in. After this cam has done its work the cams for the various drill spindles must begin to act and we are confronted with the question: Shall we make the milling cam stop while the drill cams do their work, or shall we let all cams run continually?

If we should follow the second plan, the milling cam must have the same diameter as if it were first feeding the milling spindle and then the drill spindle; in other words, as if a second cam for the drill feed were added to our diagram of Fig. 14. Two arrangements are shown in Fig. 15; and we would find that in either case the pitch diameter of the cam would have to be 9¼ in. This would make a very simple construction provided, of course, that it would be possible to use this cam for the drill feed; and before we can make a decision we must look into this matter and see if it is possible to make a construction which will permit of the use of one and the same cam for milling and vertical drilling.

If we should imagine that we have carried out this plan, then the cam used for this purpose must do the following: It must first feed the milling spindle 5½ in., then return it and, during all this time, keep the drill spindle immovable; it must then feed the drill spindle and return it and, in the meantime, keep the milling spindle immovable.

The main difficulty we would meet here is that the drill spindle with its slide and roller must move sideways while the milling feed goes on, and yet this sideways movement must have no effect on the drill feed.

For the present we will imagine that we have found a proper solution for this problem which, by the way, will be taken up in a later chapter. Having solved this problem, the question still remains whether it is advisable to have the cams for the drilling stand still while the milling goes on, and vice versa, or whether all cams should turn all the time. We found that the cam required for the combination slide has a diameter of 9¼ in., and, as the amount of feed required for the horizontal spindles is but very little less than for the vertical spindle, we may expect that we will need cams of the same size (or approximately so), for the horizontal spindles. This means three rather large cams for this machine.

On the other hand, should we follow the first plan, we will have quite a complicated system of control because the schedule of operations would be as follows:

(1) Milling cam turns, causing feed and return, then stops; for which purpose a trip must be operated by this cam itself or by something running in unison with it.

(2) This same trip starts the drill cams which make one complete revolution for feed and return, at the end of which they trip themselves out of action and not only that, but they must also trip the entire feed mechanism out of action, so as to give the operator a chance to chuck a new piece.

We will leave the solution of this problem, also, to a later chapter when we will be able to judge better as to which is the preferable method under these or other circumstances.

We can readily see that it will not be possible to make much further headway with our machine unless we now begin to sketch out some of the items in greater detail. And before we do that, we will make a study of the various functions and mechanisms which are commonly used in the construction of machine tools. When we have analyzed some of the detail constructions, we will return to our original schedule and sketches and make them more and more complete, remembering that they are the most important documents we have, as they represent the succession of steps in our process of reasoning.

Use of Optical Instruments in Machine Work

Microscope and Projector Used to Check Location and Contour of Work—Accurate Gear and Rack Cutting—An Eyepiece With Radial Lines

SPECIAL CORRESPONDENCE

ALTHOUGH the ordinary magnifying glass is perhaps the most common optical tool in universal use in the country today, the mechanical trades in general have not taken advantage of the possibilities of the more extended application of optics to their work. When we stop to consider the enormous advantages of using a light beam with its absolute rigidity, lack of inertia, friction and mechanical defects, as a multiplying lever; and combining with it as a unit of measure, the light wave with its unfailing constancy of length, we must conclude that we have ideal agents to help us bring about that most desirable aid to manufacturing, economical interchangeability.

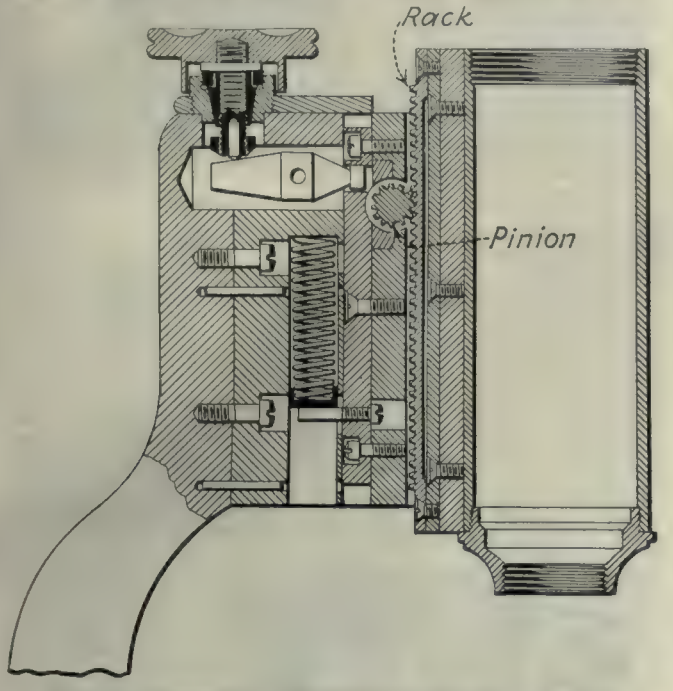


FIG. 1. ASSEMBLY SHOWING RACK AND PINION.

During the last half century the Bausch & Lomb Optical Co., Rochester, N. Y., has studied this problem thoroughly and today is using many applications which will no doubt be of much interest to industry as a whole.

The small spiral racks and pinions used in the focusing mechanism and mechanical stages of precision microscopes have always been a bugbear to the mechanics engaged on this work. The requirements are very exacting, as a degree of interchangeability is demanded that will permit of an assembly showing no visible vibration of the greatly enlarged image when focusing the microscope equipped with its most powerful objective lenses. Fig. 1 is an assembly showing the culprits in the focusing mechanism. The rolling action should be perfect, which means that the form of tooth and spacing must be maintained to a high degree of accuracy; the pitch diameter of the pinion and the depth of cut in both pinion and rack must also be held very close so that the slides can be milled to standard dimensions and assembled without fitting; the tooth cut must be smooth so that no inequalities can be felt as the rack rolls on the pinion; and last but not least the angle of spiral must be correct so that when secured in place the bearing will come over the entire length of the teeth.

The circular master tool used for forming the pinion cutters is shown in cross-section in Fig. 2. That used for rack cutters is similar in construction. The first difficult step in the problem was to find a steel, heat-treatment and cutting lubricant that would enable the tool to hold a keen cutting edge long enough to form and back off a cutter with a smooth polished surface. Not only was it necessary to have the tool hold its edge, but its properties were required to be such that the fine chips formed when in action would not pile up and adhere to the edge sufficiently to scratch the surface of the cutter. The only way found to solve this part of the problem was to make up a large number of plain circular forming tools of the different steels to be tested, and turn off a definite amount of stock from standard cutter blanks with them, then examine their edges under a high power microscope and measure with a filar micrometer-eyepiece the extent of wear and the amount of material adhering.

By varying these tests, using different heat-treatments of both the forming tool and blanks, different steels for the blanks, and trying various lubricants, the proper conditions were found that would give most nearly ideal results. It was found that under the best conditions, no forming tool could be made that would wear less than 0.0002 in. during a test representing the work necessary to finish a cutter.

In Fig. 3 is shown the appearance of the edge of the cutter finally used at 50x magnification. Fig. 4 shows a 1,000x microphotograph taken of the etched cutter as an aid in reproducing the exact conditions in cutters to be made later.

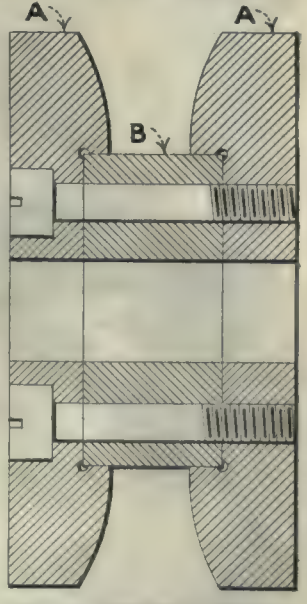


FIG. 2. SECTION OF CIRCULAR MASTER TOOL

In the construction of the master tool, the component parts are roughed out, heat-treated and ground on all surfaces. The formed surfaces of the side plates *A* are lapped on an epicycloidal generating machine, their contours being examined under high magnification on the contour projector shown in Fig. 5.

This projection apparatus and screen are self contained and use a compound microscope (in place of the ordinary projection lens) and a prism to reflect the light beam at a right-angle so as to obtain the maximum distance on a small instrument,

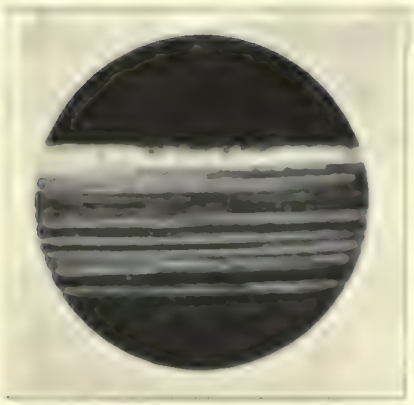


FIG. 5. MICROPHOTOGRAPH OF CUTTER EDGE AT 50x MAGNIFICATION

from the object to the screen. In Fig. 6 is shown a layout of the optical system used. The illuminant *A* is a 6-volt Mazda lamp, current for which is supplied through a 110-volt a.c. transformer. The condenser *B* is of aspheric form and when used in connection with the supplementary condenser *C*, gives as near parallel rays of light as possible. The iris diaphragm *D* allows the rays to be cut down to as small

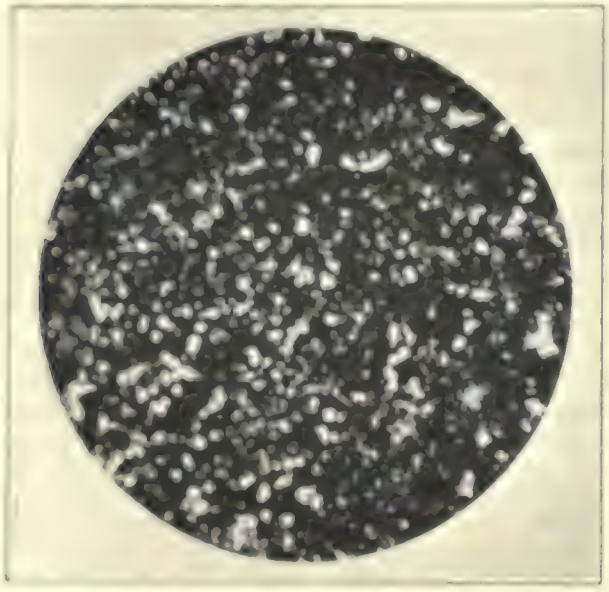


FIG. 4. MICROPHOTOGRAPH OF ETCHED CUTTER AT 1,000x MAGNIFICATION

a beam as may be desired. The rays pass through the object *E* (in the figure shown, a screw thread) into the objective lens *F* of a compound microscope. Beyond

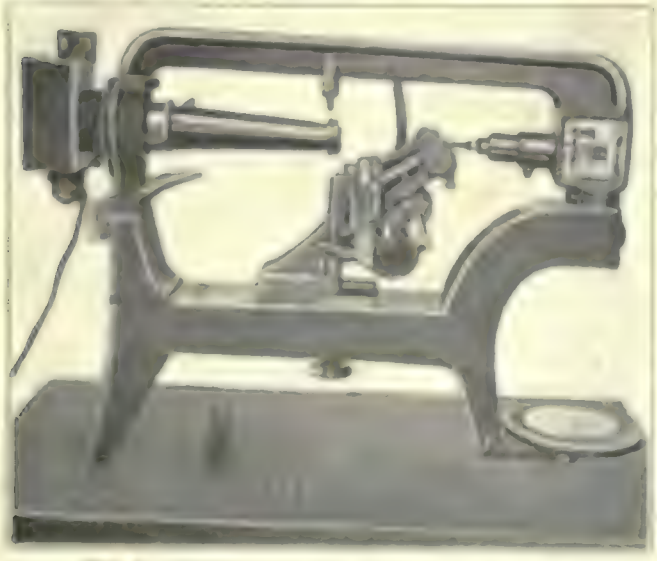


FIG. 3. CONTOUR PROJECTING APPARATUS

the eyepiece *G* is a right-angle prism *H* which reflects the light down upon the screen and forms the enlarged image *I*. It will be noted that the optical system is fixed and that focusing is brought about by moving the object back and forth on its side.

This apparatus was rigged up for shop use to overcome the disadvantages of the usual form requiring a

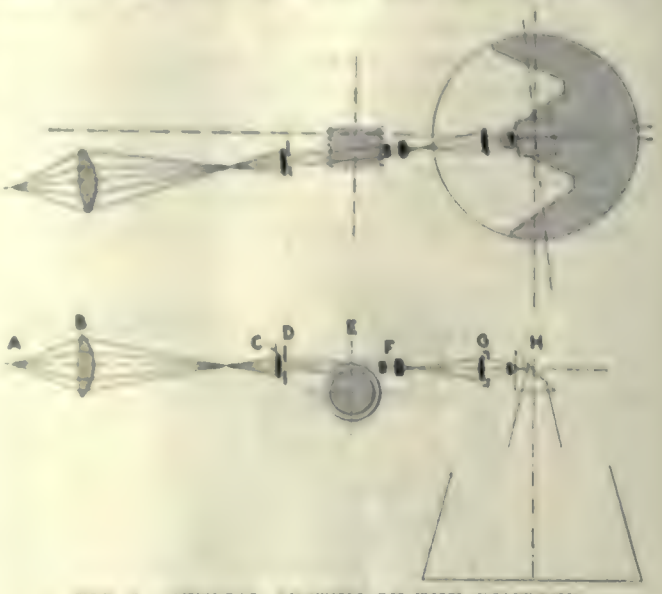


FIG. 6. OPTICAL SYSTEM OF THE CONTOUR PROJECTING APPARATUS

somewhat darkened room and a location free from excessive vibration. It can be placed anywhere in the shop and can be handled by one man without his running back and forth from the instrument to the screen.

The plates of the master tool, *A* in Fig. 2, are held on

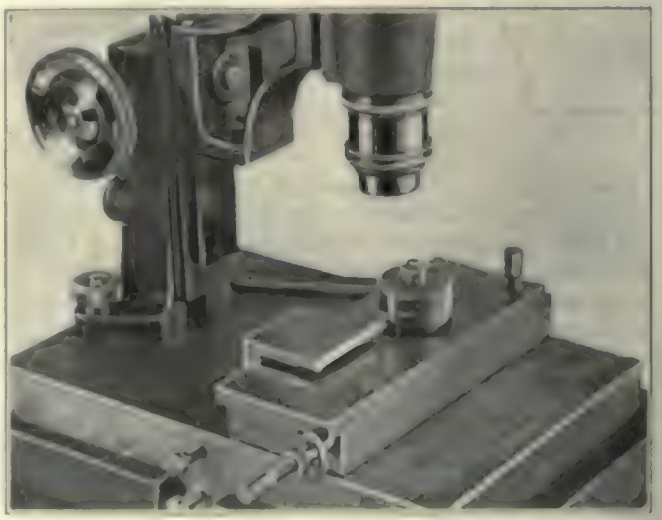


FIG. 7. GAGE FOR CHECKING THE MASTER TOOL

an arbor between centers and the image is projected against a master outline with which it must coincide. This is done at a magnification of 100*x* which makes certain of an exceedingly accurate tool if no visible error is apparent. The spacing block *B* being ground and lapped to proper thickness, the whole tool is assembled and the cutting edge sharpened to 0.180 in. below the center to give proper clearance. As a variation of shape at this particular section will deform the shape of the cutter, the operation is checked on the gage shown in Fig. 7. This gage consists of a stud over which the tool is held and a stop against which the

cutting edge is brought. A microscope with a straight line etched in its eyepiece is so mounted that the line represents the position of the cutting edge of the tool

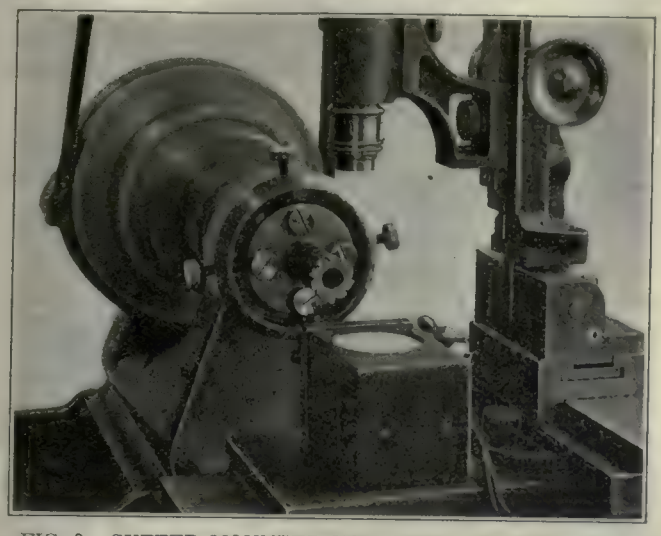


FIG. 8. CUTTER MOUNTED FOR GRINDING THE HOLE

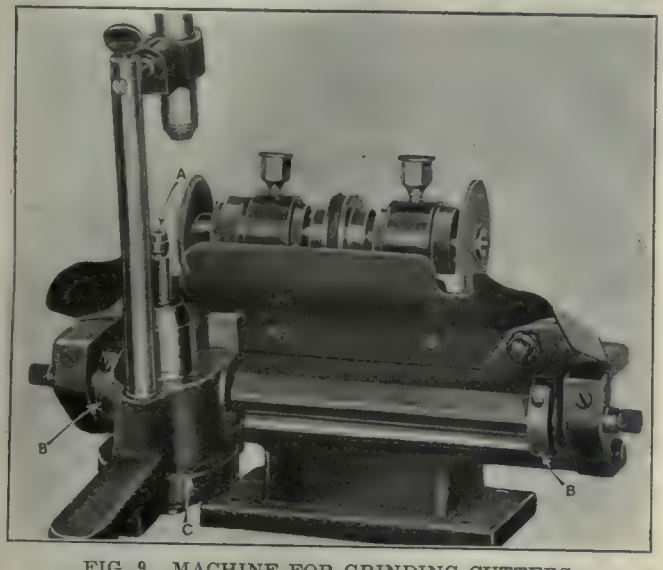


FIG. 9. MACHINE FOR GRINDING CUTTERS

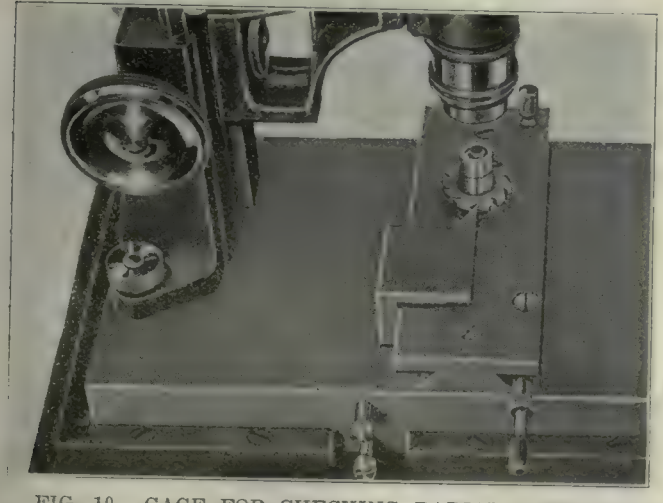


FIG. 10. GAGE FOR CHECKING RADIAL-GRINDING OF CUTTER

when properly sharpened. After this inspection, the tool is given a final examination on the contour projector, this time the instrument being focused on the cutting edge which will give an image shaped slightly different from the first inspection, due to the sharpening below the center. If the image coincides with the master on the screen, the tool is correct for forming and backing off the cutters.

The cutters are roughed all over and heat-treated and then a finish-forming and backing-off operation performed on a special backing-off machine. After this they are inspected for form, the same as described for the forming tool, and if found satisfactory are hardened and tempered. Notwithstanding the great care exercised both in the selection of steel and in the heat-treat-

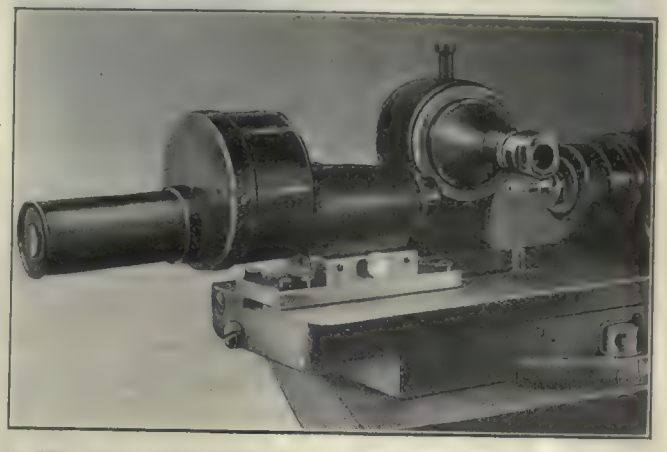


FIG. 11. OLD TYPE OF PINION CUTTING MACHINE

ment, distortion takes place to some extent and as no way has yet been found for lapping small relieved cutters of this kind, the errors of hardening must be eliminated in some other way.

The answer to this problem is shown in Fig. 8. The



FIG. 12. PINION AS SEEN BY MICROSCOPE

cutter is fastened to an adjustable chuck by means of sealing wax and "wiggled up," while being observed under a microscope, until the teeth run true. The hole is then ground to size and one side of the cutter faced off to a fixed distance from the center line of the teeth. This distance is measured with the filar micrometer

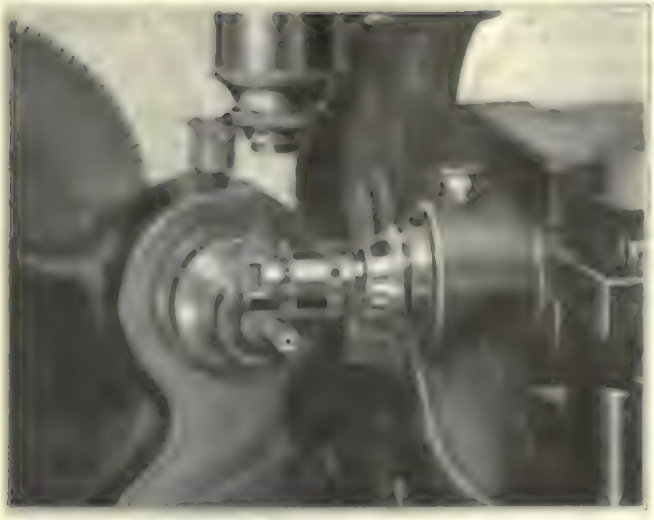


FIG. 12. LATE TYPE OF PINION CUTTING MACHINE

compared on the microscope. The opposite face is then surface ground parallel to the first side and the cutter brought to the proper thickness.

The Problem of Sharpening

The operation of sharpening caused a great amount of trouble in the past due to irregularity in grinding, resulting in high and low teeth with the consequential roughness of cut. The problem was studied in the same light as in the previous operations and solved by the special machine shown in Fig. 9 and the gage shown in Fig. 10. In the machine a microscope is mounted on the arm carrying the index head in line with the center of stud *A* that holds the cutter to be sharpened. The stop *B* is adjusted so that the crossline in the eyepiece coincides with the cutting side of the grinding wheel. When the cutter is sharpened this insures an absolutely radial cut while the index under the guard *C* brings the edges into constant relation with the backing off of each tooth. It will be noted that the machine is rigged up with two grinding wheels, one for roughing and one for finishing. The settings for both wheels are made in the same way with the arm resting against the corresponding stop.



FIG. 14. DIVIDING HEAD FOR CUTTING ACCURATE INDEX PLATE

The gage, Fig. 10, used for checking is very similar to one shown in Fig. 7, except that the crossline is set central with the cutter hole instead of 0.100 in. below center.

If the cutter passes this inspection it is again put on the contour projector and given a thorough examination before being put in stock. This final inspection must show that the shape is correct and in proper relation to face of cutter, the diameter correct, no "wobble" sideways, no rise and fall of the cutting edge of different teeth. Having now the proper cutters, the first and most difficult requirement in the manufacture of first-class racks and pinions is fulfilled.

The cutting of the pinions is done on two different types of machines, the older type is shown in Fig. 11 and the more recent one in Fig. 13. In the type of machine shown in Fig. 11 the pinion is roughed on one machine and transferred to a similar machine for the finishing cut. The cutter head can be moved back and forth to bring the center of cutter under the crossline

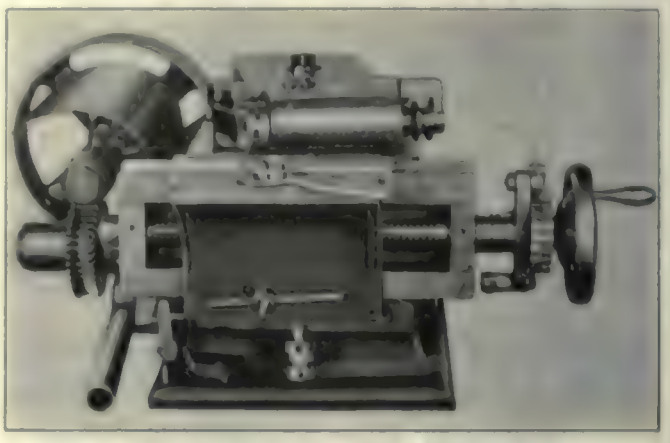


FIG. 15. RACK CUTTING MACHINE

of the microscope which is mounted on the center line of the workspindle. This insures the teeth being cut centrally. The microscope can be also used for inspecting and finishing product before it is taken from the machine. The crossline scale is etched with evenly-spaced radial lines representing the center lines of the teeth. When the finished job is observed it appears as in Fig. 12, which gives at a glance an indication of anything wrong with the set-up.

Roughing and Finishing the Pinion

In the machine shown in Fig. 13 the pinion is both roughed and finished. After the roughing operation the cutter head is moved to bring the finishing cutter into proper position for its work. Here in the same way as before, the microscope is set central with the pinion and the cutter stops adjusted to bring the cutters central. The index plates used on both types of machine were cut by using the dividing head shown in Fig. 14. The ordinary index plate on the head is replaced by a plate carrying index marks graduated on the dividing engine used for high-grade surveying and astronomical instruments. The microscope *A*, equipped with a prism tube to make more easy the observation by the operator, is used to set the lines on the graduated plate in position. This arrangement permits of extreme

accuracy. The gears used on the machine shown in Fig. 13 were also cut on this outfit to insure accuracy of the spiral to be generated.

The racks are cut on the machine shown in Fig. 15. The indexes of these machines are cut the same as those on the pinion cutting machines and the lead screws inspected for lead on the contour projector with the aid of a lead measuring attachment shown in detail in Fig. 16. This device consists of a micrometer head with a large graduated drum on the spindle and the spindle arranged to stop against a dial gage mounted in line with it. The micrometer is mounted on the movable slide which

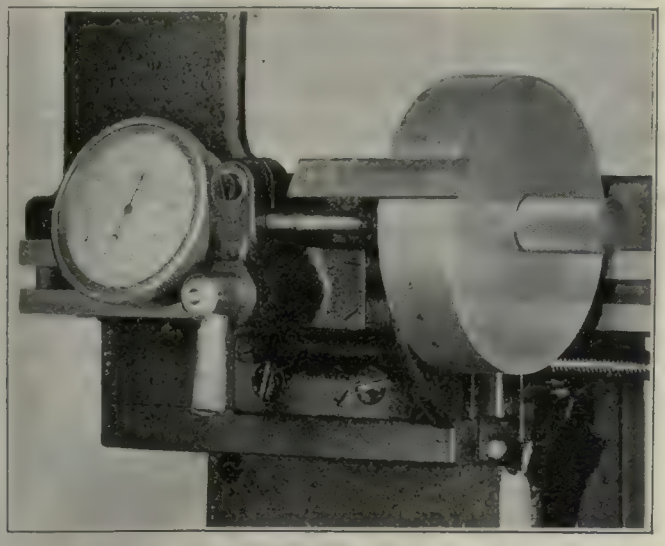


FIG. 16. LEAD MEASURING ATTACHMENT

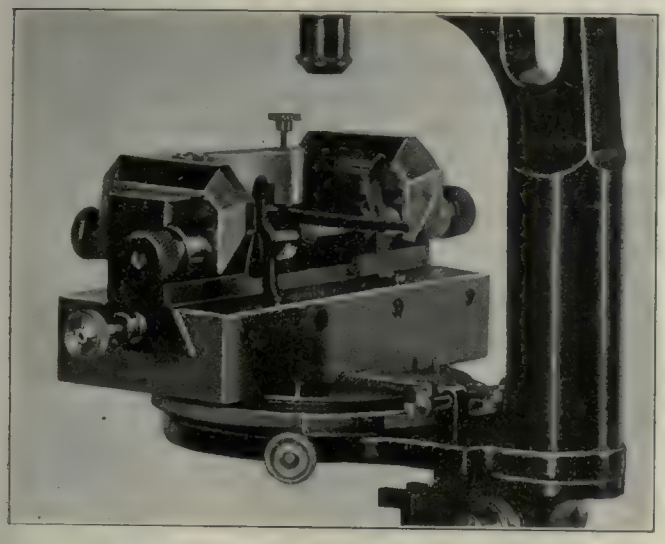


FIG. 17. CHECKING RACK AND PINION

carries the screw to be tested and the dial gage is mounted on the stationary base. The image of the projected thread is moved along so that one side of the V coincides with a master line on the chart and the amount of movement from thread to thread is measured by means of the micrometer, the dial gage simply acting as a zero point to avoid error due to sense of touch.

As a final check the indexing of the machine is inspected at intervals by fastening an accurately graduated bar on the bed of the machine and viewing it under the crosslines of a microscope mounted on the slide as the machine indexes along. The finished rack and pinion, before being used, are placed in mesh on gages shown in Figs. 17 and 18 and the angle of spiral and the rolling action observed. The gage, Fig. 17, for checking the angle of spiral is constructed to hold the pinion between centers with the rack in mesh and held down by a slight spring pressure. A microscope with a crossline is so located that if the angle is correct, the side of the rack will coincide with the line.

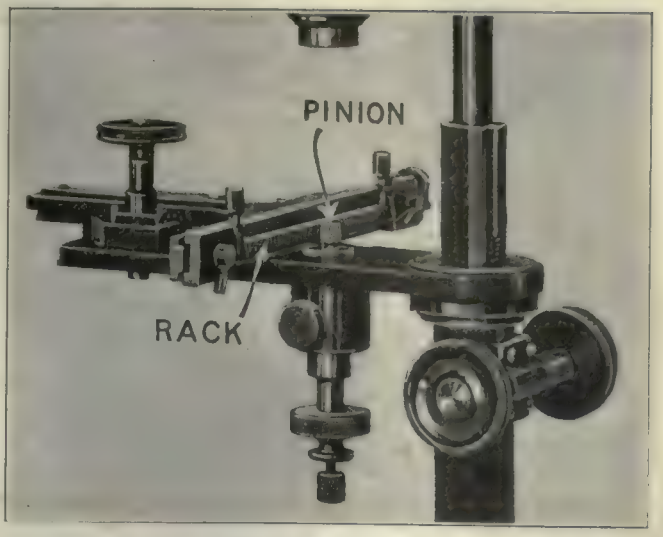


FIG. 18. OBSERVING ROLLING ACTION UNDER THE MICROSCOPE

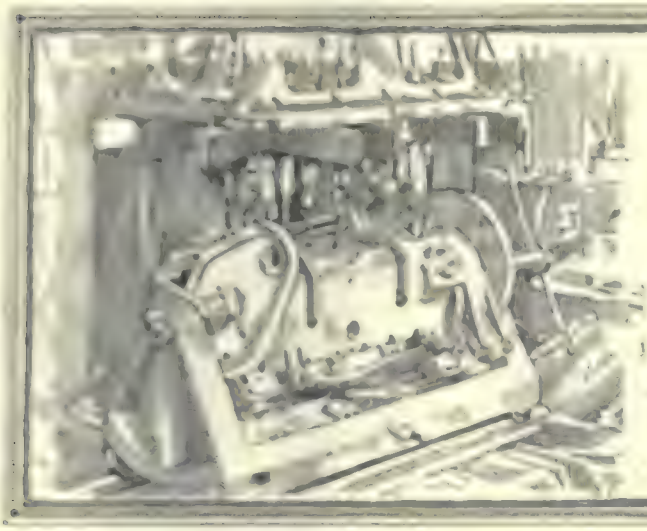
The gage shown in Fig. 18 consists of a fixture to hold the parts to be tested in position, the rack being mounted on a slide that can bring it up into mesh with the pinion. The pinion is mounted in a bearing so that it can be revolved by means of a button. A microscope is mounted above the point where the mesh occurs and the rolling action observed directly.

Periodically, a pair of members is projected and photographic records, Fig. 19, made and filed for future reference.

Only after years of patient work in the development of the methods described was it possible to produce work that could be assembled without fitting and lapping. Not only was the aid of optics necessary to produce the required accuracy, but it was also needed to bring about a speed of operation and inspection that was commercially imperative.



FIG 19. PHOTOGRAPH PROJECTION OF RACK AND PINION



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
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Methods Employed in Designing Tools for Turret Lathes—Use of Layouts and Sketches—Familiarity with Machines Necessary for the Designer

THE methods of manufacture used on turret lathes should be determined by the tool department, and not by the department foreman. If the tool department has not sufficient knowledge to do this, a capable man familiar with this class of work should be obtained as soon as possible. Factory procedure varies in this matter; some believe the department foreman the best man to make "set-ups" for various jobs; others believe that the work can be done more profitably by the tool engineering department. We do not wish to argue the points, but will content ourselves with the statement that turret lathe departments in which the work has been properly planned and tooled by a capable tool engineer familiar with this kind of work, show a production far in excess of that obtained when the department foreman is responsible for the methods of tooling.

This statement is not intended to reflect on the department foreman in any way, as his province is not to provide tools and study methods of handling, but rather to produce the work with tools which are furnished to him. Jigs and fixtures are designed by the tool engineer, and there is no valid reason why turret tooling should not be handled in the same manner. As a matter of fact, the principal reason why a turret lathe department foreman is often called upon to make turret lathe set-ups is because the tool engineer has neglected this important phase of his business, and is therefore not capable of doing the work properly.

Lack of specific knowledge regarding the operation of turret lathes is one of the principal reasons why tool engineers often feel "out of their depth" when methods of handling work on turret lathes are to be considered. By consistent study of various turret lathes and by getting into the shop and operating the machines, a tool designer can soon obtain sufficient knowledge to enable him to grasp the important points connected with the arrangement and use of turret tools. No branch of tool engineering is more interesting and instructive than turret lathe work, and the field is wide enough to allow a capable man to rise rapidly if he specializes along this line.

Also the authors' forthcoming book. All rights reserved.

One of the first considerations in making a turret layout is a knowledge of the machine which may be selected or specified on the operation sheet. In some cases the selection may be left to the tool engineer. Certain types of machines are generally considered better for roughing operations, but there is no good reason for this except the power of the machine; yet we find the opinion prevailing that certain types are unsuited for accurate finishing.

At the risk of being considered too broad in our statements, we say that in our opinion the accuracy obtainable from different types of machines is largely dependent on the tooling, always assuming that the machines themselves are in first-class condition. The tool engineer who is called upon to produce accurate work on a type of machine generally considered suitable for roughing, must design tools so as to take into consideration the possibility of inaccuracies in the machine. This can be done by piloting all tools and providing them with accurate adjustments.

Familiarity with the ratio of cutting feeds and speeds on a given type of machine is of considerable assistance when making a turret layout. The cross-slide and turret feeds are often working at the same time, so that the tools on turret and cross-slide are approaching each other. The feeds used can be proportioned so as to avoid interferences. In a grooving operation the cross-slide feed would be much finer than if turning or facing.

The feeds for different materials and in various kinds of cutting operations will be treated separately, but the tool engineer should familiarize himself with the subject in order that his designs may be consistent. Actual shop practice is of great assistance in this regard, and the man with first-hand information, gained by actual work in the shop, has a decided advantage over another not so well posted.

Turning, boring, facing and grooving operations are often done simultaneously in order to obtain maximum efficiency. The highest production is obtained by continuous cutting, thus doing away with idle time of the machine. In making the tool layout the expert engineer takes special pains to design tools that take advantage of multiple cutting, thus removing the stock as rapidly

as possible. On thin work, which is likely to be distorted, it is a good idea to take all roughing cuts before any finishing is done. After the "skin" on the casting has been removed, the internal stresses are relieved and there is less likelihood of distortion in the finishing cuts. If, however, only a part of the work is roughed off when finish cuts are taken, the work may change slightly after the final roughing cuts are made, thus causing inaccurate work.

The matter of interferences of tools with each other or with portions of the machine while indexing has been mentioned in a previous article. The tool layout should be so made that any interferences will be clearly apparent, and suitable remedies can be applied. Care should be taken to show all tools in their actual positions with relation to each other, usually at the completion of a cut.

If turret tools are turning and boring while cross-slide tools are facing, it is advisable to show the turret tools in the position that they would be in at this stage tools in the position that they would be in at this stage of the operation. In other words, if the turret feed is 0.040 in. per revolution while the cross-slide is grooving at 0.007 in. feed, the turret may complete its work before the cross-slide tools have finished. In this case it may be possible to bring up the tools on the next turret face and put them into operation before the grooving has been finished. These points should all be considered in making a turret layout.

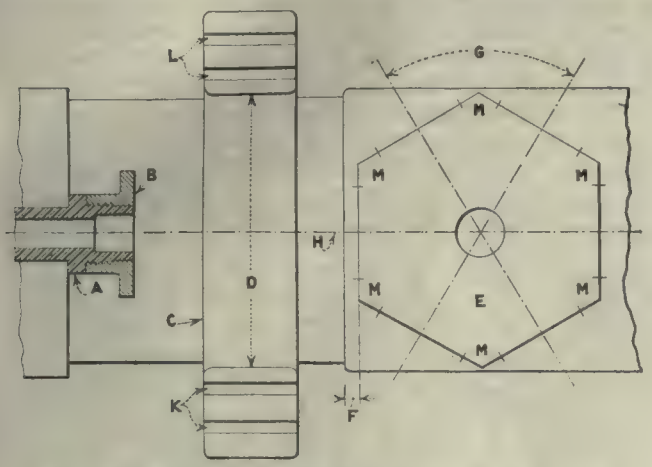


FIG. 373. TOOL ENGINEER'S MASTER LAYOUT FOR TURRET LATHE

The first step in tooling a piece of work on a turret lathe is to make a sketch to show the general method used. This sketch is usually made freehand by the tool engineer, and it is used as a guide in the design of the necessary tools. The procedure varies; some men favor the design of tools first and after this make a layout to scale, while others first make the layout and design the tools from it. The latter method is much to be preferred, but it requires a capable man to make the layout, one who really designs the tools roughly while making the drawing. Such a man, who is thoroughly familiar with the machines on which he is working, can rough out several complete layouts in a day to approximate scale.

In order to carry out this layout work to advantage and obtain the best results, layouts are most commonly made on tracing paper under which has been placed a scale drawing of the turret, spindle and cross-slide in their respective positions. The master drawing may be made to $\frac{1}{8}$, $\frac{1}{4}$ or $\frac{1}{2}$ size, according to preference. The $\frac{1}{4}$-size layout is often used and will be found all right for a large proportion of the work. Fig. 373 shows a master sheet used for this purpose. If a number of types of machines are in general use, it would be necessary to have a master sheet for each machine. As this sheet is used frequently, it is advisable to make it in ink on tracing cloth. The center lines should be well defined, so that they can be clearly seen when tracing.

In the example, the spindle *A* is shown in section and an adapter *B* of standard form is mounted upon it. It is only necessary then for the tool engineer to place his chuck or fixture in the correct position on the spindle, either screwing it in place or mounting it on the adapter. The cross-slide *C* is shown full length, and the distance *D* is laid out according to the dimensions on the machine. T-slots are shown at *K* and *L*, so that when tools are applied to the front and rear of the cross-slide they will be in their exact relation to each other.

The turret shown at *E* has all the center lines shown at *G*, in order that tools may be placed in their proper positions. Center lines at *M* on each turret face indicate the position of bolts used to fasten the tools to the faces of the turret. The line *H* is very important, as it represents the center line of both spindle and turret. On certain types of machines the base of the turret slide extends a short distance ahead of the face of the turret, as shown at *F*. As this projection would strike the cross-slide, it should be clearly indicated as at *F* in order to prevent interferences.

A master sheet of this sort is of great help when making turret layouts, and it can be made in a size suitable for the finished layout or for the freehand sketch. There is much less likelihood of errors in proportioning tools when the tool engineer who plans the work has a sheet of this sort to use as a guide. Freehand sketches are often more or less out of proportion, and this fact sometimes causes trouble when making the final layout.

In Fig. 374 is illustrated a freehand sketch with notes, as often made by the tool engineer. The work shown at *A* is a flange which is to be turned, bored,

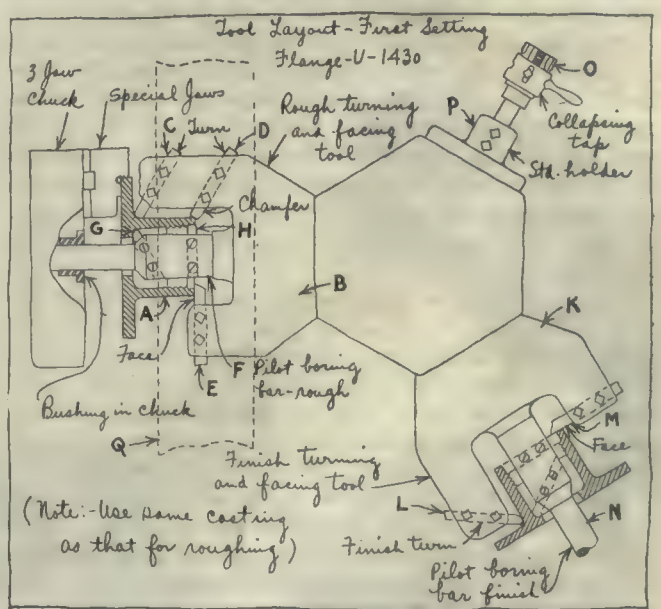


FIG. 374. TOOL ENGINEER'S FREEHAND SKETCH OF TOOL EQUIPMENT FOR TURRET LATHE

chamfered, faced and threaded. The turning, chamfering and facing operations are accomplished by using a special turning and facing tool *B*. The tool *C* does the turning, *D* cuts the chamfer on the end of the work and *E* faces the end. A boring bar *F* is piloted in a

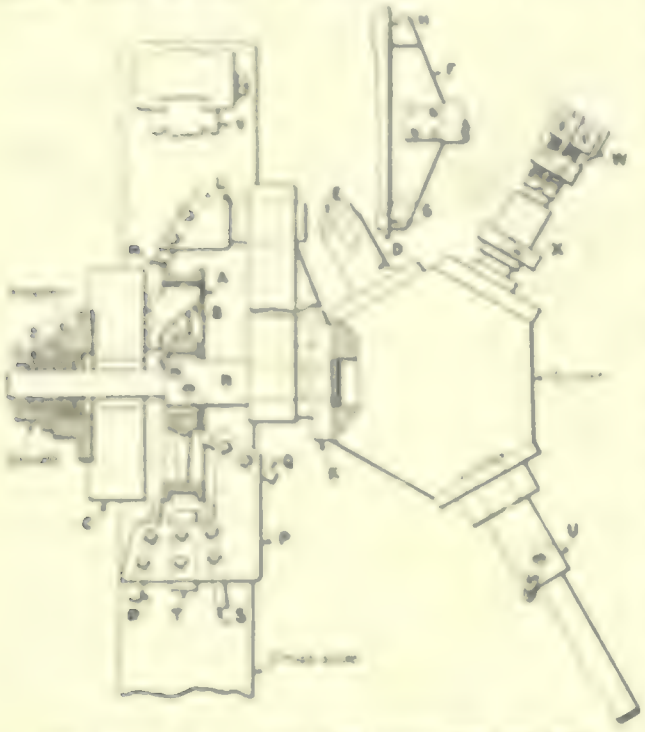


FIG. 375. TOOL LAYOUT FOR GROOVED PULLEY

bushing in the chuck. This boring bar has two tools *G* and *H*, the former doing the boring while the latter cuts a slight recess at the end of the work.

The finishing tool *K* is provided with turning and facing tools at *L* and *M*, respectively, and a finishboring bar *N* is used in connection with these tools. The thread is cut by means of a collapsing tap *O* mounted in a standard holder *P*. The cross-slide of the turret lathe is not used in this setting, but it is necessary to build the various tools with sufficient overhang so that there will be no interferences. The position of the cross-slide is shown by the dotted lines at *Q*.

This last point is very well worth thinking about, as it is not at all convenient to remove the cross-slide completely on any type of turret lathe and there is not usually sufficient clearance so that it can be moved back out of the way under the chuck. The freehand layout shown contains a number of notes to guide the tool designer in his work. The various tools are briefly specified in writing, so as to make the matter clear to the designer.

In order to make the various points of importance clear with respect to turret tool layouts, several examples will be given here with explanation to cover each particular case. Fig. 375 shows a tool layout for a horizontal turret lathe used in machining the grooved pulley *A*. In considering this layout let us first examine the work, noting that both sides of the flange are finished and that the hub is bored and reamed. The grooved portion of the pulley is also finished. It is desirable to complete the work in one setting, and the tool equipment is designed for this purpose.

The work is held by the inside in special jaws *B* in a three-jaw universal chuck *C*. These chuck jaws are cut away so that the facing tools can pass by and finish the edge of the flange without interference. The method of setting up this work is by means of a chucking spider shown at *D*. This spider is so arranged that the portion *E* stands vertically, as shown in the side view at *F*. It bears against the edge of the casting at *G* and *H* and assists greatly in straightening it up while the chuck jaws are being tightened. The work is placed on the jaws slightly in advance of the position which it will take when machining. The jaws are then brought up lightly on the inside of the work, and the turret is moved forward by hand so that the chucking spider comes against the face of the flange and pushes it on the jaws to a distance predetermined by setting a stop on the turret slide. After this the jaws are tightened sufficiently to hold the work.

The holder *K* is fastened to the first turret face and contains a toolholder *L*, in which the tool *M* is used for turning the outside diameter. A boring bar *N* is used at the same time, and the end of this bar is piloted in a bushing *O* in the spindle. The turning tool is really in a vertical position, but is shown horizontally in order to illustrate the action clearly in one view. While the boring and turning operations are going on, a special toolblock *P* on the front of the cross-slide is used for facing the hub with a tool *Q*. Two other tools *R* and *S* face the sides of the flange, while the wide tool *T* roughs out the bottom of the groove.

The next operation is finish boring of the hole by means of another piloted bar, shown at *U*. While this operation is going on the dovetail forming tool *V* at the rear of the cross-slide is put into operation to finish out the groove. The final operation on the work con-

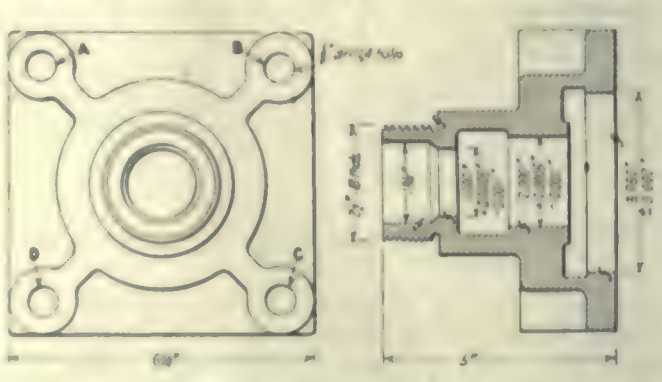


FIG. 376. WORK REQUIRING TWO TURRET LATHE OPERATIONS

sists of reaming the hole with an adjustable reamer *W* in the floating holder *X*.

The toolholder *K* is a standard type and can be purchased in considerable variety in the open market. The adjustable reamer is also a standard make, but the other tools shown must be built specially to suit this particular piece of work. It is advisable to use standard tool equipment for turret lathe work when possible, providing the production can be kept up to the maximum. When work is out of the ordinary and heavy cutting is necessary, special toolholders are often required.

The work shown in Fig. 376 requires two turret lathe operations, and both layouts are shown in order to illustrate the method of handling. The base of this casting is square and there are four holes *A*, *B*, *C* and *D* as shown. In deciding upon a method of handling, it seems advisable to use a chuck for the first operation

if possible, as it makes the setting up so much easier. The holes through the center of the piece must be concentric, yet they cannot all be machined in the same setting. The method of handling, therefore, must consider two settings and the location for the second

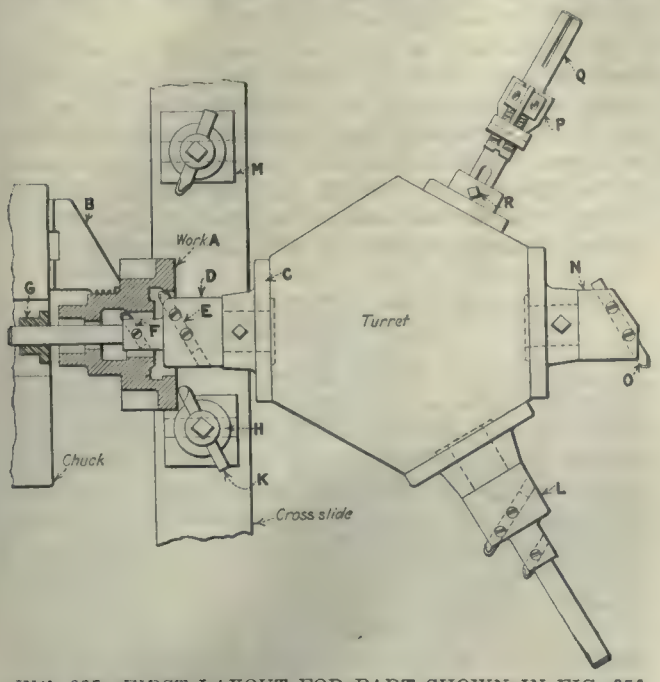


FIG. 377. FIRST LAYOUT FOR PART SHOWN IN FIG. 376

operation must be such that concentricity in the holes can be obtained.

In Fig. 377 is illustrated the method used for the first setting. The work *A* is held by the outside of the hub in special jaws *B* in a three-jaw chuck. End location is obtained by the position of the work against the end of the chuck jaw. The toolholder *C* is used on the first turret face to hold a double boring bar *D*, in which are two tools *E* and *F*. The bar is piloted in a bushing *G* in the chuck. While this boring operation is going on, a standard toolholder *H* on the front of the cross-slide is used with a tool *K* for rough-facing the flange.

The second operation is identically the same as the first, except that the boring bar *L* is used for finishing two diameters in the hole while the facing tool *M* finish-faces the flange from the rear of the cross-slide. A reference to the work will show the dimension 3.250 ± 0.002 in. This is not a very accurate dimension, but the 2-in. hole is held close to size. In order to avoid the expense of a reamer for the large hole, a special boring bar *N* with a single-point tool *O* is used for sizing this hole. The final operation on the work in this setting consists of reaming the 2-in. hole with an adjustable reamer *P* having a pilot *Q* and being held in a floating holder *R*.

After the first turret lathe operation, the work is placed in a drill jig and the flange holes *A*, *B*, *C* and *D* are drilled. This operation is done between the two turret lathe settings in order to provide an effective method of driving for the second operation. It would be possible to do the drilling at another time and use a pin against the side of the casting to assist in driving, if for any reason the drilling operation would be inconvenient and require a great deal of extra handling.

In setting up for the second operation, the work is located by the plug *A* in the 2-in. hole, Fig. 378. A special faceplace fixture *B* has four hardened studs in it at *C*, and the face of the flange rests on these studs. The work is clamped in place by four straps *D*, and there are two pins (not shown) which enter the holes drilled in the flange and act as drivers. The holder *E* contains a bar *F* in which are two tools for boring the 1.500 and 1¾-in. diameters. This bar is piloted in a hole in the end of the locating plug, in order to preserve the alignment between the various holes.

The toolholder *E* has a vertical extension *G*, in which are two turning tools *H* and *K* for turning the outside diameters. This turning toolholder is shown in a horizontal position because it is more convenient to represent it in this way. The front of the cross-slide carries a toolblock *L*, in which the two tools *M* and *N* are set in such a position that they will face the shoulder and the end of the hub, respectively.

The second operation on the work is done by a holder *O* of similar form to that just mentioned. The tools carried in it are finishing tools for the same surfaces as those previously machined. The rear of the cross-slide is equipped with a block *P* carrying a tool *Q*, which finish-faces the shoulder and cuts a recess for the thread. The tool *R* finish-faces the end of the hub.

The next tool used is a reamer *S* carried in a floating holder *T*. This reamer sizes the 1.500-in. hole and is

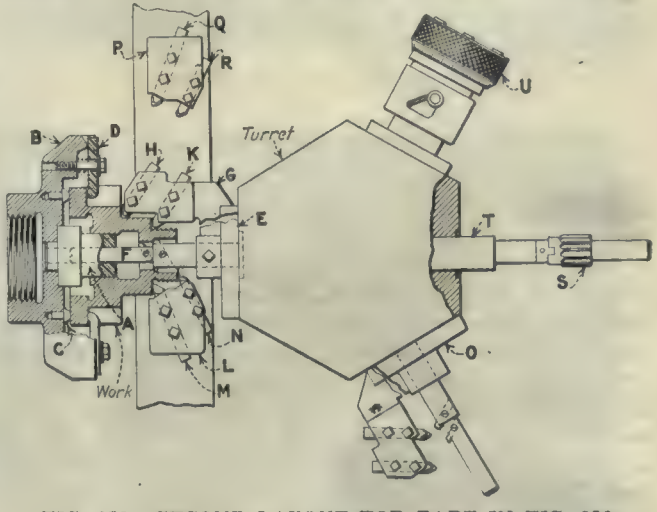


FIG. 378. SECOND LAYOUT FOR PART IN FIG. 376

piloted in order to preserve the alignment. The final operation on the work is done by means of a diehead of the opening type, shown at *U*. Care must be taken in using large dieheads for cutting threads to make sure that the capacity of the machine is sufficient to permit the diehead *to swing over the back of the turret slide* when indexing.

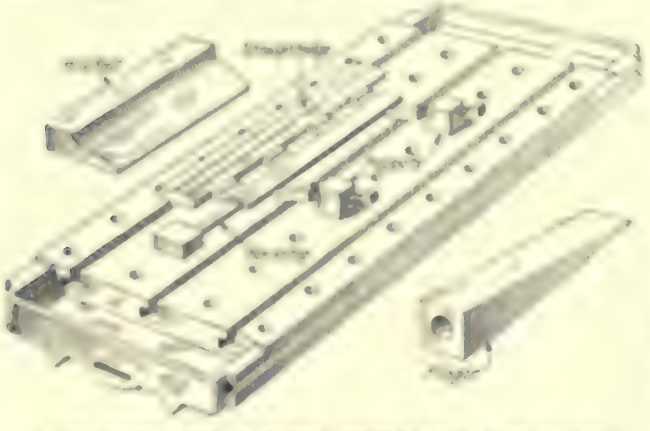
Planing Flat Gibs

By Harry Senior

The article appearing on page 219 of AMERICAN MACHINIST under the title "Planing Flat Gibs," is of interest to the mechanic for several reasons. The introductory sentence in reference to the importance of devoting proper attention to clamping methods, is indubitably correct. The statement that there are many planer hands that have not grasped this fact, is open to question.

It would seem to me that any man who had worked long enough on a planer to be entitled to the designation of planer hand would have demonstrated to himself the importance of clamping methods, for the reason that unless his work was of a very rudimentary nature it would otherwise be impossible for him to obtain results that could be assembled.

Though I have seen many planer hands that did not know how to clamp an unfamiliar piece without springing it, I have yet to see a man who has worked more than a week upon a planer who did not thoroughly understand that if a piece was sprung in clamping, it would not be straight when released.



HOLDING THIN NARROW PIECES FOR ACCURATE PLANING

That the object to be attained in clamping work is to prevent it from shifting under the cut cannot be gainsaid. This tendency to shift must be guarded against in all directions. Not only must a sturdy backstop be interposed against endwise movement and suitable clamps used to prevent the work from being shifted sidewise, but it must be held *down* as well; and the necessity for resistance to a lifting moment, as well as the difficulty of applying it, increases in inverse ratio to the thickness of the piece.

Cost of Experiments in Trying to Plane Thin Work on a Production Basis

Anybody can, without difficulty, plane parallel a piece of iron 14 x 18 in. in size and 6 in. thick, but I once spent a good many hundreds of dollars of my own and other people's money in trying to find a way to machine, on a production basis and to 0.0005 in. limit, pieces of iron of those major dimensions but only 0.0625 in. in thickness. I would still be glad to have some one tell me how it can be done.

In the example of planing cited by the article under discussion there are several errors. In the first place there is little to be gained (nothing unless a double-head planer is used) and much to be lost by attempting to hold two strings of work with one set of clamps, for trouble in one string invariably involves trouble in the other and half the work of setting up has gone for nought. Again, there is no resistance to a lifting moment except the vise-like grip of the shoes, and this must be several times greater than would be required if the pressure were properly applied.

Mr. Berna tells us that the blocks used in the T-slots must not be a drive fit therein and gives an excellent reason *why* they should not; but unless they *are* a driving fit, and sufficiently tight to resist the enormous side pressure brought to bear upon them by the toggle action of the clamps, they will tilt, and the vertical face will no longer be vertical, a condition that at once militates against security of hold and accuracy of results.

Cold Rolled Steel Better for Spacers Than Pieces of Old Files

I can see absolutely no reason for making the pieces which Mr. Berna calls "spacers" (marked *C* in his illustration on page 219) out of old files. It would be much cheaper to make them out of cold-rolled steel. They would serve the purpose quite as well and do away with the necessity for having old bits of file around a planer, a pernicious practice. There are circumstances under which the file bits have their uses, but these circumstances do not exist here.

The desirability of having the under surface of the gib bowed instead of concaved is entailed by the position of the clamps. If there were three clamps to each piece, or if two clamps only were so spaced as to divide the length into thirds (one-third being the combined lengths outside of each clamp) the necessity would not exist. As for bending a cast-iron gib to make it conform to the requirements, how many machinists that have tried to bend a piece of cast iron of this section will agree with Mr. Berna that it is "easy"? It is no simple matter to bend even a *steel* gib, unless you are disposed to consider a "kink" a bend.

In my opinion the proper way to hold these gibs for planing would be to put a "straightedge" on the planer (using a double-faced straightedge in the central slot if thought advisable to plane two strings at one setting) and interpose between it and the work a suitable number of those peculiarly shaped pieces called "holdfasts" in machinists' parlance. The clamping pressure may be applied by toggles as shown by Mr. Berna, but the pieces he calls spacers *should bear directly upon the work* and not upon a separate shoe. Here, and here only, is the use of the file bits justified, and for an entirely different purpose than when used with a separate shoe. Suitably shaped fingers of hardened steel, used in connection with poppets, would be much better.

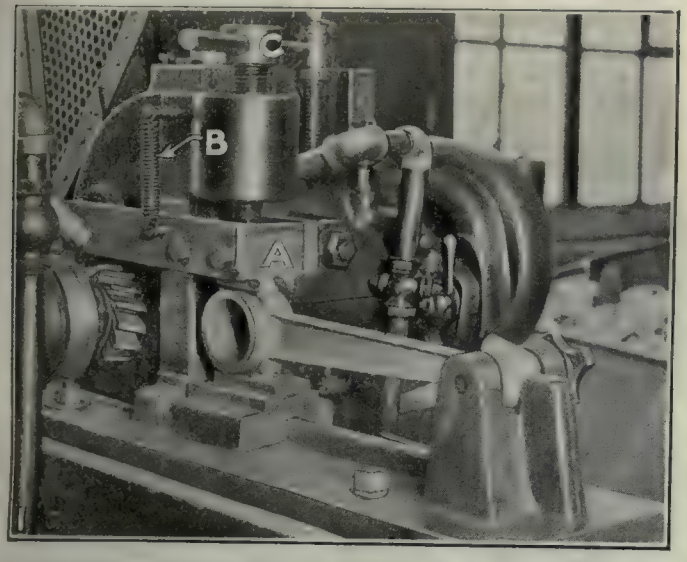
I have endeavored to show in my illustration my idea of the way to hold a thin narrow casting, such as Mr. Berna has cited, for accurate planing; and this method applies just as forcibly when thousands of pieces are to be produced as when but a single casting is desired, provided real accuracy is essential. It is, however, beyond the scope of a magazine article to teach the art. It is not the simple process that it seems in the outlining but is one that brings to mind bits of tissue paper, lead or brass hammers, steel fingers, stops, poppets, etc., and constant shifting, clamping and replaning of the work, calling into play all the skill of hand, eye and even ear, of the trained machinist. Such men will understand that I am writing about planing a piece *straight* and *parallel*; not "somewhere near."

Mack Connecting Rod Methods

Some Unusual Fixtures for Milling and Slitting—A Sequence of Operations that Is Out of the Ordinary—Final Straightening and Inspection

By FRED H. COLVIN
Editor, American Machinist

THERE are two sizes of motors used in Mack trucks, the smaller having the two-bolt and the larger the four-bolt method of fastening the connecting-rod caps in place. The connecting rod is of sturdy design as befits a heavy-duty motor, and yet is not clumsy in any way. Both types of rod are shown flash left by the forging dies. The machining operations begin with the milling of the crankpin end in the double-spindle Cincinnati machine, shown in Fig. 1. The large end of the rod is held by the bolt bosses by means of the V-blocks shown, the upper block *A* being lifted out of the way by the spring *B* as soon as the



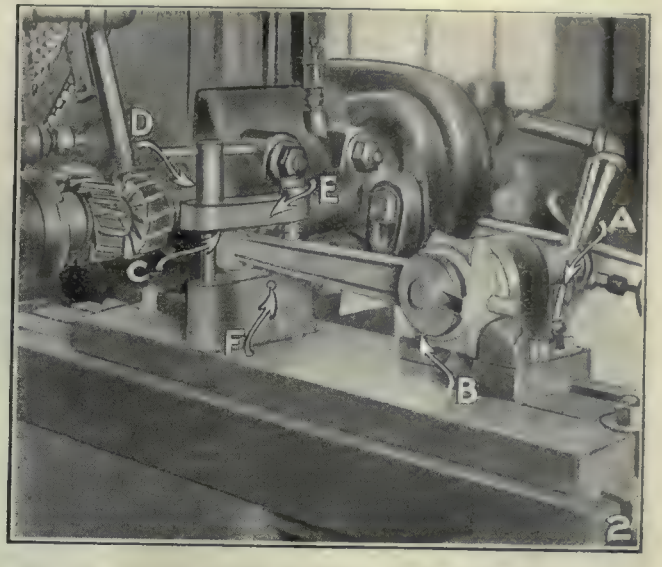
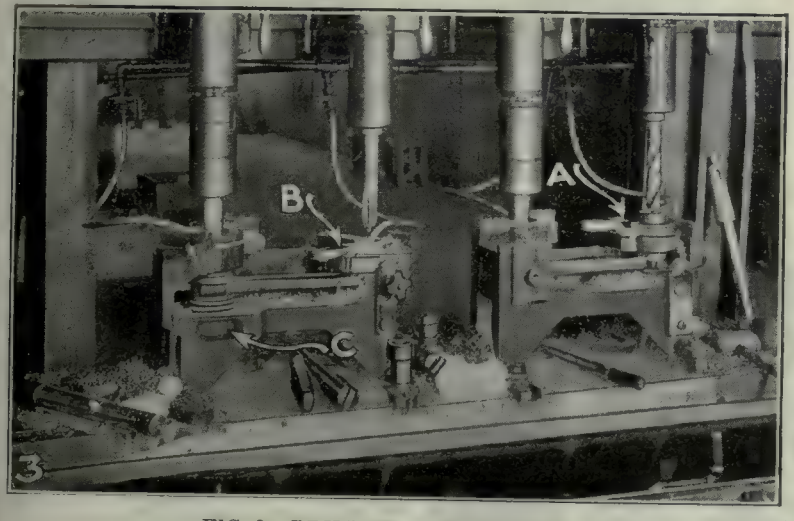


FIG. 1. MILLING SIDES OF LARGE END. FIG. 2. MILLING THE SMALL END



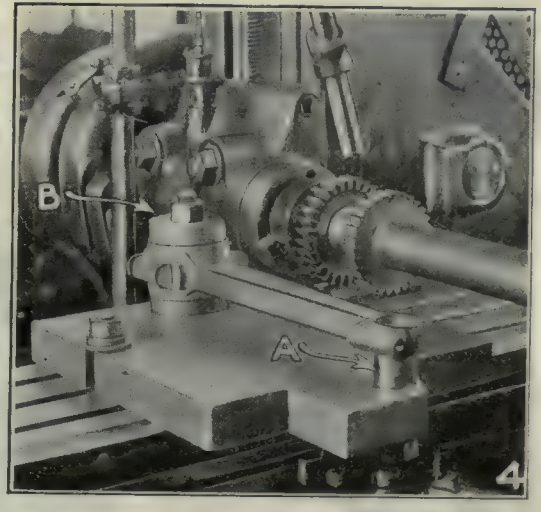


FIG. 3. DRILLING AND REAMING BOLT HOLES. FIG. 4. FACING THE BOLT SEATS

in connection with the machining operations. While utilizing the four-bolt bearing-fastening on the rod for the large motor, the rod is made as light as possible, particularly on the small end where it is desirable to reduce the weight of reciprocating parts to the minimum. The large end, of course, is a rotating member and can be easily balanced.

After annealing and heat-treating, the forgings are given a preliminary straightening, are inspected and sandblasted after which they are snagged to remove the clamping screw *C* is released. The small end is clamped between centers which fit into depressions left by the forging dies.

The small end is then milled on a similar machine, as in Fig. 2. The rod is clamped against the milled faces by means of the screw *A* and the open washer *B*. The small end is held by the clamps shown which consist of hardened round-ended pins. These pins are held in place in the upper and lower clamps, the upper clamp *C* being readily swung out of the way for remov-

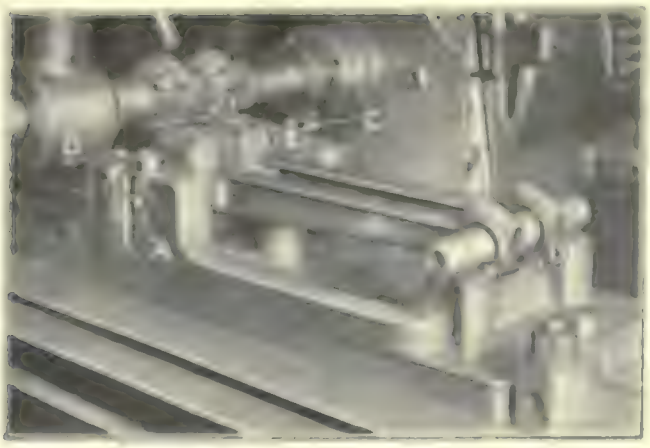


FIG. 4. MILLING BETWEEN BOLT BOSSES

ing and replacing the rod. The clamp screw is at *D*, and *E* and *F* show the pins which act as fulcrums for the floating clamps. The clamps allow the rod to be self-centered without distortion, so that the faces on each end will be milled parallel.

Next comes the drilling and reaming, both operations being shown in Fig. 5. The fixtures are not unusual in design, although the quick-acting bushings shown at *A* and *B* have much to commend them. This illustration shows the way in which the rods are held and also shows very clearly the provision made for the escape of the cutting lubricant by coring a passage as at *C*. This allows the lubricant to flow through the hole being bored and to wash the chips completely out of the way. Both holes are then broached, after which the bolt seats are milled, as shown in Fig. 4. The rod is positioned by the pin *A* which fits the small end, while the clamp *B* holds the large end firmly during the milling cut. The rod is then reversed and the opposite side milled.

In forging the four-bolt rod, the large end is left solid between the bolt bosses, as shown in Figs. 5 and 6. Fig. 5 shows how the rod is lightened by milling the space between bosses and also the way in which it is supported. The rods are milled in pairs, the mandrel *A* fitting both rods and having ends which are squared and slotted for clamping by the bolts *B* and *C*. The mandrel *D*, supports the small ends and holds both rods in line. Fig. 6 shows a rod both before and after milling and also gives a clear idea of the construction of the mandrel *A* by which the large ends are centered and clamped.

The projection on the lower end of the rod, known as the oil scoop, is next drilled, as shown in Fig. 7. The large end of the rod is placed over the stud *A*, while the projecting scoop is centered by jaws *B* and *C*, which are moved by the handle *D*. The drill is guided by the bushing in the plate above. This fixture enables the work to be handled very rapidly.

The bolt holes are next drilled in the fixture shown in Fig. 8, the rod being located on the studs *A* and *B* and held in position by the swinging clamp *C*. This view shows the drilling of one of the two-bolt rods, but the operation on the four-bolt rods is very similar. The radial drilling machine used enables the other holes to be drilled by simply swinging the arm.

The clamping-bolt hole is drilled and tapped in the fixture shown in Fig. 9, which requires very little explanation. The large end of the rod is over the piece *A* and the small end over the supporting mandrel *B*. The



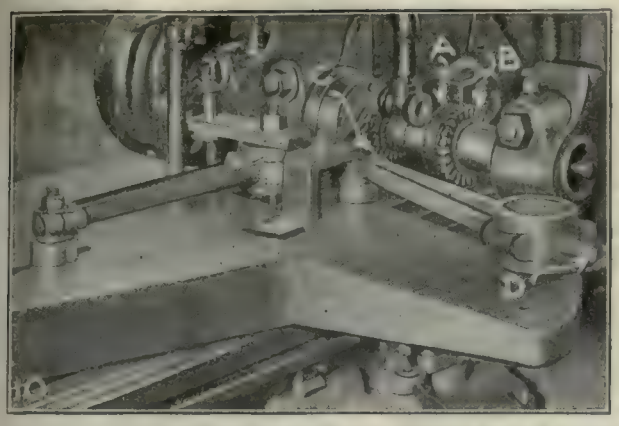
FIG. 6. ROD BEFORE AND AFTER MILLING







FIG. 7. DRILLING HOLE IN OIL SCOOP. FIG. 8. DRILLING BOLT HOLES. FIG. 9. SLITTING ROD AND MILLING OIL SCOOP



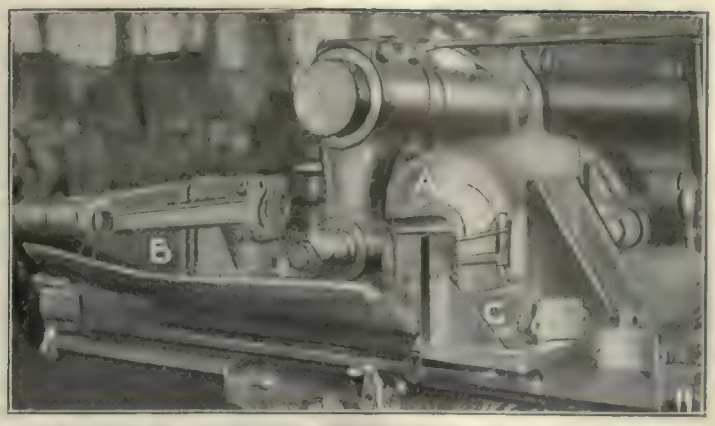
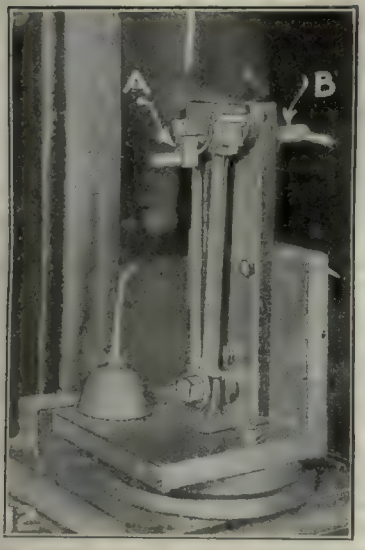


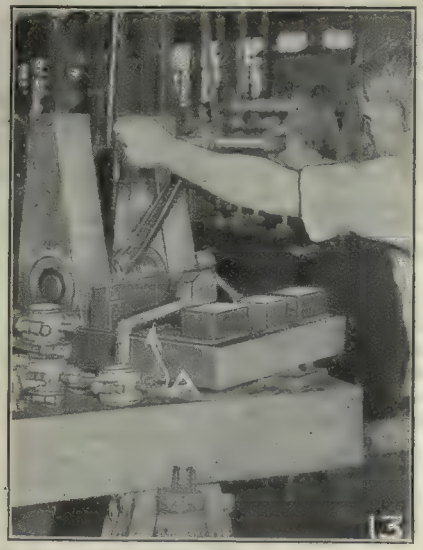
FIG. 10. DRILLING AND TAPPING PINCH HOLE. FIG. 11. MILLING CAPS FROM THE ROD

drill bushing *C* swings out of the way for the tapping operation.

The piston-pin end is slit and the oil scoop milled in a double operation shown in Fig. 10. The slitting saw for the piston-pin end is shown at *A*, while the cutter *B* faces the boss for the clamping bolt. The oil scoop back against the rod by the screw *B*. The clamp *A*, when released, can be easily swung up out of the way so as to make removal and replacement of the rods an easy matter. The fixture revolves on its round base to bring the other hole under the cutting tool.

The pinch-bolt hole is then retapped and burred,





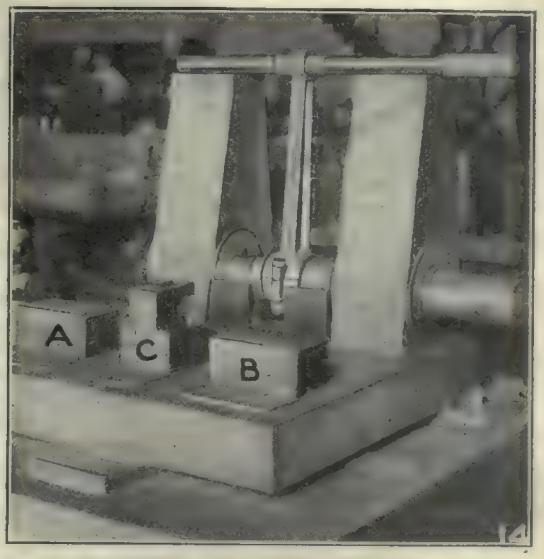


FIG. 12. COUNTERBORING AND REAMING BOLT HOLES. FIG. 13. INSPECTING AND STRAIGHTENING. FIG. 14. THE FINAL INSPECTION

is being milled at *C*, this operation cutting away half of the projection, as can be seen at *D*.

The sawing of the cap from the rod is shown in Fig. 11, a knee type milling machine with a double fixture being used for this purpose. The slitting saw is shown at *A* and the two holding fixtures at *B* and *C*. One rod can be changed while the other rod is being sawed, so as to make nearly a continuous operation.

The bolt holes are then reamed and countersunk in the fixture shown in Fig. 12. Here the small end of the rod fits over the lower stud while the upper end is held in position around the upper stud and against the shoulder by the swinging clamp *A*, which is drawn after which inspection and any necessary straightening takes place, as shown in Figs. 13 and 14. It will be noted that these fixtures are very substantial so as not to be sprung by any straightening which may be necessary. The type of wrench used is shown at *A*.

Fig. 14 shows the testing fixture in more detail, from which it will be noted that the usual steel surfaces test the squareness of the rod in both directions. The test bar in the small end swings down onto the blocks *A* and *B*, and the movable block *C* then locates the small end with relation to its parallelism with the large end. It also shows whether or not the faces of the small end are in correct alignment with the large end.



Standardized Method of Translating Inches to Millimeters

The Sectional Committee of the A. S. M. E. on Plain Limit Gages for General Engineering Work has received a communication from the standardizing body of the Netherlands regarding the translation of inches to millimeters. After careful consideration the committee has through its chairman, E. C. Peck, general superintendent, Cleveland Twist Drill Co., prepared the following statement:

It is believed that the necessity for a standardized method of translating inches to millimeters has been brought about by the lack of interchangeability found in many articles of manufacture and commerce. A mere agreed upon method or standard method of translation will be of little value unless it admits of interchangeability in all manufactured product in which the inch dimensions have been translated to millimeters. Interchangeability demands as a fundamental principle that there can under no circumstance be an unintentional interference of metal between mating parts. This means that strict interchangeability does not exist if through any cause (viz: the wear of gages, the inaccuracy of gages, or the translation of inches to millimeters) there is permitted an interference of metal that is not intended.

It seems equally important that the standardized method of translation must meet the requirements of all the arts and industries, that is, the translation must meet the requirements of those doing fine, accurate work as well as those making articles of more common commercial accuracy.

As a matter of fact, the accuracy of this translation is of more importance to the fine work because of its smaller working tolerance. Conversely, it is less vital to those engaged on work of a common commercial kind on account of the larger allowance for fits and the greater manufacturing tolerance.

It should be borne in mind that to avoid interference of metal in mating parts for the purpose of interchangeability, decimal places may be dropped for the dimensions of internal members; but, if the decimal figure dropped is greater than five, the remaining decimal cannot be increased. For external members, the converse of this is true. To illustrate, $\frac{3}{8}$ in. equals 9.525 mm., and for some purposes 9.53 mm. might be satisfactory; but for the internal members of a pair of mating parts in which a good fit is demanded, this 9.53 mm. makes it possible to have this internal member nineteen one-hundred-thousandths of an inch too large to be received by a correct gage. Hence, there is an interference of practically two ten-thousandths of an inch.

Must Suit Present and Future Generations

Any standard method of translation proposed must not only suit the needs of the present generation but those of future generations. Methods of manufacture are being revised each year, and the requirements of machinery as regards accuracy of product are becoming more exacting. Methods of measuring are being improved so rapidly that in gage-making the gage tolerance is spoken of in terms of millionths of an inch, and several manufacturers of gages guarantee their product to be within a tolerance of ten millionths of an inch, or roughly, about one-fourth of a micron.

It must, therefore, be evident that the only method of translation which will suit all cases and work a hardship on none is that which translates in the smallest measurable units that are at the same time workable. This, then carries the translation of inches into microns, and it will be shown that this is not too small for good work and at the same time will not penalize those industries using measurements which do not require great accuracy. When inches and decimals are used, the accuracy desired is obtained by dropping decimal places from the right-hand end; if a translation of inches into metric units and the fraction expressed in microns is used, then the desired accuracy is obtained in the same manner.

It is customary in many shops when a decimal place is dropped and the dimension remaining ends in zero, to call the work correct if it is ± .5 of the value of the decimal place dropped. To illustrate: 2¼ in. (2.250) equals 57.150 mm. and if the zero on the right is dropped, it indicates that no accuracy is required beyond 57.15 mm. A dimension stated this way without tolerance leaves a chance for controversy, as it will rarely be exact. Therefore, it is the practice in some shops to interpret this to mean that if the work is between 57.145 and 57.155 mm., it is correct, because if greater accuracy were desired, it would have been expressed with the tolerance in microns; thus:

$$57.150 \pm \begin{smallmatrix} 0.000 \\ 0.002 \end{smallmatrix}$$

meaning that it cannot be over but may be two microns under correct size. If the translation of 2¼ in. to mm. is carried to tenths of a mm., the dimension would have to be 57.1 or 57.2, and by the usual rule, it would be the latter, and, no doubt, for many purposes would be good enough, but for others entirely unsuitable.

Suppose this 2¼ in. dimension was a crank bearing of an automobile engine, the grinding dimensions would probably be 2.2495 in. to 2.2499 in. (good American practice). Then, the use of 57.1 or 57.2 mm. would not be near enough for interchangeability, as 57.1 mm. equals 2.24802 in., and 57.2 mm. equals 2.25196 in. If we carry out the translation to the nearest 0.01 mm., the dimension becomes 57.15, and with no tolerance expressed, we would, as figured above, use 57.145 mm. equals 2.2498 in. and 57.155 mm. equals 2.2502 in.; and for this work a juggling of tolerances might make it acceptable.

Gage Work

For gage work, however, all translations ought to be carried out to microns, as this is not too fine for this work. A micron is 0.00003937 in. or practically 39-millionths of an inch and the choice of which micron a measurement is intended to be leaves the value of the possible discrepancy as about 20-millionths of an inch, which is greater than the tolerance some gages are made to. It must, therefore, be evident that the metric system does not contain a unit small enough for the finest work now being done in this country, and it is prophesied that for some purposes the micron will be sub-divided into tenths.

We propose this method of translating inches into the metric system. Adopt the value of the American inch, 25.4 mm. as the basis of all translations of length, and my reasons are as follows:

(1) The error cannot equal one micron until 10 in. is reached and is only one micron for each 10 in. of length.

(2) It is fine enough for any work.

(3) If 25.4 mm. (carried only to tenths mm.) is used, as it will be for many purposes, the error is only one-tenth of a micron or practically four-millionths of an inch, a quantity so small as to permit of interchangeability for all industrial and commercial purposes.

(4) It allows the translation to be made by the simple multiplication of 25.4 by the inches or decimal fractions thereof. (Many divide the inches and fractions by 0.03937 to get mm.).

(5) For precision work, the computation may be carried out to the extreme decimal part of a mm. and used without changing the value of the inch as used in America.

(6) If tables are compiled on this basis, the accuracy desired will be determined by the user who will drop as many decimal places as suits his particular purpose.

Exhibition at Gothenburg

The Aeronautical Chamber of Commerce of America has received the program for the international aero exhibition which is to be held at Gothenburg from May 15 to Sept 10, 1923. This exhibition will be held in conjunction with the 300th anniversary of the foundation of the city of Gothenburg. The aeronautical part of the program will take place from July 20 to Aug. 12. It will be under the direction of the Royal Swedish Aero Club.

Further information about this exhibition can be had from the Aeronautical Chamber of Commerce of America.

Machine Tool Shops According to the 1919 Census

Analysis of the Figures Published in the Last Census of Manufacturers Show Interesting Economic Facts—Larger Shops Much More Efficient

IT IS quite likely that few business men realize the fund of information contained in our national census compilations. The documentary mass is usually so imposing that only an ardent seeker after facts has the perseverance to dig into it and come out with something valuable.

From the accompanying table, however, some interesting deductions can be drawn. The shops of the country making machine tools have been classified in four groups according to the dollar value of their product. The number of shops in each class is listed in the second column and the total value of their product in the third. The cost of the materials used is placed in the fourth column and the fifth column is obtained by substracting 4 from 3.

It should be noted that Class 2, over $500,000, means over $500,000 and below $1,000,000. Summations are made below the first set of figures and show, among other things, that the total turnover of capital for the year is slightly less than one, $\frac{212,400,000}{231,000,000} = 0.917$, to be exact.

The fact that 80 per cent of the product, measured in dollars, is made by 93 of the 403 shops and that 95 per cent is made by 277 is also worth noting. Taking only the shops with an output of over $1,000,000 we find that 13 per cent of the shops turn out 69 per cent of the total output.

If we now take into consideration the number of wage earners employed in each class of shop, we discover that the bigger the shop the larger the value of the product per wage earner employer. The same applies to the added value per wage earner.

Reducing some of these figures to a percentage basis it becomes evident that 13 per cent of the shops, the big ones, produced 69 per cent of the value of product and employed 66 per cent of the wage earners. On the other end of the scale 44 per cent of the shops, the little ones, produced but 3 per cent of the value of product and employed but 5 per cent of the workers.

The struggle for existence which confronts the small shop is indicated by the fact that even in a good year like 1919, it produced 25 per cent less per wage earner employed than the average of all shops.

Machine Tools—1919 Census

INVESTED CAPITAL $231,000,000.00

Class by Value	Number of Shops	Value of Product	Material Cost	Value Added by Manufacturers	Number of Wage Earners	Product per Wage Earner
1—Over $1,000,000	52	$146,142,000	$38,636,000	$107,506,000	35,525	$4,100
2—Over 500,000	41	27,856,000	7,847,000	20,009,000	7,235	3,869
3—Over 100,000	134	31,760,000	10,271,000	21,849,000	8,162	3,873
4—Under 100,000	176	6,642,000	2,280,000	4,362,000	2,186	3,030
Total all classes	403	212,400,000	59,034,000	.....	53,111	4,000
80 per cent—Class 1 and 2	93	173,988,000	46,483,000	.....	42,763	4,050
95 per cent—Class 1, 2 and 3	227	205,758,000	56,754,000	.....	50,925	4,032

Class	Added Value per Wage Earner	Ratio Added Value to Product	Ratio Material to Product	Material per Wage Earner	Per Cent of Shops	Per Cent of Value	Per Cent of Wage Earners	Wage Earners per Shop	Product per per Shop
1—	$3,029	74	26	1,071	13	69	66	683	$2,810,000
2—	2,766	71	29	1,103	10	13	14	176	679,000
3—	2,634	66	34	1,239	33	15	15	62	238,000
4—	1,946	67	33	1,084	44	3	5	12	38,000
Total	2,887	72	28	1,113	100	100	100	132	531,000
80 per cent	2,979	73	27	1,071	23	82	80	461	1,870,000
95 per cent	2,927	72	28	1,105	56	97	95	224	906,000

To Examine Ordnance Designs

L. W. Wallace executive secretary of the Federated American Engineering Societies, is in receipt of the following letter from Brigadier General W. S. Peirce, Assistant Chief of Ordnance of the Army:

"In reply to your recent letter referring to the matter of examination by the engineering societies of ordnance designs and especially in regard to the economy and facility of production in quantity, I take pleasure in informing you that, pursuant to your reference of the matter to the American Society of Mechanical Engineers, that society submitted the question to letter ballot by its ordnance division, and that ballot being in favor of the resolution, the same was adopted by the council of the A. S. M. E.

"Pursuant to this action by the A. S. M. E., it has been decided that the best plan of procedure will be for the Ordnance Department to submit drawings showing proposed designs, which the executive committee of the ordnance division, A. S. M. E., will refer to certain specially qualified members for criticism. Undoubtedly there will be further details of procedure to be determined from time to time, but it has been thought best to leave the matter until several particular cases have been handled."

Unique Power Plant in a Small Shop

By Ellsworth Sheldon

While prospecting around in Northern New England the other day the writer chanced upon a small garage and machine repair shop in which there was a power



FIG. 1. THE COMPLETE POWER PLANT

plant that displayed some novel, not to say unique, features.

The main unit in its original form has no particular claim to distinction. It was manufactured by the Ford Motor Co., of Detroit, and until the present owner lifted its mangled remains from a local automobile wreck, was exactly like thousands of its contemporaries that are still doing business in the ubiquitous Fords. But I doubt if in its present shape any of Ford's engineers would recognize it.

The complete plant, shown in Fig. 1, comprises a Ford engine so changed as to adapt it to kerosene instead of gasoline fuel; a 110-v. direct-current Bullock generator; a 56-cell chloride accumulator, and a device for producing distilled water as a by-product.

The accumulator cells are located in a large, well ventilated closet behind the switchboard and are not, of course, evident to the casual observer. The jars are of glass, of ample proportions to hold the plates without the necessity for wooden separators, and are neatly

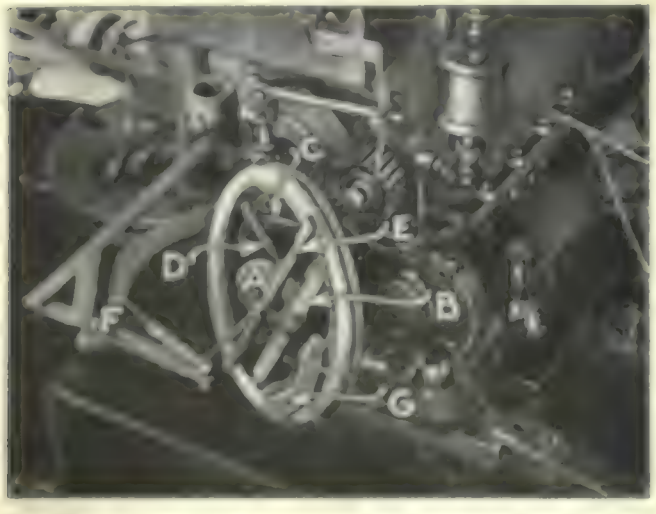


FIG. 2. THE GOVERNOR OF THE ENGINE

arranged in groups on several shelves so that any one cell may be removed for cleaning and another one substituted without disarranging the battery or interrupting the current except for the moment required to make the connections.

The plant is entirely self-contained. Despite the integrating wattmeter to be seen at the top of the switchboard, the proprietor neither buys nor sells current, all "juice" being made and consumed on the premises.

When I first saw the shop the power was not running but as I immediately evinced interest in it, the proprietor volunteered to "start 'er up." Casting an anxious look about the floor, he called to one of his men: "Frank, where is the crank we start this engine with?" "Dunno," responded Frank, "las' time I seen it it was down cellar behind the piano." As Frank spoke the engine started, and before I could turn to see how the thing was done, was in full operation.

The proprietor, hugely enjoying my puzzled discomfiture, allowed me to hunt for several moments to find the starter before he opened the closet door and showed me the storage battery. Not until then did I realize that it was the generator, running as a motor upon the accumulator current, that was doing the work. Opening the throttle and turning down a two-throw switch on



FIG. 3. THE "DISTILLERY"

the board, the engine took over the job without hesitation and everything was in full blast.

The only physical change in the engine necessary to adapt it to its new fuel was to increase the combustion space and readjust the carburetor. The former was done by removing the head and introducing between it and the cylinder block a flat plate of cast iron about 1½ in. thick, bored to correspond to the cylinders and using two gaskets instead of one to remake the joint. The engine runs equally well with either gasoline or kerosene but, of course, loses some of its original "pep."

To maintain a constant speed for shop power purposes some kind of automatic governor was necessary and this, perhaps the most simple and ingenious device of the whole outfit, is shown in Fig. 2. A flanged bushing *A* is keyed and setscrewed to the protruding end of the crankshaft and bolted firmly to the flanged end is the bar B, made of two pieces of square cold-rolled stock and journaled at the ends to take the ring which acts as the governor weight.

The ring is the balance wheel of an old sewing machine. The spokes have been cut out and two holes drilled in the inner side of the rim into which the journals of the bar *B* are fitted. The rim revolves with the

engine shaft in a true circle but is free to swing out of a true plane, thereby becoming an ellipse. The tendency of the revolving rim is, of course, to swing into a true plane by virtue of the action of centrifugal force.

This action is resisted by the coil spring *C*, attached at one end to the inner end of the flanged bushing while the other is hooked over the notched post *D* that is driven into the rim. By moving the spring to or from the center of rotation along the line of notches the effective pull is diminished or increased; thereby adjusting the engine to any desired speed within its range.

A smaller crossbar *E*, bolted to the rim, carries an extension at right-angles which connects through the system of levers at *F* with the throttle. The piece *G* is a lead weight added after the device was complete, to bring it into balance.

The cooling system and water distilling apparatus consists of an old oil barrel, some pieces of hose, and the radiator of the Ford, all of which may be seen to better advantage in Fig. 3. The radiator is built into an opening in a wooden stack which extends through the roof of the shop and thus there is a natural draft of air passing through the radiator cells at all times.

After the engine has been running for a short time the water in the barrel becomes hot enough to throw off a vapor, and this vapor in passing through the radiator becomes condensed, the condensation dripping into the stone jar below. The distillery does not work very fast but its works all the time, without expense or supervision. There is always a supply of distilled water in the jar.

The accumulator will drive the shop for an hour if need be, but its real service, besides starting the engine, is to furnish current for lighting the shop and the proprietor's residence, adjoining, at times when the engine is not running. Standard 110-v. bulbs are used and the cost is nothing but a little extra kerosene and the very small amount of attention required by the accumulator. Direct current is also available at all times for recharging the small storage batteries of automobiles, which is a part of the proprietor's business.

When I expressed surprise at the presence of the wattmeter with no bills either payable or receivable to account for, he said: "Oh! I just picked it up somewhere and installed it to keep tabs on the engine. If she don't tread up the meter according to my figures I know she ain't earning her kerosene and I just start an investigation."

Erratum

Too late to make the changes on the original plate, we received from G. E. Katzenmeyer the accompanying chart which is a revision of Fig. 2 in the article "Strength and Proportion of Industrial Gears," on page 666 of our issue of May 4. Those readers who clipped the original article for reference should see that this chart replaces the incorrect one.

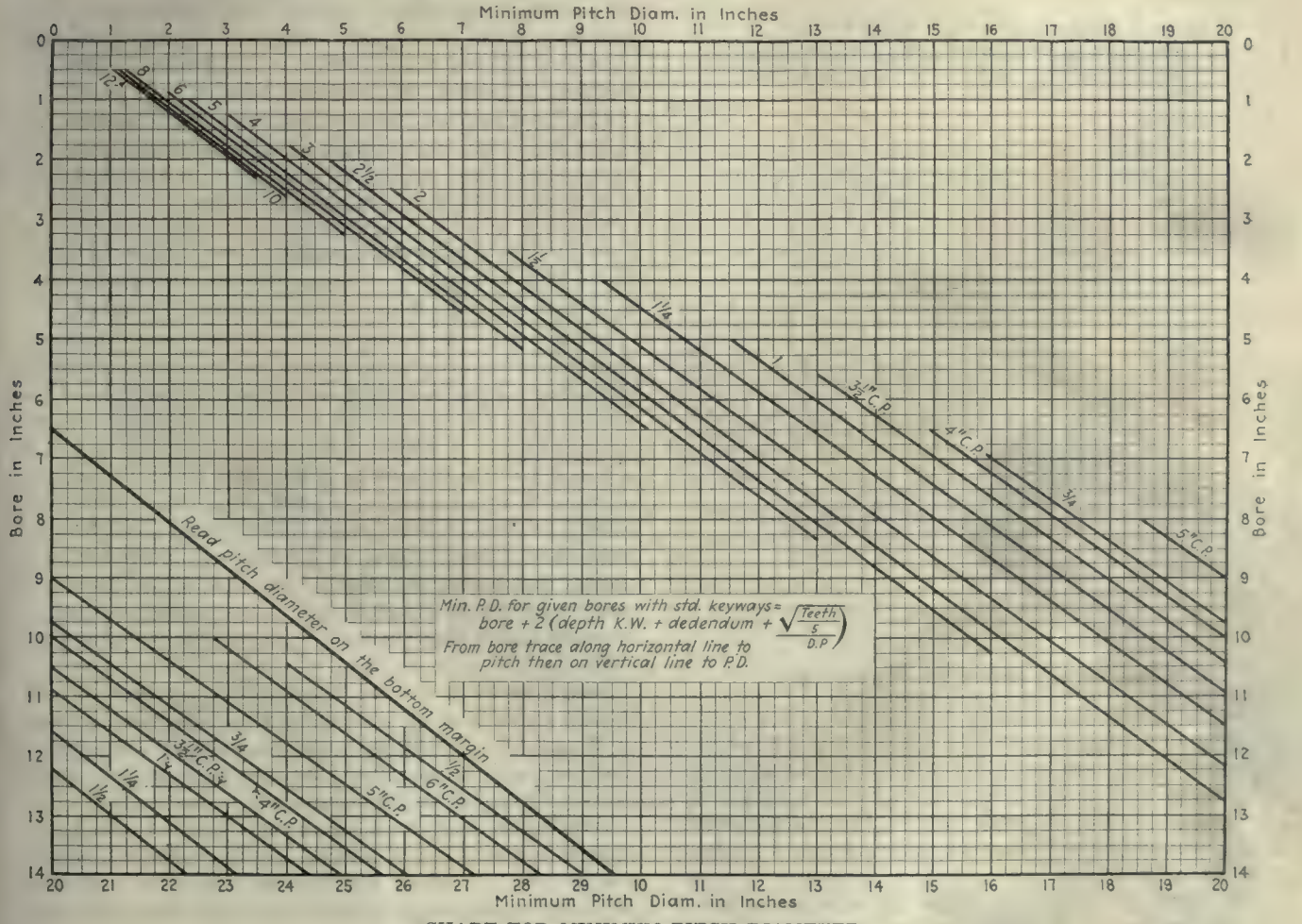


CHART FOR MINIMUM PITCH DIAMETER

Amortization of Plant Facilities*

Pursuant to Art. 184 of Regulations 62, the Commissioner of Internal Revenue has determined and publishes the following ratios of estimated post-war cost of replacement for use by taxpayers in computing claims for tentative allowance for amortization.

The purpose of establishing these ratios is to facilitate the preparation and examination of claims and to bring about, to such extent as may be practicable, uniformity as to the basis of claims. The allowances based thereon will be purely tentative and subject to redetermination in accordance with the provisions of the law.

These ratios, condensed as they are to cover sixteen groups, are necessarily composite figures, arrived at by an examination of many items entering into the respective groups, and it is realized that in some cases where only a limited number of items in the group are involved, the ratios given may not fairly be applicable to a particular case. In such cases the claim for amortization should be made in accordance with the ratios published, but the taxpayer, along with his claim, should submit a statement showing in detail the reasons why, and the extent to which, such ratio is not properly applicable to his claim, so that such cases may receive special consideration. In like manner, there may be cases where the ratios as applied to the particular claim would give the taxpayer more than a reasonable allowance, and in such cases the ratio properly applicable will be determined on the examination of the claim and the taxpayer given notice thereof.

All ratios are expressed in percentages based on prices as of June 30, 1916.

Ratios for computing estimated post-war cost of replacement of buildings, vessels, care tanks, blast furnaces, open hearth furnaces, annealing furnaces, electric furnaces, coke ovens, and construction of all kinds.

		Per Cent
1	Lumber	
	(a) Hard	240
	(b) Soft	175
2	Structural steel	60
3	Building materials, other than lumber and structural steel	225
4	Steel (other than structural steel) and steel products	90
5	Building equipment	150
6	Labor (all classes)	160

Ratios for computing estimated post-war costs of replacement of machinery and equipment.

7	Electrical machinery and equipment	130
8	Engines, turbines, compressors, and similar facilities	117
9	Pumps	135
10	Boilers	160
11	Transmission equipment	
	(a) Shafting, pulley, hangars, etc	135
	(b) Belting	100
12	Machine tools and small tools (machine tools are considered as that class of metal working machinery which can be used on both cast iron and steel)	130
13	Wood-working machinery	155
14	Textile machinery	135
15	All other machinery (including cranes)	
	(a) Machinery, the cost of which did not exceed 10 cents per pound as of June 30, 1916	120
	(b) Machinery, the cost of which did exceed 10 cents per pound as of June 30, 1916	130
16	Office furniture and equipment	125

*For further information in regard to Regulations 62, see editorial in MACHINIST issue of March 16, 1921, page 462.

Standardization in Hardware

The following paragraphs are from a letter sent to the Chamber of Commerce of the United States by a prominent hardware manufacturer. It can be seen what advantages may result from the elimination of unpopular products. The example set by this manufacturer might well be followed by many makers of small products such as hand tools.

"We have generally considered ourselves as originating the movement for the elimination of unnecessary patterns, sizes and finishes, especially in the hardware field. We started this work ten years ago.

"We have cut our line of hammers, hatchets, axes, files and sledges down from 2,752 items to 761 items. We have done even more than this. We have concentrated nearly 90 per cent of our business into 344 of those 761 items. We have gone further along this line than has any of our competitors. Our whole industry responded willingly to the request first made upon them by the Hardware Manufacturers' Organization for War Service and followed up by the Conservation Division of the War Industries Board, but the industry as a whole has not gone as far as we have individually.

"Since the war some members of our industry have restored part of the items they dropped, but not many. We do not consider this any disadvantage to us. If they want to take action which we consider economically unsound, we feel that it puts them at a disadvantage in competing with us. It helps us to reduce our costs lower than theirs. It gives us a selling argument. It increases the strength of our selling argument to our distributors—that there is no dead wood in our line."

Handling Men

By F. W. Reardon

During the late war the writer was in charge of straightening gun and rifle barrels in a gun shop engaged in the production of sporting arms. A contract was taken for rifles for the Government, and at the time we had a lot of unfinished sporting arms in the shop. It was thought advisable to finish this work up as rapidly as possible, but as the government work was on a piece work basis while our regular work was paid for by the hour, we were confronted with the problem of getting piece workers to do day work.

Finally I divided the men into two equal squads and told them that each squad would work one-half day on alternate days on sporting arms until the work was completed, making it fair for all hands.

Once in a while some man would stay out on the half day his squad was to work on the sporting arms, but when he came in I made him do two consecutive half day's work on them. This cured the laying off.

Later on I was given charge of the barrel reaming department where the operators had never been graded according to their ability, but were all paid alike regardless of their skill or the class of work they were on.

The quality of work turned out was not up to standard and no one apparently knew how to do it properly or seemed able to learn. I said apparently. However, I felt sure that matters could be improved if the proper inducements were given, so I called all hands and told them I was going to make a change and that the work was going to be divided into four classes, according to quality, and that their ability and skill would control their pay.

Rough-reaming was to be paid for at a certain rate. Second reaming 5 per cent more with a further increase of 5 per cent for finish-reaming; and the best finish-reamers were to be picked as tool setters and sharpeners with a still further increase of 5 per cent.

Soon each man was doing his best to reach the highest grade of work and pay and I advanced him as fast as his skill would warrant and vacancies occurred. New men were put on rough-reaming. Soon the work was up to standard and all hands were satisfied.

Ideas from Practical Men

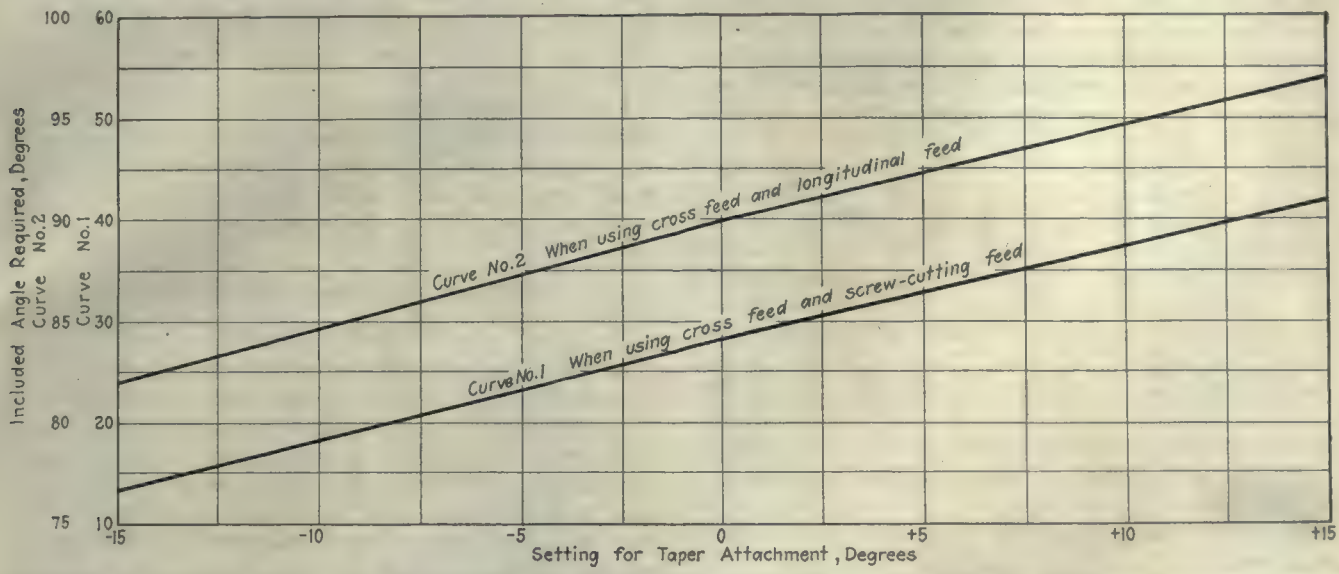
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Turning Special Tapers

By Wilmer H. Bath

It is sometimes necessary to turn special tapers on the lathe, i.e., tapers of such angles and length that it becomes impossible to turn them with the use of the taper attachment or the compound rest.

This was the case recently in the shop with which the writer is connected. The angle in question was 19 deg. 20 min. included, and nearly 10 in. long. This angle we could not get with the taper attachment which has provision for a maximum angle of 15 deg., included and the travel of the compound rest was so small that it would have been necessary to reset the tool several times during the cut.



CURVES OF TAPERS THAT CAN BE TURNED BY USING CROSS AND LONGITUDINAL FEEDS IN CONJUNCTION WITH TAPER ATTACHMENT

With these handicaps in mind we began to look around for a quicker method. The idea of any special apparatus was not acceptable as the time consumed in making it would have been greater than that required to do the job, since there was but one piece to be made.

We investigated the conditions on a 16-in. Hendey lathe to try and determine an easy set-up for the job. During this investigation it was discovered that it is possible to turn tapers on the lathe mentioned as noted by the accompanying curves.

By using the taper attachment alone we have found it possible to turn tapers up to and including 15 deg., and by using the longitudinal feed in combination with the crossfeed to turn a taper of 90 deg. included. By using the screw-cutting feed in combination with the crossfeed a taper of 28 deg. 4 min. 12 sec. included could be turned.

The endeavor, then, was to combine one of these set-ups for apron power feed, with the taper attachment, in other words, to vary the angles 28 deg. 4 min. 12 sec. or 90 deg., by an amount equal to that indicated by the setting of the taper attachment.

The action we get when using a combination of feeds, as mentioned, is that the taper attachment causes the crossfeed nut to move through a distance equal to the tangent of the angle to which it is set while the cross-power feed operates the crossfeed screw. Operation of either the nut or the screw causes the motion of the toolpost. In addition to this combined movement there is motion due to the longitudinal feed or the screw-cutting feed. The screw-cutting feed operates the carriage at a speed four times that due to the longitudinal feed.

A word of explanation as to the derivation of the angles 90 deg. and 28 deg. 4 min. 12 sec. Since the ratio of the longitudinal feed to crossfeed is 1:1, we have two equal values representing the adjacent side and the opposite side of a right-angle triangle. This gives a tangent of 1, or an angle of 45 deg. Doubling this, we get 90 deg. included.

Similarly, since the ratio of screw-cutting feed to crossfeed is 4:1, we again have the two sides of a triangle and taking the tangent of the angle we get 0.250 or the tangent of 14 deg. 2 min. 6 sec. Doubling this gives 28 deg. 4 min. 12 sec. included.

If the screw-cutting and crossfeeds are used and the taper attachment set to 15 deg. included, it would seem as though the angle would be 43 deg. 4 min. 12 sec. included. This, however, is not the case as the cross motion would be the sum of the tangents of the two angles, 7 deg. 30 min. and 14 deg. 2 min. 6 sec., or 0.38165 which is the tangent of 20 deg. 53 min. 21 sec. This, doubled, gives an included angle of 41 deg. 46 min.

42 sec. This, no doubt, will explain the origin of the curves shown. Taper attachment settings are noted as plus or minus. Plus indicates motion toward the operator and the lathe spindle and minus indicates away from the operator and toward the lathe spindle.

Since any combination of feeds through the apron gives motion of the tool toward the operator when the carriage is moving toward the spindle, or away from the operator when the carriage is moving toward the tailstock, it will be observed that it was necessary to use a negative setting of the taper attachment as the work had to be held by the small end for boring.

A feature of the boring job was that we reversed the direction of the lathe spindle and used a tool forged left-hand, or opposite to a regular boring tool, the cut being taken on the back side of the bore.

Tools for Trimming Electric Push-Button Switch Plates

By George Wilder

In Fig. 1 are shown five sizes of electric push-button switch plates, namely two, three, four, five and six gang. After the blanking and stamping the next operation is trimming to remove the flash left by the stamping tools. The operation for producing similar plates with only one pair of holes has been explained in a previous

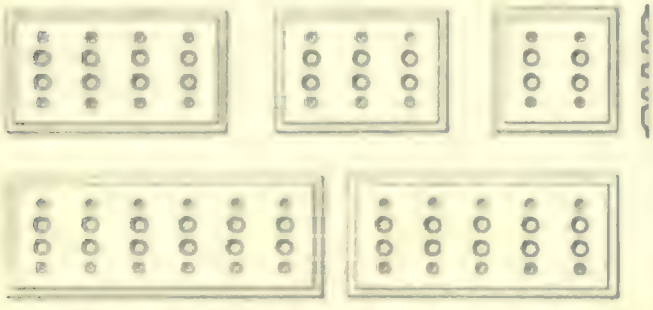


FIG. 1. SWITCH PLATES TO BE TRIMMED

article so this description will be confined to the trimming tools.

Because of the very thin metal it would not be good practice to try to push the plates through a die, as this procedure would cause the metal to buckle and leave small kinks that would be next to impossible to remove and often invisible until after the plates are buffed. Also if a clipping die were made for each size it would necessitate five sets, and the cost would be very high.

As orders for the large sizes of plates call for comparatively small quantities, the large tools would hardly be a paying proposition, therefore a set of tools, simple in design, was built to clip all sizes of plates at a total cost of little, if any, more than the cost of one big set.

One objection offered to this method of handling all sizes with one set of tools was that each plate would have to be handled twice as only two sides could be clipped at once, but it was shown that even with this handicap it would take over five million plates (clipped four sides at once) to pay for the five sets of tools and their upkeep. Therefore the set shown in Fig. 2 was built and operated successfully at a cost one-third under the estimate.

The operation of this set of tools is as follows: The plate is placed on the die, being located by the stamped contour fitting over the corresponding nest, and as the press descends the blade *A* clips the front side while the blade *B* clips the right-hand end. The piece is then reversed to clip the remaining sides.

In the punch holder is a pad *C* backed by the springs

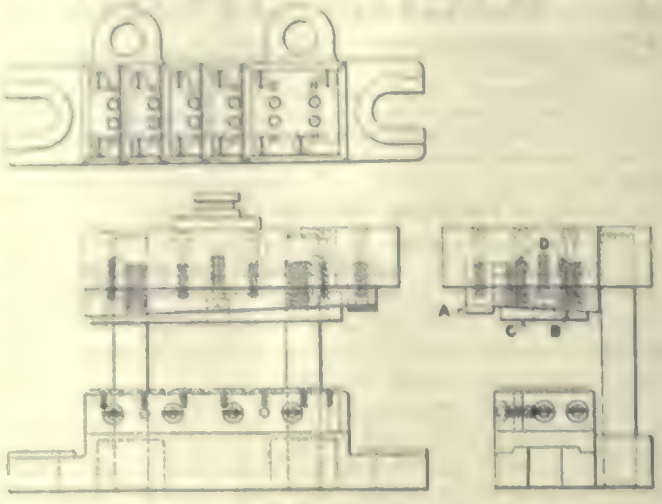


FIG. 2. THE TRIMMING TOOLS

D, which holds the work firmly in the die while the blades are cutting. The blades are ground to an angle to give a shearing cut.

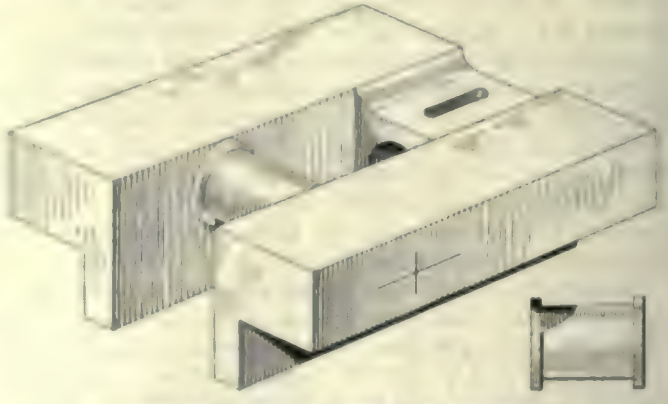
The tools were of the pillar types and with them the operator was able to clip about five thousand pieces per day, irrespective of the size of the piece. A Farrell press, equipped with safety devices to prevent the operator from getting caught, was used.

Chilling a Crosshead Wristpin

By F. M. A'Hearn

In the average repair shop where there are seldom to be found special devices for the purpose, the turning of a wristpin in a crosshead of the type shown in the illustration is a tedious operation and involves a lot of hard labor for the man who has to rock the work back and forth while the lathe hand, with the usual array of bent tools and goosenecks, endeavors to round up the pin and face the shoulders.

Such a crosshead was needed for a 17 x 24-in. locomotive and, as is usually the case, the engine was being held out of service until a casting could be made and machined. To reduce the time and labor required we decided to try casting the pin in a chill.



CROSSHEAD WITH A CHILLED WRISTPIN

The gray-iron bushing shown at the right of the sketch was made to the required dimensions as to length and bore, leaving a wall of about ⅜ in. It was

then thoroughly coated with graphite to prevent the molten metal from adhering, and placed in the mold. When the casting had cooled, the shell of the bushing was easily broken away and we found the bearing parts to be in satisfactory condition.

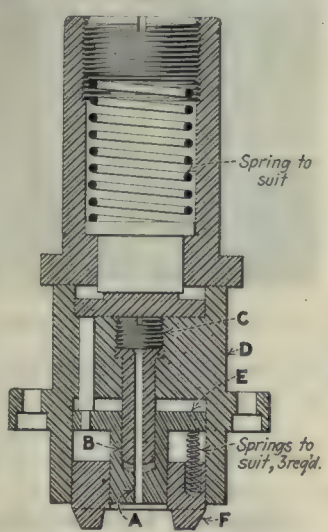
To lay out the casting for finishing so that the pin would be square with the planed surfaces we placed the pin in a V-block with the crosshead in a horizontal position and scribed the lines as indicated upon the outer surface. Raising the crosshead to a vertical position the cross lines were laid out and centers established, from which we were able to plane and finish the casting with the pin in proper relation to the guides.

The job proved to be satisfactory in every way and the labor of finishing the pin was saved, thus reducing by that amount the time that the locomotive was out of service.

Tool for Locating Watch Wheels for Piercing Center Hole

BY I. BERNARD BLACK

In the manufacture of watches there are many operations, especially the blanking and piercing of the escape, center, third and fourth wheels, which may cause a lot of trouble in the time keeping. Sometimes this is due to the wheels being blanked out of round, or to the holes being pierced at one side, the latter cause being most often the case. When the holes in the wheels are not central, a lot of friction is developed in the train and the watch naturally stops. The wheels causing this trouble have to be replaced, of course, with wheels that are absolutely perfect as regards concentricity. In many cases ingenious methods have been devised to correct this fault and most of them have proved successful.



LOCATING AND PIERCING TOOL FOR WATCH WHEELS

In the illustration is shown a method adopted recently for accurately locating watch wheels to be pierced. Part *A* is the piercing punch, which is lightly driven in the holder part *B*, the upper part being riveted over and backed up by the setscrew *C*. The holder part *B* is a drive fit in the main holder part *D*, and a sliding fit in part *E*, which in turn is a sliding fit in parts *D* and *F*. Part *F* is a sliding fit in part *D*, and is attached or rather held to part *D* by two screws. The action of the holder is as follows:

When the ram descends, the bell-mouthed piece *F* centers the wheel in the die, and recedes into part *D* until part *E* presses down on the wheel in the die, thus firmly clamping it while the piercing operation is done by part *A*. On the upward stroke of the press parts *E* and *F* spring back to their relative positions, the operator takes the pierced wheel off the die and is then ready to pierce another. Centralization of the hole is thus secured, and with a die that will punch a truly round wheel, very accurate work is produced.

Making Long Screws

BY R. G. HOGG

On page 132 of AMERICAN MACHINIST, L. J. Grinnell outlines some very elaborate methods of making and transporting two guide screws 64 ft. and 74 ft. long, respectively.

The factory situated next door to the one where I served my time, and later where I served two years, had a regular habit of making such screws 64 ft. and 68 ft. long every few days.

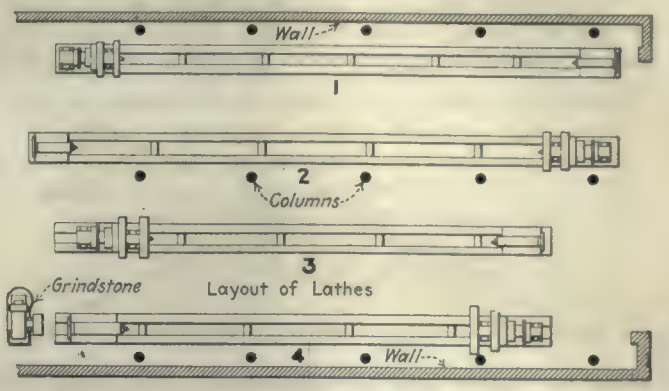


FIG. 1. ARRANGEMENT OF THE LATHES

First the turner would select a bar of steel, drag it over the cobbles by divers means, center it with the aid of about three helpers and juggle it into position between the lathe centers. After the thread was cut, came the puzzle how to reverse ends in the lathe to finish a thrust bearing on the other end. The shop was about 75 ft. long and 30 ft. wide and freely dotted with columns to support the second story which contained about 40 small lathes. The ground floor contained four large and long lathes and one pre-historic grindstone, the arrangement of the tools being shown in Fig. 1.

Now I am wondering how the Driggs Co. turned the screws end for end. The enclosed crude diagrams will explain how we turned them. The short ones were transferred from No. 1 lathe to No. 2. The extra long ones were machined on lathe No. 2 (the longest in the shop) and had to be jockeyed on two or three small four-wheel trucks around the block to be turned and then brought back to the lathe. The route taken can be seen in Fig. 2.

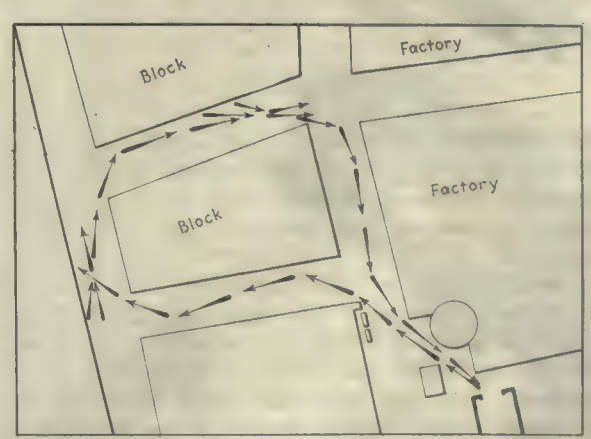


FIG. 2. SWINGING THE LONG SCREWS AROUND THE BLOCK

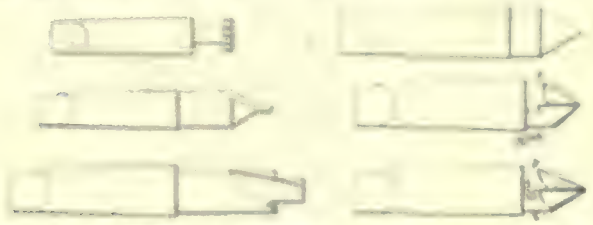
William, or "Old Bill," who is not yet sixty has

been making these screws for over twenty-eight years and as for transportation troubles, after he was through with his part he didn't give a whoop, but we never had any complaints to my knowledge.

Uses for Discarded Taper Shank Drills

By Frank C. Beers

Taper shank drills that have been worn out or broken in service, but of which the shank is still undamaged, may be used up in several ways as shown in the sketch



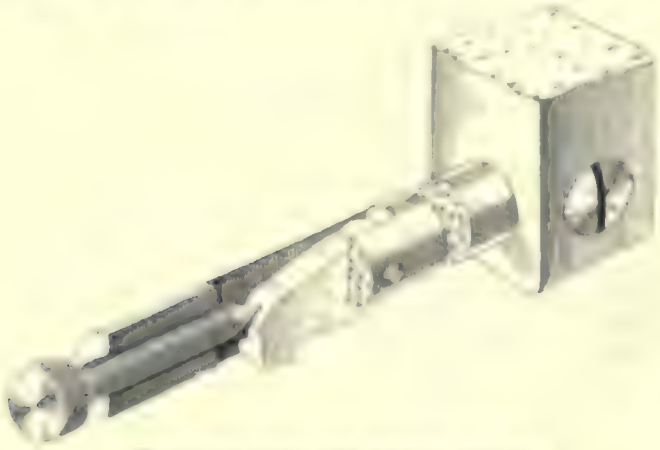
TOOLS MADE FROM BROKEN TAPER SHANK DRILLS

herewith. Lathe centers, combination center-drill and countersink, countersores, end mills, Woodruff key-cutters, and many other similar tools may be made from these odd bits that are usually thrown away.

Cutting a Keyway in a Small Bushing

By Clarence B. Coe

A job that caused us considerable trouble was the cutting of a keyway ¼ in. wide by ⅛ in. deep in a bushing 3 in. long and of ½-in. bore. As there were



SPLINING TOOL FOR SMALL HOLES

but a few pieces a broach would have been too expensive and an ordinary splining tool out of the question because of the small diameter and length of hole. We finally disposed of the job with the tool shown in the cut.

A piece of ½-in. drill rod about 5 in. long was slotted by drilling a series of ¼-in. holes and filing to fit the cutter. A hole was tapped in the end for a ¼-in. screw. The pin on which the cutter is hinged is ⅛ in. in diameter. This may seem like a very weak pin, but as the strain comes almost entirely on the screw, a small pin will stand up and will not weaken the bar as much as a larger one.

The cutter was made of ¼-in. stock cut out to about the shape of the sketch. The screw is a stock screw with a 60-deg. point. The bar is held in a tool having a ¼-in. crosshole near the end.

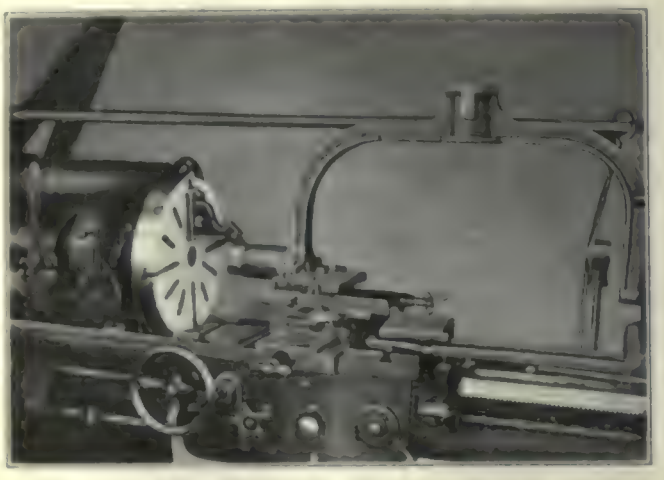
The device was used in a shaper with the apron clamped down, as the cut comes on the back stroke. The tool came forward, the screw was given a slight turn, which forced the cutter out at each stroke.

A Large Job in a Small Lathe

By S. J. Morgan

The illustration shows how we turned the trunnions on a yoke for a concrete mixer, in a lathe much smaller than would have been required to swing the piece. This yoke was 48 in. long and the distance from center to outside was such that it would have required a 48-in. lathe to swing it. We used an 18-in. lathe.

Little explanation is required. We made a bracket to hold the toolbit and fastened it to the large faceplate of the lathe. One end of the work was bolted to the wings of the lathe carriage and the other was supported by the tail center, the foot stock being coupled to the



A LARGE JOB IN A SMALL LATHE

carriage and left loose upon the shears so that it would be drawn along later by the movement of the carriage.

The turned portions of the hubs were 3⅜ in. in diameter by 6¼ in. long. The time was about one hour.

Testing Connecting Rods—Discussion

By Gus Haessler

The method of setting up for testing connecting rods described by G. A. Luers on page 382 of American Machinist, is a satisfactory one; but the use of a surface gage and scriber for the purpose is justified only when no better means are at hand, or when only one rod is to be tested, since the scriber does not register.

Any one of the small dial indicators now on the market may be attached to a surface gage or to a height gage by means of small C-clamps that may be purchased for little cost. Assuming that the wristpin and the mandrel in the connecting rod are true cylinders and are parallel to the surface plate, a dial indicator would show it by registering the same at both ends, while if they were not parallel the dial would indicate in thousandths of an inch the amount of error.

In testing work of the kind under discussion a height gage and dial indicator is preferable, and the latter may be attached to the scriber, or, by removing the scriber and yoke, it may be attached directly to the sliding jaw with one of the small clamps mentioned above. The indicator may be attached in a moment and with this combination the job may be done more conveniently.

Editorial

Getting and Using Trade Information

THERE are many indications that trade associations are destined to play a big part in the success or failure of individual businesses in any industry. This does not mean price-fixing associations, which are not likely to be tolerated under any circumstances, but associations which will study business conditions more thoroughly than can be done by any except the largest of individual concerns.

Anyone who endeavors to find accurate and comprehensive data concerning almost any industry will be amazed at the difficulty and at the meagerness of the facts he is able to muster. How many know the number of firms engaged in their own line of work, the total output in machines, the variety of shops which utilize them, or similar data? How many have any data, accurate or otherwise, as to markets for special machines?

Information of this kind can be satisfactorily collected and digested only by a well organized association or a government department. The latter, not necessarily through any fault of its own, is usually very slow. The strong trade association is in the best position to do this and to distribute the information promptly. The feeling seems to be growing that in either case the information must be made public, thus giving the greatest advantage to those who use it most intelligently.

There is, unfortunately, no sure way of getting these data into the minds of those who need them. Until business men realize that accurate, last-minute information of their industry is more vital to them than the stock market or the baseball score, industry and the country at large suffer, not to mention their pocketbooks.

An unopened and unread business paper on a manager's desk is an admission of inefficient planning of his working day. A study of the bank balance may have a more pressing appeal but, unless he also studies his industry as outlined and laid before him in his business papers and trade association bulletins, he may not have any bank balance to study.

Problems in Business Revival

THE hopes of those who had an abiding faith in the future of the country are beginning to be realized. Business is coming back, especially to those who go out and get it. Those who have decided that it cannot come before fall will probably find that to be true—for them. But when fall comes, they will be several laps behind those who go after business now.

Only the short sighted, however, will dream that their troubles and anxieties are over because business revival is under way. In reality they may have just begun. Not anxiety as to meeting the payroll and keepin the sheriff away, perhaps, but anxiety as to being able to manage the business so as to have it occupy its proper place in the industry.

The real manager must continue to look ahead, to build for the future as well as for the present, not in enlarging plant facilities, in many cases, but in manufacturing and sales methods and in both trade and industrial relationships. He will avoid price juggling so far as possible, as nothing is more fatal to steady business or the confidence of customers.

This is contrary to the doctrine of some economists who advocate an advance in price for every increase in demand. Practical considerations, however, make this inadvisable, especially at a time when business is on its painful way back to normal. Price changes should be as infrequent as possible as they shake confidence in stability, and confidence is especially desirable now.

Spiral or Helical?

IF YOUR hands were tied, could you explain the difference between a spiral and a helix? We think this a pertinent question, because movements of the arms seem to be necessary to the average individual in explaining the shapes of these curves. Because of the fact that the two terms are used so frequently in present-day practice, the difference should be well understood.

Before offering a definition, we might attempt to clear our way a bit by stating that we propose keeping to the real mathematical meanings of the terms. True, this action conflicts a bit with the ideas that are entertained by many a good mechanic and engineer. What is more, it conflicts with such authorities as Webster and many standard handbooks.

The confliction is justified, however, by the fact that the men engaged in a field requiring the accuracy of both thought and workmanship that building machinery entails, have need for the most mathematically correct nomenclature, as well as formulas. There is no wisdom in applying two terms interchangeably to two different things; we have need for a specific name for each. The tendency is all toward the precise usage of the terms spiral and helical, and eventually handbooks will not present them as synonyms.

Using the term in a mathematical sense, a helix is that curve formed on a cylinder by a straight line lying in a plane that is wrapped on the cylinder. The best practical examples are ordinary screw threads, worms and some types of reamers. A spiral, however, is the curve developed by a point moving about another point and continually receding from or approaching it. This type of curve is well exemplified by watch springs and scroll plates.

The difference between the two curves might be summed up in this way: For the spiral, the point about which rotation occurs is fixed, while for the helix it advances along a straight line. Furthermore, the radius to the revolving point continually increases for the spiral, but is constant for the helix.

The shop man wishes to be correctly informed and up-to-date on matters of nomenclature. However, he certainly cannot be blamed if his ideas are incorrect on this subject, when so frequently management does not give it sufficient consideration. Pay attention to the use of the terms, so that they are accurately applied, particularly when naming a tool or an operation.

Shop Equipment News

Barr "Autoplex" Drilling Machine

An automatic duplex drilling machine, designated as the "Autoplex," has recently been placed on the market by H. Edsil Barr, Erie, Pa. The machine, shown in the



BARR "AUTOPLEX" DRILLING MACHINE

accompanying illustration, is intended for high-speed drilling, reaming, facing, polishing and such operations on small parts made in large quantities.

There are two spindles mounted on the face of the column, each spindle rotating in a square guide block or quill. Noiseless gears at the upper ends of the spindles transmit power from the drive pulley. This pulley has three steps, so that the speed can be adjusted to suit either high-speed steel or carbon-steel cutting tools. The feed and the work chuck are operated by a separate five-step cone pulley mounted at the rear. One countershaft carries cone pulleys to drive both the pulleys on the machine.

The camshaft is mounted at the rear of the machine and geared to the cone pulley that drives it. It carries two pairs of cams, one for each spindle unit. Each large cam has a follower running on it and pivoted at the back of the frame; one of these followers can be seen at the left of the machine in the illustration. The end of the lever arm toward the spindle has a gear segment cut on it that meshes with a rack on the square spindle quill. The rise on the cam is uniform, so that the spindle feeds downward evenly. It has a quick drop, however, so that the spindle returns rapidly after the cutting stroke. The cams are so set that the spindles operate alternately.

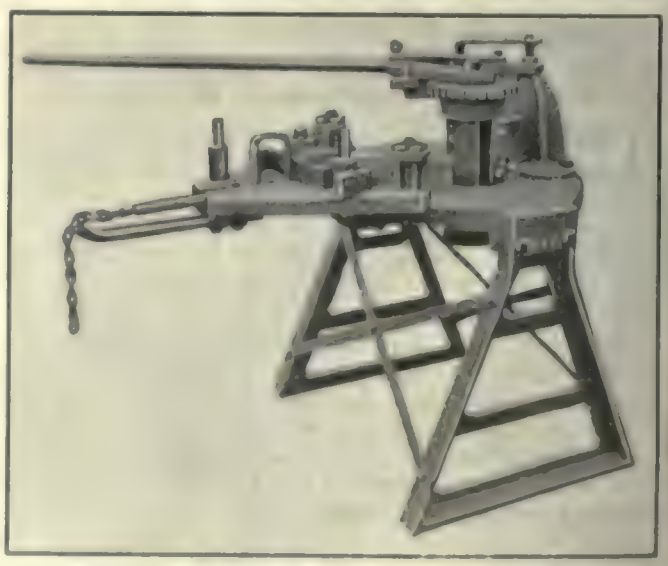
At the end of each camshaft is an internal cam connecting by means of a tie rod to the work-holding fixture. Each fixture head has four pockets to hold the work. The head is rotated one-fourth of a turn after each rise of its spindle. The rotation occurs when the internal cam pulls the side rod toward the rear. The forward movement of the side rod is without effect on the head, as this motion simply places the dog in position to rotate the head another quarter turn. The head is automatically locked in place while the drill is cutting. The position of each work head can be adjusted vertically by means of the handwheel beneath the head.

Ordinarily the work is carried on a sheet-metal container, and the operator feeds one head with each hand. The machine then does the drilling automatically and drops the parts into chutes leading to tote boxes placed at the rear. The heads are removable, so that special fixtures can be mounted. The machine can handle drills or reamers up to ⅞ in. in size.

Bussel Universal Bending, Forming and Shearing Machine

A machine for bending, forming and shearing metal has recently been placed on the market by the Bussel Machine Co., El Paso, Texas. The machine is hand-operated and furnished in three sizes. The smallest size is intended for bench mounting; the medium size or No. 2 machine has only one bending post and no shearing plate or compound ratchet. The machine illustrated is the No. 3 size, is equipped for forming and shearing and has a compound ratchet lever.

No extra dies are required to bend any size of stock within the capacity of the machine. The stock is securely held so that it does not slip, no matter to what angle the bend is made. The machine operates either right- or left-handed and is operated by one man. The compound ratchet is not used for light work, the post



BUSSEL NO. 3 BENDING, FORMING AND SHEARING MACHINE

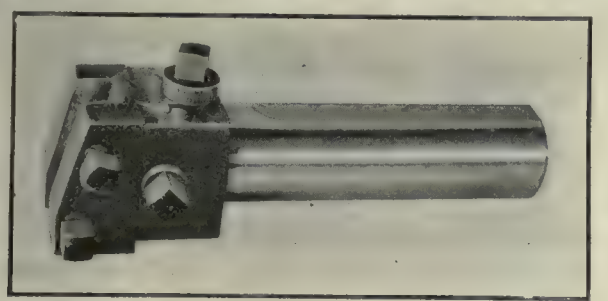
being equipped for direct pull. The work can be easily removed, although bent in the form of a complete square or circle.

Small holes in the table permit of adjustment of the attachments to the position desired. When the forming and shearing plate is removed, all sorts of work, particularly heavy bending, can be handled. The bending post has four edges and makes less than a quarter turn in producing a 90-deg. angle. Stock larger than can be placed in the bending post edge-wise, can be bent on the outside of the post. A 90-deg. angle can be bent accurately without the use of a square.

The No. 3 machine has two bending posts, one for light and one for heavy work. The small post permits of bending cold ¼ x 6-in. and ⅜-in. round or square steel, and ⅜ x 6 in. with a sharp corner hot. With the large post, ⅜ x 6 in. can be bent cold, 1 x 6 in. with a sharp corner and 1⅜ x 6 in. with a round corner when hot, and pipe up to 2 in. in diameter. The No. 3 machine weighs 840 pounds.

Warner & Swasey Adjustable Angle Cutter Holder

An adjustable angle cutter holder for use on turret lathes has recently been brought out by the Warner & Swasey Co., of Cleveland, Ohio. The purpose of the device is to eliminate uncertainty in adjusting cutters to close limits; an adjustment as small as 0.0005 in. can be made. A graduated adjusting screw operates a small cutter slide. The lock screw is ordinarily drawn up lightly and kept in that position, so that the adjustment can be made without changing the tension of the screw.



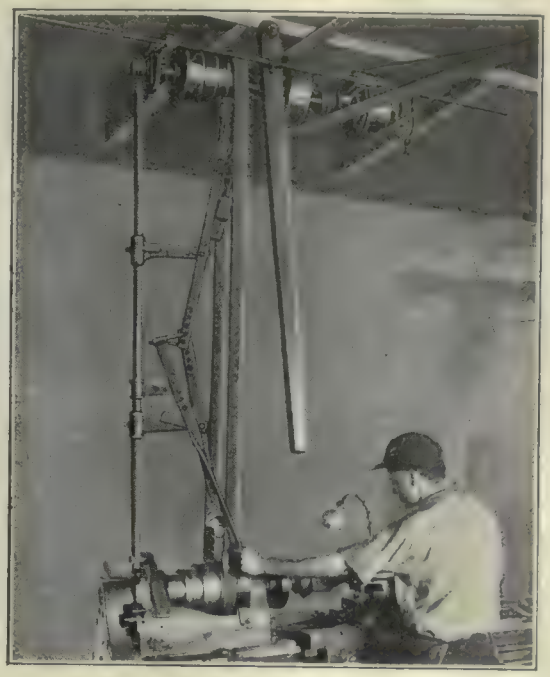
WARNER & SWASEY ANGLE CUTTER HOLDER

When turning to accurate size with a cutter head, at least two cuts must be taken over the surface. The roughing cut should be held within limits of 0.004 in., which can easily be done with a common toolholder by tapping the cutter lightly with a hammer. The finishing cut, however, requires considerable skill in adjusting the tool, to prevent moving the cutter too far and spoiling the work. The adjustable angle cutter provides a positive means of accurately setting the tool, so that the work can be easily turned to the proper diameter in the finishing cut.

The head is made of hardened steel. It is sufficiently strong to enable obtaining the same size on each piece, no matter if the conditions of operation be severe. In addition to obtaining the original setting quickly and easily, the exact size of the work can be maintained as the cutting edge wears down and as the machine warms up. It should be noted that cutter wear takes place especially on the first few pieces machined after grinding the cutter.

Kleckler Belt Shifter

In the accompanying illustration is shown the Klecker automatic device for shifting a belt on cone pulleys. The device has recently been placed on the market by the Keuka Industries, Inc., Hammondsport, N. Y. It is intended for use on all machines operated by belts running on cone pulleys, and it enables the speedy changing of the belt from one step to the other. Its principal feature is the fact that the belt does not slacken to a great extent during the shifting and does not permit of too much slowing down or actual stopping of the machine. Only one hand is necessary to operate it, and the operator can continue to give his attention to the work while shifting the belt.



KLECKLER BELT SHIFTER APPLIED TO LATHE

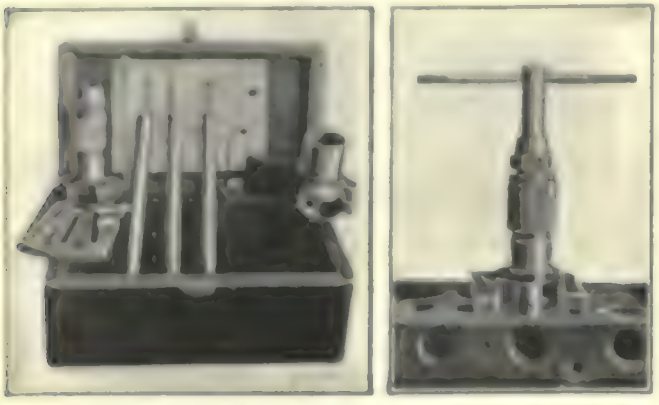
A loop fits the belt at both the countershaft and the pulley of the machine. Near each end of the mechanism is a weighted pendulum pivoted to the outer ends of the belt actuating levers. Gear teeth on the lever ends so mesh that pressure is exerted on the belt at that pulley on which the move is to be made from the lower to a higher step. The pendulums accelerate the action of the shifters. The belt directing loops are so pivoted that their sides remain parallel with the belt for all movements. This action prevents roughing and wearing the edges of the belt during shifting, so that its life is prolonged.

Steel lacings can be employed, since it is not necessary for the operator to touch the moving belt with his hands. The belt can be shifted almost instantaneously from one pulley to the other, or can be moved across the entire range of five speeds without appreciable stop on any one. It enables the machine operator to quickly attain the necessary speed for any operation, without the necessity of moving from his position in front of the work.

The device can handle belts from 2 to 5 in. in width on any standard machines. It can be applied to most lathes by securing it under the rear cap bolts. For especially long and heavy belts, heavier pendulums are provided.

"Davis" Valve Re-seating and Boring Tool

The Hinckley Machine Works, Hinckley, Ill., has placed on the market the "Davis" valve re-seating and boring tool for use on cylinder blocks of automotive



"DAVIS" VALVE RESEATING AND BORING TOOL

engines. The tool in operation is shown on the right side of the accompanying illustration. It will be noted that the cutter bar is not guided by only a small pilot at the bottom, but a large bearing above the valve seat holds it in place. This bearing is in a plate or holder that is clamped to the top of the block to be machined. The bar is inserted in the holder and the cutter put in place at the bottom of it.

The cutter bar is turned by hand. The side thrust is taken by the holder so that the seat is accurately cut. Feed is provided by a screw, so that digging-in, chattering or sliding over the surface is prevented. The cutters are lathe tools made of high-speed steel.

The tool will re-bore valve ports to a larger size, so that bigger valves can be employed. In renewing or enlarging ports, the contacting surface on the valve seat can be made narrower. This surface usually becomes widened after continual use and grinding so that carbon is apt to injure the seat.

The set consists of three boring bars, with ⅞, ⅞ and ⅞-in. pilots, two valve seating cutters, one knurled handle to turn the cutters, two boring cutters, and a wrench for a hexagon setscrew. An attachment is provided for handling the valve cages of Buick motors. The parts are inclosed in a wooden case, as shown at the left of the illustration. The total weight is 18 lb., or 25 lb. when boxed for export.

A General Method for Spring Design—Discussion

BY A. J. STRONG

The article under the above title by Joseph Kaye Wood, on page 757, Vol. 55, of AMERICAN MACHINIST, brought to my mind some experiences I had with springs twenty odd years ago while with the Western Electric Co. at West and Bethune Sts., New York.

At that time the Western Electric Co. made apparatus for the Western Union Telegraph Co., and decided to tool up for telegraph keys to show costs which would enable it to get this business which other concerns were getting on price. These instruments had a cast brass base with the key posts or uprights cast integrally. It was decided that these bases could be made at a cheaper rate and more neatly if they were punched from sheet brass and if the edges were finished by die shaving.

This new method was also applied to the key, which consisted of steel about ⅛ in. in thickness, and 6 in. in length, and made quite a heavy job as compared with the run of press work we had been doing. It was on the dies for the key that we had our troubles with the springs.

We designed and built for each piece, four post subpresses, placing the punch at the bottom, with shedders to push the punching back into the stock. The available press was rather limited in height for die room, so there was not space enough to work in springs of the length we preferred. For pushing out the punching we placed in the top member three springs of square section, making these of bar stock by cutting a thread on the outside and then boring out the inside until the spring section was equal or exactly square. The thread, of course, had been cut with a square tool. After tempering, these made very good springs.

Things progressed nicely until we placed our key job in the press to try it out, and then much to our sorrow we found that there was not push enough in our shedder springs to force the punching out of the die. We screwed the springs down to the limit and still they would not shed the punching as intended.

We pulled the job down and after a council of war decided to make an additional set of springs in the same way the first set was made, but with an outside diameter which would allow them to drop freely inside of the first set. It was further decided to make the holes in the second set small so the spring section would be rectangular and give more power. After this second set of springs was installed, giving us six instead of three springs, the die worked without trouble and that part of the problem was solved.

That was many years ago, as man's life is measured. As I look back to those rough days of the "rule of the thumb" methods and as I read the article by Mr. Wood, I thought how fine it would have been if we had had the formulas set forth by him from which to figure the springs for our sub-presses, so that they could have been placed in the machine and correctly operated the first time.

I have had some experience with formulas and systems in use at the present time, which fail to function if slightly overloaded, and which are presumed to be of assistance to business, and when I read Mr. Wood's article it occurred to me that possibly it may at least, in a general way, represent some of the ills from which present-day business is suffering.

Grinding Automobile Crankshafts

On page 505 appeared the statement: "for grinding a high tensile strength steel an aluminous abrasive is recommended, while a carbide of silicon wheel is suggested for low tensile steel. It is the physical and not the chemical properties of the *wheel* which are to be considered." In the last sentence the word "wheel" should read "metal."

Usually a silicon of carbide wheel is selected for low tensile strength material such as cast iron, chilled iron, brass, aluminum, marble, granite, etc. All steel is of such high tensile strength, relatively speaking, that it is best ground with grinding wheels made with aluminum oxide abrasives.

News Section

Change in Agricultural Appropriation Bill

The conferees on the agricultural appropriation bill in their report to the Senate and House state that they have stricken out the language proposed by the Senate appropriating $10,000 for the study of standardization of farm machinery. This language was to the effect that the investigation should be by the Department of Agriculture in co-operation with the Bureau of Standards of the Department of Commerce.

Railroads Report Fewer Freight Cars in Use

Freight cars idle because of business conditions totaled 529,884 on April 23, compared with 491,513 on April 15, or an increase of 38,371, according to reports just received from the railroads of the country by the Car Service Division of the American Railway Association.

Of that total, 371,764 were surplus freight cars, that is cars in good repair in excess of current freight requirements, while the remaining 158,120 were freight cars in need of repairs in excess of the normal number unfit for service.

Surplus coal cars totaled 229 892, an increase since April 15 of 41,974, while an increase within that period of 827 was reported for coke cars which totaled 3,669. Surplus box cars numbered 98,406, which was a decrease within approximately a week of 280 cars. Reports showed 16,114 surplus stock cars, which was a decrease of 3,317 since April 15 and miscellaneous cars also showed a decrease of 478 within the same time.

Indiana to Buy Road Machinery

The Indiana Highway Commission will soon purchase a quantity of road maintenance machinery. The machinery will be used largely to repair the damage done by floods over virtually every section of the state. The commission is asking for bids on from one to four portable stone crushers, with a capacity of 10 to 20 cu.yd. an hour; one to ten portable screening plants; one to three tar kettles of 100 to 200 gal. capacity; one to fifteen road rollers of the three-wheel variety and 10-ton weight; forty to one hundred and fifty wagon screens; six to twenty-five concrete mixers; ten to twenty road graders and two to four contractors' plows. The commission also will purchase from 100 to 200 drag scrapers and from fifteen to thirty-five wheel scrapers for use in excavating.

Thousands of dollars worth of public property was destroyed by the recent floods and the state is taking immediate steps to rebuild roads, bridges, wharves and dams.

European Conditions Main Topic of U. S. Chamber Meeting

The main topic of the tenth annual meeting of the Chamber of Commerce of the United States will be "European Conditions and Their Effect upon American Business." This meeting will be held in Washington, D. C., May 15 to 18.

Discussion of manufacturing questions will take place at two group sessions, which are being arranged by the fabricated production department of the National Chamber. The lowering of costs and stabilizing of production is a subject which will attract manufacturers to the first group session. This subject will be handled by a large manufacturer whose name will be announced later.

Another step in the reduction of economic waste will be taken by the discussion of simplifying variety and standardization. This subject will be presented by W. A. Durgin, of the Department of Commerce. An interesting report of cut-outs made in nearly fifty articles of common use will show the trend of this kind of economy.

Uniform methods of cost reckoning as an aid in expediting production is to be discussed by a Western expert who will show how it can be done.

The practical study of business cycles to increase continuity of employment is the subject with which Wesley Claire Mitchell, an economist of national prominence, will deal.

On the second day group meetings will discuss manufacturing problems as they relate to the general subject of the meeting.

This naturally divides itself into two principal divisions, the manufacturing situation in Europe and the importance of foreign trade to domestic production.

The merchant marine committee of the chamber was asked to examine the Hague Rules and report its conclusions. This committee has now presented a report in which it states that the Hague Rules represent an important step toward the definiteness and uniformity which are important both for shippers and ocean carriers and they should be supported.

The question of endorsement of the Hague Rules will be placed before the directors before this meeting for consideration and such action as the chamber may think appropriate.

Bill for 8-Hour Day

Senator Moses, of New Hampshire, has introduced a bill in Congress to establish the 8-hour day, effective Jan. 1, next, in mines, quarries, mills canneries, workshops, factories or manufacturing establishments whose products enter interstate commerce. Violation of the law would subject the offender to a fine of not less than $100 and not more than $1,000, or imprisonment for one year or both.

Loans to Aid Export Trade Paid Back

The War Finance Corporation has announced that the advance of $5,000,000 to the Baldwin Locomotive Works, Philadelphia, Pa., made on Jan. 15, 1920, for the purpose of financing the exportation of locomotives, has been repaid in full eight and one-half months in advance of the date of maturity.

The corporation also announced that the advance of $4,000,000 to the International Harvester Co., Chicago, Ill., made in the spring of 1920 for the purpose of financing the exportation of agricultural machinery and implements, has likewise been repaid in full about one year in advance of the maturity dates.

Shipping Board's Plan

In a report to Congress analyzing the proposed plan of government aid to shipping, the Shipping Board states that considerations of marine design and construction justify the differential plan of government aid based on speed, tonnage and distance covered in the foreign trade, ranging from 2 cents per gross ton on ships making 13 knots an hour, to 2.1 cents per gross ton on those making 23 knots and over. The board points out that increased speed above 16 knots per hour involves a greater expenditure for high power machinery and greater cost of fuel consumed.

Farm Machinery Totaled Half Billion in 1920

Farm machinery to the value of $536,945,000 were manufactured in the United States during the year 1920, and all but $66,626,000 worth were sold at home, according to a circular just issued by the United States Department of Agriculture.

The extensive use in agriculture of farm machinery is clearly reflected in the circular. which contains definite information concerning the number and value of tractors, farm implements, vehicles, and other items of equipment; the extent to which farmers purchased different sizes and types, and the kinds and numbers exported. Data collected from 583 manufacturers were used in making up the tables. Figures are given for gas tractors, steam traction engines, plows and listers, and tillage implements, as well as planting, cultivating, haying, and harvesting machinery, machines for preparing crops for market use, and horse-drawn vehicles.

The circular also contains data on the various kinds of machines in the different classifications, from woodsaws to sirup evaporators. Although a few firms refused to give data on their business, enough was secured to make the figures dependable and fairly representative of the industry.

Spring Inspection Meeting of Connecticut Sections of A.S.M.E. and A.S.S.T.

About 350 people, members and friends of the Connecticut sections of the American Society for Steel Treating and the American Society of Mechanical Engineers were the guests of the New Departure Manufacturing Co., Bristol, Conn., on Saturday April 29. The group is shown in the picture below.

Assembling at nine o'clock, the party was divided into groups of fifteen, each group under the guidance of a member of the company's engineering or production staffs. The morning was devoted to an inspection of the plant, which was in full operation. Starting at the receiving sheds where the raw material is delivered directly from the railroad sidings, the parties were conducted through the extensive forge shops, the annealing and carburizing departments, and were given a glimpse of the chemical and physical test laboratories by means of which a close watch is maintained upon the quality of material entering into the New Departure product, which consists mainly of ball bearings.

Considerable time was spent in the heat-treating department, in which the members of the party were particularly interested, as it represents one of the most complete and up-to-date installations in existence for the automatic control of temperatures and heat periods.

A visit to the company's extensive ball plant followed, and from thence the party traced the evolution of a ball-bearing through grinding, assembling, inspecting and testing processes to the display rooms where every kind of bearing made by the company was on exhibition.

At noon a lunch was served in the cafe of the Endee Inn, and after an hour for rest and recreation the party was conducted through the administration building where the executive machinery of the company was explained to the visitors.

In the afternoon a mass meeting was held in the rooms of the Endee Club where F. P. Gilligan, national president of the A. S. S. T., presided. President DeWitt Page, in the name of the New Departure Co., bade the guests welcome, after which W. H. Eiseman, secretary of the A. S. S. T., delivered an address on the general subject of heat-treating, followed by an interesting talk on the "Fatigue of Metals," by Prof. H. F. Moore of the University of Illinois.

During the lunch hour the party was photographed on the lawn in front of the administration building.



SPRING INSPECTION MEETING OF THE AMERICAN SOCIETY FOR STEEL TREATING AND THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, CONNECTICUT SECTIONS, AT THE PLANT OF THE NEW DEPARTURE MANUFACTURING CO., BRISTOL, CONN.

Engineering Council Flays Patent Legislation

Pending patent legislation was denounced as "dangerous and destructive of the American patent system," before the Senate Patents Committee in Washington on May 1, by a delegation from American Engineering Council of the Federated American Engineering Societies. Edwin J. Prindle, of New York, chairman of the council's patents committee, voiced the protest of the engineers against the passage of the Stanley and Ladd bills, saying that the poor inventor would be injured and that the American patent system would degenerate into a position of the second or third class.

The bills attacked were the Stanley Bill, S-3311, providing for the granting of compulsory licenses where patents have not been worked to a reasonable extent within a reasonable time (which amended Section 4887 of the Revised Statutes of the United States); which bill was replaced by Stanley Bill, S-3410, which applied the same amendment to Section 4886 of the Revised Statutes.

The former Stanley Bill might, in effect, apply only to foreign-owned American patents, but the substitute bill would unquestionably apply to all United States patents, whether owned by American citizens or aliens. The questions of whether a patent had been worked to a reasonable time, are to be decided by the Commissioner of Patents or such other governmental agency as the President shall designate. The Ladd Bill, S-3297, was also introduced, and this bill provides that patents shall lapse if not worked within five years after they are granted, or two years after they have been assigned.

These bills would so lessen the value of patents that the incentive to produce inventions would be so greatly decreased as to put our American patent system in the position of a second or third class system and deprive our country of that incentive to invent which has made us the foremost country in inventiveness, in manufacturing, and in agriculture.

The object of the bills is to throw German-owned American patents open to American use and prevent the Germans from manufacturing in Germany and importing here, while restraining the use of their inventions here through their American patents.

Government Economy in Use of Machinery

Economies in government departments covering machinery during the year which will end June 30 have been reported to Congress by the Budget Bureau. There have been savings of $165,000 at the Frankford arsenal; $193,000 at Rock Island; $40,000 at the Aberdeen Proving Ground; and $92,000 at the Picatinny Arsenal. The Navy Bureau of Engineering reports a saving of $30,000 in the construction of a machinery plant at the Cavite, P. I., naval station, and a $9,000 saving in a plant at Olongapo, P. I. The Bureau of Standards reports savings in its investigations on testing machines, mechanical apparatus and standardization.

The Navy Bureau of Engineering reports a saving of $90,000 in the fitting out of vessels, recently acquired from the Shipping Board, with pumps, evaporators, generators and refrigerating machinery, by employing used material.

The report was received with favorable comment in Congress.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The spotlight of optimism was shifted from the Stock Exchange to the commodity markets last week. Grain, cotton, coffee, steel, copper, lumber, wool, silk, rubber, hides, and even burlaps with its humble parent, jute, are all in some degree higher.

Sugar is about the only important staple that showed a lagging tendency. This was due to the difficulties of a Cuban banking house whose failure was narrowly averted, but the fact that the much talked of Cuban surplus has been so rapidly distributed that stocks on the island are now down to last year's level suggests a situation to which the trade cannot long be oblivious.

Dealers in the other articles named explain the advance in each by reference to some technical influence, but to the student of underlying conditions an improvement which is so all inclusive has a significance that overshadows the details which would have been ignored if the public were not in a mood to interpret them bullishly.

Commodities Higher

Thus wheat is higher because it has suddenly been discovered that the season is late and the indicated demand for export large—but this is hardly news. Corn is slightly higher "in sympathy" with wheat, but sympathy is not a concrete thing—it is an emotion. In the South the temperatures have been low, the Mississippi has carried away some levees and the Government has published a statement which indicates that the consumption of cotton is or soon will be as large as it was before the war.

To these facts the sharp advance in cotton is attributed, but they have been known and pointed out for some time.

The advance in steel, copper and building materials is related to the increase in new construction but it has been stressed in these letters for weeks.

Silk is up from 30 to 50 cents a pound and some in the trade say that the advance is due to Japanese speculation, but the truth seems to be that American distributors have sensed a better demand for silk fabrics. Rubber is not much higher, but it is steadier on the increased demand for tires which has been for some time predicted.

Wool is worth more in America and the wool merchants say that the foreign markets are advancing, but the fact is that the improvement is a reflection of the world's increased purchasing power.

Coffee has recovered the decline recorded last week because the short time coffee loans to the Brazilian government have been refunded in a 30-year bond issue for £9,000,000, which is being offered simultaneously in New York and London. Inasmuch as it would appear that the 4,535,000 bags of coffee pledged for the security of this loan have all been bought and that no more can be purchased except as present holdings are sold the arrangement would not seem to be one that will further advance the market. But the public has preferred to regard it otherwise and those who could not be induced to buy coffee at six cents a pound are now taking it eagerly at ten cents.

The advance in burlaps and jute is attributed to a shortage in the supply that was known but unappreciated until a general improvement in trade which led to a demand for more bags and bagging brought it into relief.

But the improvement in the markets for raw materials has not yet reached the jobbing or the retail trade. It is still confined to the basic staples out of which the things that are sold over the counter are made.

There is and always will be a noticeable interval between activity in the raw materials and an increased distribution of the things into which they are converted by the processes of industry. This interval represents the time required for manufacture. Averaging it at two months the indicated revival in distributive trade is due about July 1 to 15 and it may be expected around that time unless there is widespread crop failure or some other great disaster.

There are many premonitory signs which justify a prediction so precise. In the drygoods market, particularly, many contracts for the future delivery of both cotton and woolen material are being made. Business is decidedly more active, but immediate delivery cannot be had because stocks are light.

Railroad earnings for March were at the rate of 6 per cent annually on the accepted valuation of the properties and the credit of the roads is so much improved that they are able to buy more equipment and make necessary improvements.

A better demand for mercantile credit, and bank clearings, which are now running more than 20 per cent over last year, are other evidences of increased activity. They lead me to again advise prospective borrowers to make their credit arrangements now. The weekly statement of the Federal Reserve System shows a decline of nearly 2 per cent in the reserve ratio which has fallen from 78.3 to 76.7 per cent.

Credit Expanding

For the first time in many weeks the gold held has not increased and the New York bank has in fact lost $24,000,000 of its gold which has been transferred to the other banks. This connotes an expansion of credit and circulation in the interior, and the strength of all foreign exchange except marks suggests that it is quite possible that we may soon have to export some gold against the European bond issues recently placed here and the expenditures of the many tourists who have gone or are going abroad this summer. In that event an immediate tightening of the money market may be anticipated, for our bankers have always been hypersensitive to a loss of gold.

There has been a slight lull in the security markets. Bonds are quieter and some stocks have shown a reactionary tendency but the oil shares are higher on the expectation of an advance in petroleum and the rails are daily becoming more responsive to rumors of consolidations that appeal to the public imagination with increasing force. From Chicago, for instance, it is reported that the Frisco system is negotiating for the purchase of the International & Great Northern, now in the hands of a receiver. I do not know that the report has any foundation in fact, but such a deal if carried out would bring another major railway system into being and the mere suggestion of it inflames speculation.

Then there are the operations of the Van Sweringen brothers of Cleveland. They have already acquired control of the Nickel Plate, the Lake Erie & Western and the Clover Leaf. They are pictured as Harriman's successors with an ambition to create a new trunk line in the central West by consolidation.

The idea may be fanciful but under present conditions it has plausibility and the public who are fond of romance in the railway world are ready to believe it. Their mood has changed and from having been unwilling to believe that prosperity would ever return they are now confident that it is here and will last indefinitely.

Signs Unheeded

The unsettled coal strike is therefore ignored. So is the textile strike. A bonus bill that will ultimately cost over four billion dollars seems to have lost its terror, despite the fact that the public debt increased $45,500,000 in April and the internal revenue decreased $875,000,000 during the nine months ending March 31, chiefly as a result of the falling off in income and excess profits taxes.

The practical failure of the Genoa Conference and a civil war in China are also unheeded, for the delusion that she is independent of the rest of the world is again taking hold of America.

It is the anasthesia of secondary inflation. The anasthetic is the gold we have been importing. We are just beginning to feel its effect. It will last as long as we can borrow easily and cheaply. There is no indication of its immediate ending and before it passes we may witness one of the greatest speculative movements that has ever swept the country.

Those who can go with the tide without surrendering themselves to it and being swept away will indeed be fortunate. The wisest men never try to get the top of the market.

The Trend of Business Improvement—Plants Resuming

The Missouri, Kansas & Texas Railroad Co. has resumed operations at its shops at Sedalia, Mo., following a shutdown since Jan. 19. The plant will be run on a piece-work basis, giving employment to about 500 men.

The Buick Motor Co., Flint, Mich., is increasing its production schedule for the second quarter of the present year, totaling about 60 per cent over the output for the first three months, or approximately 27,000 cars as compared with 19,000 in the January-March period. The company, a division of the General Motors Corporation, will take over the plant of the Scripps-Booth division at Detroit, and will operate an assembly unit at this point.

The Cleveland Tractor Co., Cleveland, Ohio, manufacturer of motor-tractors, has adopted a capacity schedule at its plant, with full working force operating under full time. Around the first of the year the plant was running at less than 40 per cent of normal.

The Packard Motor Car Co., Detroit, Mich., is increasing production 50 per cent in all departments, and will add about 1,000 men to the working force. The plant has been giving employment to about 5,000 operatives, an advance of 1,500 since the first of the year.

Durant Motors, Inc., New York, N. Y., has arranged a production schedule providing for a maximum of 200,000 automobiles during the next year, divided into 120,000 Star cars, and 80,000 Durant machines.

The American Car and Foundry Co. has increased production to a normal basis at its Memphis, Tenn., works, and the regular working force is being employed for the first time in many months. All other plants of the company are now on a capacity basis. A recent order includes 1,700 freight cars for the Chesapeake & Ohio Railroad Co.

The Verona Steel Castings Co., Verona, Pa., has resumed operations at its plant, following a shut down for more than a year. Employment will be given to about 800 men.

Following an increase in the manufacture of Knight motors to a basis of 100 a day, the Wilson Foundry and Machine Co., Pontiac, Mich., is planning to advance the output to 150 motors daily, a maximum production, with extra working shifts.

The American Tube and Stamping Co., Bridgeport, Conn., is arranging for the immediate resumption of operations at its steel plant, which has been closed for about fifteen months past. The company has adopted a capacity schedule at its cold rolling mills.

The Ford Motor Co., Detroit, has scheduled a production of 120,000 cars during May, making the highest output ever attained at the plant. From 5,000 to 8,000 men will be added to the present working force of 37,000 operatives. The former high mark in manufacture was in August, 1921, when the output reached 110,000 cars with the employment of approximately 40,000 men.

The National Acme Co., Cleveland, Ohio, has advanced production at its plant and is now running at better than 90 per cent of capacity. Further increase is expected at an early date. A large part of the output is devoted to radio equipment and parts.

The Iron City Pipe and Foundry Co., Birmingham, Ala., has adopted a capacity schedule at its plant. A large portion of the present output is for shipments to South America and Cuba.

The Chevrolet Motor Co., Flint, Mich., a division of the General Motors Corporation, has inaugurated a night shift at its plant for the first time in a number of months. The plant is operating on a basis of 800 motors and 900 axles per day, with the employment of approximately 3,000 workers.

Ambrose Swasey Elected to Academy of Sciences

Ambrose Swasey, president of the Warner & Swasey Co., Cleveland, Ohio, was elected to membership in the National Academy of Sciences, at the annual meeting held in Washington on April 26.

The National Academy of Sciences is an organization incorporated by an Act of Congress on March 3, 1863, and approved by President Lincoln, to investigate, examine, experiment and report



AMBROSE SWASEY

on any subjects of art or science when called upon to do so by any department of the Government. Members of the Academy are grouped into committees of mathematics, astronomy, physics, engineering, chemistry, and others.

Mr. Swasey is also a member of the National Research Council, which was organized in 1916 at the request of President Wilson, under the charter of the National Academy of Sciences.

This honor was conferred upon Mr. Swasey more especially on account of his achievements in the design and construction of telescopes and other scientific instruments of precision. He established the Engineering Foundation and is an honorary member of a number of leading American and European scientific and engineering organizations, as well as an officer of the Legion of Honor, of France.

Chicago Letter

Business figures for the month of April show a slight increase over those of March and the first week of May has shown a further improvement towards an industrial revival. The increase in the number of inquiries and sales in the last few days, together with the fact that a number of large corporations are advertising extensively for help, shows that confidence has been restored to industry. There is no doubt in the minds of those who have followed past history that the next few years will make up for the years in which production has been at a standstill.

The Chicago, Burlington & Quincy has issued its long expected list which calls for approximately eighty machine tools. The Santa Fe has made a few additional inquiries and is expected to place orders shortly for a number of machines.

During the month of April permits for 1,315 buildings were issued in Chicago, calling for an expenditure of $17,078,560, which is about $2,000,000 lower than last month and a little less than $2,000,000 more than for the same month last year. The gain in number of buildings over last year amounts to 782. There is an evident increase in building activities among residential properties.

The New York Car and Wheel Co. recently purchased a fifteen acre tract adjoining the Standard Steel Car Co. plant at Hammond, Ind., for the reported sum of $18,000. This firm will start construction shortly on a $250,000 building which when completed will employ approximately 250 men. Gostlin, Meyn & Hostings, Inc., handled the deal and report having sold sites to two other big industries, details of which they will give out later.

Among the corporations formed lately are: Advance Radio Co., 169 N. Jefferson St., Chicago, to deal in and manufacture radio outfits and electrical appliances; Theodore Stone, 11 S. LaSalle St. is one of the incorporators. The Airphone Development Co., 111 West Washington St. was recently incorporated with a capital of $20,000 to manufacture and deal in radio equipment. The incorporators are Louis Grossette, W. E. Hooper and W. P. McCracken, Jr.

The Board of Education of Milwaukee, Wis., has issued a list of machinery for which it is in the market. The list is reported to be fairly large.

Longstreth Medals for Inventors

At the April meeting of Franklin Institute, of the State of Pennsylvania, the committee on science and the arts awarded Edward Longstreth medals to four men who have, through their improvements in scientific invention, aided the progress of industry.

The first award was made to Joseph F. Keller, of New York, for his invention of an automatic die cutting machine. Another award was to Samuel T. Freas, of Trenton, N. J., for his interlocking tooth saw. Medals were also presented to Charles F. Wallace and Martin F. Tiernan, of Newark, N. J., for their apparatus for the distribution of liquid chlorine for water purification.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

A further drop of the exchange during March has acted as a powerful stimulant to buying, fanning it almost to a feverish heat. The eagerness to transfer paper money into goods on a rapidly rising market almost amounted to a panic. It seemed as though all the repressed and dormant demand was roused into action. The speculative element in this buying craze was very strong. The industries were almost overwhelmed with the rush of incoming orders. Everything within sight was soon sold; delivery times were stretched by months in quick succession, almost within a few weeks. Today it can be said that the larger part of the whole produce of the current year is disposed of. For a considerable number of products, especially those dependent on foreign raw materials, no quotations can be obtained, the long delivery time required putting such commodities entirely out of reckoning.

This applies to all lines of industry hardly without an exception. Even the building trade, which so far has been the Cinderella in German industry, is enjoying a strong revival of business. In the machine building industry, the leading works ask from five to seven months delivery, others three to four months. Such quotations are not always bona fide statements but frequently appear in the light of vague promises strongly guarded by a number of provisos. The chances of getting delivery in schedule time can be judged by the fact that according to reports of the Prussian Chamber of Commerce, many contracts for machinery, concluded last fall on the basis of a delivery of from two to three months, are not yet fulfilled.

Machine Tools Profiting

The present situation of the main branches of the machine building and metal industries can be briefly described as follows: The machine-tool industry is probably profiting most by the existing boom. The demand which at first tended strongly toward quality and specialties, has now extended to quantities, thus benefiting also the second and third ranks of the industry. Standard machinery, which during the first run of the boom last fall was still somewhat neglected, is now also drawn into the vortex of buying. Second-hand dealers have been able to clear a considerable part of their largely accumulated stock and are eagerly buying machinery where it is offered, even of the most obsolete types and in run-down condition. Prices paid for second-hand tools by dealers, which a while ago ranged from 5 to 15 m. per kilogram according to quality and size have now almost doubled. A hustle can be noticed in the market almost bearing a resemblance to war times, and discrimination in buying has been lost. Users are, however, drawing a distinct line against out-of-date designs. It is hard to see where the latter, which are still being made, although in greatly diminished quantities, go to. It can be noticed that the standard of requirements of the average buyer, which in earlier times showed signs of advancing to that set by the leading works, has again somewhat dropped. This is partly due to longer delivery quoted by the manufacturers of the best makes, and also to the fact that the gap in prices between those and the staple tools, which had visibly diminished, has again widened. It must be remembered that the prices for the best quality of tools, which also form the main contingent of the exports, have during the first half of last year been kept in check by the dictates of foreign markets, which pressure was later relieved by the exchange movement, again giving prices a leeway for expansion. Most orders from domestic sources are now placed on a sliding scale, moving in a certain ratio to the increase of cost of material and labor. The manner in which such sliding prices are keyed to increase of cost varies greatly. The best scheme so far, judging from the favor it receives from buyers, seems to be to state the cost of labor and material at the time of the conclusion of the purchase, and to stipulate an increase of the price expressed in per cents for each 5 per cent of increase of wages and material. Foreign buyers rarely accept such an unstable basis for their purchases, and insist upon firm prices, thereby accepting a rather high percentage of risk which the manufacturer is forced to add to his price.

Prices of tools ranged at the beginning of April from 40 m. per kilogram for heavy tools, to 200 m. per kilogram for light precision machinery, like small automatics weighing 250 kg. Besides metal-working machine tools, all labor saving machinery is in great demand.

Power generating machinery is fairly well employed, mostly on orders for renewals. The locomotive industry is enjoying brisk business on light and medium size engines for private domestic orders and for export. The specifications of the state railroads have not yet been placed. Car building works are for that reason in a less fortunate condition. The difficulty is the demand of the railroad administration to contract on firm prices, to which the works find it difficult to accede. Shipyards are employed fairly well on repair work and new ships for the German mercantile marine. Tenders for foreign orders have, however, frequently broken down over the question of price. The automobile industries are exceedingly busy. The leading works are sold out almost to the end of the year.

The electrical industry is doing well in all branches, as great efforts are being made to increase the efficiency of power plants by replacing the existing equipment. The only striking exceptions in the wide field of the metal-working industries are the equipment for electric railways and railroad signal equipment.

Trend of Exports

The exports of machinery have increased since December, although not commensurate with the general rise of business. In February they had not yet reached the total of last July. The following figures show the quantities and value of the machinery exported from July, 1921 to February, 1922. The ad valorem figures are expressed in million paper marks. For the purpose of comparing them with gold mark prices, the average rates of exchange of the various months are shown in the third column.

	Metric Tons	Million Marks	Relation of Marks to the Dollar
1921 July	39,792	790	77
1921 Aug.	29,036	619	84
1921 Sept.	28,757	611	105
1921 Oct.	26,626	647	150
1921 Nov.	27,989	808	263
1921 Dec.	37,484	1,703	192
1922 Jan.	32,695	927	192
1922 Feb.	39,257	1,254	208

As can be seen from the above figures, prices did not keep pace with the exchange movement. In gold marks the value of exported machinery is even decreasing. The gold mark price per ton, which in July was about 1,000 m., has in February dropped to 650 m. This is astonishing in view of the fact that a large part of the sales is effected in foreign currency, a procedure which has been adopted just for the purpose of making exports more or less independent of the fluctuations of the exchange. It is true that February shipments comprise many contracts concluded several months before on the basis of a better exchange, and before the ordinances to quote in foreign money came into force, but the fluctuations of the exchange were, at least in the last five months, not so large that they can satisfactorily explain the drop of the whole value of exports. The system of control of export prices has been greatly perfected, so it is claimed. Judging from the thorough way in which export licences have to pass, it must be assumed that they are handled with circumspection. It is difficult to see how a drop in the value of exports from 44 million gold marks in July to 25½ millions in February, for approximately the same quantity, could pass unnoticed. It would seem, therefore, that either the system of export control or the statistical figures are faulty.

What has been said about machinery in general also applies to machine tools, although in a slightly lesser degree. For the latter, the following returns of the export business from July to February are given.

	Metric Tons	Million Marks
1921 July	8,733	131
1921 Aug.	4,581	88
1921 Sept.	5,544	94
1921 Oct.	4,431	90
1921 Nov.	4,591	104
1921 Dec.	5,389	137
1922 Jan.	6,897	174
1922 Feb.	7,336	178

According to these figures, the average price per ton in July was 15,000 m. or approximately 830 gold marks, while in February it was 24,300 m. or slightly more than 500 gold marks. The latter price constitutes only half of the prewar standard, which was 1,000 m. per ton.

Compared with exports, the machinery imports are insignificant, especially when considering that the supplies from territories detached from Germany under the peace treaty are largely figuring in the imports. The latter are ranging from 200 to 1,000 tons per month. In the list of imported machinery, machine tools occupy the foremost position, machines for agriculture and for the textile industry following. Of the 198 tons of machine

tools imported during the first two months of the year, 81 tons came from America, 37 tons from Austria, and 25 tons from Holland. The latter are probably of American or English origin. The value of these imports is given as 2,300,000 m., or 47,000 m. per ton.

The business of the last few months has enabled the industry to recover from the whole previous period of depression, and beyond that to make great strides toward prosperity; so at least it appears on the surface. The inside situation presents, however, less healthy features, causing considerable anxiety.

Since January the living costs have risen by almost 40 per cent. The costs of material upon which the machine building industry depends, have increased almost in the same proportion. Mild steel bars, for instance, which a year ago were 2,440 m. per ton, which price decreased until June to 1,735 m., are now being sold at approximately 10,000 m. per ton. Even this price can hardly be maintained for any considerable time, as the prices of raw material are still moving up in a steep line, and are now approximately where semi-finished products were at the end of February. The dependence of the iron and steel industry on foreign ore supplies is making itself strongly felt. Scrap, which has been a balancing factor, is getting very scarce under the strain of industrial activity. The supply of iron ore has been somewhat eased by large contracts which have been placed on favorable terms for Canadian Wabana ore, and in a limited degree for Spanish ore. The effects of the recent large increase of the coal prices are not yet reflected in iron and steel prices, the present level of which is based upon the price conditions of several months ago. It is instructive to compare such prices with those of finished machinery which were in force during the first half of last year. A lathe could then be had at approximately the same price per kilogram as raw castings cost now.

Summing up the situation, it is easy to see that the present industrial activity is taxing the country's financial strength to the utmost limit. Prices have already passed the limit set by the purchasing power of the populace. Every business has, by the buying craze into which the country has dropped so suddenly, been involved in a heavy risk, extending over many months, which can hardly bear any further addition. Manufacturers seem loath to cover themselves with raw material for future contracts. It must be borne in mind that the exchange has reached a dangerous level where a fluctuation of a fraction of a cent reported from New York expresses itself over here in many marks. Signs are visible that the buying wave has passed its crest. Moreover, it is now heard frequently from manufacturers that the industry cannot keep up its present intensity of production, and that the boom having reached a hypertrophical state, a reaction will soon follow. The eyes of the business world are now all turned toward Genoa, and although little is expected to materialize from this conference, it constitutes a strong element of uncertainty for business. The slender chance that something unexpected may happen, which might influence the exchange favorably, is sufficient to put some restraint on all enterprise and cause a temporary lull in business.

Navy to Sell Surplus Iron and Steel

The navy central sales office, Navy Yard, Washington, D. C., will receive bids up to 10 a.m., May 16, for the sale of approximately 350 net tons of iron and steel. The material is located in the Navy Yard at Norfolk, Va., and will be sold in accordance with the terms of sale as stated in catalog No. 83-B. The material is divided into lots and includes wrought iron, strap iron, bar steel, cold-rolled machinery steel in bars, galvanized bar steel, spring bar steel, reinforcing steel, tool steel and steel plate.

Proposals for any of the lots must be made on the authorized form which is attached to the catalog. Bids should be addressed to the officer in charge, Navy Central Sales Office, Navy Yard, Washington, D. C.

More Census Figures

From the recent report of the Bureau of Census we glean some information which should be of interest to manufacturers of machinery.

In 1920 machinists, millwrights and toolmakers numbered 894,662, compared with 488,049 as shown by the 1910 census report. The sub-divisions of the 1920 figure, shown in a special compilation about to be issued by the bureau are: Machinists, 801,901; millwrights, 37,669; toolmakers, die-setters and die-sinkers, 55,092.

The report also shows the total number of mechanical engineers, practicing their profession in 1920, was 37,689. In 1910 the figure was 14,514.

Some Statistics of Manufacturing Industries

In making a special report to the Senate Finance Committee, the Bureau of the Census shows that 521 establishments with an aggregate capital of $866,962,052 are engaged in the manufacture of agricultural implements. Salary and wage payments, when the last census was taken, totaled $88,630,177 annually. These plants have an aggregate horsepower of 128,249. They employ 303 steam engines, 31 steam turbines, 166 internal combustion engines, 72 water-wheels, and 7,998 electric motors.

The 315 automobile plants listed by the census represent $1,310,451,400 of invested capital. The salary and wage payments totaled $379,381,674 in 1919. The aggregate horsepower used was 287,323. These plants employed 170 steam engines, 24 steam turbines, 21 internal combustion engines, and 25,702 electric motors.

Cash registers and calculating machines were manufactured in 65 establishments, representing an invested capital of $82,798,293. The total salary and wage payments was $26,519,935.

Establishments engaged in the manufacture of motorcycles, bicycles and parts are shown by the report to number 51, with an invested capital of $25,862,150. Salary and wage payments total $12,963,593. The aggregate horsepower employed is 14,806.

Eighty-eight establishments with an invested capital of $47,794,300 were engaged in the manufacture of typewriters in 1919. Salary and wage payments totaled $21,079,171. The aggregate horsepower employed was 13,066.

Machinery Exports in March Exceed February

Exports of metal-working machinery increased sharply in March, when the value of foreign shipments reached $1,057,106. This is an increase of $341,861 over the exports of February, but is only one-half the value of similar exports in March, 1921. The increase may be accounted for largely by heavier shipments of lathes and machine tool parts. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS

	March 1921	March 1922
Metal working machinery	$2,321,553	$1,057,106
Lathes	337,856	106,561
Boring and drilling machines		51,097
Planers, shapers and slotters		19,885
Bending and power presses		13,511
Gear cutters		1,278
Milling machines		25,817
Sawing machines		3,262
Threading and screw machines		19,368
Punching and shearing machines		9,191
Power hammers		10,477
Riveting machines		7,067
Wire-drawing machines		968
Polishing and burnishing machines		1,989
Sharpening and grinding machines	95,645	56,584
Chucks, centering, lathe, drill and other		24,414
Hammers, castings, dollies and other parts		151,009
Pneumatic portable tools		23,641
Foundry and molding machinery		97,044
Other metal working machinery and parts	1,888,052	433,953
Wood working machinery	107,865	
Mining, oil well and pumping machinery:		
Rock drills		46,121
Mine hoists and derricks		2,826
Ore crushing and separating machinery		73,166
Coal mining, drilling, etc., machinery		13,239
Smelting and roasting machinery		51,786
Other mining and quarrying machinery	760,452	445,737
Oil well machinery	1,288,018	
Pumps	1,293,318	551,404
Centrifugal pumps		70,164
Steam		93,849
Other power		165,098
Hand		71,745
Other pumps and machinery		152,548

IMPORTS

Machinery	992,672	979,807

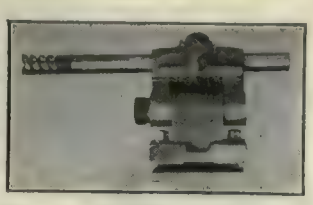
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Toolholder, Boring, Swing

George W. Dover Co., Inc., Providence, R. I.

"American Machinist," January 19, 1922



The holder is held to the lathe toolblock by two bolts and a strap that fits in the T-slot. The bearing about which the swinging member turns is parallel with the bar, and does not affect the parallelism of the cutter bar with the lathe spindle. The bar is secured by means of a yoke drawn up by a hexagon nut. An adjusting screw allows the bar to swing back for inspecting or calibrating the work. A double-lipped bar supplied with the device enables the operator to make two grindings at each trip to the grinding wheel.

Micrometer, Piston-Ring

D. F. Dunham, Oxnard, Cal.

"American Machinist," January 19, 1922

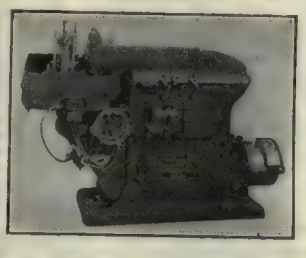


The micrometer is for use in piston ring factories and shops where cylinder regrinding and repairing are done. It is composed of a steel tape secured at one end to a pin and attached to a brass rack at the other end, the rack operating on a pinion. The work is placed within a loop of the steel tape in the opening at the right, and the handle at the left is revolved to tighten the tape on the ring. The size is indicated to 0.001 in. on the dial at the left. Rings from 2⅜ to 5 1/16 in. in diameter can be gaged. Since the pressure on the tape closes the ring, its exact size can be determined.

Grinding Machine Ring, Automatic, Rotary-table, No. 25

Heald Machine Co., Worcester, Mass.

"American Machinist," January 26, 1922



The machine grinds such work as the sides of piston rings and ball and roller bearing races. It can be furnished with either an 8, 12 or 16-in. magnetic chuck, but the automatic feeding device is for the 8-in. chuck only. The feeding plate is indexed by a lever and is operated by a friction device. The wheelslide is driven by an hydraulic system to give any feed from nothing up to the maximum. When the machine is used without automatic feed, the chuck bracket can be adjusted to allow for grinding concave and convex surfaces. Wheel: diameter, 14-in.; face, ⅝ to 1¼ in. Speed, 850 to 1,200 r.p.m. with 10 to 15 hp. Floor space, 90 x 40 in. Weight, 4,000 pounds.

"Detectorod"

Bennett Metal Treating Co., Hartford, Conn.

"American Machinist," January 26, 1922

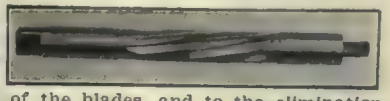


The device determines the atmospheric conditions in steel-treating furnaces, indicating when the furnace is in a reducing, or non-oxydizing condition, and when it is safe to introduce the work without scaling it. Its operation is based on the fact that a hydrocarbon gas is non-inflammable. The steel rod is about ⅛ in. in diameter, and has a hole 0.025 in. in diameter passing lengthwise through it. The handle is in two parts, one being a reservoir filled with kerosene oil and the other a pneumatic pump which creates the air pressure. If the jet of gas ignites, it indicates that too much oxygen is present in the furnace.

Reamer, Hand, Helical-Flute, Expansion

Millersburg Reamer & Tool Co., Millersburg, Pa.

"American Machinist," January 19, 1922



The reamer is furnished in all sizes up to 2½ in. in diameter. The helical flutes produce smooth and clean-cut holes of accurate size, due to the shearing action of the blades, and to the elimination of chatter. The blades may be expanded to compensate for wear and resharpening, thus maintaining the original size.

Stamp, Steel, "Super"

Pittsburgh Stencil and Tool Co., 40 Water St., Pittsburgh, Pa.

"American Machinist," January 19, 1922

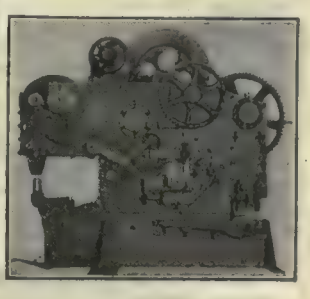


The stamp is used in stamping numerals or symbols in metal. It is made from a special quality of steel and heat-treated. The head is so tempered that it mushrooms and curls down until the pieces merely drop off under the blows, instead of splitting and flying. The end carrying the symbol is hard enough to stamp spring steel.

Punch, Shear and Bar Cutter; Diagonal Stroke; Armor Plate; No. 26

Buffalo Forge Co., Buffalo, N. Y.

"American Machinist," January 26, 1922

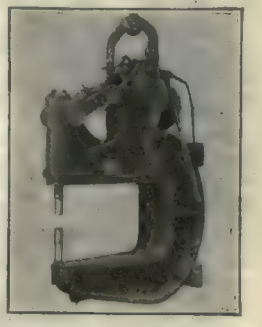


The machine can perform three distinct operations at one time without interference. It is not necessary to tilt the work when beveling or mitering. The punch is engaged by a handle or a treadle, the shear by a jaw clutch, and the bar cutter by shifting the ram with a counter-weighted lever. Angles up to 6 in. in size may be placed in the throat for trimming. A 7½-hp. motor operates the machine. Capacity: punching, 1¼ x ⅝ in., or 1 x 1 in.; shearing, ⅝-in. plates, or 3½ x 1-in. flats, with special upper knife, 8 x 5/16 in., or 2⅝ x 1 in. flats; bar cutting, 2¼-in. round, or 2-in. square stock, 8-in. I-beams of 18-lb. weight.

Riveter, Pneumatic, Compression-yoke type

Southwark Foundry and Machine Co., Philadelphia, Pa.

"American Machinist," January 26, 1922



The machine has an operating valve of the plain slide type, with one wick packing on the stem end, and a removable valve seat. The pull-back is accomplished by the line pressure. Two separate pressures on the die are given by a plug cock in the valve plate. The portable machines are provided with suspension bails. When the machines have a reach above 36 in., feet are provided for mounting. Capacities, 10, 17½, 30, 50, 75, 100, 125 and 150 tons. Cylinder diameters, 7½ to 20¾ in. Smallest size: reach, 4 in.; gap, 10 in. Largest size: reach, 21 ft. 6 in.; gap, 24 in.

Business Items

The Norton Company, of Worcester, Mass., has moved its New York office to 33 Park Place.

The name of the Wayne Oil Tank and Pump Co., of Fort Wayne, Ind., has been changed to the Wayne Tank and Pump Co. The organization and product remains the same. The company will market the Barrcentle water softening systems under the name of Wayne.

The Specialty Gauge and Tool Co., machine tool manufacturers, of Indianapolis, Ind., has filed papers with the secretary of state showing the intention of the corporation to dissolve.

The Minster Machine Co., Minster, Ohio, celebrated the fiftieth birthday of its general manager, A. L. Herkenhoff, with an entertainment and dinner in the plant offices on April 26. The event also celebrated Mr Herkenhoff's twenty-sixth year as manager of the Minster shops.

The Alaskan Steel Co., Brown & Co., Inc., of Pittsburgh, and Heller Bros. Co., of Newark, N. J., have changed their Chicago office from 28 East Jackson Blvd., to 11 South Desplaines Street.

W. P. Ferguson and A. H. Sunderbruch, 304 Market St., Chattanooga, Tenn., have lately entered into partnership, trading under the name of the Hamilton Machinery Co. The firm will handle a general line of machine tools, boiler shop equipment, electric cranes, hoists, etc. Both members of the firm are old machine tool salesmen and are well known in the South.

Arthur M. Watkins, dealer in machine tools as Eastern agent for the Covington Machine Co., and New York agent for American Tool Works and Ohio Machine Tool Co., has removed his offices from 165 Broadway, to the Dodge Building, 53 Park Place, New York City.

The American Patent Law Association, 614 Washington Loan and Trust Bldg., Washington, D. C., has issued a pamphlet setting forth the testimony of inventors, manufacturers and others on the Stanley compulsory patent bill (S. 3416). The pamphlet will be sent to anyone interested, upon application to the association.

The Campbell-Davenport Co., Inc., has been organized and has opened a garage and machine shop at 55 Smith St., Brooklyn, N. Y.

The machine shop of the Jones & Laughlin Steel Co., in Pittsburgh, Pa., was badly damaged by fire on May 3. The damage is estimated at $60,000.

The Markey Machinery Co., of Seattle, Wash., has converted part of its plant in that city to the manufacture of boilers for heating plants.

The Wilton Tool Co., Sharon, Pa., has started work on a machine shop addition to its plant.

The Sharon Pressed Steel Co., of New York, has removed its offices from 66 Broadway to the warerooms in the Dodge Bldg., at 47 West Broadway.

The Herberts Machinery and Supply Co., of Los Angeles, Cal., has been appointed the exclusive representative in California, Arizona and Nevada for the Norton line of grinding machines.

The Joseph Hollander Manufacturing Co., 172 Wade St., Bridgeport, Conn., manufacturers of hardware and metal specialties, has filed a voluntary petition in bankruptcy. Liabilities are $16,081, and assets $1,650.

J. L. Purcell, Inc., 40 Trumbull St., Hartford, Conn., has been incorporated to carry on a general mill supply business at the above address. The company will take over the present business of J. L. Purcell, which is well known in Connecticut. The new concern will have a capital stock of $100,000. J. L. Purcell, F. J. Murphy and E. M. Day, all of Hartford, are the incorporators.

Banigan Manufacturing Co., of Killingly, Conn., has recently been incorporated to manufacture and deal in tools, machinery, and such products. The capital stock of the company is $50,000, and the incorporators are: J. J. Banigan, Providence, R. I.; Richard D. Banigan, 43 Broad St., Danielson, Conn.; and E. Banigan, also of Danielson.

The West Border Spring Co., of Chelsea, Mass., has been organized with a capital stock of $25,000, to manufacture springs, etc. Herbert T. West, 17 Chestnut St., Winchester, Mass., is president and treasurer of the new concern.

The Budd Wheel Co. has purchased the Government plant at Philadelphia, formerly occupied by the Hero Manufacturing Co. The plant will be arranged to manufacture Budd wire wheels.

The Precision Die Castings Corporation, which has had a plant at Fayetteville, a short distance from Syracuse, N. Y., has been sold by C. Hamilton Sanford, as receiver, to Frank E. Wade for $27,500. The details of re-organization have not been decided upon. Mr. Wade represented the creditors. The reorganized company will operate the Fayetteville plant which normally employs about 200 men. Officers of the new company are: F. E. Wade, president; J. Wiltsie Knapp, vice-president and general manager; H. W. Smith, secretary and treasurer. Frederick P. Assman heads the board of directors.

The McCabe & Sheran Machinery Corporation has moved its sales office from 149 Broadway to 50 Church St., New York City.

Personals

BASIL MILES, who was secretary to the American delegation at the Limitation of Armament Conference, has been appointed administrative commissioner for America at the headquarters of the International Chamber of Commerce in Paris. Mr. Miles succeeds Frederick P. Keppel, who has resigned.

E. M. WAGNER, of the Runecke Wagner Pump and Supply Co., Pittsburgh, has been elected president of the recently organized Manufacturers Club of Pittsburgh, which has purchased the Hotel Chatham, Pittsburgh, for its home.

JOHN N. WEIR, assistant superintendent of the Eliza Furnaces, Jones & Laughlin Steel Co., Pittsburgh, Pa., has resigned to accept a position as superintendent of blast furnaces for the Pittsburgh Crucible Steel Co., Midland, Pa.

HENRY P. RANKIN, at one time connected with the Pittsburgh Crucible Steel Co. as superintendent of construction and later in charge of mill at Midland, Pa., and who for the past few years has been Pittsburgh manager for the H. M. Johns-Manville Co., has been appointed manager for the latter company in the Cleveland and Pittsburgh districts, with headquarters in Cleveland.

J. W. HARTMAN, formerly with the R. K. LeBlond Machine Tool Co., is now South-western manager for the Eccles & Smith Co., with headquarters at Los Angeles, Cal.

R. A. CASE has been appointed general sales manager of the Eccles & Smith Co., with headquarters at San Francisco, Cal.

Obituary

JOHN R. SHERWOOD, sales manager of the Singer Manufacturing Co., manufacturer of sewing machines, Bridgeport, Conn., died at the Bridgeport Hospital on April 26, from the effects of a recent operation. Mr. Sherwood, was well-known in industrial circles in New England and New York.

EDWARD T. BROWN, retired manufacturer of cotton ginning machinery, died at his home in New London, Conn., on May 2. He was eighty-three years old. He was the founder of the Brown Cotton Gin Co., and was its president for many years.

JOSEPH H. BRIGHTMAN, assistant secretary and treasurer of the Brightman Manufacturing Co., South Columbus, Ohio, died at his home in Columbus on April 21. He was thirty-five years old. Mr. Brightman had been engaged in the manufacture of shafting machinery for eleven years.

Forthcoming Meetings

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

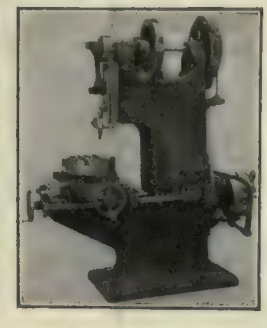
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa

Condensed-Clipping Index of Equipment

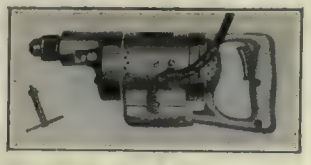
Patented Aug. 20, 1918

Slotting Machine, Die, Vertical
Peters-Bossert Co., 617 East Pearl St., Cincinnati, Ohio.
"American Machinist," January 26, 1922



The machine is used in making dies and punches of either regular or irregular shape, and is fitted with a special mechanism for producing a curved relief on the die. The ram slides in vertical ways, is fitted with a gib, and is driven by a crank on the main shaft, with an adjustable crank-pin to vary the length of stroke from zero up to 4 in. The machine has cross, longitudinal and circular hand feeds, each operated by a separate screw and handwheel. Power feeds may be furnished when desired. A variable-speed gear box inside the frame gives three changes of speed operated by a lever.

Drill, Electric, Portable, Automatic, "Willey"
James Clark, Jr., Electric Co., Louisville, Ky.
"American Machinist," January 26, 1922



The device is used for production work with small sizes of twist drills. It is made in three sizes to hold drills up to $\frac{5}{16}$, $\frac{1}{4}$ and $\frac{3}{16}$ in. The switch for operating the motor is controlled by the grip on the handle. The motor may be wound for either 110 or 220-volt alternating or direct current, single-phase of 60 cycles or less. The tool consists of the spindle with gears, motor body, and handle with the automatic switch. Length, with a Jacobs chuck, 11⅞, 12¼ and 13¼ in. respectively. Weight, 6½, 7 and 7⅝ pounds.

Grinding Machine, Surface, Tilting-Table, Hand-feed, No. 1
Wilmarth & Morman Co., Grand Rapids, Mich.
"American Machinist," January 26, 1922



The machine is adapted to grinding small work on a magnetic chuck in finishing surfaces at angles. The chuck is bolted to the table, which is then tilted to the required angle. The table is provided with T-slots for holding a magnetic chuck, vise or other fixtures, and is graduated in degrees. The truing device on the wheel hood dresses the grinding wheel horizontally or at any angle. A radial truing device which operates from the table can also be furnished.

Chuck, Drill, Small, No. 0
Jacobs Manufacturing Co., Hartford, Conn.
"American Machinist," January 26, 1922



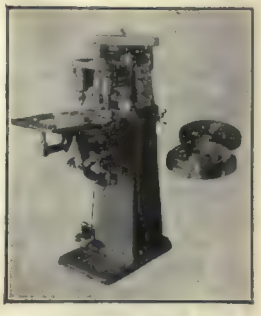
The chuck holds small drills used by jewelers for the drilling of small holes. It is 1¼ in. long and measures $\frac{7}{8}$ in. in diameter. It can be furnished with a sleeve of even smaller diameter, so that the chucks may be run in multiple at ¾-in. centers. In this case the sleeve is not knurled. Maximum capacity, $\frac{1}{8}$ in. Weight, 2 ounces.

Welding Machine, Tube, Oxy-acetylene
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," January 26, 1922



The machine is used in tube making for long runs on one size of tubing. It is equipped with two pairs of rolls, one set for feeding, and the other for welding. The welding roll at the back is fixed in place. The front one is adjustable, and its spindle bearing is in a slide controlled by a screw and handwheel. The upper and the lower feed rolls are geared together. A multiple-jet, water-cooled torch is employed. Maximum capacity is for tubing 6 in. in diameter and of No. 10 gage. Welding can be done on more than one size of tubing with any one machine.

Tapping Machine, Dial-Feed, Multiple-Spindle
Anderson Die Machine Co., Bridgeport, Conn.
"American Machinist," January 26, 1922



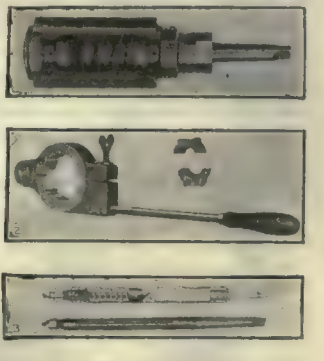
The machine is equipped with three spindles, and is used in tapping small brass and steel pieces. The chief feature of the machine is a dial for feeding the work to the spindles. The spindles are driven in opposite directions by a toothed segment and train of gears. The segment is controlled by a crank disk at the upper end of the vertical shaft, to which are secured the cams for indexing the dial and for locking it in its proper position. The machine when holding from No. 4 to No. 10 taps is ordinarily run at a speed of 56 strokes per minute. Either one, two or three holes can be tapped in each piece.

Truck, Lift, Hand-operated
Western Tool and Manufacturing Co., Springfield, Ohio.
"American Machinist," January 26, 1922



The truck is made of iron and steel, and can be turned in its own length, the front wheels swiveling about a ball thrust bearing. Roller bearings are employed on all wheels. With the truck one man can raise a load of 2,000 lb. The lift of the platform is 1½ in. The platform is ordinarily 23 x 38 in. in size, and 7½ in. above the floor when raised.

Lapping Tools, Internal and External, Replaceable Shell
R. & C. Lap Co., Davenport, Iowa.
"American Machinist," January 26, 1922



The laps are used in tool making and production work in the shop. The abrasive shells are supplied in two grades. The laps are made for both external and internal use in sizes from ½ in. up. In Fig. 1 is shown the cylinder lapping tool, consisting of a floating shank and an expanding device for adjusting the size, as well as for taking up the wear. In Fig. 2 is shown an external lap for use on crankshafts. A small internal lap is shown in both the sectional and the full view in Fig. 3. The lap is made with a standard shank, and may be fitted in a lathe or drill press, or operated by hand.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—A leading dealer in shop supplies at New York, issues new price card quoting rivets 20c. higher on 100 lb. lots; active Spring demand also caused nuts, washers and screws to advance. Pig iron quotations in all cities are given at from $1.50 to $3.50 higher, Pittsburgh quoting No. 2 Foundry at $21.50; Basic, $23.00, and Bessemer, $23.96. Chicago sends new prices of iron machinery castings: Light, 5c.; Medium, 4.5c., and Heavy, 3.5c. Linseed oil at 86c.

Declines—Open hearth spring steel (base) New York, at 3.50c., coppered bessemer rods fell 50c. from 7c. Tin, 5-ton lots at New York, at $31.50. Zinc is firm.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	23.52
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	25.40
Virginia No. 2	28.34
Basic	25.50
Grey Forge	24.46
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern, sil 2.25@2.75	23.92
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.30
Basic	23.00
Bessemer	23.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Boston	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.85	3.15	3.38
No. 12	2.45	3.43	3.20	3.43
No. 14	2.50	3.48	3.25	3.48
No. 16	2.70	3.68	3.35	3.68
Black				
Nos. 17 and 21	3.00	4.05	3.55	4.10
Nos. 22 and 24	3.05	4.10	3.60	4.15
Nos. 25 and 26	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11	3.15	4.25	3.75	4.30
Nos. 12 and 14	3.25	4.35	3.85	4.40
Nos. 17 and 21	3.55	4.65	4.15	4.70
Nos. 22 and 24	3.70	4.80	4.45	4.85
No. 26	3.85	4.95	4.60	5.00
No. 28	4.15	5.25	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¼ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	69	57½	¼ to 1¼	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	3.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.50	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛	8.00		12@13
5/32	6.50		11@12
⅛ to ½	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	31.50
Lead (up to carlots), St. Louis, 5.40; New York	5.75
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	11.75	10.25
Copper, heavy, and wire	9.50	10.75	9.25
Copper, light, and bottoms	8.50	9.00	8.25
Lead, heavy	3.75	4.50	3.65
Lead, tea	2.75	3.25	3.00
Brass, heavy	5.75	6.00	8.00
Brass, light	4.25	4.50	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.50	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	.99
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	55%	60–10%	60%
1½ and 1¼x3 in. up to 12 in.	40%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	55%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60-10%	50–5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, hex. heads	+10–15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Cal., Oakland—Kingsley Co., 1122 Castro St.—one automatic or hand operated turret lathe machine capable to take 4½ in., one automatic or hand operated turret lathe each machine capable to take 6½ in., metal band saw, Niagara preferred, one small punch mill, one quantity of cold drawn steel, running 1 in. to 4½ in. O.D., at least ¼ in. wall thickness and lengths—butt ends cut to.

Conn., Bridgeport—The Amer. Fabrics Co., 2160 Connecticut Ave., W. Lloyd, Purch. Agt.—one No. 1 13 in. x 24 in. universal grinder, one No. 2, 15 in. x 6 in. x 12 in. surface grinder, equal to Brown & Sharpe, (used).

Conn., Springdale—The Segal Metal Products—grinders, stamping machines, etc., for machine shop.

Ill., Chicago—The Amer. Steel Foundries, McCormick Bldg.—one 5 ft. radial drill variable speed motor drive; one 20 in. x 14 ft. and one 24 in. x 24 ft. lathe, both belt drive.

Ill., Chicago—G. Hanson, 2442 North Maplett St.—punch press similar to Niles No. 11, 20 or 22, and one 16 in. shaper.

Ill., Chicago—K. Wright, 1226 East 44th St.—one 200 lb. Bradley helve hammer.

Ill., Kewanee—The Walworth Mfg. Co., P. O. Box 111, H. W. Gamble, Kewanee Wks. Purch. Agt.—one 14 in. simplex radial drill with tapping attachment.

One 24 in. x 60 in. duplex vertical milling machine.

One 48 in. New Era type bullard vertical lathe.

One 14 in. surface grinder with magnetic chuck, 220 volts.

One 5 in. x 10 in. flat turret lathe.

One 20 in. x 11 in. heavy duty turret lathe.

Three 10 in., 12 in., 14 in. or 15 in. x 54 in. turret lathes.

One 20 in. x 8 ft. heavy type turret lathe.

Ill., Rockford—The Barber Colman Co., W. W. Hulls, Purch. Agt.—two No. 4 Lees Bradner thread rollers, 14 in. between centers, 15 in. swing, one Brinnel Hardness testing machine 1,000 kg.; one Erickson machine for testing sheet; one Universal testing machine, 1 or 4 screw type of 10,000 lb. (10,000 kg.) capacity with automatic and autographic beam.

Mich., Detroit—The General Steel Mchy. Co., 2510 Taylor Ave., A. L. Tushbant, Purch. Agt.—miscellaneous machine tools for general machine work.

Mich., Detroit—The Monroe Sheet Metal & Roofing Co., 850 Porter St.—metal working equipment.

Mo., Joplin—The Dunn Auto Shop, 715 Virginia Ave., J. J. Dunn, Purch. Agt.—power lathe, drill press and emery wheel.

Mo., Joplin—The Jefferson Grading Co., 111 S. Main St., H. C. Burgess, Purch. Agt.—used lathe for power machinery.

Mo., Joplin—The Joplin Radio Shop, 122½ Main St., J. J. Graber, Purch. Agt.—one 10in. power bench for copper brass and soft metal work.

Mo., Joplin—G. Kent, 502 Main St.—lathe for motorcycle repair work.

Mo., Joplin—Lawson & Hanson, 210 West 11th St., C. Lawson, Purch. Agt.—lathe for garage.

Mo., Joplin—W. Zook, 1401 Grand Ave.—drill press, lathe and emery wheel for automobile repair work.

Mo., St. Louis—The Brown Mchy. Co., 2107 North 11th St., C. Brown, Purch. Agt.—band saws 20, 26 and 36 in.; coping lathes, flip saws and matcher; 20 x 6 in. double surfacer, tenon, dimmer, edgers, saw mills, log saws, band saws for power machinery.

Neb., College View—The Service Garage, C. Gipson, Purch. Agt.—Weaver press and one 3-wheel Weaver jack, (used).

N. H., Keene—The Humphrey Machine Co., manufacturer miscellaneous machinery—one milling machine similar to No. 4 Cincinnati; one Wolcott screw cutting engine lathe 16 in. x 8 ft.; one 16 in. Wolcott crank shaper.

N. Y., Binghamton—R. J. Bump Co., Wall St.—bench miller and vertical post drill.

N. Y., Buffalo—McKaig-Hatch Inc., 1584 Niagara St.—machines and equipment for proposed machine shop on Skillen and Ontario Sts.

N. Y., Geneva—W. L. Parkard—modern screw cutting lathe, 32 in. swing, 8 ft. between centers.

N. Y., New York—The Electric Motor & Mchy. Co., 250 East 43rd St.—3 electric motors, 4 drill presses and several lathes.

N. Y., New York—The Elk Manufacturing Co., 1926 Bway., experimental work—magnetic chuck, demagnetizer and internal grinding attachment for No. 13 Brown and Sharpe Universal grinder.

N. Y., Rochester—W. P. Farley, 1005 Harvard St.—machinery and equipment for proposed machine factory.

N. Y., Watertown—G. Bushnell, 621 Lansing St.—lathe, 14 in.-18 in. back geared; drill press; bench miller and portable electric drill; small tool equipment for shop for motor repairs and small machine work.

O., Cleveland—The A. & B. Box Co., 8825 Woodland Ave., H. C. Roberts, Secy.—band saws, lathes and box nailers.

O., Columbus—The Columbus Heating & Ventilating Co., 1125 West Town St., C. A. DaMonte, Secy.—several pieces of metal working machines.

O., Columbus—The Miller-Van Horn Co., 81 East Main St., J. Van Horn, Purch. Agt.—one drill press and one grinder.

Pa., Beaver Springs—J. A. Catherman, (woodworker)—hollow chisel mortiser.

Pa., Meadville—P. Galbo—machinery and tools for new garage on Pine St.

Pa., Mercer—The Star Fdry. & Machine Co., V. Doak, Purch. Agt.—machinery and equipment for foundry and machine shop.

Pa., Phila.—H. Rosenfeld, 431 Fitzwater St.—several 30 in. square shears, (used).

Pa., Pittsburgh—The Acme Stamping & Mfg. Co., 307 Corliss St.—one 3 A Bliss double crank geared press, (used).

Pa., Sharon—F. Messersmith—machinery and equipment for proposed garage in Brookfield.

Wis., Cable—The Cable Auto Co.—equipment for proposed garage on Main St.

Wis., Kaukauna—W. Van Lieshout—equipment for auto repair work.

Wis., Kenosha—Krisor Bros., 772 Milwaukee Ave.—equipment for auto repair shop including 3 ton press.

Wis., Madison—The Madison Gas & Electric Co., 120 East Main St., J. St. John, Mgr.—auto repair equipment for proposed service station and garage on Main St.

Wis., Madison—Wingra Park Garage Co., 1501 Monroe St.—equipment for repair shop including press, compressor, etc.

Wis., Milwaukee—The South End Garage, Kinnickinnic and Fernwood Aves.—medium size drill press for use in garage.

Wis., Racine—J. C. Olsen, Route 3, Box 71—one sheet metal brake, folder rolls, turner, burning machines, beader and ruler.

Ont., Drumbo—J. Harmer—complete equipment for garage and auto repair shop. Estimated cost, $40,000.

Ont., Welland—L. R. Weeks Eng. Co.—rolling machine for seamless steel tubing plant.

Machinery Wanted

Conn., Stafford—The Phoenix Woolen Co., manufacturer of woolens, jersey cloth, etc.—one cloth drying machine, Heathcote Upright preferred.

Ky., Lexington—The Bybee Pottery Co., c/o T. B. McCoun—machinery and equipment for proposed pottery plant.

Mass., Charles River—C. Hall—five-cut "Link & Link" 26 or 28 in. bed space knitting machine; one 6-spindle shoen winder machine; 500 or 600 seven point single thread loopers, (used).

Mich., Detroit—The Gunberg Packing Co., 2380 20th St.—miscellaneous mechanical equipment for the manufacture of sausages, etc.

Minn., Bemidji—The Bemidji Woolen Mills—one napping machine suitable for napping blankets, (used).

Minn., Fergus Falls—The Fergus Falls Woolen Mills Co.—one cloth drying machine, (used).

Minn., Mankato—The Mankato Co-operative Dairy Assn., A. L. Veigel, Mgr.—ice cream machinery, including 15 ton ice machine and some cream vats.

Mo., Joplin—A. Boswell & Co., 628 Main St., manufacturer of face powder, etc., H. Arthur, Purch. Agt.—powder grinders and mixers.

Mo., Joplin—H. Hakon, Frisco Bldg.—lense grinders for power equipment.

Mo., Joplin—The Jones Optical Co., 509 Main St.—lense grinders and polisher for power equipment.

Mo., Joplin—The Keystone Products Co., 10th and Wall Sts., G. G. Deixell, Mgr. and Purch. Agt.—belting and shafting for soap factory.

Mo., Joplin—The Printers Bulletin, 1621 Main St., J. Anderson, Purch. Agt.—linotype, power metal cutting off machine, stenotype machine and casting box for print shop.

Mo., Joplin—A. Stevens, 709 Virginia Ave.—air compressor, belting and shafting.

Mo., Kansas City—C. Thompson, 98th and Holmes Sts.—belting and shafting for creamery.

Mo., St. Louis—The Acme Electric Co., 221 Market St.—Curtis air compressor, with tank and motor.

Mo., St. Louis—The Natl. Lead Co., 722 Chestnut St., W. M. Lowry, Purch. Agt.—one a.c. electric driven mine hoist, rope capacity of 500 ft. of 1¼ in. rope, single laid on drum, capacity 15,000 lb. unbalanced load rope full 22,000 lb.; two 1,500 cu.ft. free air per min. air compressors, 100 lb. pressure, motor or belt drive, a.c. direct connected, preferred; two 2,000 cu.ft. free air per min. air compressor, 100 lb. pressure, motor or belt drive, 140 lb. steam pressure, 1,250-1,500 k.w. a.c. generator, 3 phase, 60 cycle; one low pressure turbine, 140 lb. steam pressure, 1,250-1,500 k.w. a.c. generator, 3 phase, 60 cycle.

N. J., Belleville—The Thompson Machine Co., 298 Main St., W. J. M. Walker, Treas.-Genl. Mgr.—blue-printing machine and steel filing equipment to file drawings, tracings and sketches.

N. Y., Binghamton—The Nailless Heel Co., Court and Milford Sts., O. Cone, Purch. Agt.—special machinery and equipment for the manufacture of shoe heels.

N. Y., Binghamton—L. & S. Battery Mfg. Co., 659 Washington Ave., C. H. Langdon, Purch. Agt.—machinery and equipment for the manufacture of storage cells, charging apparatus and panels.

N. Y., Buffalo—The Buffalo Nipple & Machine Co., 335 Glenwood Ave.—enameling oven.

N. Y., Carthage—R. D. Reichel—printing presses and other machinery requirements for daily newspaper.

N. Y., Chemung—G. Shaw Co.—saw mill machinery and equipment to replace fire loss.

N. Y., Franklin—F. Hoffman—machinery and equipment for making pastry and bread, including pans, mixing troughs and mixer, electric driven.

N. Y., Jamestown—H. R. Ericson, 14 Spring St., Ext.—small or medium size printing press and small engraving machine or machinery.

N. Y., Jamestown—C. F. Carlson, 19 Norwood Ave., Sta. A.—printing press, (new or used).

N. Y., New York—J. W. Sullivan Co., 827 East 9th St.—steam driven 2 stage air compressors with capacity 1,200 cu.ft. per min.

N. Y., Rome—W. E. Allison Co., Washington and Front Sts.—knitting looms and machinery for the manufacture of underwear, etc.

N. Y., Rome—F. C. Spadaforce, 831 East Dominick St.—complete electric driven air compressor and tank for high pressure.

N. Y., Schenectady—The Mary Ann Creek Mining Co., Inc., 469 State St., W. F. Wellman, Purch. Agt.—fine grinding machines, Ball or equal; cyanide oil flotation equipment; rock drills, air compressor and rock handling equipment.

N. Y., Utica—The Utica Independent Laundry Corp., 21 Grant St., B. Abelove, Purch. Agt.—machinery and equipment for modern laundry.

N. Y., Watertown—A. E. Marshall, I. O. O. F. Bldg., Stone St.—machinery and equipment for repairing and charging storage batteries.

N. Y., Watertown—The Shaughnessy Knitting Co., 208 East Moulton St., M. J. Shaughnessy, Purch. Agt.—machinery and equipment for the manufacture of fibre silk underwear.

N. Y., Watertown—P. S. Slate, Otis Bldg.—shafting and transmission equipment and electric motors for board mill at Black River.

N. Y., West Seneca (Buffalo P. O.)—The Triangle Dairy Co., Inc., W. J. Milligan, 236 Triangle St., Buffalo, Purch. Agt.—machinery and equipment for proposed dairy.

N. C., Canton—W. T. Barker—canning machinery and equipment for proposed factory.

N. C., Kinston—R. W. Fowler Co.—cold storage and ice making machinery and equipment.

N. C., Salisbury—The Rowan Creamery Co., W. G. Yeager, Mgr.—butter, creamery and refrigerating machinery and equipment.

N. C., Wilmington—W. C. Smith, P. O. Box 1128—machinery for knitting mill and machinery for sawmill.

O., Cincinnati—The Maxwell & Rothschild, Textile Bldg.—one doubling and folding machine, Windle make preferred, (used).

O., Cleveland—The Industrial Fibre Corp. of America, West 98th and Walworth Sts., W. W. Birge, Pres.—twisting and reeling machines.

O., Cleveland—The Western Novelty Mfg. Co., 1540 East 49th St.—one 12 x 18 or 14 x 22 press and 30 in. paper cutter.

O., Cleveland—The Wilberite Roofing Co., Brook Park Rd., F. S. Wilber, Sales Mgr.—additional machinery for the manufacture of roofing materials.

O., Columbus—The State of Ohio, Dept. of Welfare, Oak and 9th Sts.—steam driven air compressor for Massillon State Hospital, Massillon, estimated cost, $6,000; ice manufacturing machine, 10 ton capacity, for Ohio Sanitarium, Mt. Vernon, estimated cost, $6,500; coal crusher and conveyor for the Cleveland State Hospital Cleveland, estimated cost, $3,500.

Okla., St. Louis—A. S. Partridge—double engine, single drum hoist.

Pa., Bradford—The Bradford Era—fast printing press and other equipment for proposed printing plant.

Pa., Erie—The Odin Stove Mfg. Co.—equipment for stove factory on West 12th St.

Pa., Phila.—The Phila. Brewing Co., Fairhill and Clearfield Sts.—woodworking machinery, steam bending machine for wood, metal working machine and various machines for brewery.

Pa., Phila.—The Superior Knit Wear Corp., 8th and Wallace Sts.—double rolling napping machine 60 in., (used).

Pa., Phila.—H. Swoboda & Sons, Inc., 1027 North Bodine St.—acid vats, conveyor systems, finishing and polishing machinery for leather factory.

Pa., Pittsburgh—The A. S. Davison Co., Oliver Bldg.—one 10 ton, 50 ft. span overhead traveling crane.

Pa., Warren—F. Nichols, Baizinger Blk.—machinery, tools and equipment for modern shoe repair shop.

S. C., Bennettsville—O. R. Brown—machinery to manufacture boxes, barrels, etc.

S. C., Clinton—The Thornwell Orphanage, L. R. Lynn, Pres.—machinery and equipment for laundry.

S. C., Greenwood—M. C. Marshall—complete machinery and equipment for canning factory.

W. Va., Parkersburg—The Seward Wire Co., T. J. Seward, 17 West 42nd St., New York, Mgr.—insulated wire machinery for manufacturing rubber covered electric wire.

Wis., Appleton—The Weber Knitting Mills, 624 Richmond St.—motors, power machinery, knitting and special machinery for proposed knitting mill on Main St.

Wis., Clinton — Terwilliger — gasoline storage tank and pump for garage.

Wis., Eldorado—Dodd School Cheese Factory, Route 1, F. Dodd, Pickett, Purch. Agt.—belt driven machinery and vats for manufacturing cheese.

Wis., Hartford—J. A. Grimm—conveyor for coal hoppers.

Wis., Hartford—A. P. Janzer, Palace Bakery—mechanical baking equipment, steam tank.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, Pres.—motors, refrigerating machinery and special machinery for proposed ice cream plant.

Wis., Madison—The Bd. Normal School Regents, Capitol Bldg., W. J. Kettle, Secy.—blacksmith machinery and machinery for tool repairing at State Normal School, Platteville.

Wis., Milwaukee—J. C. Heisa, 5010 Vliet St.—air compressor complete with motor and tank.

Wis., Milwaukee—H. Nesser, 1257 26th St.—portable power sawing outfit.

Wis., Morgan (Gresham P. O.)—O. E. Morgan—belt driven planing mill machinery.

Wis., Portage—The Market Grocery—mechanical baking equipment, including oven, portable Vulcan or equal.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co., J. W. Paris, Secy.—about 28 looms for woolen mill.

Wis., Pulaski—The Northern Oak Chair Co., c/o F. Poprocki—special woodworking machinery.

Wis., Rosholt—J. Wiza—gasoline storage tank with pump and air compressor.

Wis., Sturgeon Bay—Peterson Bros. Co., c/o G. Peterson—equipment for auto repair work including compressor, one ton press, etc.

Wis., Trippville (Glendale P. O.)—H. Wheeler—complete equipment for blacksmith shop.

Wis., Truesdale—The Truesdale Canning Co., 78 North Main St., E. Mischler, Pres.—canning machinery and conveyors for proposed cannery.

Wis., Waukesha—O. W. Rowlands, Route 9—special machinery for proposed pasteurizing plant.

Wis., Wisconsin Rapids—Hein & Sutor, 142 1st St.—paper cutting machine.

Ont., Niagara Falls—E. Coste & Co., Ltd., has taken leases on a large area in Tilbury West and plan to drill for natural gas—natural gas drilling equipment. Estimated cost, $35,000.

Ont., St. Jacobs—The Snider Flour Milling Co.—modern flour milling equipment.

Ont., Welland—The Empire Cotton Mills, Ltd.—150 automatic looms for weave shed addition.

Ont., Woodstock—A. Hastings & Son, Dundas and Berch Sts.—seven visible oil and gas pumps operated by electric vacuum system.

Man., Winnipeg—The W. A. T. Electrical Mfg. Co., 402 Lotredale Ave.—automatic machine for wrapping celluloid.

Metal Working Shops

Cal., San Francisco—L. R. Lurie, Flatiron Bldg., has had plans prepared for the construction of a 1 story machine shop on Folsom St. near 5th St. Estimated cost, $15,000. S. Heiman, 57 Post St., Archt.

Conn., Waterbury—The Connecticut Light and Power Co., Lakeville St., has had plans prepared for the construction of a 4 story, 60 x 135 ft. garage, etc., on Freight St. Estimated cost, $100,000. L. A. Walsh, 51 Leavenworth St., Archt.

Ill., Chicago—R. F. France, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 100 x 200 ft. garage at 2470-78 North Clark St., for K. R. Beak, c/o architect. Estimated cost, $50,000.

Ill., Chicago—Newhouse & Burnham, Archts., 4630 Prairie Ave., are receiving bids for the construction of a 1 and 2 story, 140 x 308 ft. garage on Fair Oaks Ave. and Bway., for E. Bain and L. A. Wolf. Estimated cost, $80,000.

Ill., Chicago—C. D. Paschong, 6445 South Sangamon St., has awarded the contract for the construction of a 1 story, 110 x 150 ft. garage on Calumet Ave. and 63rd St. Estimated cost, $70,000.

Ind., Hammond—Jones & Laughlin Co., Ross St., Pittsburgh, Pa., plans to build a steel plant here. Probably private plans.

Ky., Louisville—The Haury Motor Co., 811 South 3rd St., has awarded the contract for the construction of a 2 story, 60 x 200 ft. garage on 3rd and York Sts. Estimated cost, $75,000. Noted Feb. 9.

Mass., Springfield—The Westinghouse Electric & Mfg. Co., Page Blvd., will build a 1 story, 80 x 520 ft. addition to its plant, for the manufacture of electric specialties. Estimated cost, $100,000.

Mass., Westfield—The Foster Machine Co., South Broad St., is having plans prepared for the construction of a 1 story, 25 x 120 ft. addition to its plant for the manufacture of textile machinery. Estimated cost, $35,000. Private plans.

Minn., Minneapolis—The Amer. Elevator & Warehouse Co., has purchased the plant of the Amer. Malt & Grain Co., on Childs St., here, and plans to build an addition. Estimated cost including equipment $50,000. C. E. Thayer, Pres.

N. H., Manchester—The Commonwealth Last Co., Somerville St., has awarded the contract for the construction of a 2 story, 91 x 160 ft. factory on Maple St., for the manufacture of shoe lasts. Estimated cost, $40,000.

N. J., Trenton—Fitzgibbon Crisp Co., Calhoun and Dunham Sts., has awarded the contract for the construction of a 1 story, 50 x 100 ft. factory for the manufacture of auto bodies. Estimated cost, $10,000.

N. Y., Oswego—The Fitzgibbons Boiler Co., 23 Mercer St., plans extension to plant. Estimated cost, between $40,000 and $50,000.

N. Y., Rochester—W. P. Farley, 1005 Harvard St., plans to build a machine factory on Halstead St. Estimated cost, $8,000. Architect not announced.

N. Y., Salamanca—C. R. Gibson plans to build a 2 story, 45 x 110 ft. garage on Wildwood Ave. Estimated cost, $40,000. Architect not announced.

O., Cleveland—J. Basta, 7001 Union Ave., has awarded the contract for the construction of a 1 story, 50 x 80 ft. garage at 11903 Miles Ave. Estimated cost, $40,000.

O., Cleveland—The Bd. Educ., East 6th St. and Rockwell Ave., will receive bids until May 15 for the construction of a 2 story, 65 x 245 ft. addition to high school on Scranton Rd. and Castle Ave., including manual training and workshop departments. Estimated cost, $400,000.

O., Cleveland—The Vichek Tool Co., 3000 East 87th St., has awarded the contract for the construction of a 1 story, 49 x 82 ft. heat treating plant on East 87th St. Estimated cost, $40,000.

Pa., Erie—Odin Stove Mfg. Co. plans to build a 26 x 122 ft. factory on West 12th St. for the manufacture of stoves. Estimated cost, $10,500. Architect not announced.

Pa., Kane—The E. & O. Mfg. Co., of Fredonia, N. Y., manufacturer of auto signal lamps, plans additions and alterations to former plant of Berry Truck & Body Co. here. Estimated cost between $15,000 and $20,000.

Pa., Koppel—The Koppel Car Repair Co. will build a 1 story, 60 x 300 ft. factory. Noted March 30.

Pa., Penn—The White Dental Co., 211 South 12th St., has awarded the contract for the construction of a 1 story, 44 x 99 ft. factory on Garfield and Unity Sts. Estimated cost, $11,000.

Wis., Beloit—J. Trevithick, Clinton has awarded the contract for the construction of a 1 story, 75 x 100 ft. garage on Broad St. Estimated cost, $40,000. Noted April 13.

Wis., Cable—The Cable Auto Co. has awarded the contract for the construction of a 1 story 50 x 90 ft. garage on Main St. Estimated cost, $40,000.

Wis., Elkhorn—F. Hilton & Co. is having plans prepared for the construction of a 2 story, 50 x 60 ft. factory for the manufacture of hand instruments. Estimated cost, $—,—. M. Tallgren & Sons, 425 East Water St., Milwaukee, Archts.

Wis., Hoshoose—W. Van Lieshout has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost, $40,000.

Wis., Kenosha—Kriner Bros., 772 Michigan Ave., have awarded the contract for the construction of a 1 story, 60 x 110 ft. garage. Estimated cost, $40,000. Noted April 27.

Wis., Madison—The Madison Gas & Electric Co., 120 East Main St., is having plans prepared for the construction of a 2 story, 60 x 110 ft. service station and garage on Main St. Estimated cost, $45,000. J. St. John, Mgr. Private plans.

Wis., Madison—J. Peterson, 102 South Carroll St., is having plans prepared for the construction of a 1 story, 134 x 137 ft. garage on Monona St. Estimated cost, $—,—. M. P. Schneider, 401 West Doty St., Archt. Niagara Park Garage Co., 1501 Monona St., lessee.

Wis., Neshoto—J. Wm. Polasia, plans to build a 1 and 2 story garage, here. Estimated cost, $40,000. Private plans.

Wis., Sturgeon Bay—Peterson Bros. Co. c/o G. Peterson, has purchased a site and plans to build a 2 story garage and repair shop. Estimated cost, $40,000. Architect not selected.

Ont., Welland—L. R. Weeks Eng. Co. is having plans prepared for the construction of a 1 story, 60 x 140 ft. plant for the manufacture of seamless steel tubing. Estimated cost, $150,000.

General Manufacturing

Cal., Fresno—The Fresno Bee has awarded the contract for the construction of a 1 story newspaper plant on Van Ness and Calaveras Sts. Estimated cost, $100,000.

Cal., San Francisco—O'Brien Bros., Inc., brokers, 240 Montgomery St., are receiving bids for the construction of a 2 story factory on Howard St. near 4th St., for L. B. Lorie, Platiron Bldg. Estimated cost, $—,—. Hake-Hilte Oven Mfg. Co., Howard Bldg., lessee.

Cal., Stockton—O. Kern, c/o Davis-Hollar-Powers Co., Delta Bldg., is having plans prepared for the construction of a 2 story, 75 x 100 ft. bakery and apartment building on California and Oak Sts. Estimated cost, $30,000.

Conn., New Britain—E. H. Hitchcock & Co., 283 Main St., has awarded the contract for the construction of a 2 story, 65 x 160 ft. printing plant on Chestnut St. Estimated cost between $35,000 and $40,000.

Conn., New London—The E. Bloom Co., Inc., has awarded the contract for the construction of a 2 story, 56 x 165 ft. addition to its silk factory on Elm St. Estimated cost, $50,000.

Ind., Hammond—The Standard Steel Car Co. has awarded the contract for the construction of a 1 story, 150 x 400 ft. paint shop. Estimated cost, $100,000.

Ky., Lexington—The Rybee Pottery Co., c/o T. B. Mecham, plans to build a pottery plant here. Cost to exceed $5,000. Architect not announced.

Me., Skowhegan—The Maine Spinning Co. has awarded the contract for the construction of a 3 story 54 x 300 ft. spinning mill. Estimated cost, $200,000. Noted March 16.

Mass., Lawrence—The Kress Carriage Co., 106 Concord St., will soon award the contract for the construction of a 2 story, 40 x 95 ft. addition to its carriage factory. Estimated cost, $35,000. Private plans.

Mass., North Dighton—The Mt. Hope Finishing Co. has awarded the contract for the construction of a 1 story 115 x 300 ft. main building; 1 story, 50 x 150 ft. soap house; 1 story, 40 x 155 ft. dairy plant and 4 steel storage buildings. Estimated cost, $300,000. Noted April 13.

Mich., Detroit—A. Backus Junior & Sons, 1533 West Lafayette Ave., plans to build a 2 story box factory on Livernois Ave. along the track of the Detroit Terminal Railroad. Estimated cost, $300,000. Architect not selected.

Mich., Detroit—The Gunsberg Packing Co., 2350 20th St., having plans prepared for the construction of a 2 story addition to its sausage factory on 20th St. Estimated cost, $25,000. Kohner & Seeler, 1402 Kresge Bldg., Archts.

Mich., Detroit—H. Scherer, 440 East Jefferson Ave., manufacturers of auto trimmings and upholstering materials, has awarded the contract for the construction of a 10 story, 66 x 140 ft. shops and office building on Woodward Ave. Estimated cost, $75,000.

Mich., Kalamazoo—The City is having plans prepared for the construction of a gas plant. Estimated cost, $2,000,000. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., Engrs.

N. Y., Allegany—The Acme Milling Co., Olean, plans to build a 2 story, 24 x 36 ft. and 1 story 36 x 38 ft. addition to its feed mill, here. Estimated cost, $10,000. Architect not announced.

N. Y., Buffalo—The DuPont Fibre Silk Co. has awarded the contract for the construction of an addition to its silk plant on River Rd. Estimated cost, $2,000,000. Noted April 13.

N. Y., Little Falls—The Barnett Leather Co., 81 Fulton St., New York, has awarded the contract for the construction of a factory, here. Estimated cost, $100,000.

N. Y., Lockport—G. P. Hardy, Engr., 309 Bway., New York City, is receiving bids for the construction of a paper mill here for A. W. Jack Corp. Estimated cost to exceed $100,000.

N. Y., New York—State Hospital Comm., Albany, has awarded the contract for the construction of a bakery building, etc., at the Manhattan State Hospital, Wards Island, here. Estimated cost, $240,000.

O., Barberton—The Silica Sand Co. plans to build a sand plant to replace the one recently destroyed by fire. Estimated cost, $25,000.

O., Cincinnati—Tietig & Lee, Archts., 901 4th Natl. Bank Bldg., will soon receive bids for the construction of a 5 story, 61 x 65 ft. cold storage plant on Cormany St., for the J. and F. Schroth Packing Co., Cormany and Township Sts. Estimated cost, $70,000.

O., Cleveland—The A. & B Box Co., 8528 Woodland Ave., has had plans prepared for the construction of a 1 story, 90 x 182 ft. factory on East 152nd St. Estimated cost, $60,000. H. C. Roberts, Secy. H. M. Morse & Co., Finance Bldg., Archts.

O., Cleveland—The Industrial Fibre Co., West 98th St., near Walford Rd., has had plans prepared for the construction of a 2 story, 41 x 99 ft. factory on West 98th St. Estimated cost, $50,000. J. H. Williams, c/o owner, Archt.

O., Cleveland—Rothkopf Bros., 6113 Central Ave., is having plans prepared for the construction of a 2 story, 40 x 130 ft. dairy at 10713 Superior Ave. Estimated cost, $75,000. A Sogg, 319 Hippodrome Bldg., Archt.

Pa., Erie—The Erie Burial Casket Co., 20th and Peach Sts., is having plans prepared for the construction of a 2 story, 200 x 300 ft. casket factory along the tracks of the Pennsylvania R.R. between 8th and 10th Sts. Estimated cost, $300,000. Private plans.

Pa., Pittsburgh—H. J. Heinz Co. has awarded the contract for the construction of a 6 story, 93 x 150 ft. spaghetti factory. Estimated cost, $250,000.

Pa., Phila.—Powers, Weightman-Rosengarten Co., 916 Parrish St., has awarded the contract for the construction of a 2 story, 42 x 80 ft. chemical plant on 35th and Moore Sts. Estimated cost, $20,000.

Pa., Pittsburgh—The St. Louis Independent Packing Co. has awarded the contract for the construction of a 2 story, 106 x 109 ft. cooler building at 6349 Station St. Estimated cost, $50,000. Noted April 27.

R. I., Olneyville—LePoutre Bros., c/o Lafayette Worsted Mills, Woonsocket, plan to build a large 2 story, spinning mill, here. Architect not announced.

Wis., Appleton—The Weber Knitting Mills, 624 Richmond St., plans to build a 2 and 3 story, 46 x 50 ft. knitting mill on Main St. Estimated cost, $50,000. Architect not announced.

Wis., Hartford—A. P. Janser, (Palace Bakery), will build a 3 story, 30 x 70 ft. addition to bakery. Estimated cost, $10,000.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, Pres., has awarded the contract for the construction of a 2 story, 50 x 100 ft. ice cream factory. Estimated cost, $55,000.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co. will receive bids until May 20 for the construction of a 2 story, 47 x 187 ft. woolen mill. Estimated cost, $100,000. J. W. Paris, Secy. Parkinson & Dockendorff, Linker Bldg., LaCrosse, Archt.

Wis., Truesdale—The Truesdale Canning Co., 78 North Main St., Kenosha, is having preliminary plans prepared for the construction of a 2 story cannery. Estimated cost, between $50,000 and $60,000. E. Mischler, Pres. G. H. Leipold, 160 Martin St., Milwaukee, Archt.

Wis., Waukesha—O. W. Rowlands, Route 9, is receiving bids for the construction of a 1 story, 40 x 62 ft. pasteurizing plant near here. Estimated cost, $15,000. F. B. Gray, First Natl. Bank Bldg., Aurora, Ill., Archt.

Ont., St. Jacobs—The Snider Flour Milling Co. plans to rebuild flour mill which was partially destroyed by fire. Estimated cost, $100,000.

Special Opportunities

of many kinds in the machinery industry will be found in the

SEARCHLIGHT SECTION

of this issue — Pages 93 to 105

American Machinist

Volume 56 NEW YORK, MAY 18, 1922 Number 20

Shall We Standardize Machine Tools?

The Dangers of Promiscuous Standardization—What Real Standardization Means and How a Start Can Be Made—Good Standards Available

BY GEORGE E. MERRYWEATHER
President, Motch & Merryweather Machinery Company

FOR the last fifteen or sixteen years the builders of machine tools have been discussing the merits of standardizing some of the parts of machine tools. Everybody agrees that something ought to be done about it and that it would be a good thing for the industry and for each individual. Then a committee is appointed and the matter is forgotten. So far none of the committees has committed anything more serious than time-slaughter and not much of that, probably because they took a good look at all the things that ought to be done and couldn't decide just where to start.

They had to buck the splendid conservatism of the dollars-and-cents men at the head of the different companies, too. And no wonder there was opposition to standardization, as it was, and still is understood by a good many people. I haven't a doubt that a lot of the machine tool builders thought the standardization scheme was going to be something like the one that was put up to me during the war by one of the younger "experts" of one of the government departments. This fellow blew into my office one day and said he wanted the names of all the companies in the country that made "laths" and "planners." It was a couple of minutes before I gathered what he meant, but when it finally percolated I managed to keep my face straight and ask him what he wanted them for.

"LATHS" AND "PLANNERS"

Well, it seems he was going to standardize all the "laths" and "planners" so that everybody who made them would produce just one kind and the parts made by one fellow would be interchangeable with those made by every one else. Then we would have real quantity production and lathes would roll out of the shops as the universal cars roll out of Henry Ford's factory. When I asked him if he was going to use the same kind of lathe for turning shells that he used for spinning he seemed a bit disturbed for he evidently thought that a "lath" was a "lath" and that was all there was to it.

Of course this incident is only an example to show how standardization can be reduced to an absurdity, but it does bring out the danger in putting standards work in any but the most expert hands.

Another impression that must be overcome is that the adoption of a standard means that everything which does not conform to the standard must immediately be scrapped. Of course this isn't so. Take the experience of the Society of Automotive Engineers. They have probably done more work along these lines than anybody else and established more standards. I think I am right in saying that not a single one of their standards was actually used in the first year after its adoption by the society.

Manufacturers cannot afford as a rule, to scrap parts or machines already in production because they do not conform to some particular standard. But when changes in design are made, as they must be periodically in order to keep up with the procession, it is easier to make use of an existing standard than it is to take the trouble to design something different. In the course of time everybody has to make changes and before long they all wonder how they ever got along when every designer had a slightly different way of making the same piece.

ONE WAY INSTEAD OF FORTY-SEVEN VARIETIES

As far as the machine tool builders are concerned there are two ways to go at the standardization question, or perhaps it would sit easier if we said "simplification" for that is what it amounts to in the long run. In the first place there are many parts of any machine tool which might just as well be made in just one way instead of forty-seven different ways, differing from each other in non-essential particulars only. The individuality of the designer or of the machine could still find plenty of places and ways to express itself.

Take T-slots, we might just as well decide on enough standard sizes and proportions to take care of any possible requirement and then use them the next time we bring out a new model. The same thing might be done with spindle noses and handles and other inconsequential parts that are more or less alike anyhow. Something could certainly be done about tapers.

Even in these simple things there is room for lots of argument so perhaps it might be better to start out along the other track. There are any number of perfectly good standards already in existence and in common use. There are undoubtedly some of the S. A. E. and A. S. T. M. standards that could be adopted bodily without much effort on the part of anybody. There are ball-bearing standards and specifications for steels and alloys and bearing metals that could be used just as well in machine tools as in automobiles. The National Screw Thread Commission has some excellent recommendations on fits and tolerances in threads and the American Gear Manufacturers' Association is making strides with gears. Getting proved and workable standards in this way would be just as easy as collecting a ready-made family by visiting the orphan asylums and adopting good-looking orphans with satisfactory pedigrees.

As I said before, persuading the industry to accept any kind of a standard isn't going to be an easy job. It

to find out many years ago that one of our most progressive makers of nailing machines called me several particularly hard kinds of a fool for telling him that he would use hardened steel gears and other parts in his machine before he got much further. He's advertising them now.

What is to be gained by standardizing, or simplifying? Well, here's one instance: I know of a company that makes machines for cutting gears. They naturally use gears in their machines and they have been cutting the gears in their own shop on their own machines. Some idiot asked them not so long ago if they could buy their gears cheaper than they could make them as they were making them in relatively small lots. He was laughed out of the office but he made an impression, for they were curious enough to inquire of one of the big gear shops what their gears would cost. To make a long story short, they found that they could buy these gears, cut on their own machines in the gear shop, at about half what they could make them for in their own shop. Is it necessary to go any further?

Now, let me repeat what I said in the beginning. What is needed is a committee that will commit something definite. It should be made up of some men with vision who can grasp the possibilities of simplification and also some of the old reliable hard heads who will keep the visionaries from attempting too much at first and at the same time insist on pushing through the standards that are found to be feasible and worth while.

Rewards for Suggestions—Discussion

By Oscar E. Perrigo

On page 448, Vol. 55, of AMERICAN MACHINIST, C. J. Morrison makes some timely and very practical remarks on the subject of "Rewards for Suggestions." His ideas are perfectly correct, in that it requires a very wise management to formulate an equitable system for the examination of and the reward for suggestions, so as always to be fair to the suggestor as well as to the management.

There are a number of good and practical reasons for this condition. Suggestions thoughtfully and honestly made, with a view to the improvement of some general or special condition existing in the plant, or in some of its equipment, are sometimes of no possible value in any form. Sometimes a slight change in the suggestion may render it of considerable value. Again, the germ of thought contained in a suggestion may, when properly developed, form the basis of a good and valuable patent.

The person making the suggestion should always be allowed to be present when his suggestion is to be acted upon, and frequently a few words from him will dissipate a misunderstanding. Besides, we should not forget that: "Every American citizen has the undoubted right to be heard in any cause in which he has a personal interest." Yet many of these cases are decided on ex-parte testimony. That is a reason why men sometimes feel "sore," and think that they have been denied their rights. It is an old shop maxim that "there is no profit in a sore man."

The method of judging the value of suggestions, and of making the payments is a much more important matter than is generally considered. Since some suggestions which seem valuable and are paid for as such are finally found to be useless, while others are paid a nominal sum and afterwards found to be very valuable, suggests a system which will be equitable to all concerned.

The plan is this: Instruct a committee to be liberal in its judgment of the value of suggestions. If there is a doubt as to the practicability and value of a suggestion, give it the benefit of the doubt. Then pay a nominal reward for all suggestions passed upon as favorable. At the end of six months, if no additional value seems to have accrued upon a certain suggestion, let it lay for another six months. If no special value is seen at that time, it is dropped and no further account is kept of it. But, if at the end of six months the suggestion has proved of value, repeat the original payment; and if similar advantage is seen at the end of another six months, repeat the payment again. If, at the end of the second six months, the suggestion has proved of especial value, a final payment of its real worth to the plant is estimated and paid.

The first important feature of this plan is that suggestions of special merit will receive special reward; while, secondly, employees are much more likely to present suggestions for permanent or continued benefit rather than those of temporary or transient value. The aggregate amount which the management feels should be devoted to this purpose can be so divided that the annual expense will be no more than by the usual method, while the good influence which the system exerts among the employees will be greatly enhanced.

Accepting Suggestions

As an illustration of how easy it is to make mistakes in judgment as to the value of suggestions, the following incidents well known to the writer are given. Quite a number of years ago a draftsman was employed to design a certain precision machine, the requirements for which were very rigid. The machine was designed in somewhat less time than the management had expected, and was built under the direction of the designer. Upon the first test it was apparent that changes in the material of some of the parts would be advisable. These changes were made, and upon the final test before the management, the machine was pronounced a success, and several others were ordered to be built. Within a week the designer was made superintendent of the plant.

A number of years after, this same man was employed in a plant where an elaborate suggestion system was in force, and a committee of supposedly technical experts had been appointed to examine the suggestions presented. A certain machine built by the company required as a part of its design a device producing a similar effect to that on the machine which the man had designed years before, so that he now filed a suggestion covering a sketch of the necessary parts. It was examined by the committee, which declared that the principle was wrong and that such a device would be inoperative.

A rather ludicrous sequel to the matter was that a year or so after the above event, this same company purchased a very high-priced and elaborate precision machine in which the very principle that had been rejected was used upon one of its most important precision parts, and was working precisely as it had worked on the machine which had earned this designer a superintendent's position. These happenings naturally lead to the conclusion that it is a man very certain of his ground who undertakes to say that a certain device will not work, lest some man who does not know nearly as much as he should make it work. The time-honored question of "who shall decide when doctors disagree," is not confined to the medical profession.

Methods of Machine Tool Design

Third Article—Machine Tool Drives Analyzed—Why the Drive Problem Is More Difficult for Machine Tools than for Other Machines

By A. L. DeLEEUW

THE drives of many classes of machines consist merely of the simplest kind of power transmission, such as two pulleys and a belt or a couple of sprockets and a chain. As a rule only one speed is required and in the majority of cases the maximum load is well known. Conditions are entirely different with most machine tools. The maximum load is not definitely known and is only guessed at. Very frequently a number of speeds are required and the range of these speeds is much in excess of the range of variable speeds found in any other class of machines. In addition, these speeds must be readily obtained by the operator if they shall be of any use at all.

In fact, there is no other class of machines which combines all of these requirements. A spinning machine does require variable speeds, but over a very small range and requiring little power. An automobile also requires variable speeds, but again over a very limited range and only very few speeds. A machine tool, on the other hand, may require anything between 100 hp. or a fraction of 1 hp. and many machine tools are constructed with as many as thirty, and sometimes even more speeds, all mechanically controlled. It is perfectly true that, as a rule, the user of the machine tool does not require all the speeds furnished, but as the maker of the machine cannot know which speeds might be required by the various users, he is compelled to furnish all useful speeds and bring them close enough together so that whatever the job may be there will always be some speed which is nearly correct for that particular case.

Selecting Speeds

If we had a large boring mill to be used exclusively for the turning and boring of large flywheels, we would require a number of speeds which would make this machine as economical as possible for the turning and facing of the rim and then a few other speeds which would make it as economical as possible for the boring and facing of the hub. For instance, we might have speeds of 1—1.1—1.2—up to 2 r.p.m. for the rim; and 10—11—12—up to 20 r.p.m. for the hub, and this would be perhaps the best arrangement possible if nothing else ever had to be turned up on this boring mill but large flywheels. If a concern should build a special machine for this purpose it would probably arrange the speeds in some such fashion; but in doing so it would make of the machine a special machine in every sense of the word. It would have to be rearranged as soon as different kinds of work were assigned to it. The builder of standard or commercial machine tools is confronted with the problem of selecting speeds which will make the machine as economical as it is possible to make it for any job within its range.

In practically all cases the various speeds of a machine tool are arranged in geometrical progression. It was quite customary to advertise this feature as a special merit of some machine, and even now we may find occasionally an advertisement mentioning the geometrical progression as a special feature of high value and peculiar to the advertised machine; but this only occurs nowadays when the advertiser honestly believes the public to be as ignorant as he himself. We realize at the present time that the geometrical progression of the speeds of a machine tool is the best all-around *compromise*. We know full well that it does not give us the exact speeds we desire, but that no other standardized arrangement would bring us so near to the speed we need under all conditions of size and material of work.

To illustrate this a little further let us take for example a 24-in. lathe made by a well-known machine tool builder. The speeds are twelve in number and range from 8.1 to 315. These speeds, being in geometrical progression, would be 8.10—11.30—15.76—22.00—30.7—42.8—59.6—83.2—116.0—161.8—226—315.

This lathe swings 19¾ in. over the carriage, so that if we have a piece in the machine of a diameter equal to the full swing over carriage, and we should run 8.1 r.p.m., we would have a cutting speed of only 42 ft. Now, there are very few occasions indeed where a piece of the full swing of the lathe and at the same time of a very hard material would have to be turned up, so that we may say that the lower speeds of this lathe are emergency speeds and it would perhaps be perfectly satisfactory if only one of these low speeds were provided. However, the various series or groups of speeds are obtained by the shifting of a pair of gears or the throwing in of a clutch, so that the general nature of a group is reproduced but at a higher speed.

If in this particular case we should leave out the second and third speed so that the first speed would be 8.1 and the second 22, then if we should shift so as to get the next series of speeds beginning with, say, 59.6, the second speed of that series would be 161.8. Now these speeds of 59.6, etc., are used on the great majority of the work done on this machine and it would not be permissible at all to have as great a gap between the speeds as that of 59.6 and 161.8. The necessity of having speeds fairly close together in the higher ranges compels us to bring them fairly close together in the lower ranges also, though we may not need them there. In some other machine we may need the lower speeds close together and this would compel us to furnish a number of high speeds also, though we can get along without them.

Calculations for Geometric Progressions

The following calculations in regard to the speeds of a machine tool also apply to the feeds. In general, they apply to any mechanism in which we wish to have a series of speeds in geometrical progression.

The various drives of machine tools can be divided into two classes. In the first class the first driving element of the machine has a constant speed. In the second class it has an adjustable speed. Machines of the first class are generally called "constant speed" or "single pulley" machines. All the speed changes are

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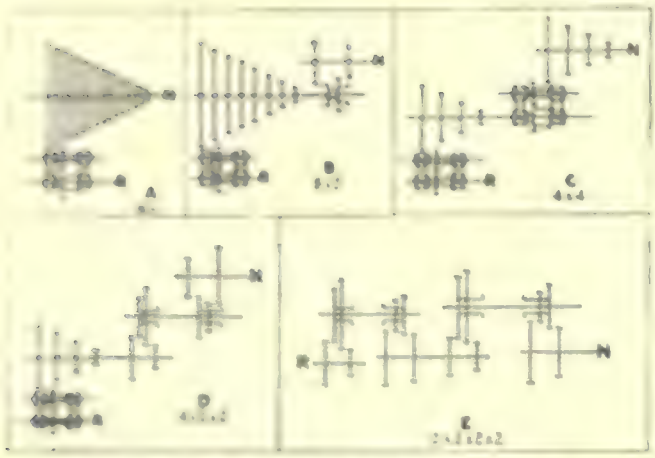


FIG. 16. DIAGRAMS OF 16-SPEED SHIFTS

made by means of the mechanism of the machine itself. In the second class part of the changes, and sometimes all, are made by mechanism of which part is outside of the machine proper, such as a countershaft with cone pulley, or a variable speed countershaft, or an adjustable speed motor.

For the present we will confine ourselves to speeds arranged in geometrical progression. If all speeds are obtained by means of one single system of machine elements, such as, for instance, a number of steps on a cone pulley or a number of gears all served by one tumbler gear, we will say that we have a single shift arrangement. If such a shift is exhausted and we bring into play some other group of elements we will get a two-shift arrangement, etc. The number of shifts possible depends on the number of factors of the numeral indicating the number of speeds. For intsance, with sixteen speeds we would reason thus: We can consider sixteen as 16 x 1, or as 8 x 2, or as 4 x 2 x 2, or as 4 x 4, or as 2 x 2 x 2 x 2. The first would correspond to a cone pulley with sixteen steps (which, by the way, is not likely to be used). In the second arrangement we would have two factors and therefore two shifts; in the third arrangement, 4 x 2 x 2, we have three factors and therefore three shifts, while in the fourth arrangement, 4 x 4, we again have two shifts, and in the last arrangement, 2 x 2 x 2 x 2, we have four shifts.

With eighteen speeds we would have the following: 18, or 2 x 9, or 3 x 6, or 2 x 3 x 3, which will give us respectively 1—2—2—3 shifts. With twenty speeds we would have 20, or 2 x 10, or 4 x 5, or 2 x 2 x 5, which would give us in the same order 1—2—2—3 shifts.

Such arrangements are shown in Fig. 16 in diagrammatic form. Each arrangement consists of as many speed variators as there are shifts, and each individual speed variator is represented as a cone of gears with the well-known tumbler gear and idler, or sometimes as a set of sliding gears.

In Fig. 16-A-B-C-D and E are given the various possible shifts for sixteen speeds. Fig. 16-A shows a cone of sixteen gears or a cone pulley with sixteen steps or maybe sixteen steps of an adjustable speed motor. Fig. 16-B shows a combination of two speed variators, one with eight and one with two steps. Fig. 16-C also has two shifts. This time each one for a speed variator of four steps. Fig. 16-D shows three shifts, one for a speed variator of four steps and two for speed variators of two steps each. Finally, Fig. 16-E shows a four shift variator, each of the two elements being a two step variator. Fig. 17 shows the possible combinations for eighteen speeds and Fig. 18 for twenty speeds.

It should be thoroughly understood that the diagrams do not show the construction of speed changing mechanisms, but merely the way they can be split up into their elements. They do not even show the proper order of these elements; for instance, in Fig. 17-H the six step variator comes first and the three step afterward. This order may be reversed. Which one would be the best sequence would depend on circumstances.

We have shown these various arrangements as all-gear drives, because it simplifies the diagrams. However, some of the groups or variators shown might be adjustable speed motors or belt constructions. There are many arrangements in existence in which the first group or speed variator is replaced by an adjustable speed motor, but, whenever such a motor is used, it will be found as the beginning of the arrangement. One

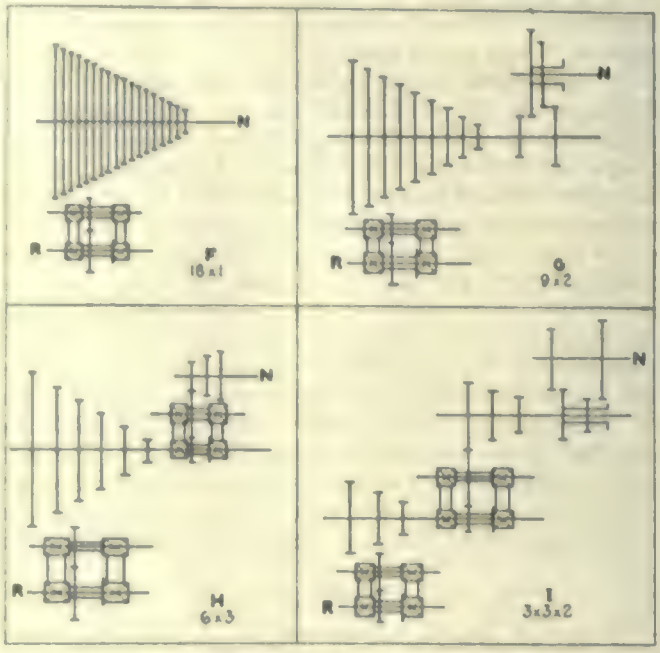


FIG. 17. DIAGRAMS OF 18-SPEED SHIFTS

does not find it as a substitute for the second, third or fourth group. On the other hand, belt drives lend themselves to many variations and groupings.

In Fig. 19 a partial schedule is given of the possible arrangements of machine tool drives. They are divided into two groups, one for constant speed motor or pulley and one in which adjustable speed motors or cone pulleys are used. As we are not really concerned with the adjustable speed motor the diagram proceeds without regard for this element, considering only various belt drives. No effort is made to show the various kinds of constant speed drives because they have been considered in the previous paragraphs. The belt drives are again divided into two groups, in one of which all variations of speeds are made by belt while the other makes its variations by means of belts and gears. This diagram does not show all the possible combinations of belts and gears because they are unlimited in number. It does show, however, a number of the most common constructions used in machine tool drives.

When there are two countershaft speeds they may be arranged either so that a shift from one countershaft speed to the other splits up the variation between two adjoining cone speeds, or else they may be arranged

in such a way that after all the cone speeds are exhausted one makes a shift to the next countershaft speed and begins again with the first cone step.

A few of the arrangements of the above diagram have been further analyzed. They are marked as Case 1-A, Case 1-B, Case 2, 3, 4 and 5. The numerals refer to corresponding numerals in Fig. 19. Cases 1-A and 1-B differ only in so far that in Case 1-A the two cones are supposed to have the same steps as is customary in most machine constructions; while in Case 1-B these cones are not alike. This latter case is not very common. However, it is used where the machine must have speeds very much in excess of the countershaft speeds. The countershaft being a machine unit which depends for its alignment on ceilings and beams and such like is not very well adapted to be run at a very high speed; so that it is advisable to do some speeding up between countershaft and machine, if the machine must run at a high speed. In such cases we will find the countershaft cone different from the machine cone.

The following calculations show a method of obtaining the main elements of the various arrangements indicated in Fig. 19. As all of it may not be quite clear in

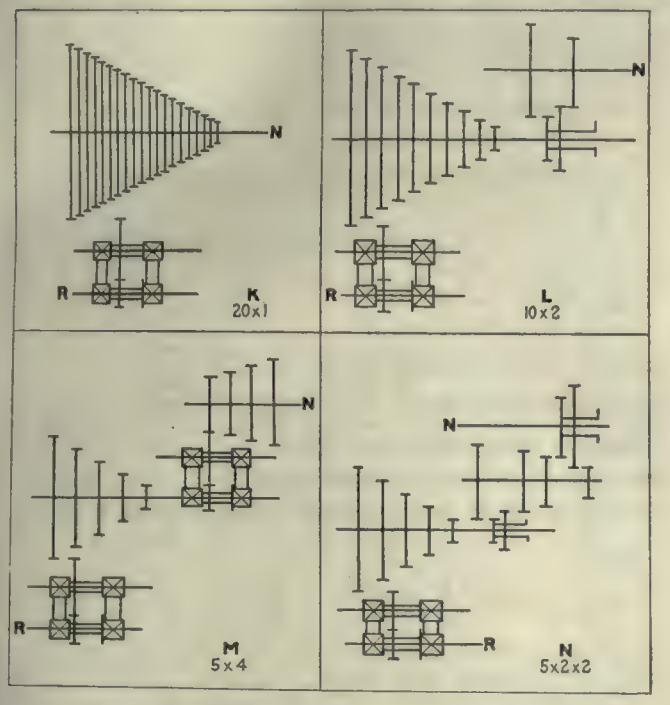


FIG. 18. DIAGRAMS OF 20-SPEED SHIFTS

the mind of the reader at the first reading, we will go over one example, Case 1-A. The number of speeds is given as n, the low speed as s, and the high speed as S. As these speeds are supposed to be in geometrical progression they are:

$$a \text{——} ar \text{——} ar^2 \text{——} ar^3 \text{——} \cdots \text{——} ar^{n-1}.$$

The range R is the highest speed divided by the lowest which is $\frac{S}{s}$; so that $\frac{S}{s} = r^{n-1}$ and $r = \sqrt[n-1]{\frac{S}{s}} = \sqrt[n-1]{R}$.

The countershaft speed C can be expressed as the largest step of the lower cone divided by the smallest step of the upper cone times the low speed; and we might also express it as the smallest step of the lower cone divided by the largest step of the upper cone times the high speed. This shows us that the countershaft speed equals the square root of the product of high and low speeds.

The accompanying calculation shows so clearly how to find one extreme step of the cone when the other one is given that it is not necessary to go further into this matter. What is not so plain is how to find the next step. In the accompanying calculation the next steps to be calculated are called x and y, and the sum of x and y is supposed to be the same as the sum of d and D which, as we know, is customary. We find, therefore, that step y equals d plus D minus x. Keeping this in mind it will be easy to follow the rest of the calculations.

Case 1-A

When the two cones are alike

No. of speeds $= n$
Low speed $= s$
High speed $= S$
Range $= R = S \div s$

$$\text{Ratio of two adjoining speeds} = r = \sqrt[n-1]{R}$$

$$\text{Countershaft speed} = C = \frac{D}{d} \times s = \frac{d}{D} \times S$$

$$\frac{D^2}{d^2} = \frac{S}{s}$$

$$\frac{D}{d} = \sqrt{\frac{S}{s}}$$

$$C = \sqrt{\frac{S}{s}} \times s = \sqrt{Ss}$$

If small step $= d$ diameter

$$\text{Large step} = D = d\sqrt{\frac{S}{s}}$$

$$\text{Step } y = D + d - x$$

$$C \times \frac{D + d - x}{x} = s \times r$$

$$\sqrt{Ss} \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D + d - x}{x} = \frac{sr}{\sqrt{Ss}} = \frac{r\sqrt{Ss}}{S}$$

$$D + d - x = \frac{r\sqrt{Ss}}{S} \times x$$

$$D + d = x\left(\frac{r\sqrt{Ss}}{S} + 1\right)$$

$$x = \frac{D + d}{\frac{r\sqrt{Ss}}{S} + 1}$$

$$y = D + d - x$$

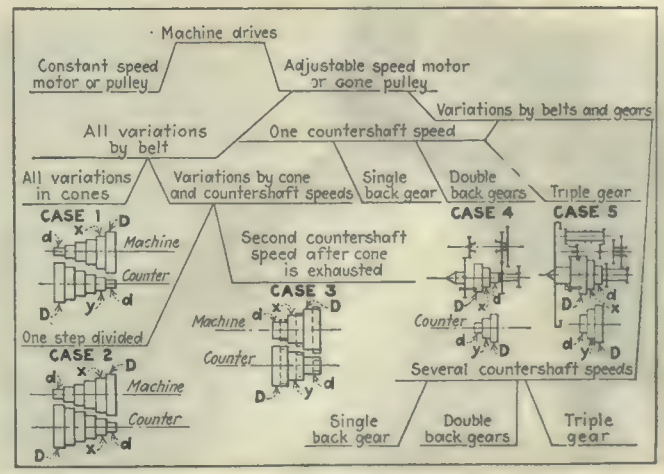


FIG. 19. SCHEDULE OF POSSIBLE DRIVE ARRANGEMENTS

Case 1-B

WHEN THE TWO CONES ARE NOT ALIKE

No. of speeds $= n$
Low speed $= s$
High speed $= S$
Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Countershaft speed $= C = \frac{D}{d} \times s$

Step $y = D + d - x$

$$C \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D}{d} \times s \times \frac{D + d - x}{x} = s \times r$$

$$\frac{D}{d} \times \frac{D + d - x}{x} = r$$

$$\frac{D^2 + Dd - Dx}{dx} = r$$

$$D^2 + Dd - Dx = rdx$$

$$D^2 + Dd = (rd + D)x$$

$$x = \frac{D^2 + Dd}{rd + D} = \frac{D(D + d)}{rd + D}$$

$$y = D + d - x$$

Case 2

WHEN THE TWO CONES ARE ALIKE

No. of speeds $= n$
Low speed $= s$
High speed $= S$
Range $= R = S \div s$

Ratio of two countershaft speeds $= r = \sqrt[n-1]{R}$

Ratio of two adjoining pulley speeds $= r' = \sqrt[n-1]{R^2}$

Fast countershaft speed $= C_F = \frac{D}{d} \times rs = \frac{d}{D} \times S$

$$\frac{D^2}{d^2} = \frac{S}{rs} \qquad \frac{D}{d} = \sqrt{\frac{S}{rs}}$$

$$C_F = \frac{D}{d} \times rs = rs\sqrt{\frac{S}{rs}} = \sqrt{rSs}$$

$$C_s = \frac{1}{r}\sqrt{rSs} = \sqrt{\frac{Ss}{r}}$$

If small step $= d$ diameter

Large step $= D$, $\frac{D}{d} = \sqrt{\frac{S}{rs}}$, $D = d\sqrt{\frac{S}{rs}}$

Step $y = D + d - x$

Third speed is obtained with belt on x and y and with slow countershaft speed.

$$sr' = \frac{1}{x} \times C_s = \frac{D + d - x}{x} = \sqrt{\frac{Ss}{r}}$$

$$sr^2 \times x = (D + d - x)\sqrt{\frac{Ss}{r}}$$

$$sr^2 x + x\sqrt{\frac{Ss}{r}} = (D + d)\sqrt{\frac{Ss}{r}}$$

$$x = \frac{(D + d)\sqrt{\frac{Ss}{r}}}{1 + \sqrt{\frac{Ss}{r}}} = \frac{(D + d)\sqrt{rSs}}{r + \sqrt{rSs}} = \frac{(D + d)C_F}{r + C_F}$$

$$y = D + d - x$$

Case 3

WHEN THE TWO CONES ARE ALIKE

No. of speeds $= n$
Low speed $= s$
High speed $= S$
Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[\frac{n}{2}-1]{R}$
Slow countershaft speed $= C_s$

Slow countershaft speed brings speed up to step $\frac{n}{2}$

Fastest speed of machine cone, using slow countershaft is $s \times r^{\frac{n}{2}-1}$

$$C_s = \frac{D}{d} \times s = \frac{d}{D} \times sr^{\frac{n}{2}-1}$$

$$\frac{D^2}{d^2} = r^{\frac{n}{2}-1}$$

$$\frac{D}{d} = \sqrt{r^{\frac{n}{2}-1}} = r^{\frac{n-2}{4}}$$

$$C_s = s \times r^{\frac{n-2}{4}}$$

To find x and y follow Case 1-A, substituting $s \times r^{\frac{n-2}{2}}$ for S (as this speed is the highest obtainable speed with this countershaft speed)
Fast countershaft speed $= C_F$

$$C_F = C_S \times r^{\frac{n}{2}} = s \times r^{\frac{n-2}{4}} \times r^{\frac{n}{2}} = s \times r^{\frac{3n-2}{4}}$$

Case 4

ONE COUNTERSHAFT SPEED, DOUBLE BACK GEARS

No. of speeds $= n$

n must necessarily be divisible by 3

Low speed $= s$
High speed $= S$
Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Cone steps bring speeds from high to $\frac{2n}{3}$ speed

Fast back gear brings speed from $\left(\frac{2n}{3}-1\right)$ to $\frac{n}{3}$ speed

Slow back gear brings speed from $\left(\frac{n}{3}-1\right)$ to slow speed

Slowest speed of machine cone without using gears is $s \times r^{\frac{2n}{3}}$

$$C = \frac{d}{D} \times S = \frac{d}{D} \times sr^{n-1} = \frac{D}{d} \times s \times r^{\frac{2n}{3}}$$

$$\frac{D^2}{d^2} = \frac{sr^{n-1}}{sr^{\frac{2n}{3}}} = r^{\frac{n-3}{3}}$$

$$\frac{D}{d} = r^{\frac{n-3}{6}}$$

$$C = \frac{D}{d} \times s \times r^{\frac{2n}{3}} = r^{\frac{n-3}{6}} \times s \times r^{\frac{2n}{3}} = sr^{\frac{5n-3}{6}}$$

To find x and y follow Case 1-A substituting $s \times r^{\frac{2n}{3}}$ for s (as this is the slowest speed obtainable by direct drive).
Ratio of machine cone and shaft driven by fast back gears $= r^{\frac{n}{3}}$

Ratio of fast and slow back gears $= r^{\frac{n}{3}}$

Case 5

ONE COUNTERSHAFT SPEED, DOUBLE BACK GEARS AND TRIPLE GEAR

No. of speeds $= n$
High speed $= S$
Low speed $= s$
Range $= R = S \div s$

Ratio of two adjoining speeds $= r = \sqrt[n-1]{R}$

Ratio of triple and back gear $= r^{\frac{n}{5}}$

Ratio of back gears $= r^{\frac{n}{3}}$

Ratio of shaft driven by fast back gear and machine cone $= r^{\frac{n}{3}}$

Countershaft speed $= C = sr^{\frac{9n-5}{10}}$

If small step $= d$ diameter

Large step $D = \frac{Sd}{C}$

Step $y = D + d - x$

$$C \times \frac{D + d - x}{x} = \frac{S}{r}$$

$$\frac{D + d - x}{x} = \frac{S}{Cr}$$

$$D + d = x\left(\frac{S}{Cr} + 1\right)$$

$$x = \frac{D + d}{\frac{S}{Cr} + 1}$$

$$y = D + d - x$$

Reo Connecting Rod Methods

A Double Milling Fixture—Babbitt Expanded in Holes by Rolling—A Neat and Accurate Gage for Inspecting Squareness of Bores

By FRED H. COLVIN
Editor, American Machinist

THE milling fixture used in the first operation is of different design than that usually employed for this work. It consists of a substantial framework built to contain two rods in a revolving fixture, so that one end is free for unloading and reloading while the cutters are at work on the other end.

The rod rests in the lower V's *A* and *B*, Fig. 1. The small end, however, is supported by an additional block which takes the thrust of the clamping finger *C*. Finger *D* centers and clamps the large end of the rod, both clamps being operated by a handwheel and screw above. A single screw holds both ends of the rod through an equalizing clamp.

Drilling the Large Hole

The large hole is drilled in the fixture shown at the right in Fig. 2. The rod is lightly held, the forged opening centering the drill and the pin *A* preventing the rod from turning under the cut. In drilling the small end, the large bore is used for locating and squaring the rod, as shown at the left at *B*. The quick-acting clamp *C* is a bit unusual, the handle *D* unlatching the locking block and allowing the rod to be swung out of the way after drilling.

After splitting the cap from the rod itself (the bolt holes being previously drilled and tapped), the studs are put in place and the cap assembled to the rod. It is then washed, tinned and babbitted as shown in Fig. 3. The rod slips over a babbitting mandrel which has strips to represent the shims, as at *A*. The cap is held



FIG. 1. MILLING SIDES OF CONNECTING RODS

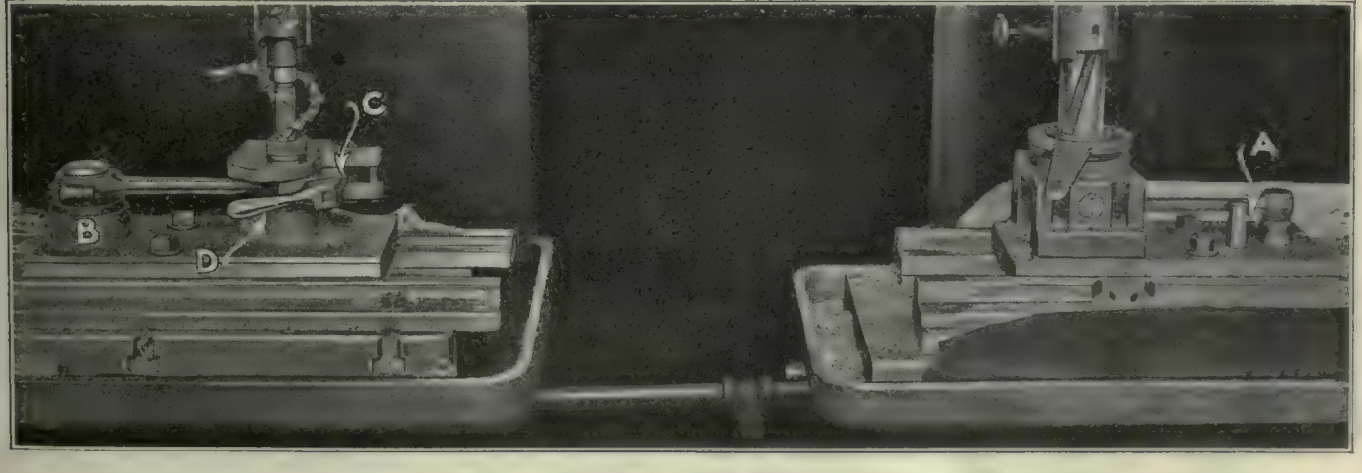
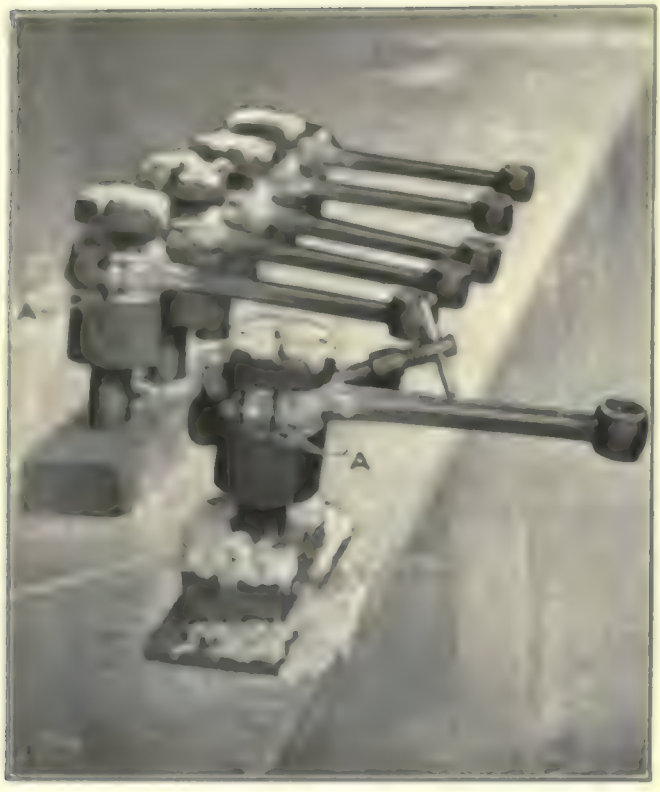


FIG. 2. DRILLING BOTH ENDS OF ROD



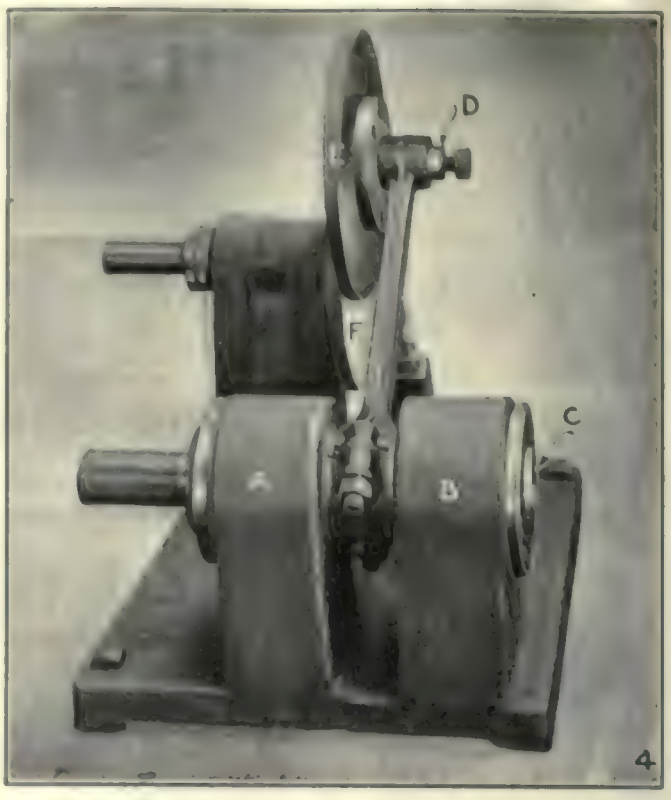


FIG. 3. BABBITTING THE RODS. FIG. 4. TESTING FOR SQUARENESS OF HOLES

in position by the clamp shown while the babbitt is poured.

The oil groove is next cut, the babbitt faced and rough reamed, and then spun with a rolling tool to compress the metal before the final reaming.

In Fig. 4 is shown the test for squareness of the two holes. The large end of the rod is placed between the heavy uprights *A* and *B*, and the plug *C*, representing the crankpin, is pushed in place. The stud *D* on the disk *E* is placed in the piston-pin hole and the rod is then swung so as to bring the disks *E* and *F* in contact. The large size of these disks makes it easy to detect very slight errors in squareness, and it is these errors which have much to do with causing undue wear and producing unsatisfactory motors.

In the final operations the oil dip on the end of the rod is formed, the oil hole carefully cleaned out, the rod buffed and weighed and sent to the assembling department to be fitted to the crankshaft as in Fig. 5.



FIG. 5. FITTING RODS TO CRANKSHAFT

Chamber Urges Political Emancipation of Federal Reserve System

A statement issued recently by the finance department of the Chamber of Commerce of the United States urges protection of the Federal Reserve System from politics. The chamber's finance department emphasizes the fact that current uninformed criticism and misrepresentation may threaten the welfare of the system. Efforts that are being made to control the system's discount rates and to alter the composition of the Federal Reserve Board are not in accordance with sound principles, declares the chamber. It is not suggested that sincere and constructive criticism should be discouraged, but that for the moment it should be put to one side in order to confront what is believed to be dangerous tendencies that, unchecked, will promote a gradual ascendancy of political influence in affairs of the system, and contrary to the interests of all the people, undermine the independence of its administration.

The chamber's committee on banking and currency stated some time ago that in dignity the Federal Reserve Board should rank with the Supreme Court and should be equally free from any suspicion of political control. The department adds the opinion that the entire system should be kept non-partisan in character, free from the suspicion of the taint of politics, and should be protected from any efforts to manipulate it in the interests of any class or party, with consequent loss of public confidence in its integrity.

Some forty bills, proposing to amend the Federal Reserve Act, a few constructive but most of them unwise, have been introduced in the present Congress.

Factory Storekeeping and Material Control

The Second Article—Material Routine Personnel—Duties and Qualifications—Who Is Responsible for Quality, Quantity, Time and Cost—Location of Offices

BY HENRY H. FARQUHAR

THE personnel concerned with material handling must necessarily differ both in quantity and quality, as well as in organization, with the particular factory dealt with. In any strictly regulated material procedure, however, whatever be the type of industry, the following duties must be performed regardless of whether or not the exact titles used below are employed, or of whether, as in the smaller plants, several of these duties may be combined in one person.

The function of the engineering department is to ascertain the proper quality of goods and to consider the uses to which each article is to be put. The results are written up in purchase specifications, which are repeated or referred to in the balance sheet. The engineering department must also inspect and test materials upon receipt to see whether they conform with these specifications.

The person in charge of this work must possess technical knowledge of a high order, he must possess firmness, backed by sound judgment, and he therefore requires an intimate knowledge of production needs. He may often be assisted to good advantage by various advisory committees appointed for the purpose.

The purchasing agent is responsible for purchasing all goods as and when called for at the lowest price consistent with quality. He is responsible for the follow-up of all outstanding purchase orders. and for seeing that delivery is made when promised. It is his duty to report at once to the proper person any change in conditions in the market or in transportation which may affect the time or amount of ordering goods. The purchasing agent should possess shrewdness, tact, common sense and ability to hold his own in an argument. Technical knowledge is an advantage.

The balance clerk is called also stock clerk, material clerk, material record clerk. The general function of a central clearing house, as embodied in the balance sheets, is to give all information in regard to material on hand, material outstanding on order, material which has been apportioned or reserved to manufacturing or other needs, and material which may be further apportioned or which is considered available. It is the duty of the balance clerk to keep the balance sheet for each item up to date by posting any one of the above transactions when it occurs, to see that perpetual inventory is accurately maintained, to requisition materials for stock as necessary.

The qualifications of a balance clerk require absolute accuracy, foresight and a whole lot of common sense. I strongly believe that first-class people should be used for balance card work. Bookkeeping is more or less mechanical, but balance work requires an alert mind. Much money may be lost or made at the balance cards.

Besides his general supervisory duties, it is specifically the duty of the works manager as regards material regulation to approve himself, or to delegate this authority to other officials, all replenishment orders before they may be honored by the purchasing agent.

An important duty of the traffic manager is to keep those responsible for the ordering of materials fully informed as to traffic conditions, so that ample allowance may be made for embargoes or other transportation upsets. Ordinarily this information should be reported to the purchasing agent who should then be held responsible for interpreting this and other relevant information into an allowance affecting the time or amount of ordering goods. It is the traffic manager's duty also to receive all goods from the transportation agent, to see that the packages correspond with the descriptions on the way bills or other descriptive documents, to certify the transportation charges to the auditor, and in general to conduct all dealings with transportation agencies.

The receiving clerk unpacks all packages and checks contents against his copy of the purchase order. He makes out a notification of receipt and sends it immediately to persons interested. This notification or an accompanying form must contain information showing action by the engineering department or other inspectors.

The transportation men move materials and apparatus into and out of storerooms and to other designated places as per directions.

The storekeeper is responsible for the receipt into stores, arrangement and stowage, custody, and issue from stores of all goods. He is also responsible for a periodic count to insure accuracy of perpetual inventory, and reduction of spoilage and deterioration.

The auditor checks invoices against notification of material received and notifies the purchasing agent to

THE PERSONNEL concerned with material routine must be organized and physically located to give the greatest serviceability.

Quality is determined by the engineering department; cost by the purchasing agent. Quantity is limited by production requirements.

The storekeeper should work directly under the works manager, the balance clerk under the production manager.

The production office should be close to the manufacturing departments. The balance sheets must be in the production manager's office but near the storeroom.

The cost department should be supervised by the works manager, but located near the balance sheets and manufacturing department.

secure adjustment for rejected materials. He pays for those goods passing inspection, or if the policy of taking all cash discounts immediately upon receipt of invoice be followed, pays invoices upon presentation.

The cost department sees that proper charges and credits are made and summarized for all materials issued or returned, and that these transactions are properly taken up in the books of account.

Besides these functions, we have that of requesting material for use, exercised by various persons throughout the plant, and finally that of planning, which, while not directly related to material routine, is the center of production activities and enables the accurate forecast of material needs.

Naturally, depending on the size and complexity of the business, these functions may not be exercised by persons as listed above. Fewer persons may be required or very many more may be necessary in larger plants. For instance, there may be one head material man, under whom would come several storekeepers, several balance clerks, special transportation men and so on. Similarly, the receiving department may be very large in itself, consisting of several men and several stenographers. On the other hand the storekeeper may in smaller plants serve also as receiving clerk, although this practice is open to considerable danger.

Regardless of the number of persons required, however, the functions to be performed remain the same, and ordinarily it is a mistake to split responsibility for any one function among different persons. Thus special considerations may require a usually unsatisfactory arrangement of several detached storerooms each with its own storekeeper. These should all report, however, to one man who heads the storage function.

Relation Between Departments

It is obvious that responsibility for the material routine rests with many officials of the plant. It therefore becomes necessary in individual cases to determine very carefully just what the relation of material regulation shall be to each of the departments affected, as well as the relation among the members of material personnel themselves, so that there may be no overlapping of functions.

Although no general rule can be laid down which will suit all cases, there are yet certain necessary relationships which should not be lost sight of in the distribution of functions in any case. On the one hand, a too great concentration of authority and responsibility may lead to fraud or careless work due to a lack of independent checks. On the other hand, by a too sparsely scattered arrangement work may be so slowed up as to be insufferable. The problem lies in choosing the middle ground between these two extremes. An illogical arrangement of functions, furthermore, may lead to complications quite as distressing as a too broad or a too narrow subdivision. Consider first the four major elements, quality, quantity, time and cost, into which material handling has been divided.

It would seem axiomatic that responsibility for quality of all goods should be centered in the engineering or other technical department. To this department, in the final analysis, must be referred all questions of quality of raw material or workmanship which affect the serviceability of the product which this department has designed. Since this technical department specifies in the beginning the quality of what is to enter into the finished product, it would seem only right that in it be centered responsibility for the inspection of incoming goods to determine whether they be suitable for use in the product.

Where a simple count and observation is all that is necessary, as is usually the case with most factory supplies, authority for inspection may be delegated by the engineering department to the receiving clerk. Responsibility, nevertheless, for this particular work of the receiving clerk must still be centered in the engineering department. There is here no occasion for divided or ambiguous responsibility in the receiving clerk's work, since quality inspection is a function that may be clearly set off from his other duties and for which he may therefore report without confusion to the head of the inspection department. Divided responsibility becomes dangerous only when two persons are responsible for the same function or duty.

Responsibility in Inspection Work

The necessity for central responsibility in inspection work was illustrated in one plant where it was perfectly well understood that all technical inspection was to be done by the engineering department. However it had been tacitly assumed that this office was not interested in or responsible for inspection of materials which did not have to go to the testing laboratory, as such materials had been customarily passed by the receiving clerk without specific directions for him to do so. This lack of a clear definite authority caused the loss of many dollars and delayed completion of work when unsuitable goods were passed for storage.

The determination of what quantity of material to buy usually rests with the production department, and in any event, must be determined through a consideration of production requirements. As indicated previously, and as will be discussed in detail further on, there are two kinds of purchasing, speculative and routine. Speculative purchasing, however, when it is done for a manufacturing establishment, should be limited in amount and in time by dictates of manufacturing needs. A safe rule to follow in this respect is that when the purchasing agent is permitted to depart from reasonably immediate needs of production in his purchases, the burden of proof must be distinctly upon him. In routine purchasing, of course, the purchasing agent is governed strictly by current replenishment orders.

The time element must be similarly divided between production and purchasing, the one specifying when to renew for all items as per balance sheets for production requirements, the other to be responsible for the time necessary to secure the article and for seeing that it be secured in this time.

The responsibility for cost rests of course with the purchasing agent. In practically all cases which I have encountered where losses were frequent, due to poor material management, the underlying cause was directly traceable to an illogical or to an ambiguous delegation of these four functions. Too often, indeed, they were all thrown upon the shoulders of one man, the purchasing agent.

As regards the administrative subdivision among the various other members of material personnel, there exists considerable difference of opinion. Accepting the concept that materials in the sense in which we use the word exist solely for the benefit of production, it would be logical that the balance of stores or worked

material clerk, the receiving clerk, and the storekeeper should all be under production. This arrangement is not at all universal, however. Probably the most common departure is where the storekeeper is under the purchasing agent. This has the disadvantages referred to previously of placing a department, the storeroom, which vitally affects production, under a man whose primary interest lies elsewhere, and of a too great concentration of authority in the lower limits of the organization. These arrangements at times have led to serious consequences.

The ideal arrangement both for purposes of safeguards and for incentive to quick and accurate action would have the storekeeper directly under the works manager and the balance clerk directly under the production superintendent or the head of the planning department. Here again practice differs, since the balance clerk frequently reports to the head of the cost department. Since the average cost accountant does not ordinarily appreciate the vital relation between manufacturing efficiency and control, such an arrangement again usually works out to a disadvantage. With the arrangement suggested, and particularly in the smaller plant, with the receiving clerk under the traffic department, which may in many instances report to sales, informed and energetic action as well as ample safeguards against collusion and fraud are provided. Clerical errors, furthermore, are much more readily caught where one department is working against another in this respect.

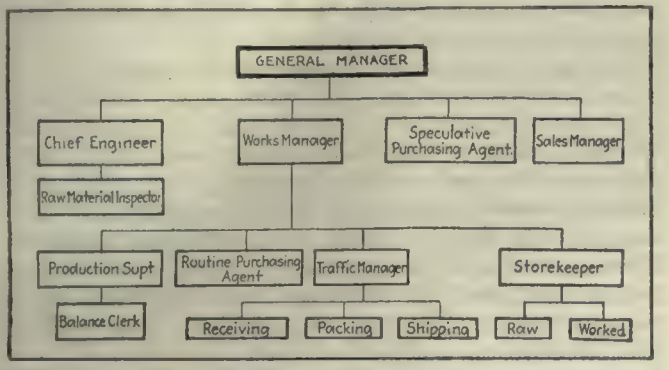


FIG. 1. ORGANIZATION CHART OF MATERIAL PERSONNEL

It must be emphasized, however, that these relations must vary with cases; that they are presented only as an arrangement which has been put in effect with excellent results in several different types of plants and which probably furnishes maximum checks with minimum labor and routine. Fig. 1 shows a skeleton organization chart of this arrangement of the material personnel.

The organization chart shows one satisfactory arrangement of the administrative relations between persons concerned with material routine. Yet even with a satisfactory organization it is always necessary to consider in addition the physical location of offices so that as a whole there may be a convenient working relation between them. The layout of the storeroom proper will be dealt with in a later article but since many cases of faulty work-relationship have come to light due simply to an improper physical location of the persons themselves, it may be useful to indicate some of the considerations which should govern the placing of these various functions.

In many cases the location for any specific department will be self-evident. For instance, in the case of the traffic department or at least that part of it which receives packages, obviously it should be placed immediately contingent to the railroad tracks and truck delivering platforms. This is both for the incoming and outgoing shipments, and necessarily the packing and shipping department should be immediately adjacent to the traffic office, whether or not these departments be under one head.

For convenience in the physical handling of packages, as well as for the transaction of the necessary paper routine, the receiving department should also be immediately adjacent to the traffic department. Here goods are received from the traffic, unpacked, checked with the copy of the purchase order and sent to the storeroom. They should pass a minimum distance from one to the other.

The storeroom, therefore, should be within reasonable truck or elevator distance of the receiving department. This is particularly true of a central storeroom, and of course the location of detached departmental or subsidiary storerooms must be carefully chosen with regard to delivery of incoming and outgoing goods.

I have encountered many cases of faulty operation of the balance of stores function due simply to the location of the balance sheets relative to the other departments with which the balance clerks deal. I consider it absolutely fundamental for effectiveness that the administrative authority for balance sheets be centered in a production official. Whoever may be intrusted with the supervision, however, there is but one logical location for the balance sheets themselves—immediately next to the production manager's elbow or whoever the official may be whose duty it is to look ahead and plan production and material needs. He is the one who has constantly to put future requirements for production against the amount of material on hand, on order, and assigned, and his work is very much handicapped unless balance sheets are instantly accessible.

This would seem almost axiomatic, and yet I have encountered numerous cases where there was a great deal of lost motion on the part of the production manager in sending or phoning to another department for information about material, information which should have been right under his thumb. The balance sheets, moreover, should not be too far from the storeroom, even where adequate automatic carriers are provided. There is much work in connection with stores handling and checking which cannot be done either by the regular factory mail system, by phone, or by pneumatic tube service, but must actually be done in consultation between the storekeeper and the balance clerk.

These and similar considerations point to the conclusion that the planning or production office should be situated just as close to the manufacturing departments and as centrally located relative to them as is possible. Follow-up will thereby be made not only easier, but also much surer and more systematic.

Cost Department Near Factory

For similar reasons I feel that the cost department, as distinct from the general accounting department, should be not only under the supervision of the works manager or the production superintendent but should be physically located close to the manufacturing department, and therefore close to the balance sheets. No matter how smooth a working system we may have, there are always innumerable questions which arise in regard to the correctness of time or job tickets, stores

of work, material issues and credits, inspection slips and numerous other sources of information which have to be adjusted in consultation between the storekeeper, the balance clerk, the cost clerk, and the foreman. Here again, any sort of communicating service will serve only for a portion of the adjustment. Ordinarily they must be made in person. When one has but to step out of his door as it were, to adjust some small matter, he is very much more likely to do it, and certainly can be very much more readily held to account for not doing it, than would be the case where this adjustment necessitated a long trip back and forth.

The general accounting offices, on the other hand, may be located wherever convenient, and it is very customary to find them in a large city many miles distant from the factory itself. There is no direct connection between general accounting and the shop. Most of the means by which costs are tied into the general accounts through reports of the cost office to the general accounting office and back again, should be worked up in the form of exhibits for the guidance of administrative officers anyhow, so that the general accounting offices may be located wherever desirable without inconvenience.

The location of the purchasing agent's office similarly may be wherever desired, although ordinarily this should be much closer to the works than the general accounting office, because of the constant necessity of consultation and the constant passage of papers between the purchasing agent and numerous other officials of the plant.

It will be understood that the above considerations apply to the plant of medium size. With increasing size, the problem of securing a balanced arrangement among various departments becomes increasingly difficult until in a plant of very large size decentralization becomes desirable. We then get back in considering individual units to the problem of the moderate sized plant just discussed. In every case, however, administrative relationships and the physical layout must be arranged so as to secure the greatest serviceability between related departments.

The Little Shop Around the Corner Is at Bat

By W. F. Sandmann

Ask any machine tool salesman what question has been hurled at him most frequently during the last six months, and almost invariably he will answer that it has been, "Who in the world is buying machinery nowadays?" or its equivalent—probably couched in more highly expressive language.

The belief of a great many manufacturing executives, especially in the large plants, is that the factories of this country are fairly bulging with surplus equipment that they or no one else have any use for. They throw up their hands in horror or try to laugh out of their office the salesman that dares to suggest new machine tool equipment.

The alert machine tool salesman is now avoiding the big plants, almost to the point of neglect, and is wandering up the byways and side streets to the little unpretentious concrete block or frame building that shelters the shop that is doing the business. He doesn't find a cork-floored waiting room and an attendant at a mahogany information desk to take his card. When he enters the door he walks right into the shop proper and when he inquires of the nearest lathe hand for the proprietor he has pointed out to him the operator of a grinder or drill press who from outward appearances is a workman of the rank and file.

The salesman doesn't expect this proprietor-workman to stop working while he talks to him for the proprietor of the "little shop around the corner" is a busy man. Instead the salesman is more than likely to lend him a hand to lift a heavy piece of work on the machine while at the same time he explains the merits of some particular new equipment which he thinks will interest this working-manager. He finds him a ready listener and he is not laughed at when he broaches the subject of new machinery here, for the little shop around the corner is in the market.

Its big brother around the corner on the main street finds competition hard. The acres of buildings and the backbone of an organization that it must keep if it ever expects to do business again means that a sizeable overhead must be met on every article produced. The overhead of the little shop is the rent, power and the salary of the office girl.

During the rush times the machinery manufacturers and dealers wasted but little time on the struggling mechanic that sought to build a business of his own up the side street. Then the big plants were taking the machine tool output without quibbling about the price. Delivery was the thing and it was with difficulty that enough tools were produced to satisfy their demands. What time was there for the little shop that wanted but one tool, and that on terms extending over a number of months? The result was the little shop couldn't get the equipment it wanted then.

But now their turn has come. The little shops around the corner are at bat now and a home-run harvest they are reaping too! Recent radio developments have put hundreds of the little shops "on their feet" with a vengeance. The demand for cheaper automobile and screw-machine parts has helped them. The big plant with the idle equipment can't touch them when it comes to a bid, for they don't have to figure in the upkeep on scores of polished desks when they make a price.

Do the owners of the little shops scour the used tool market before buying? Of course they do, but when all is said and done the greater portion of the equipment they install is new, for they are too good mechanics to be led into buying the worn-out machinery of the rush time. They get new tools and they keep them new by constant personal attention because they have no money to throw away. Besides, new equipment is alluring in a way. It holds out promise of unlimited working life and there is comfort in the knowledge that when a machine is set up it will require no overhauling or replacement of parts before it is ready to do a day's work, and the repairman will be unnecessary for a long time.

Some of these little shops around the corner will grow and grow and spread out and accumulate overhead and some day be large enough to move out beside their older brothers on the main street. But just the same when business hits one of its inevitable periods of low ebb they will have to watch their step or some new little shop around the corner will be picking off the juicy morsels.

It's all in the cycle of manufacturing though; and what a truly life-saving cycle it is for the "peddler" of machine tools and the factories he represents.

The Grinding of Gear Teeth and Its Future in the Industry

Application of Ground Gear Teeth in the Automotive Industry—Overcoming the Effects of Heat-Treatment—Elimination of Noisy Gearing by Grinding

By R. S. DRUMMOND
Vice-President, Gear Grinding Machine Co.

THE production of gears for accurate and noiseless operation has been a problem for many years and the refinement of the machinery and methods of manufacture have gone forward with each year. We are indebted to the demand in automobiles for silent operation for a great many improvements in the methods and machines for the production of machine parts of great accuracy and low cost. This article will deal largely with the application of ground gear teeth to automobile transmission gears, as this is the field which has so far used the greatest number of gears with ground teeth. This large use of ground toothed gears is proportional to the use of heat-treated gears, and has been brought about by several natural influences, such as:

a—The demand for silent operation of gears loaded and idling. The willingness of sales agents to acknowledge that noisy operation was an evidence of inefficiency and wear;

b—The demand for an unusual long life of gears without wear of the teeth with its accompanying gear noises.

c—The demand for a hardened tooth surface, which introduced the distortion due to high temperatures of heat-treating processes;

d—The need to eliminate the last ounce of unnecessary weight.

The General Result

The general result of these demands is the present-day transmission. With all its faults it is one of the most serviceable and satisfactory parts of the car construction, so long as it operates without noise.

Aside from the auto-transmission the following are some important uses of ground gears:

a—Gears made of high manganese steel (approx. 13 per cent Mn.). This composition of steel can be machined only by grinding. Gears as large as 33 in. in diameter, 20 in. face and of ¾ diametrical pitch have been ground in our shops at Detroit. These gears and others like them are in use for as long as six years without injurious wear and have replaced other similar gears which had a normal life of six to ten months. The long life of these gears is due to the high manganese content and to the fact that the initial construction provided working surfaces which were properly finished to a smooth and accurate tooth shape.

b—Main drive gears of large electric locomotives. The first attempts at gear drives of this type were noisy and increasingly so as used, due to tooth wear. An effort was made to modify the objectionable sound and wear by the use of special teeth—spiral spurs, herringbone, etc. Then the plain spur gear type was tried with the tooth shape accurately and smoothly ground, and this is the accepted standard today, as it permits the use of heat-treated gears and the finishing of the teeth to such form and shape as will operate quietly and with minimum wear.

c—Airoplane driving gears, used especially by designers where power transfer is necessary between multiple power plants, and combinations of propellers in planes of large size.

d—Geared speed reductions of the spur gear type, where large horsepower is transmitted and the operating speeds are high. During the war such heavy-duty speed reductions were in demand and many sets were produced which operated under very large loads without objectionable noise.

e—Work on tractor gears—These gears were saved for good standard use at only a fraction of their first cost by the resurfacing of the teeth.

f—Plain bevel gears and pinions such as are in use in rear axles of automobiles. Many thousands of these gears have been saved for good use, literally taken from the scrap pile and converted into good silent drives.

g—The field of broaches and gages lends itself to treatment similar to gear grinding when the external surface is toothed or splined. There is also a large field of usefulness closely related to gear tooth grinding in the grinding of the splined portion of shafts.

A short review of the attempts at gear tooth grinding is of interest.

a—The earliest effort on record was made by a gear foundryman as early as 1874, at which time emery wheels were described in the patent file showing the wheel molded to the approximate shape of the tooth space. This wheel passed between the teeth, removing some roughness and burrs. This in no wise constitutes the placing of a finish gear tooth on a gear tooth—it was simply a roughing operation intended to replace the hand truing which had previously been done with files or chipping hammer.

b—From this date little is disclosed until the effort was made in a Leland-Ferris bevel gear grinder, shown by the patent files in 1898, at which time the edge of the wheel was used with a generating type of machine to form a surface on bevel gear tooth.

c—About this same time Cheney developed a similar machine, very little different from the Leland-Ferris type.

d—In about 1891 the Fellows Company produced a generating type of machine showing very little change from previous work done by Leland and Cheney.

e—A machine was developed in Germany by the Reinicke Co., of Chemnitz, Germany. This machine used the side of the emery wheel and generated the gear tooth form.

f—Patent files show in 1906 a Phelps spur gear

Paper presented at Buffalo convention of the American Gear Manufacturers' Association.

grinder which again is a generating type of grinder.

g—We also have in this country today generating types of machines manufactured by Pratt & Whitney, Gorton, and Lees-Bradner Co. These machines are all of one general type, using the edge or the side of the emery wheel in generating the curve on the tooth surfaces. One distinctive type of gear tooth generated with emery wheels is shown in the patent of the Brown-Lipe Co. under patent issued to A. T. Brown in 1914. This machine operates with a very large segment wheel sufficiently large in diameter to approximate a flat surface where it contacts with the tooth in the grinding operation.

h—There are two other unusual types of machines for correcting tooth form. One of these is an experimental machine in use in some factories where a mechanical shaping device is in use; a piece of flat stone is rubbed against the tooth surface by the generating process. This is an awkward, inefficient and inaccurate device.

i—The second of these peculiar machines is represented by the device gotten up by Adler at Frankfurt-am-Main, where formed diamonds were set very accurately to the shape of the teeth to be formed and these diamonds so set were used as a means of trimming the revolving wheel, which was then placed against the work. It was necessary, as you will understand, to re-set these diamonds whenever they wore down. This method utterly failed.

j—It will be noted from the foregoing that a great many people have spent considerable time in an effort to properly generate the tooth form with emery wheels, in contradistinction to shaping the tooth form by the direct cutting section of the wheel when operated in the same way as the ordinary gear cutter.

With this short history of gear grinding, it can be realized that the original work done by the engineers of the Gear Grinding Machine Co. was accomplished along entirely different lines of effort. They sought to reproduce from master forms a gear tooth form upon the wheel, it being possible in a few moments to retrim the wheel and so replace the worn form without losing the setting of the machine.

It is possible on the Ward gear grinder, shown in the illustration, as used by our company, to first trim the wheel and use it for a roughing operation around the gear, removing the most serious inequalities and the extreme distortion of the heat-treatment. Then to retrim the wheel with great accuracy and remove from the teeth a finishing cut of very small amount, giving a perfect reduction on the tooth surface of the master forms from which the diamond trimmers are operated.

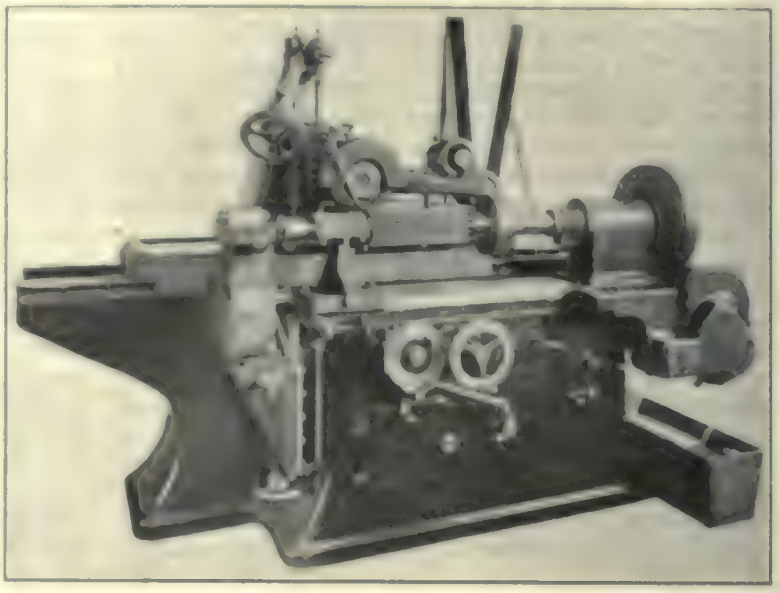
The wheel normally passes between two teeth, finishing adjacent sides of two teeth and bottom of the spaces, although it works with facility on one side of one tooth without grinding the adjacent side of the next tooth if desired. You will realize further that this gear grinder finishes the surface of the tooth from top to bottom as it passes over the tooth without small strokes which are used in some generating types of machines.

There are two distinctive uses for the grinding process for finishing gear teeth.

(1) The resurfacing of gears which have already been "finish cut" to size.

(2) The surfacing of gears which have been left with grinding stock.

Under the first of these headings we refer to the large volume of business which was done by gear grinders during the first five years that this work was actively done. The process was then used principally to salvage parts which had not passed inspection due to malformation of the teeth or distortion of their shape in heat-treatment. It is probable that one million gears have been resurfaced with gear tooth grinders with a large saving to the automobile industry. These gears, as a whole, were scrap parts which it was impossible to salvage by other processes on account of the high cost. When saved by this process of gear grinding the backlash in the gears was increased by the amount of stock which was removed from the surface of the teeth when they were corrected. This stock averaged from 0.008 to 0.006 in. on the tooth surface, adding backlash to a given gear from 0.006 to 0.012 in. in a tooth space, and such gears mated together would normally show an increase in backlash somewhere between 0.012 to 0.015 in. We will touch on the subject of backlash later.



THE WARD GEAR GRINDING MACHINE

The second division as mentioned above is the finish grinding of gear teeth which have been rough cut leaving grinding stock. Today this constitutes the largest volume of gear tooth grinding. The tendency of the market on gear teeth is decidedly toward this method of gear production, especially where the teeth are required to contact noiselessly at high speeds, and more particularly in automobile transmissions where the gears are heat-treated so that wear on the teeth will be small. In this portion of the gear tooth grinding business the refinement of the article, the finish of the gear tooth and its accurate form, is produced after the heat-treatment. This feature is really new to many people and yet it is very simple to understand, being exactly parallel to the work which is done on all other important surfaces used in the transmission of power.

The question is being asked, and asked properly: Should we use expensive machines and tools of extreme accuracy for finish-cutting, all tuned up and scraped to the last degree of accuracy; should we use

expensive refined cutters made with the most accurate form and shape, designed for production of teeth with maximum degree of accuracy; and then plunge the pieces at high temperature into a bath of oil or water and blame the results on anything but our own poor practice?

Years ago they turned shafts by accurate tools on most accurate machines, but today they leave grinding stock and finish-grind. Grinding has become so accurate a process in most parts for power transmission that roughing these parts on tonnage production machines has become standard practice.

During the last month we investigated twenty-three individual lots of gears for other companies. We found a wide variety of error, but the very largest was the distorted shape of the teeth due to heat-treatment. We have had teeth under test which could only have been produced on a rubber mandrel, or by distortion after machining, one tooth being slanted east and others slanted west. On the same gear, curves were low at points and high at points due to heat-treatment. We have heard a lot about heat-treatment within 0.0002 in., but we have not seen the evidence in quantity production. We have such high respect for temperatures over 1,000 deg. F. that we prefer to keep finished parts at a reasonable distance from them or grind the surfaces of parts after heat-treatment.

In an effort to overcome the warpage of heat-treatment the following methods have been used:

(a) Rolling gears together, then filing or stoning them to a smooth roll and a good appearance.

(b) Running the gears together relatively dry, permitting them to wear down the high spots and correspondingly wear grooves in the mating gears. Certain combinations of gear teeth can be improved in their roll by wearing a groove in one gear opposite the projecting rough places on the opposite gear. In the case of a "hunting" tooth, every tooth in the mating gear is thus damaged by the inequality in the mating gear.

(c) Running the gears together with a lapping compound causes maximum wear at the point of maximum pressure. This is like the previous method, but very much accelerated.

(d) Remating gears by hand rolling. Some operators when working on a limited number of types of gears become quite expert in mating gears with others of corresponding tooth curves. Thus they pick out a pair of gears with equally low curve position, etc. They do not always know what the result is, except that experience has shown them that the parts will work together. This process fails under severe or varied operating conditions.

(e) Mating gears by mechanical or optical measurement of the tooth form. This field holds a great benefit for the industry as soon as its use and application is cleared up.

One must consider that in a gear making tooth contact 14,000 times per minute, irregularity of contact will cause peculiar sounds. Many improperly shaped teeth cause an abrupt acceleration of the mating gear and equally abrupt slowing down. This reversal of acceleration occurring thousands of times per minute gives a harsh sound and produces rapid wear. A most common error is misplaced involute curves and irregular surface contact which cuts the oil film.

In the shape of the involute curve the shape is approximately radial near the base circle, whereas at the top it is very much rounded and falls away rapidly from a radial line. If this curve is misplaced downward as much as 0.005 in. this misplacement will effect the part of the tooth near the base circle very little but the effect at the top of the tooth is quite severe.

This effect occurred recently in a confusing manner. Idler gears were ground accurately from the bore of the gear, but made noise in the assembled transmission. Upon inspection of the idler it was found to be bushed and the bushing was eccentric, causing the tooth form to be high on one side and low on the other. The noise was not a sound of eccentricity, but a low growling sound. New accurate bushings corrected the tooth form position. One interesting feature of this transaction was that one idler which was cleaned up accurately with the tooth position and which was a loose fit on the shaft was relatively quiet.

(To be concluded in next week's issue.)

Standardization of Malleable Iron Chain

The following interesting paragraphs are taken from the report of a trade association in the industry manufacturing malleable iron chain:

During the period of fifty years in which malleable chain has been manufactured, its development had well illustrated the many abuses incident to growth without guidance and definite plans. Every time a manufacturer making a new machine decided to use malleable chain, it was common to call for a special type rather than to adhere to well developed sizes already made. This practice, which was often merely a whim, is also traceable to a mistaken policy of applying special parts for purposes of assuring an exclusive repair business. The result was an accumulation of thousands of slightly different patterns, lack of interchangeability to a marked degree, confusion and irritation to customers, and high costs to both the producer and the consumer.

The first step of standardization was the selection of an assortment of chains which would cover all reasonable requirements of design and application, which would be standard stock items. Beyond these an additional list was made, including chains required by certain manufacturers because of present design and demanded in reasonably large production quantities; these to be listed in catalogs but to be made up on customers' orders only. This plan gives the benefit of quantity production costs and shipment from stock to those customers who arrange to use stock items. Naturally this policy will continue the encouragement of the application of stock items.

The effects of elimination are shown in the case of one maker who listed 2,044 items previous to industry standardization, and who since then shows 820 items. This is a reduction of 60 per cent, although some types afforded greater opportunity for elimination than others, the maximum being 75 per cent in one type. However, it must be remembered that although 40 per cent of the items remain for catalog listing, there are probably only 20 per cent of the original number which are shown as being carried in stock.

Technical inquiry into dimensions led to consideration of weight, design and quality, resulting eventually in a cooperative series of tests of the present stock output. Over 2,000 physical tests and several hundred chemical tests have shown makers those possibilities which exist for the improvement of product and consequent increased serviceability.

It will be seen that the original suggestion from the War Industries Board which covered elimination of items only has developed a program of standardization—now accomplished—covering dimensional interchangeability, standard designation and the assurance of better product. The resulting benefits to both maker and buyer are self evident.

Alloys of Aluminum

Why Copper Alloy Is Preferable—Superior Casting Properties of Aluminum Alloys—Casting Alloy No. 12—How To Machine Alloys

From Sales Department Condensed Data Prepared by the Technical Department, Aluminum Company of America

THE two principal alloying ingredients of aluminum casting alloys at the present time are copper and zinc, usually taking the form of aluminum-copper or aluminum-zinc-copper alloys. Manganese and magnesium are frequently used. Nickel, chromium, tin and other metals have been alloyed with aluminum with varying degrees of success, but their application has never been very extensive and their use is advisable only in very special cases. Under certain conditions, bismuth, cadmium, lead and chromium do not mix with molten aluminum, but form two liquid layers in much the same way as do oil and water.

When commercially pure aluminum is alloyed with one or more of the common metals, the usual effects are an increase in the tensile strength and hardness, a reduction in the shrinkage and an improvement in the machining qualities of the metal. These are all desirable results for they correct those qualities in the pure aluminum which make it unfit for general casting purposes. These effects, however, are accompanied by a decrease in the elongation, which reduces the ductility of the metal and renders it more rigid.

Inasmuch as pure aluminum is very ductile a certain amount of its ductility may be sacrificed for greater tensile strength and hardness, without making the alloy too brittle for casting purposes. The degree of this sacrifice will depend upon the duty which the casting must perform. For example, a casting which will be subjected to the shock and vibration of an automobile motor will require an alloy very different from a casting which in actual service will be stationary and not subject to sudden shock or vibration. An alloy for the latter purpose may be stiff and rigid to an extent that would render it unsuitable in an automobile casting. Increased tensile strength and hardness are not always accompanied by a decrease in the elongation. However, there is usually a decrease in elongation when the increase in strength and hardness is caused by a change in the chemical composition of the alloy; but any change in the casting conditions which increase the tensile strength of an alloy, also increases the elongation; hence, there is a double gain of tensile strength and ductility.

What is true of alloying aluminum with small quantities of other metals is also generally true when other metals are alloyed with small amounts of aluminum. When this is done the good effects, as in the previous case, at first predominate, but the tendency for the ductility to decrease is present and it increases as the amount of aluminum increases.

In the United States the inclination of manufacturers toward the use of a very small number of standard alloys is, we think, a logical one. It is logical because the possible range of physical properties except for special purposes, may be obtained by the proper manipulation of very few of the infinite number of combinations of aluminum with other metals; because of the economies following increased efficiency of the foundry which standardizes on one or two satisfactory alloys; and last, but not least, because of the increasing good will which accrues to the account of the foundry turning out a uniform and reliable product.

INCREASED TENSILE strength and hardness, reduction in shrinkage, decrease in elongation, reduction in ductility, are the results obtained in alloying aluminum.

Copper alloys cast well and give little checking or drawing trouble.

Zinc is sensitive to temperature, which limits its application, requires very careful founding, but produces a sharp, sound casting.

Magnesium alloys are harder, stronger and lighter than pure aluminum. They have tensile strength equal to No. 12 Alloy and greater elongation.

The useful aluminum alloys may be divided into two groups: (1) Those of aluminum with not more than 20 to 35 per cent of other metals, and (2) those of other metals containing not over 10 to 15 per cent aluminum. Usually, alloys lying between these limits have no commercial value. Alloys of the former class are generally referred to as "light aluminum alloys" and those in the latter class as "heavy aluminum alloys." It is with alloys of the former class that we are here principally concerned.

All the useful alloys of the aluminum-copper series may be placed in one or the other of the two classes: Those containing less than 15 per cent copper, and those containing less than 11 per cent aluminum. The first class embraces the alloys most applicable to general casting purposes in the aluminum industry. The addition of copper increases the tensile strength and hardness, reduces the shrinkage and improves the machining qualities of the pure aluminum. The alloying also decreases the elongation, and thereby detracts from the toughness of the metal and ultimately limits the amount of copper that can be added. It has been found that an alloy composed of more than about 15 per cent of copper is not of practical use. However, if the copper content is kept well within this limit, the alloy is sufficiently tough for most uses. Because of the nature of their constituents, alloys of this class are not subject to burning in the foundry, as are alloys containing more volatile metals.

The copper content in this series of alloys is now fairly well standardized. After years of experimentation and commercial practice in which almost every combination of aluminum and copper has been tried, trade sentiment has gradually crystallized in favor of an alloy containing from 7.0 to 8.5 per cent copper

This amount of copper produces a tough alloy the tensile strength of which will vary from 15,000 to 20,000 lb. per square inch, depending upon the casting conditions. It casts well and gives little trouble from checking and drawing of the casting, and is the one most generally used for all-round aluminum casting work. It is commonly known as No. 12 Alloy and will be discussed in detail later.

Alloys containing a higher copper content than this are sometimes used in the United States for castings which are to be subjected to high temperatures, water or steam pressure. A high copper alloy is frequently used in the die-casting industry because of its relatively low shrinkage. Inasmuch as castings made from such alloys may fail if subjected to repeated shocks and stresses, foundrymen should inform themselves as to the purpose for which the casting is required before they attempt the use of such alloys.

Alloys of the second class, containing less than 11 per cent aluminum, are known as aluminum bronzes. The aluminum content usually ranges from 1 to 10 per cent, that containing 10 per cent aluminum probably being most popular. A greater amount makes the metal hard and brittle, for the effect of aluminum is very similar to that of copper in the light alloys of aluminum. The tensile strength of aluminum bronzes is high, and ranges from 80,000 to 110,000 lb. per square inch. These bronzes do not corrode readily, and have a great resistance to alternating stresses, being superior to some steels in this respect. However, a detailed discussion of the aluminum bronzes will not be attempted here, for obviously they do not fall in the class of light aluminum alloys now under consideration.

Intermediate alloys of the aluminum-copper series, ranging from 15 to 90 per cent of copper, give crystalline and brittle grayish-white alloys of no use. After about 80 per cent of copper is reached the red color of the copper begins to show.

Zinc Sensitive to Temperature

The useful alloys of the aluminum-zinc series may, like those of aluminum and copper, be divided into two classes: Those containing less than 33 per cent zinc, and those containing a relatively small amount of aluminum.

The first class comprises the useful zinc casting alloys. Zinc produces a very strong alloy with aluminum, the tensile strength running as high as 38,000 lb. per square inch for the alloy consisting of 50 per cent zinc and 50 per cent aluminum. Such an alloy, however, is excessively brittle. The decrease in ductility of these alloys as the zinc content increases places the maximum of zinc at 33 per cent, and even this is much too high if the casting is expected to withstand stresses. The best aluminum-zinc alloys usually possess considerably less zinc than this. Zinc tends to give additional fluidity to aluminum, and produces sharp and sound castings when skillfully cast.

For forging, few metals excel an alloy containing from 10 to 15 per cent zinc. This alloy is tough, flows well under the forging dies and produces a finished product which is solid, easily machined and remarkably strong per unit of area. Castings made from aluminum-zinc alloys machine well, and the machining qualities improve with aging of the metal.

Alloys of this class seem to be unusually sensitive to irregularities in the casting process. If the metal is overheated there is danger that the zinc may be burned out. In addition, these alloys are more subject to drawing in heavy parts or lugs than are the copper alloys. This tendency, however, can in most cases be overcome by proper gating, suitable chills and risers, and adequate temperature control. Zinc alloys are unusually sensitive to high temperatures, and therefore cannot be used where the casting will be subjected to considerable heat. A casting made from a 25 per cent zinc alloy when raised to a temperature of 100 deg. C. loses one-third of the tensile strength it possessed at 20 deg. C. Zinc alloys have never been very popular in the United States. Doubt in the minds of many as to their freedom from deterioration with age has probably had much to do with their limited use. Recent tests by Rosenhain and Archbutt, however, seem to disprove such deterioration. The ease with which zinc alloys may be injured in the melting process may also account to a certain extent for their unpopularity. A better understanding of the peculiarities of this series of alloys will undoubtedly result in their more extensive use, particularly for small inexpensive castings which are not to be subjected to severe shocks or strains.

Alloys in the second class of the aluminum-zinc series, those composed of relatively small amounts of aluminum, are known as aluminized-zinc. The aluminum content is usually 5 or 10 per cent. These alloys are used in zinc galvanizing baths to make the bath more fluid and to clear it of oxides, and in the manufacture of aluminum brass, but they are never used directly as are the aluminum-zinc casting alloys.

Zinc-Copper a Favorite Alloy

As previously stated, an alloy of aluminum and zinc has never been very popular in the United States. Where zinc is used the trade favors the addition of small quantities of copper. Copper increases the tensile strength, improves the casting qualities and gives greater rigidity to the aluminum-zinc alloy. In England an alloy composed of 13 per cent zinc and 3 per cent copper is used quite extensively. In the United States an alloy containing 15 per cent zinc and 3 per cent copper finds most favor, and is known to the trade as No. 31 Alloy. These alloys, either with or without the addition of copper, have never been as popular in the United States as they are in Europe, especially in England, where such an alloy holds much the same prominent position as No. 12 Alloy occupies in the United States, being used for automobile castings and for casting work in general.

In general, manganese influences aluminum in much the same manner as copper, renders it first both harder and stronger but less ductile, and subsequently decreases the strength as well as the ductility. Manganese alloys are very resistent to corrosion, being superior to the pure aluminum in this respect, the resistance increasing with increase in the manganese content. These alloys are most frequently rolled into sheets, but as 1½ and 2 per cent manganese alloys are dense and close grained, they are not infrequently used for casting small parts, such as pipe fittings, which are to be subjected to water or steam pressure.

Alloys of magnesium with aluminum are usually known as magnalium. Because of the great affinity of magnesium for oxygen, these alloys tend to form considerable dross on remelting unless the magnesium content is low. As a result, it is not generally good practice to add more than 5 per cent magnesium. Most alloys

possess even less than this amount, and few commercial alloys carry over 2 per cent magnesium.

Magnesium alloys are harder, stronger and lighter than pure aluminum. Their tensile strength is practically equal to that of No. 12 Alloy, and their elongation is greater. Magnesium tends to make the mixture more fluid at low temperatures.

Magnesium may be introduced in the following manner: The pure magnesium is held in a pair of iron tongs and pushed slowly to the bottom of the crucible after it has been removed from the fire, or in the ladle just before pouring. It must be stirred slowly until the magnesium has completely melted from the tongs as determined by the sense of touch. The magnesium should be added in small amounts. If a long stick is pushed into the crucible it may break and the broken pieces float to the surface, where they will catch fire before they are melted, taking oxygen from the air instead of from the aluminum or the dissolved gases. After sufficient magnesium has been added more vigorous stirring should be continued for a short time in order to give the oxide of magnesium a chance to float to the surface. Then it should be poured and skimmed in the usual way. No other flux is necessary. Care should be taken to see that the tongs and magnesium are dry, to eliminate violent action and danger in introducing the magnesium.

Other Alloys Less Useful

Nickel is sometimes used as a hardener for aluminum, and produces practically the same effect as copper. However, as nickel costs more than copper, and as it has been found very difficult to make the nickel-rich alloy for incorporating the nickel in the melts, there is very little possibility that nickel will supplant copper as an alloying ingredient. The nickel content should never exceed 5 per cent, for a 5 per cent alloy develops practically the full tensile strength that can be obtained without decreasing the elongation to such an extent that the casting would be unsuitable for commercial foundry work. Aluminum-nickel alloys for casting purposes will probably never be used very extensively.

Small proportions of tin are sometimes advantageously used with aluminum to give greater strength and rigidity to heavy castings as well as to reduce the shrinkage of the metal. Tin also serves to give sharpness to the outline of the casting. This tendency, however, to reduce the elongation to the point of impracticability prevents the general use of tin-aluminum alloys.

No casting alloys of any value are formed by alloying aluminum with iron. A small amount of iron always occurs in aluminum as an impurity, but is only detrimental when it exists in amounts exceeding 1.5 to 2.0 per cent. The effect of more than these percentages of iron is to dangerously reduce the elongation. It also makes the molten metal sluggish, necessitating a higher temperature in the furnace with the consequent tendency toward blow holes and shrinkage cracks in the finished casting. There are very few commercial metals not chemically pure which contain as little iron as does the aluminum upon the market at the present time. Aluminum is extensively used as a deoxidizer in the manufacture of steel and is used in the form of the commercially pure metal.

Silicon in the ordinary casting alloys hardens the metal, reduces elongation and affects adversely the machining qualities when it occurs in too large quantities. Care should always be taken to keep the silicon content low, not exceeding 1.0 to 1.5 per cent.

Preparing No. 12 Alloy

As manufactured by the Aluminum Company of America, Number 12 Alloy consists of 7.0 to 8.5 per cent copper and not over 1.7 per cent other elements, balance aluminum. When properly cast this alloy can be depended upon to have the following physical properties:

Tensile strength, pounds per square inch, sand cast	18,000
Elongation in 2 in., per cent	1.5
Specific gravity	2.84 to 2.87
Brinnell hardness (10 mm. ball at 500 kg.)	50–65
Shrinkage in inches per foot	0.18
Electrical conductivity, annealed copper taken as 100	30–35

The alloy is made in lots of approximately 11,000 lb. per heat. Each heat is carefully guarded as to the amount and quality of the ingredients, is melted under rigid pyrometric control and is subjected to detailed chemical analysis.

This alloy is used extensively in the automobile industry for crankcases, transmission housings, oil pans, etc., and for all general casting purposes which call for a tough and strong alloy capable of withstanding repeated shocks and vibration. It was successfully used in the difficult Liberty motor castings, for which the requirements were exacting and the inspection very rigid.

The time saved in machining aluminum is often sufficient to make an aluminum casting requiring a great deal of machining, cheaper than an iron or brass casting of the same kind. Tools should be operated faster for aluminum than for brass while the feed should be slightly slower. A good lubricant should always be used. For boring and reaming pure lard oil is the best, while for turning and facing, a mixture of lard oil and benzine, 50 per cent each, works well. For all jobs of tapping and chasing and for general work, an ordinary non-alkaline cutting compound is used.

Tools should be ground with plenty of clearance; that is, they should increase slowly in thickness from the edge. A razor blade is an example of extreme clearance. While tools for machining aluminum should not, of course, have clearance to that same degree, they should have considerably more than similar tools used for machining brass or iron. The cutting tools should have a highly whetted edge such as would be used in woodwork, for dull tools will tear and drag the aluminum.



Geometric Progressions by Short-Cut Methods

The Value of These Progressions to Standardization—Four Simple Methods—How They May Be Utilized in Machine Design

By LUTHER D. BURLINGAME
Chairman, Sectional Committee of A. S. M. E. and S. A. E. on Standardization and Unification of Screw Threads

THE use of geometric progressions for proportioning mechanical work has been greatly increased in recent years, because there has been a growing realization that for many purposes proportions are best graded when in geometric progression. This is true, whether it is a question of the proportion for spindle

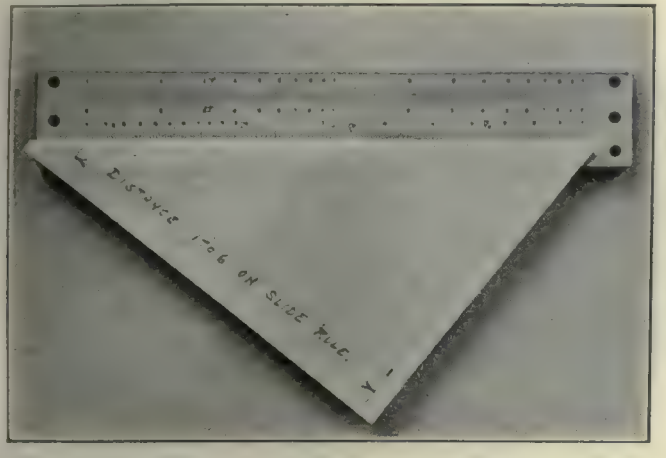


FIG. 1. GEOMETRIC PROGRESSION FOUND WITH SLIDE RULE AND CROSS-SECTION PAPER

speeds from the slowest to the fastest, for feeds from the finest to the coarsest, or of the proportion for screw diameters, wire gage sizes, key sizes, or diameters of arbors, or whether it is determining the capacities or proportions of a series of machines.

Recent work in standardization has brought the advantage of the use of geometric progression very prominently to the front, and one of the first tests to be applied to any new line of standardization is whether the sizes or proportions recommended follow a geometric progression.

The principle of having the feeds of machine tools such as milling machines, for example, follow a geometric progression, has been used for a great many years. The Brown & Sharpe milling machines on the market in the '80's had belt feeds so proportioned, and geared feeds and speeds have since followed the same rule. In 1895, Carl G. Barth took out a patent for a feed operating device which included a train of gears in geometric progression, and in this patent he emphasized the importance of proportioning the feeds in such a progression.

The German engineers, in their recent standardization work, have proposed a series of "preferred numbers" in geometric progression, these numbers ranging from 10 to 100. In the "20" series the selected numbers are spaced in geometric progression from 10 up to 100 in twenty steps, making twenty-one preferred numbers in the series. The alternate numbers produce a "10" series of eleven preferred numbers, while again taking the alternate numbers of the "10" series produces a "5" series of six preferred numbers, so that different requirements can be filled depending upon how close the succeeding steps should be to each other. This all tends toward uniformity in scientific work and correlates the varying lines of standardization.

In many cases an approximation only is desired in the nearest round numbers. But this must be one that still approaches a geometric progression, and is based on that principle. When such is the case, short-cut methods which can be readily used become especially useful. This applies also to standardization and similar work which requires reviewing or inspection and where such methods can be used to check the work of others.

I have found several different short-cut methods that have proved convenient, and the one to be chosen depends on the particular conditions of the problem. As these methods may be useful to the reader, I will describe them with simple problems to show their application. The first method can be applied if a slide rule and cross-section paper are available.

As an example, find the proportion for the shaft keys of shafts from 1 to 6 in. in diameter. It is determined that to adequately provide for the needs, there shall be thirteen sizes of keys within this range. Both the keys and the diameters of shafts where the keys change from one size to another, to give the best range, should be in geometric progression to the nearest even fractional sizes.

To find the geometric progression for diameters of shafts between 1 and 6 in., space with a compass on the slide rule the distance from 1 to 6. On the section paper with the compass so set, strike a radius until it intersects some line which can easily be divided into twelve parts because there are twelve steps in the series. For example, 3 in., divided into quarters give twelve steps.

TABLE I. PROPOSED STANDARD FOR KEYS
13 Sizes, 12 Steps.

Shaft		Key	
Geometric Progression	Approximate Fractional Size	Geometric Progression	Approximate Fractional Size
1.00	1	0.250	$\frac{1}{4}$
1.16	$1\frac{1}{16}$	0.290	$\frac{5}{16}$
1.35	$1\frac{3}{8}$	0.338	$\frac{3}{8}$
1.57	$1\frac{9}{16}$	0.393	$\frac{7}{16}$
1.82	$1\frac{13}{16}$	0.456	$\frac{1}{2}$
2.11	$2\frac{1}{8}$	0.529	$\frac{9}{16}$
2.45	$2\frac{1}{2}$	0.612	$\frac{5}{8}$
2.84	$2\frac{7}{8}$	0.712	$\frac{3}{4}$
3.29	$3\frac{1}{4}$	0.828	$\frac{7}{8}$
3.82	$3\frac{3}{4}$	0.960	1
4.45	$4\frac{1}{2}$	1.115	$1\frac{1}{8}$
5.15	$5\frac{1}{4}$	1.295	$1\frac{5}{16}$
6.00	6	1.500	$1\frac{1}{2}$

possess even less than this amount, and few commercial alloys carry over 2 per cent magnesium.

Magnesium alloys are harder, stronger and lighter than pure aluminum. Their tensile strength is practically equal to that of No. 12 Alloy, and their elongation is greater. Magnesium tends to make the mixture more fluid at low temperatures.

Magnesium may be introduced in the following manner: The pure magnesium is held in a pair of iron tongs and pushed slowly to the bottom of the crucible after it has been removed from the fire, or in the ladle just before pouring. It must be stirred slowly until the magnesium has completely melted from the tongs as determined by the sense of touch. The magnesium should be added in small amounts. If a long stick is pushed into the crucible it may break and the broken pieces float to the surface, where they will catch fire before they are melted, taking oxygen from the air instead of from the aluminum or the dissolved gases. After sufficient magnesium has been added more vigorous stirring should be continued for a short time in order to give the oxide of magnesium a chance to float to the surface. Then it should be poured and skimmed in the usual way. No other flux is necessary. Care should be taken to see that the tongs and magnesium are dry, to eliminate violent action and danger in introducing the magnesium.

Other Alloys Less Useful

Nickel is sometimes used as a hardener for aluminum, and produces practically the same effect as copper. However, as nickel costs more than copper, and as it has been found very difficult to make the nickel-rich alloy for incorporating the nickel in the melts, there is very little possibility that nickel will supplant copper as an alloying ingredient. The nickel content should never exceed 5 per cent, for a 5 per cent alloy develops practically the full tensile strength that can be obtained without decreasing the elongation to such an extent that the casting would be unsuitable for commercial foundry work. Aluminum-nickel alloys for casting purposes will probably never be used very extensively.

Small proportions of tin are sometimes advantageously used with aluminum to give greater strength and rigidity to heavy castings as well as to reduce the shrinkage of the metal. Tin also serves to give sharpness to the outline of the casting. This tendency, however, to reduce the elongation to the point of impracticability prevents the general use of tin-aluminum alloys.

No casting alloys of any value are formed by alloying aluminum with iron. A small amount of iron always occurs in aluminum as an impurity, but is only detrimental when it exists in amounts exceeding 1.5 to 2.0 per cent. The effect of more than these percentages of iron is to dangerously reduce the elongation. It also makes the molten metal sluggish, necessitating a higher temperature in the furnace with the consequent tendency toward blow holes and shrinkage cracks in the finished casting. There are very few commercial metals not chemically pure which contain as little iron as does the aluminum upon the market at the present time. Aluminum is extensively used as a deoxidizer in the manufacture of steel and is used in the form of the commercially pure metal.

Silicon in the ordinary casting alloys hardens the metal, reduces elongation and affects adversely the machining qualities when it occurs in too large quantities. Care should always be taken to keep the silicon content low, not exceeding 1.0 to 1.5 per cent.

Preparing No. 12 Alloy

As manufactured by the Aluminum Company of America, Number 12 Alloy consists of 7.0 to 8.5 per cent copper and not over 1.7 per cent other elements, balance aluminum. When properly cast this alloy can be depended upon to have the following physical properties:

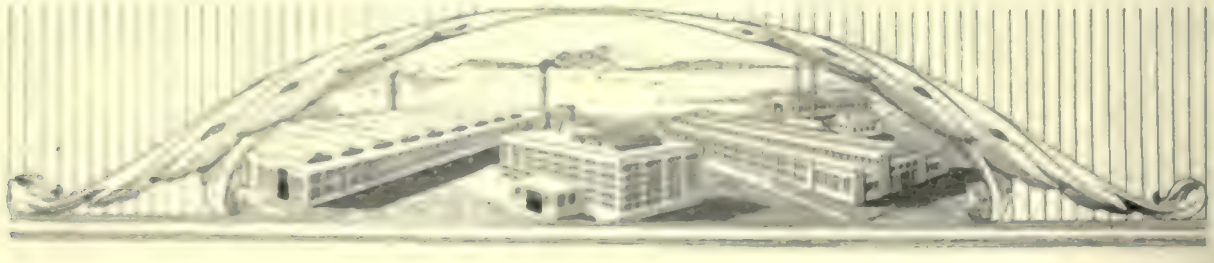
Tensile strength, pounds per square inch, sand cast	18,000
Elongation in 2 in., per cent	1.5
Specific gravity	2.84 to 2.87
Brinnell hardness (10 mm. ball at 500 kg.)	50–65
Shrinkage in inches per foot	0.18
Electrical conductivity, annealed copper taken as 100	30–35

The alloy is made in lots of approximately 11,000 lb. per heat. Each heat is carefully guarded as to the amount and quality of the ingredients, is melted under rigid pyrometric control and is subjected to detailed chemical analysis.

This alloy is used extensively in the automobile industry for crankcases, transmission housings, oil pans, etc., and for all general casting purposes which call for a tough and strong alloy capable of withstanding repeated shocks and vibration. It was successfully used in the difficult Liberty motor castings, for which the requirements were exacting and the inspection very rigid.

The time saved in machining aluminum is often sufficient to make an aluminum casting requiring a great deal of machining, cheaper than an iron or brass casting of the same kind. Tools should be operated faster for aluminum than for brass while the feed should be slightly slower. A good lubricant should always be used. For boring and reaming pure lard oil is the best, while for turning and facing, a mixture of lard oil and benzine, 50 per cent each, works well. For all jobs of tapping and chasing and for general work, an ordinary non-alkaline cutting compound is used.

Tools should be ground with plenty of clearance; that is, they should increase slowly in thickness from the edge. A razor blade is an example of extreme clearance. While tools for machining aluminum should not, of course, have clearance to that same degree, they should have considerably more than similar tools used for machining brass or iron. The cutting tools should have a highly whetted edge such as would be used in woodwork, for dull tools will tear and drag the aluminum.



Geometric Progressions by Short-Cut Methods

The Value of These Progressions to Standardization—Four Simple Methods—How They May Be Utilized in Machine Design

By LUTHER D. BURLINGAME
Chairman, Sectional Committee of A. S. M. E. and S. A. E. on Standardization and Unification of Screw Threads

THE use of geometric progressions for proportioning mechanical work has been greatly increased in recent years, because there has been a growing realization that for many purposes proportions are best graded when in geometric progression. This is true, whether it is a question of the proportion for spindle

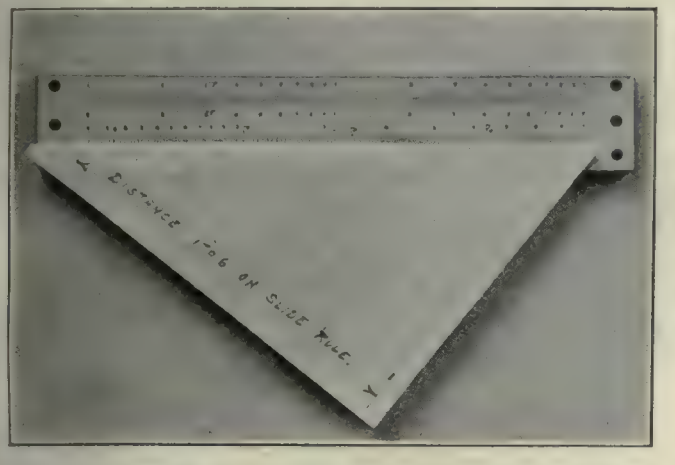


FIG. 1. GEOMETRIC PROGRESSION FOUND WITH SLIDE RULE AND CROSS-SECTION PAPER

speeds from the slowest to the fastest, for feeds from the finest to the coarsest, or of the proportion for screw diameters, wire gage sizes, key sizes, or diameters of arbors, or whether it is determining the capacities or proportions of a series of machines.

Recent work in standardization has brought the advantage of the use of geometric progression very prominently to the front, and one of the first tests to be applied to any new line of standardization is whether the sizes or proportions recommended follow a geometric progression.

The principle of having the feeds of machine tools such as milling machines, for example, follow a geometric progression, has been used for a great many years. The Brown & Sharpe milling machines on the market in the '80's had belt feeds so proportioned, and geared feeds and speeds have since followed the same rule. In 1895, Carl G. Barth took out a patent for a feed operating device which included a train of gears in geometric progression, and in this patent he emphasized the importance of proportioning the feeds in such a progression.

The German engineers, in their recent standardization work, have proposed a series of "preferred numbers" in geometric progression, these numbers ranging from 10 to 100. In the "20" series the selected numbers are spaced in geometric progression from 10 up to 100 in twenty steps, making twenty-one preferred numbers in the series. The alternate numbers produce a "10" series of eleven preferred numbers, while again taking the alternate numbers of the "10" series produces a "5" series of six preferred numbers, so that different requirements can be filled depending upon how close the succeeding steps should be to each other. This all tends toward uniformity in scientific work and correlates the varying lines of standardization.

In many cases an approximation only is desired in the nearest round numbers. But this must be one that still approaches a geometric progression, and is based on that principle. When such is the case, short-cut methods which can be readily used become especially useful. This applies also to standardization and similar work which requires reviewing or inspection and where such methods can be used to check the work of others.

I have found several different short-cut methods that have proved convenient, and the one to be chosen depends on the particular conditions of the problem. As these methods may be useful to the reader, I will describe them with simple problems to show their application. The first method can be applied if a slide rule and cross-section paper are available.

As an example, find the proportion for the shaft keys of shafts from 1 to 6 in. in diameter. It is determined that to adequately provide for the needs, there shall be thirteen sizes of keys within this range. Both the keys and the diameters of shafts where the keys change from one size to another, to give the best range, should be in geometric progression to the nearest even fractional sizes.

To find the geometric progression for diameters of shafts between 1 and 6 in., space with a compass on the slide rule the distance from 1 to 6. On the section paper with the compass so set, strike a radius until it intersects some line which can easily be divided into twelve parts because there are twelve steps in the series. For example, 3 in., divided into quarters give twelve steps.

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1.82	1 13/16	0.456	½
2.11	2 1/8	0.529	9/16
2.45	2½	0.612	5/8
2.84	2 7/8	0.712	¾
3.29	3 3/8	0.828	⅞
3.82	3 7/8	0.960	1
4.45	4½	1.115	1 1/8
5.15	5 1/8	1.295	1 5/16
6.00	6	1.500	1½

Draw a diagonal line where the radius intersects the 5-in. line. The quarter inches on the cross-section paper will subdivide the space on the slide rule from 1 to 6 into twelve equal parts. After the paper has been cut or folded along the line of the diagonal as shown in Fig. 1, it may then be laid against the graduations on the slide rule and the sizes of the shaft in geometric progression read and tabulated. These results will be found in Table I where the approximate fractional sizes selected are also given. When the smallest and largest keys to be used are determined, the geometric progression between these limits will

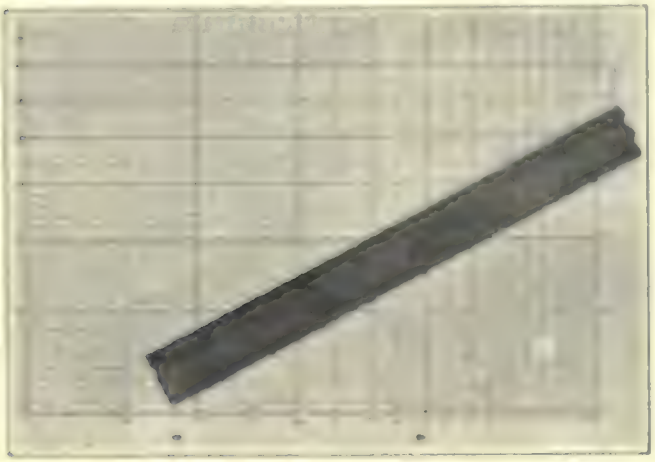


FIG. 2. GEOMETRIC PROGRESSION FOUND WITH LOGARITHMIC PAPER AND SCALE

indicate the proportions which the keys themselves should follow. Table I gives also the geometric progression of keys from ¼ to 1¼ in. and the approximate fractional sizes.

Where logarithmic paper is available it can often be used to advantage for this kind of a problem. As an example, design a line of milling machines of six sizes with the longitudinal travel of the smallest 18 in. and of the largest 30 in. To have the longitudinal travels vary in geometric progression, divide the space on the logarithmic paper between 18 and 50 into five equal

TABLE II. MILLING MACHINE SERIES
LONGITUDINAL TRAVERSE
6 Lengths, 5 Steps

Geometric Progression	Selected Series	Geometric Progression	Selected Series
18 0	18	33 1	33
22 1	22	40 2	41
27 1	27	50 0	50

parts. This can be done by laying an ordinary scale diagonally on the paper at such an angle that 5 in., as five steps are required, coincide with the lines 18 and 50 as illustrated in Fig. 2. Each inch space on the scale will represent one of the steps in the series. The figures given in Table II will thus make up the range of longitudinal travel such a series of milling machines should possess.

In another method which suggested itself as especially convenient for many problems of this character, the slide rule is set in a block of wood, so that an ordinary foot rule and triangle can be used in connection with the block to read off the proportions. The block shown in Fig. 3 answers all the requirements. It may be of interest to note that this block, made by a patternmaker, was completed within seven minutes from the time the job was first put into his hands. This period includes the time required for instructions as to what was wanted. This is mentioned as an illustration of how simply and cheaply many jobs may be done and prove satisfactory, if conducted in the right way.

TABLE III. DIAMETERS OF BEARINGS
FOR SERIES OF LIMITS AND TOLERANCES
5 Diameters, 4 Steps

Geometric Progression	Selected Diameters	Geometric Progression	Selected Diameters
0 500	½	3 250	3½
0 932	1	6 00	6
1 730	2		

To illustrate the use of this apparatus in connection with standardization work, determine the sizes of the bearings at which the tolerances and limits should be increased in a series up to 6 in. in diameter, and assume the proportions to be varied in six steps. If ½ in. is assumed to be the largest size of the first step and 6 in. the largest size of the final step, then the geometric progression of five sizes, or four steps, between these limits can be found. One end of the scale is placed on the block in line with 0.5 on the slide rule using a triangle to secure the correct alignment. The triangle can then be moved to 6 on the slide rule and the scale swung with the end resting against the steel rule as a pivot until the 4-in. point on the scale, as four is the required number of steps, intersects the

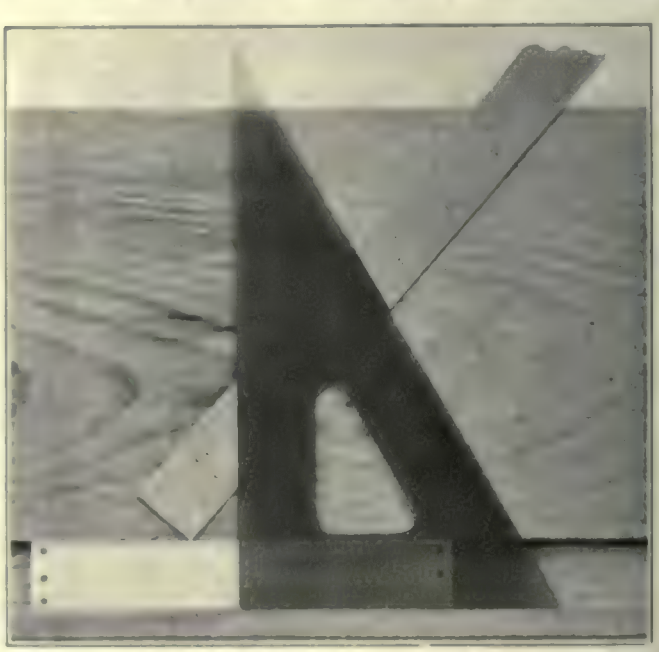


FIG. 3. SIMPLE APPARATUS TO USE WITH SLIDE RULE

edge of the triangle. Then the reading on the slide rule, when the triangle is brought in line with each even inch of the scale, will give the desired geometric progression.

This involves a condition which did not exist in the first two problems, where the largest size is more than ten times the size of the smallest. Therefore this requires that the reading shall be on the upper scale of the slide rule where the series is repeated, although by extending the slide of the slide rule as in Fig. 4 it could be read on the lower scale if greater accuracy were required. In this case the scale should be set so

that the 8-in. mark coincides with the edge of the triangle when the latter is set at 6 on the slide rule, and each reading should be taken 2 in. apart on the scale.

In Fig. 3 is shown the triangle set at the 1-in. mark for the second reading, and shows that the next size above 0.5 in geometric progression would be 0.932. Table III gives the complete series and the approximate fractional sizes.

The last illustration, Fig. 4, indicates the method of calculating a series which has an extreme range that will require the use of the full upper scale with the

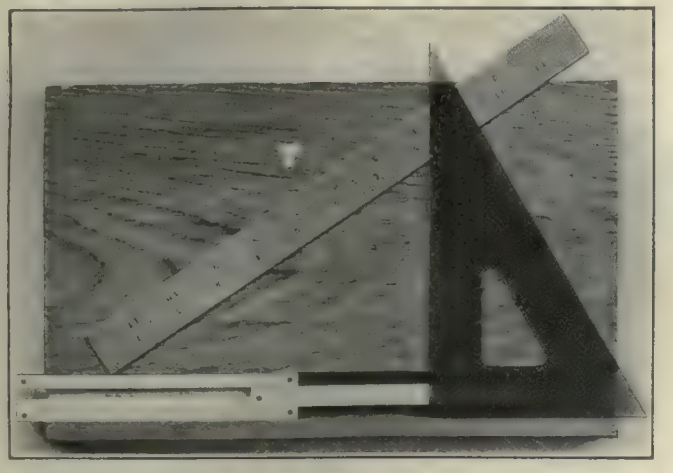


FIG. 4. APPARATUS SET FOR EXTREME VARIATION, USING ALL FOUR OF THE SERIES ON UPPER SCALE AND SLIDE

slide extended. For an example of this kind it is convenient to use a pocket slide rule because it is so short that such a series can be obtained within the range of the ordinary one-foot rule and draftsman's triangle and with a comparatively small-sized guiding block.

As an example, obtain a range of numbers from 4

TABLE IV. SERIES OF NUMBERS FROM 4 to 10,000
11 Series, 10 Steps

Geometric Progression	Selected Round Numbers	Geometric Progression	Selected Round Number
4.0	4	440	450
8.8	10	960	950
19.2	20	2,080	2,100
41.8	40	4,600	4,600
91.0	90	10,000	10,000
199	200		

to 10,000, with ten steps, making eleven in the series. Set the end of the steel scale in line with 4 in the first series of the upper scale on the slide rule. Set the triangle at 1, for 10,000, at the extreme right-hand end of the slide on the slide rule when the latter is extended, and swing the steel scale until the 10-in. mark intersects the face of the triangle. Then each inch on the scale will be in a position to indicate the corresponding geometric progression as the triangle is pushed along the block. Fig. 4 shows the setting at the eighth step to be 2,080. Table IV gives the complete series approximately.

An early application of the principle of geometric progression to mechanical work was made in the production of the American or Brown & Sharpe wire gage (designed in 1857 by Lucian Sharpe of the Brown & Sharpe Manufacturing Co.), which had forty-four published sizes ranging from 0.006144 to 0.460. The British Association screw thread standard is also arranged in geometric progression. Series like these can be readily laid out or checked by the methods shown above.

It is believed that an appreciation of the ease with which these methods can be used even by those who are not technically trained would lead to a much more general use of a principle which, when properly applied, will give the fewest numbers in a series to cover the requirements, whatever these may be, and thus secure the most satisfactory results.

The Foreman's Duties

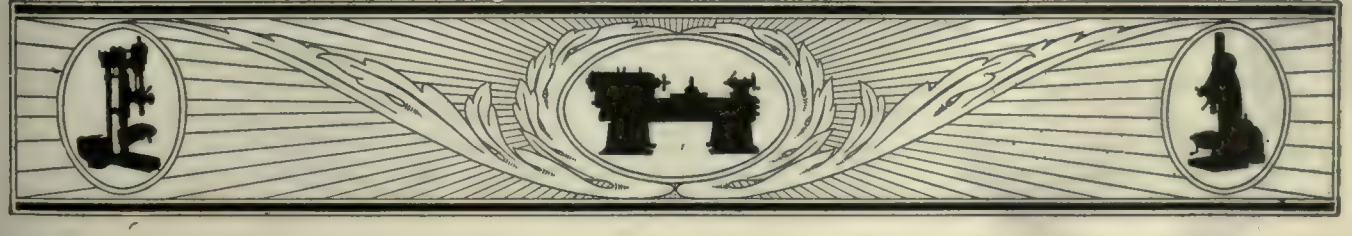
By Robert Grimshaw

The foreman's duties are manifold enough, even when under modern organization methods the functions of each one are limited in number and scope, and delegation of details is carried out in the highest degree compatible with the character of the business and the number and variety of its employees.

The modern tendency—that of functional foremanship—substitutes for the intimate relationship of each foreman to only a comparatively small group of workers, over the members of which he exercises supremacy in connection with all their activities, an entirely different standing. It charges a foreman with a group of duties rather than a group of workers and in that connection may (or may not) have to do with every worker in the place.

Formerly he employed, assigned, and discharged at will, every worker in his group. Now, where the plant is large enough, he employs and discharges none, and assigns few; but in proper understanding with an employment foreman or an employment bureau, accepts what human materials are confided to his direction, seeing to it that their duties in his particular branch—and in no other—are discharged with the greatest possible efficiency, and leaving to various foreman-specialists the duty of determining machine speeds, making repairs, furnishing power, and the like, the realms of these specialists embracing the entire plant.

This principle of division of labor, so long profitably employed in industry, makes for individual efficiency on the part of each of these specialist foremen, and of the workers under him, and contributes to—in fact constitutes—the efficient and economical working of the entire establishment.



Atlanta Entertains the Mechanical Engineers

Important Matters Discussed at Business Meeting—Side Trips to Other Southern Cities Feature of Semi-Annual Convention—Textiles and Power Divide Honors

NO HIGHER tribute could be paid to Atlanta hospitality than to say that its warmth equals that of the city's May weather. The Atlanta section laid itself out to entertain the members of the American Society of Mechanical Engineers and succeeded nobly. The semi-annual convention began with a council meeting on Monday, May 8, and broke up Thursday evening to scatter to Birmingham, Greenville and Muscle Shoals. Some of the members attended a two-day session at Charlottesville, Va., on the way to Atlanta and had a chance to get acquainted with the beautiful campus of the University of Virginia. Joint meetings were held with the Society for the Promotion of Engineering Education.

The main subject before the business meeting on Monday afternoon was the discussion and acceptance of the proposed new constitution of the society. The suggested draft was presented by John L. Harrington, of Kansas City, chairman of the committee on constitution and by-laws.

Revised Version of New Constitution Adopted

President Kimball presided at the meeting which adopted a considerably revised version of the proposed draft after three sweltering hours of argument and parliamentary procedure. A number of minor changes were made and several important ones, notably, the retention of the minimum age limits for members and associate members as given in the old constitution, and the rejection of the provisions in the new constitution for changes in the make-up and terms of office of the council, in favor of the arrangement existing at present. The principal reason for sticking to the old system was the fact that under it a greater aggregate number of years of experience on the council is provided. The new article required a minimum of but sixteen years of total experience while the old article gave twenty-seven. In view of the growth of the society to over 16,000 members and the vital need for providing for an enduring policy extending over a period of years, it was felt unwise to curtail the experience of the council members.

The next order of business was the report of the joint committee on a code of ethics for engineers. The report was presented by Prof. A. G. Christie, chairman of the joint committee which was composed of members from the societies of mechanical, civil, mining and electrical and heating and ventilating engineers. It was adopted without change.

The hour was then so late that no report from the representative on American Engineering Council was made other than the reading of a telegram stating that Secretary Hughes had announced that the patent treaty with Germany which existed before the war would be renewed.

An added event on the program was a short talk Monday evening by Rear Admiral Fullam, U. S. N., urging support for the development of naval aviation. His talk was illustrated by moving pictures of the bombing of the "Alabama" and the "Ostfriesland."

Tuesday morning was given over to simultaneous sessions on textile machinery in which papers were presented by S. E. Gillespie on cotton-ginning machinery, and by E. H. Marble on maintenance of textile machinery; on materials handling in which F. L. Leach read a paper on material handling machinery as used in the iron and steel industry; on general topics in which papers were given on the accuracy of boiler tests, by Alfred Cotton, and on using exhaust energy in reciprocating engines, by J. Stumpf and C. C. Trump. At the same time there were public hearings on three power test codes; definitions and values, displacement compressors and blowers, hydraulic power plants and their equipment.

In the afternoon there were local excursions about Atlanta, to the famous Stone Mountain and to the Atlantic Steel Company's mills.

A dinner dance at the Ansley Roof Garden on Tuesday evening was the high point in the social activities.

Simultaneous professional sessions on Wednesday morning included presentation of the following papers: "Weaving Machinery," by L. B. Jenckes; "Extraction of Oil from Vegetable Matter," by Jos. Davidson; "Modern Shop Practice in the Building of Revolving Flat Cards," by F. E. Banfield, Jr.; "Reduction of Fuel Wastes in the Steel Industry," by F. G. Cutler; "The Control of Boiler Operation," by E. A. Uehling; "Boiler Room Performance and Practice at Colfax Station, Duquesne Light Co.," by C. W. E. Clarke; "The Muscle Shoals Plant and the Nitrogen Supply," by Maj. J. K. Clement; "Heat Losses from Bare and Covered Wrought Iron Pipe at Temperature up to 800 Deg. F.," by R. H. Heilman; and "The Evaporation of a Liquid into a Gas," by W. K. Lewis.

A real Southern barbecue occupied all hands at noon on Wednesday and those who had ambition enough left followed an exhibition golf foursome over the excellent links of the East Lake Country Club.

The Technical Sessions

More technical sessions followed on Thursday morning. The papers were: "Management Applied to Textile Plants," by George S. Harris; "The Southern Worker—His History and Character," by F. H. Neely; "Power Development in the Southeast," by Chas. G. Adsit; "Economics of Water-Power Development," by C. A. Mees; "Hydroelectric Power-Plant Design," by John A. Sirnit; and "The Report upon Efficiency Tests of a 60,000-kw., Cross-Compound, Triple-Cylinder Steam Turbine," by H. B. Reynolds and W. F. Hovey; "Strength of Electrically Welded Pressure Containers," by R. J. Roark; "Some Principles of the Construction of Unfired Pressure Vessels," by S. W. Miller; "Steel for Forge Welding," by F. N. Speller; and "Tests on Welded Cylinders," by E. A. Fessenden and E. J. Bradford.

The members of the party interested in textile machinery left Thursday night for Greenville, where on Friday they visited the plants of the Duncan Mills, Branden Mills, Judson Mills, American Spinning Co.,

Woodside Mills and Union Bleachery and Finishing Co., the American Cast Iron Pipe Company, Ensley Plant of Tennessee Coal, Iron and Railroad Company, Fairfield Plant of the Tennessee Coal, Iron and Railroad Company.

Those who wanted to inspect steel mills and power plants went to Birmingham on Friday and visited the plants of the American Cast Iron and Railroad Co. On Saturday they inspected the Wilson Dam and the government nitrate plants at Muscle Shoals.

Romances of Metal Working—Saint Eligius the Metal Worker

BY H. H. MANCHESTER

In Saint Eligius, we come at least to an historic character, though some of the legends concerning him stretch the belief of the present day.

He was born near Limoges in France at the end of the 6th century A. D., and, when a boy, was apprenticed for seven years to the goldsmith Abbo, master of the mint there. After acquiring considerable skill in metal working, he went to Paris as a journeyman and began to work for Bibo, who was treasurer for Clothair II.

Not long after this Clothair ordered a new throne, and for this purpose put into Saint Eligius' hands the gold and other precious materials for the purpose. From this Saint Eligius produced a wonderful golden throne, heavily engraved and ornamented. Clothair was so pleased that he asked Saint Eligius what reward he desired. For answer Saint Eligius brought to him a second golden throne which he had produced from the materials left over from the first. Clothair was so struck with his honesty that he at once made him master of the mint. After Clothair's death Saint Eligius continued to hold this office under Dagobert.

At first Saint Eligius dressed outwardly as the others, in fine raiment ornamented with gold and jewels, but with sackcloth next to his skin. Later he sold his jewels, gave to the poor, and dressed as a monk. In fact he founded an important monastery in Limousin. He was made Bishop of Noyon in 640 A. D.

All this time he was busy making shrines for the relics of the saints, as well as vessels for the churches, and he became very skillful not only in manipulation of the precious metals, but of iron and bronze. He was supposed to have acquired all of the secrets of metal working, and to have made many improvements.

Some of the mediaeval pictures of his shop represent the drawing of wire there by main strength through a draw plate. This invention used to be ascribed to Rudolf of Nuernberg, but as we know it was in use long before, it may have gone back to Saint Eligius.

He is also represented in art as shoeing a horse, having the horse's leg or foot in his hand. This is in commemoration of a mediaeval myth which was told, not only about Saint Eligius, but with variations concerning several of the other saints. There was at the time a blacksmith who knew something of black magic, and had put a sign over his shop in which he boasted that he was master of all master smiths. One day, however, when Saint Eligius was passing by, he found the blacksmith having great trouble in shoeing a very refractory horse, and swearing mightily over the job. Saint Eligius stepped up and offered to do the work unassisted, to which the smith assented with a doubting



ST. ELIGIUS SHOES THE HORSE

laugh. The saint thereupon took off one of the feet of the horse, nailed on the shoe and put the foot back on again, the horse meantime standing contentedly by. Then Saint Eligius repeated the operation until all the hoofs were shod. While the smith was astonished he was enough of a wizard himself not to be nonplussed. "Well," he admitted, "that's a mighty good notion; I'll do it myself." He actually tried it on the next horse. Of course he could not put the leg back on again, and before Saint Eligius would do it himself, the smith had to promise to be converted.

Wildly impossible as this superstition is, such mixtures of fact and fancy are highly typical of the legends that gathered about even historic characters in the Middle Ages.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Speeding Up an Old Planer

BY MILTON WRIGHT

We had an old 42-in. planer, built many years ago by Mark Flather, Nashua, N. H., the table speed of which was altogether too slow to keep up with the trend



TRIPLE GEAR REDUCTION ON A PLANER

of modern times. We desired to increase it so that we could use high-speed tools to advantage.

Speeding up a planer would seem at first glance to be a matter of belts and pulleys, but in this case there was a limiting factor that had to be considered. This planer was designed for a table speed of 20 ft. per minute and in the place of the nest of gears shown in the illustration, there was the usual single reduction, with a very small pinion on the first shaft and a very large gear on the second.

Even at an additional 10 ft. per minute these gears made trouble and the planer threatened to jump off the floor at each reversal. The shafts were therefore taken out and longer ones substituted, the bracket *A* made, and the "triple back gear" reduction put in place as the illustration shows.

The pinion *B*, only one or two teeth of which are visible in the picture, is keyed to the first shaft, the latter extending far enough beyond it to take a bearing in the bracket. Gear *C* is keyed to the second shaft, upon which (inside the bed) is the pinion that meshes with the bull wheel.

Gear *D* and pinion *E* are doweled securely together upon a substantial bushing which turns freely upon the second shaft. Gear *F* and pinion *G* (the latter not visible in the picture) are similarly mounted upon a bushing that floats upon the first shaft. Generous oil-holes and channels are provided to conduct lubricant to the various bearings.

The drive may easily be traced by the letters. Pinion *B* drives gear *D* and with it pinion *E*, pinion *E* drives *F* and *G*, and *G* drives gear *C* on the second shaft, thus constituting a triple reduction where before there was but a single one.

The speed of the countershaft was brought up to the requisite limit by suitable pulleys, though not in proportion to the increased table speed, as the pinion *B* is considerably larger than the one it replaced. The table now travels 50 ft. per minute with less shock at reversal than resulted from the original slow speed.

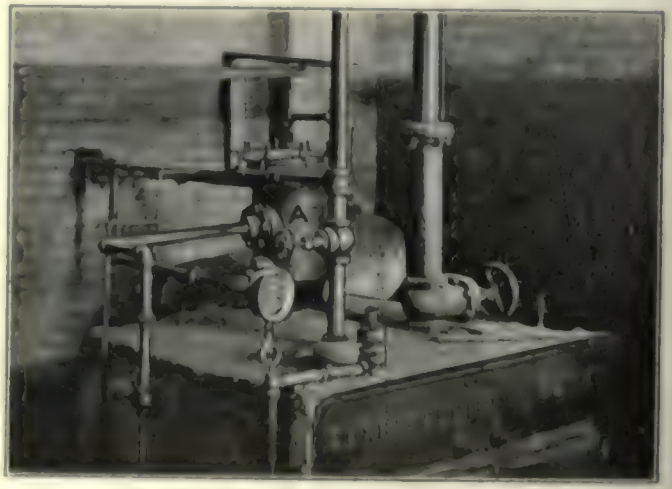
Keeping a Service Tank from Freezing

BY AMOS FERBER

The illustration shows a simple expedient which we adopted to prevent the water in the service tank, on the roof of the factory, from freezing.

Up to two years ago there had been a pipe for admitting live steam directly from the boiler to the tank, and when the fireman did not forget to turn on the steam this worked very well. Sometimes he forgot and then there was trouble. There was a lot of steam wasted anyway.

The device shown at *A* is an old heater, similar to a feed water heater, that had been lying around in some odd corner for a long time, out of service. Our superintendent conceived the idea of setting it up on top of



WATER HEATER FOR SERVICE TANK

the heating boiler, as shown, connecting the coil both top and bottom to the boiler so as to keep a circulation in the coil, and connecting the inlet and outlet to the tank by means of two pipes, one of which should enter the bottom and the other near the top as in the ordinary form of water heating systems.

The device has now been in service for two winters and the tank has not frozen since it was installed. There is nothing to forget as the valves are always open and consequently there is always a current of warm

water ascending to the tank. The cost of installation was but a few hours' work and the cost of operation is so low as to be negligible.

Milling Tapered Wedge Keys with an Automatic Hacksawing Machine

By Harry Flower

Our products call for a great number of tapered wedge keys that are made from $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{5}{8}$-in. round cold-rolled steel. These keys, which are used to hold a collar onto a crankshaft, are 2 to 3 in. long and have a flat milled the whole length of one side, as shown in Fig. 1. We had been milling the tapered flat on these keys with a milling machine, but had been having considerable difficulty in keeping up the holding fixtures, due to the fact that it took such a tremendous strain to hold the pin and keep it from turning under the

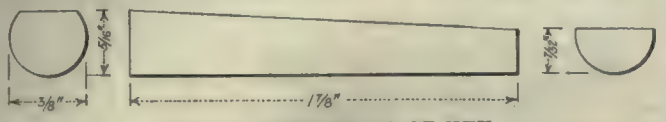


FIG. 1. DIMENSIONS OF KEY

milling cutters that the holding fixture would not stand up very long.

Our superintendent, getting hot about the collar as a result of the tremendous expense of keeping up the holding fixture, hit upon the idea of milling the keys with a hacksawing machine, using a staggered tooth broach in place of a hacksaw blade. He rigged up a No. 5 Marvel automatic high-speed saw for the purpose, and the machine has been running day after day making these keys automatically without any attention whatever from an operator except for the purpose of reloading the magazine.

Front and rear views of the machine in operation are shown in Figs. 2 and 3. The saw frame was cut down to hold a heavy broach $\frac{3}{4}$ in. wide. The broach or cutting tool was made with teeth on both sides so that when one side became dull the tool could be reversed.

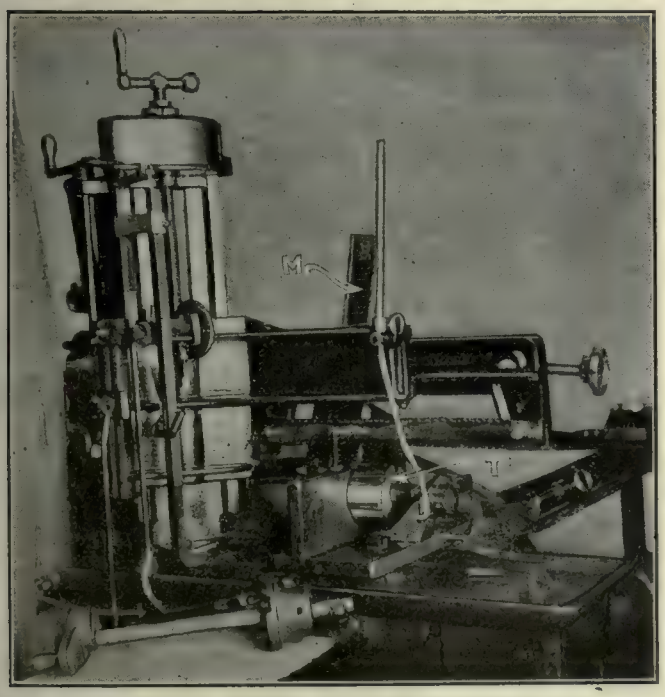


FIG. 2. FRONT VIEW OF MACHINE

A turret *T* was mounted on an angle plate which was clamped to the machine bed in place of the regular vise, and the turret drilled at six equidistant points near the circumference to receive six blank pins. The angle plate was machined at the same angle as the required taper on the key. A ratchet *R* attached to the outer end of the turret shaft was so placed that a pawl *P* actuated by the regular vise lifting rod would turn the turret one-sixth of a revolution and register a blank pin directly below the cutting tool each time the saw

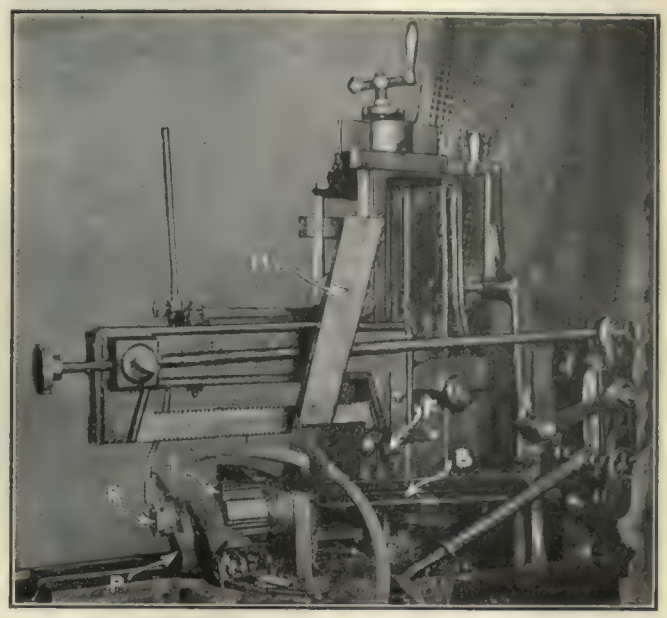


FIG. 3. REAR VIEW OF MACHINE

frame was automatically raised to the top or starting position.

A sheet metal trough *M* was provided as a magazine to hold a number of blank pins. A round rod with two trip dogs attached to it was supported so that it could slide endwise back of the horizontal bracket *B*. When the saw frame comes down to mill the key that is in position below it in the turret, the finger *F* on the rear of the saw frame strikes one of the dogs on the slide rod on the forward motion of the saw frame, driving the rod forward, and pushing the lower blank pin from the magazine into the turret, at the same time discharging a finished key. The return of the saw frame allows finger *F* to engage the other dog on the slide rod and pull the slide or loading rod back toward the rear of the machine to its original position.

How to Find the Area of an Irregular Surface

By Frank Harazim

To find the area of a plane surface of an irregular outline, place the object under a sheet of transparent paper cross-sectioned in $\frac{1}{8}$-in. squares and tack the sheet to the board. Count the number of whole squares that are within the outline; then estimate the fractional parts of the squares cut by the outline and add their sum to the number of whole squares. The result is the area in units of the dimensions of the squares. The smaller the squares of the cross-section paper the more accurate the result. This is not a new method, but needs to be mentioned frequently.

A Rotary Box-Blank Die

By P. H. White

The rotary die herein described is used in cutting blanks from which cardboard boxes are made. The stock used is of different thicknesses, varying from 0.035 to 0.065 in. and comes to the cutting machine in reels weighing on an average 400 lb. The reel of cardboard is mounted on a standard at the rear of the cutting machine, and the end of the roll is started into the machine. The feeding is done by two rollers, the upper one also doing the cutting. The rolls are of the same diameter and are driven at the same speed by means of a pair of gears having a pitch diameter equal to the diameter of the rolls.

In Fig. 1 is shown the appearance of the blank when it leaves the machine. The score lines *AA* and *CC* are cut through half the thickness of the stock, and determine the width of the box. The score lines *AB*, *AC* and *CD* determine the length of the box. Fig. 2 represents the finished box when folded and pasted together. Fig. 3 shows an assembly of the finished die. The knurling shown is to prevent the cardboard from creeping.

The different parts that go to make up the die are held in place by means of two nuts, shown in Fig. 4. These nuts are made right- and left-hand, so that any slipping between the top and bottom rolls will tend to tighten the nuts. Another function of the nuts is to act as safety rings for the purpose of preventing the two rolls being adjusted too closely together and thus injuring the cutting blades. The diameter of the nuts is made greater than that of the rolls, but smaller than the outside diameter of the circular cutters.

The circular cutters are represented in Fig. 5. The score line *AA*, Fig. 1, is cut by the undercut portion of *A*, Fig. 5, while the portion from the lines *AC* to the ends is cut by the full sized part of the cutter. Cutters *B* and *C* cut out the small portions along the lines *G* and *H*, while *D* trims the outside edges along the lines *BB* and *DD*. It should be noted that there are two of each of these cutters, making eight in all. In machining with cutters *B* and *C*, it is necessary to transfer the cutting edges from front to back at the points where they start to cut out the radii at *A*, *B*, *C* and *D*, Fig. 1. Cutters *B* and *C*, it should be noted, are relieved sufficiently to clear the blank except at the lines *G* and *H*.

In Fig. 6 *A* represents the blades which cut off the ends of the blank. *B* represents the blades which make the cross scoring lines. The blades are held in their respective slots by means of wedges, as shown at *C*.

The blades are carried in the holding rings shown in Figs. 7 and 8. The wedges have $\frac{1}{32}$ in. clearance underneath to insure their binding against the blades rather than resting on the bottoms of the slots.

The narrow ring shown in Fig. 9 carries a short blade similar to *A*, Fig. 6. One of these rings goes at each end just inside of the nut. The function of these blades is to cut up the narrow strip trimmed from the width of the stock as it passes through the rolls. When this narrow strip is not cut up, it sometimes runs out in long lengths which become objectionable.

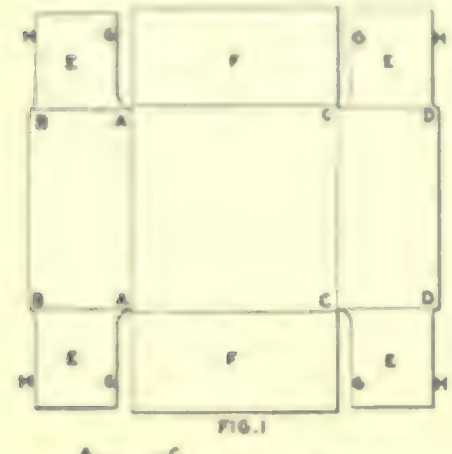


FIG. 1

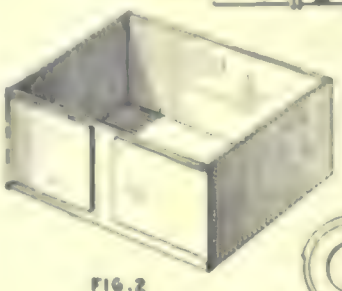

FIG. 2


FIG. 3


FIG. 4



FIG. 5



FIG. 6



FIG. 7


FIG. 8


FIG. 9

FIG. 1. THE BOX BLANK. FIG. 2. THE FOLDED BOX. FIG. 3. THE ROTARY DIE. FIG. 4. THE END NUT. FIG. 5. THE CIRCULAR CUTTERS. FIG. 6. CUT-OFF BLADES AND WEDGE. FIGS. 7 TO 9. RINGS FOR HOLDING CUT-OFF BLADES

Rebabbitting Bronze-backed Bearings with a Soldering Copper

By Robert Tait

I have read with interest the items appearing in American Machinist from time to time dealing with automotive repairs, as we do a large amount of such work.

One job, which is of frequent recurrence is the rebabbitting of bronze-backed bearings. We had tried many ways of doing this with rather indifferent success until we hit upon the following plan. Using a piece of angle iron as a mold, a quantity of babbitt bars of a convenient size are cast. The bronze shells are carefully cleaned and retinned if necessary and the babbitt applied with a soldering copper, until sufficient metal is built up to admit of boring to size. We have used this method for a good while and have yet to hear

of a bearing in which the babbitt has broken away from the bronze.

In the case of connecting rods, which are tinned directly on the steel forgings without the use of a bronze shell, the same procedure as above is used; after which we locate the rods by the piston-pin hole on an angle plate attached to a milling machine table, and bore and face with an adjustable boring bar in the usual manner.

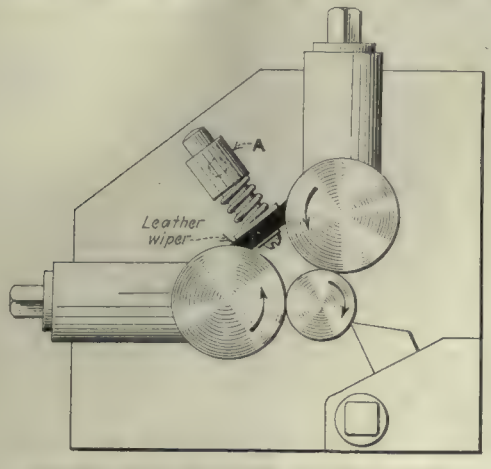
This idea may not be new to most of your readers, but it has proved of value to us, and we are glad to pass it along for consideration.

A Cleaner for the Rollers of Box Tools

By W. Burr Bennett

We had been having trouble in our shop from chips that would cling to the rollers of the box tools and mar the work, especially when the material was cast iron. To overcome the trouble the writer devised the roller cleaner shown in the sketch.

The square shouldered stud *A* screws into the face



WIPER FOR ROLLERS OF BOX TOOL

of the box tool. Fitted to the crosshole in the outer end of the stud is the stem of a plunger to the outer face of which is attached a leather wiper to bear upon the rollers, it being held in contact therewith by the pressure of a coil spring surrounding the stem of the plunger.

It was first feared that the pressure of the wiper upon the rollers would prevent the latter from revolving and thus cause flat spots to be worn upon them, but this fear proved groundless. The pressure of the work is so many times greater than that of the wiper that the rollers always revolve.

Different sizes of leather have to be provided to accommodate different settings of the tool.

What Is the Most Economical Belt?

By S. Kelly

The article by W. F. Schaphorst under the above title, printed on page 256 of American Machinist, is a timely and instructive one upon a subject to which too little attention is ordinarily given. His handling of the matter would indicate that he had had a lot to do with belts and that he does not share in the general indifference accorded to the belt subject.

Belts running upon smooth surfaced pulleys of either metal, wood, or paper are by no means positive in their action. Unless the belt is unduly tight there will be slippage and consequent loss of power; or, if the belt be sufficiently tight to prevent slippage, there will be excessive friction upon the shaft journals. Since 90 per cent of the power transmitted in this country is by belt, the total loss is enormous.

A very simple and efficient means of overcoming the difficulty and reducing the power loss from slipping belts is to cover all pulleys with a heavy cotton fabric fastened to the surface with cement. If this job is neatly done the pulley surface will present a smooth, unbroken appearance and its balance will not be affected.

The belt shows a tendency to cling to the surface of a pulley so treated much more tenaciously than to the original surface and therefore a belt that would otherwise have to be very tight in order to transmit its quota of power may be run quite slack, with a corresponding lessening of friction upon the bearings.

The power transmitting capacity of pulleys so treated ranges from 30 to 70 per cent greater than that of the same pulleys under the same conditions of speed, width, tension, etc. with uncovered surfaces, and the life of a belt may be increased from 50 to 500 per cent.

A concrete illustration of the possible saving may be drawn from the following example: A steel saw in a structural shop was driven by a 16-in. belt running upon uncovered pulley surfaces. This belt slipped excessively and so rapid was the wear that a belt would last only from 40 to 60 days. The pulleys were covered as above described and the new belt then placed on the drives has now been running for 18 months.

Clearance Grooves for Sliding Fixtures

By E. F. Oakford

In the article on "Tool Engineering" on page 798, Vol. 55, of American Machinist, there is illustrated (Fig. 255) a sliding fixture in which the clearance at the corners of the guiding strips is obtained by grooves as shown at *A* in Fig. 1.

Such a crude method of obtaining this most necessary clearance deserves the strongest condemnation. The extra cost of machining these grooves is considerable, usually needing a change of tools and always requiring increased time and labor. A more reasonable method of obtaining such clearance is shown in Figs. 2 and 3. The fitting is machined, as in Fig. 3, to leave the corners as sharp as is convenient, using ordinary tools, while the edges of the guiding strips, Fig. 2, are machined to a radius appreciably larger than that of the female portion. When assembled, an entirely satisfactory clearance is secured, combined with maximum cheapness and ease of production.

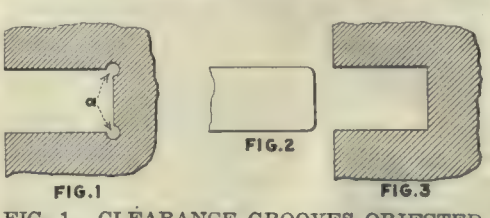


FIG. 1. CLEARANCE GROOVES OBJECTED TO BY THE AUTHOR. FIGS. 2 AND 3. CLEARANCES OBTAINED BY ROUNDING CORNERS OF THE TONGUE

It should be noted that the method of securing this clearance, as shown in the article referred to, cannot be adapted conveniently to any milling process, though such a process can be used for the modified method described here.

Editorial

Conservatism of the Mechanical Engineers

THE members of the American Society of Mechanical Engineers have decided to make haste slowly. At the Atlanta meeting last week where the draft of the new constitution was presented for discussion they decided that it was all-important to provide every safeguard for a continuing policy.

According to the changes in the new constitution affecting the council of the society, the total years of service of those members holding over at each election would have been a minimum of sixteen. Under the existing arrangement this minimum is twenty-seven.

With a membership sixteen thousand strong and still growing, and with an annual business running over six hundred thousand dollars, it is wise for any group of men to take steps to prevent sudden shifts of policy due to rapid changes in the directorate.

There is, of course, the danger of reactionary tendencies in men too long in office but with approximately one third of the council members being replaced every year this danger seems much less than the other.

We feel that the Mechanical Engineers are to be congratulated on their sound judgment. They are on the eve of accomplishing big things and need a well-balanced fly wheel to hold them steady.

Standardization Through Trade Associations

ACTIVE work on the standardization of products throughout industry in general probably began during the late war when the Conservation Division of the War Industries Board asked each concern and each industry to co-operate in the elimination of unnecessary lines. The advantages incident to standardization of products and elimination of unnecessary designs are self evident. Very frequently, however, the means of obtaining them are not so evident.

Of course, any one concern can standardize within its own organization, but the greatest work has been accomplished by trade associations that represent a whole industry or branch of one. Because of their work on standardization, trade associations are now receiving much attention and favorable comment from the Department of Commerce. Most of this work relates rather to simplification of variety, than to standardization as based on engineering principles.

The machine industry can learn from what has been done in related industries, and even in those that are far removed from it. The fact that an association representing the manufacturers of over 90 per cent of the output of farm implements in this country has been able to eliminate 955 models of farm machinery and to retain only 137, is very significant of the possibilities in this line.

If a manufacturer of writing paper can save hundreds of thousands of dollars a year by simplication in the variety of his products, and if a fertilizer manufacturer can cut the number of formulas used to only a fractional part of those formerly employed, there is certainly opportunity for similar work in the machine industry, where so much detail is involved. Common building brick, umbrellas, wood wheels and numerous other products have been standardized by the active influence of trade associations, and the work is so new that the biggest developments are still to be expected.

The idea of elimination of the unnecessary items and concentration on the important ones is so well worth developing that it might almost be taken as the motto of trade associations. The results accomplished have been so favorable and the saving for every one concerned so marked, that the work deserves the attention of every manufacturer. Time and money put into intelligent standardization will pay big dividends in the end.

Care in Starting Idle Machines

BUSINESS is picking up—and it is bringing its problems to machine tool builders and others. One of these has to do with the starting up of machinery that has been standing idle for some time. Of great importance is the matter of thorough lubrication. It is many times equally important to remove old oil.

In one specific instance that has come to our notice, a machine had been delivered two years ago but had never been run owing to lack of orders. On starting it up one of the main bearings had seized and the users demanded, through the agent, the replacing of the shaft and bearing without cost.

It hardly requires a Sherlock Holmes to determine why the bearing seized. Oil in bearings does not remain a good lubricant after standing idle for two years. In all probability it forms a residue or gum which takes up most of the space provided for the film of lubricating oil. This gum is not a lubricant but makes a highly frictional surface. Oil, even if introduced into the bearing, could hardly lubricate it properly under these circumstances. Such a bearing is almost certain to seize when put to work.

When a machine has been standing idle for any length of time, the lubrication of its bearings becomes a problem requiring careful attention. The whole lubricating system, if it has one, should be not only drained but thoroughly flushed out with kerosene to cut out any gum which may have accumulated. Care should be taken that every bearing is free to move and that it has a good supply of new lubricant.

It is a good plan to turn over by hand a machine which has been standing idle to make sure that it is free in every bearing. If it turns freely, run it by power but without load, until you are convinced that it is all right to put to work. A little precaution of this kind will save time, trouble and a tendency to dispute with the maker as to the machine's being defective.

Now is the time for builders of machine tools to be on their guard for claims for replacements due to the cause mentioned. Now is the time for users of machinery to use good judgment in starting up machinery so as to avoid unnecessary and exasperating delays.

Shop Equipment News

Bright Internal Grinding Machine

An internal grinding machine of unique design has recently been placed on the market by the Garvin Machine Co., New York, N. Y. The machine is the

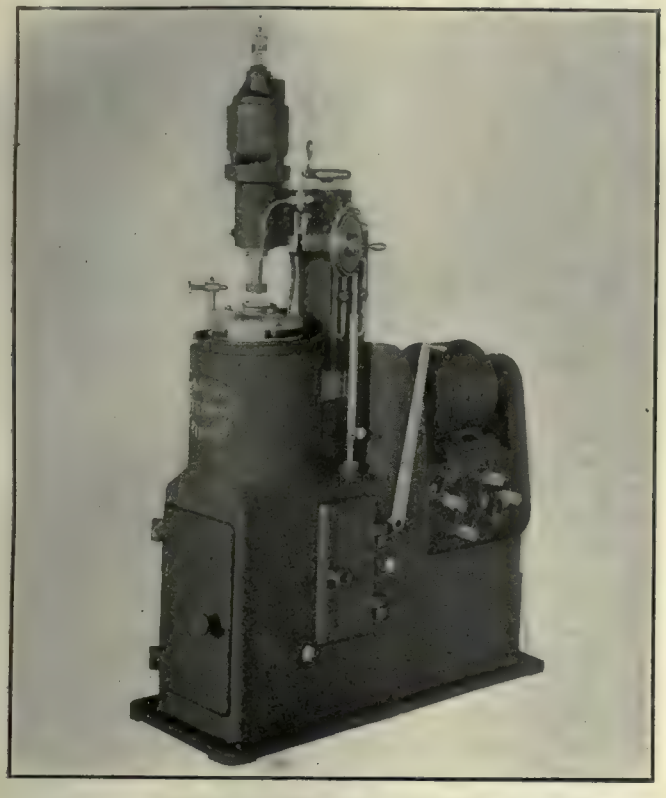


FIG. 1. BRIGHT INTERNAL GRINDING MACHINE

invention of Fred E. Bright, who is well known in the machine industry in both this and European countries. It is intended primarily for manufacturing operations; it grinds cylindrical holes only. A view of the control side is shown in Fig. 1, and of the back of the machine in Fig. 2.

The new fundamental feature (patented in many countries) is the revolving and reciprocating of the work carrying spindle in one bearing, eliminating the necessity for exact alignment of it with other essential parts of the machine. Due to this fact great accuracy and efficiency are possible in the finishing of straight round holes.

The grinding wheel spindle is directly driven, so that slowing down due to belt slippage is avoided, and the wheel speed can be continuously and accurately maintained. Other features such as the simplicity of control and the accessibility of the work, are certainly worthy of note.

Both the wheel spindle and the work spindle are placed vertically. The motor driving wheel is at the top of the machine; a separate motor, located at the rear, is provided to drive the work and to operate the feed mechanism. The capacity of the No. 2 machine is rated as 4 x 4 in. A swing of 11 in. is permissible inside the water guard, the latter a simple, adequate part of the machine.

Because of the vertical position of the spindle, the floor space required is considerably less than that of a horizontal-spindle machine of like capacity. Since the machine is self-contained, no belts nor countershafts are required. This reduces the cost of maintenance and allows the easy removal of the machine from one spot to another. The floor space is only 20 x 45 in. The machine is 63 in. in height, with the wheelhead in the raised position; the chuck plate is 38⅝ in. above the floor in its central position. The total weight of the machine is only 1,250 lb., but is said to be unusually rigid and substantial for its range of work.

The motor driving the wheel spindle is of the induction type, and easily removable from the housing of the spindle. The absence of brushes enables rotation at a very high speed. Although the motor generates 1½ hp., the outside diameter of its housing is only 5¾ in. The windings are cooled by a draft of air taken in at the bottom of the housing and expelled at the top. The armature shaft runs on one double-row ball bearing at the top.

The wheel spindle is mounted in double-row ball bearings, one at the top and one at the bottom. These bearings are adjustable to provide for taking up wear. At the bottom of the spindle, extensions to suit the type of work being done can be mounted. The arm-

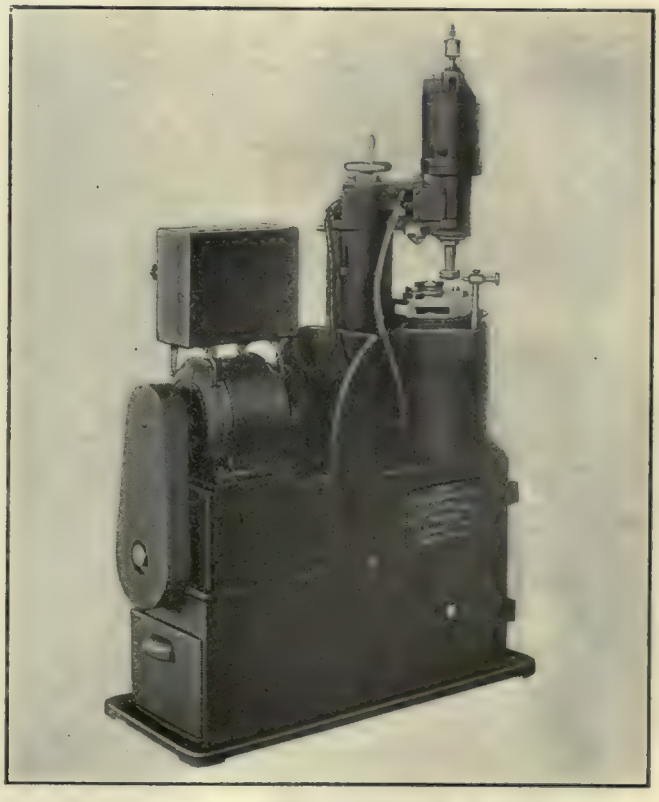


FIG. 2. REAR VIEW OF BRIGHT MACHINE

ature shaft drives the wheel spindle through a tongue-and-groove coupling. Thus, when in operation, the two shafts rotate as a unit on three ball bearings. No vibration is perceptible due to the rotation of the parts.

The oil from the cup at the top of the head drips down so as to lubricate the top bearing of the armature. It is prevented from entering the windings of the motor, and is carried through a duct to the bearings of the wheel spindle.

In order to change the speed of the wheel spindle, the frequency of the current driving the motor must be changed. The frequency-changing device ordinarily employed consists essentially of a variable-speed d.c. motor driving an alternator. It is thus possible, by merely changing the resistance in the field circuit of the d.c. motor, to vary the number of cycles, and consequently the speed of the spindle motor. At 120 cycles, or the maximum speed, the spindle motor runs at 7,500 r.p.m.; at 200 cycles, the speed is 12,000 r.p.m., which is the maximum, these and intermediate speeds proving to be effective because of their maintenance at predetermined rate without slippage. Where a single grinding machine is used, a small frequency changing unit may be employed. Where a battery of the machines is operated, one installation may serve for the entire group.

The wheel spindle and its motor are mounted on a yoke that pivots about the supporting column. This column can be lifted by means of a lever at the right side of the machine, so that the wheel clears the work. After the wheel has been raised, the whole head can be swung to the left of the machine, so as to provide clearance for removal and replacement of the work. The column consists of two telescoping parts, whose relative position is controlled by means of a screw operated by the handwheel at the top. It is thus possible to vary the length of the column, and, consequently, the height of the wheelhead.

A feed screw having a large graduated wheel is carried on the column at the right of the wheel spindle. By turning the wheel through one space marked on its periphery, the grinding wheel is fed a distance of 0.0001 in. The feed is ordinarily automatically operated. It takes place at each end of the stroke, so as to wear the wheel evenly. An automatic stop is provided, so that it is possible to work to depth without constant attention from the operator.

When the wheel is swung over the work, a block strikes the end of the feed screw, which has a spring-loaded point, in order to cushion the shock. As the head is lowered to bring the wheel inside the work, a spring-loaded yoke passes behind a pin in the screw. This yoke keeps the screw and the block pressed against each other, so that the wheel may be brought to the same position each time that it is swung over the work. As soon as the head is lifted, the yoke disengages, thus permitting the operator to swing the head by the pressure of his left hand away from the work and against the stop provided to limit the swing.

A diamond is fixed on the housing of the work-holding chuck, so that the abrasive wheel can be dressed by merely lowering the head when it is against the outer stop. A screw adjustment is provided for moving the diamond forward as the wheel wears down.

The chuck or fixture holding the work is mounted at the top of a hardened steel spindle 3 in. in diameter and 20 in. long, that is carried in two phosphor-bronze bearings fixed in a housing that can be easily removed. Due to the vertical position of the spindle, it revolves in a perfectly balanced film of oil in each bearing. The only time when there is any lateral pressure is when the grinding wheel touches the work. This force is

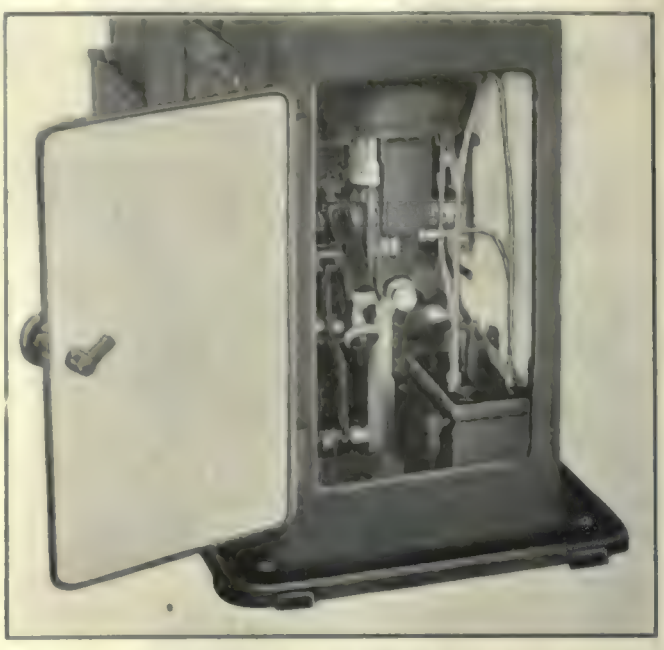


FIG. 2. STROKE ADJUSTING MECHANISM

so slight that it does not squeeze the oil from between the two surfaces. Since the metal of the bearing never touches that of the spindle, the life of the bearing is practically unlimited. The reason for making the spindle of hardened steel is to prevent injury to it prior to assemblage, or in the event that it is removed from the machine.

The chief feature, previously mentioned, is that the spindle both rotates and reciprocates in the same bearing. Consequently, the work reciprocates in the same line about which it rotates. Since the wheel maintains one position only, a straight and round bore must result.

The weight of the spindle and work is carried on one ¾-in. ball at the bottom. This ball rests in a small pocket that allows sufficient clearance for it to travel eccentrically about the center line of the spindle, so that it wears uniformly. Removable hardened steel disks are provided both above and below the ball.

The spindle is driven by means of three flexible steel keys, mounted in a bevel gear running on a separate bearing with clearance around the lower end of the spindle. As the spindle reciprocates, these keys slide in vertical splines. The advantage of this method of drive is that no side pressure is placed on the spindle, as must necessarily occur when it is driven by means of a belt. The bevel gear is mounted on ball bearings and is driven by a pinion carried on a shaft, also running in ball bearings, and connected directly to the speed-change gear box at the rear of the machine.

The work spindle is lubricated by force feed from the small pump, Fig. 3, placed in the front of the base and driven by the stroke mechanism. The oil is driven to the top of the top bearing, and works down through the two bearings to the bottom of the spindle, where it drops off into a small cup, from which it is led back to the tank of the oil pump. Some of the oil is diverted to the bevel gears, so that both they and their bearings run in oil.

The mechanism that causes the work spindle to recip-

rocate is driven by a separate shaft from the feed box at the rear of the machine. This shaft drives a cam through a worm and worm gear. The purpose of the cam is to so operate a lever and a connecting rod fastened to the bottom of the shaft carrying the ball which supports the spindle, that the spindle will move at uniform speed from one end of its travel to the other, or at a variable speed according to the form given the cam. The stroke of the spindle can be controlled from nothing up to the maximum while the machine is running, by merely turning a small knurled screw. Fig. 3 shows the mechanism by which reciprocation is controlled.

By the use of both a double and a single-lobe cam on the camshaft, twice the number of reciprocating movements provided for by the feed box can be obtained. Of course, only one cam is in operation at a time. The speed of rotation of the spindle is 100 to 385 r.p.m., in five steps. The ten reciprocating speeds permit of from 4 to 48 strokes per minute.

The total weight of the reciprocating parts is balanced by means of a counterweight inside the base. However, the spindle is slightly heavier than the counterweight, so that it drops of its own accord and keeps the follower against the cam. The motion of the cam follower is only one-third that of the spindle.

By the removal of two bars that pass through the base, the entire mechanism for operating and controlling both the rotating and reciprocating action of the work spindle can be removed as a unit through the door in the front of the base.

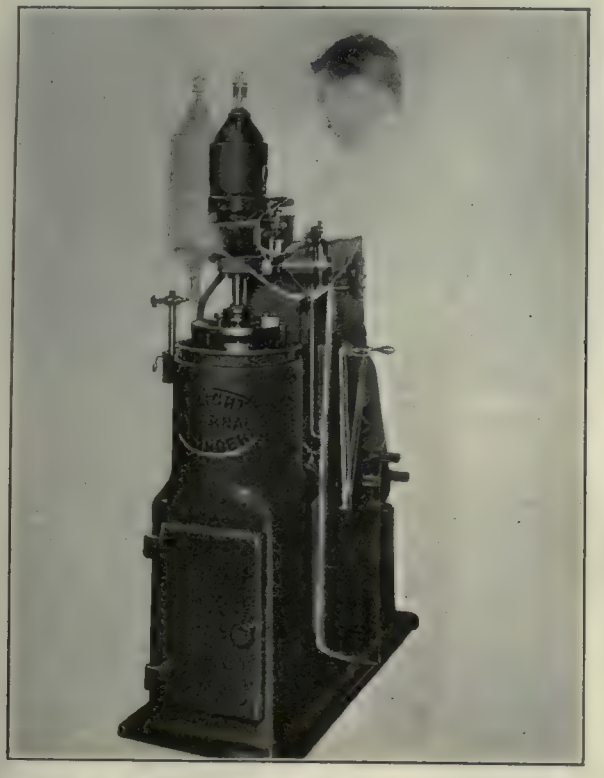


FIG. 4. POSITIONS OF HEAD AND OPERATOR

The 1½-hp. motor at the rear of the machine drives by means of an inclosed silent chain the feed box on which it is mounted. This feed box is of the automobile type, and has three shafts in each compartment. It really is two separate boxes, the upper one driving the mechanism for rotating the spindle, and the lower one that for reciprocating it. Five changes of speed operated by two hand levers are provided in each box. All gear-box shafts are mounted on ball bearings, and no gears are in mesh when not actually driving. The gears run in oil. A brake is provided at the rear end of the main drive shaft, so as to stop the motion of the work spindle as soon as the wheel is lifted from the work.

The rear of the base contains a tank for holding the cutting lubricant, as well as a pump for circulating it to the nozzle at the head. The piping is inclosed and the water tank is easily removable for inspection and cleaning. When the wheel is lowered to the work to start the cut, the cooling lubricant is automatically turned on, and it is turned off when the work spindle is withdrawn.

The guard surrounding the work chuck can be easily raised and lowered by the operator. The water thrown from the work runs down on the inside of it, but it is prevented from entering the bearings of the work spindle by a cylindrical brass guard secured to the bottom of the chuck plate. The water and grit thus pass between the two guards and into an annular chamber in the housing, the bottom of which chamber slants to one side of the machine, where a drain leads directly to the tank in the base.

To start the machine, the lever on the right is pushed backward. This action first lowers the wheel to the work. Continued movement of the lever disengages the brake mechanism and engages the clutch at the feed box. When stopping the machine, the forward movement of the lever throws out the clutch, engages the brake and then raises the head.

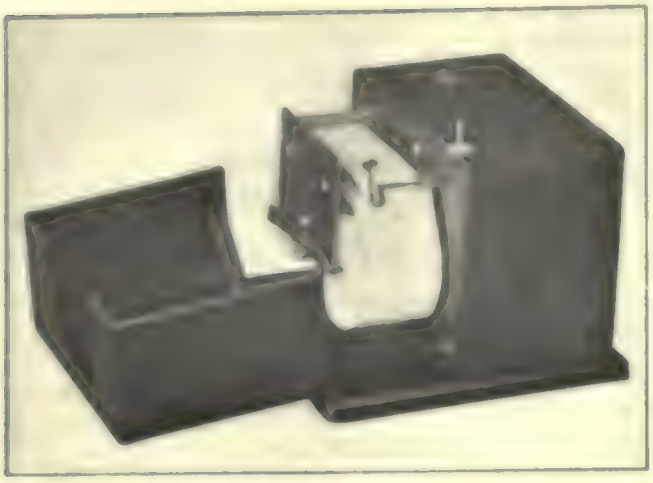
The work is in plain view and very easily accessible to the operator, whose position for operating the various movements is shown in Fig. 4. In order to dress the wheel, vertical reciprocating movement is given it by operating the lever back and forth at the front end of its stroke. The work spindle does not rotate nor reciprocate during this operation.

Williams Time-Study Machine

H. H. Williams, 1613 Chestnut St., Philadelphia, Pa., has recently placed on the market a machine for use when taking observations in time-study work. The machine times the operations and makes a permanent record. The illustration shows the machine with the cover at the rear of it removed, so that the recording mechanism can be seen.

A strip of paper is moved by a positive drive at a uniform rate of speed that can be regulated to suit the conditions. A pen is so mounted as to trace a line on the moving strip of paper. This pen is caused to move back and forth across the strip by two finger keys. The observer presses one of the keys at the completion of each element of the cycle during an observation, so that the pen moves by steps across the strip. At the end of the cycle, the pen is returned to its starting position by pressure on the other key. It is thus not necessary for the observer to give close attention to the machine, and he can keep his eyes on the worker continuously, so as to observe his movements in performing an operation.

The graph or record that is obtained gives all the data necessary for filling in a time-study observation sheet of the usual type. The data in the record on the strip can be transferred to such a sheet at the con-



WILLIAMS TIME-STUDY MACHINE

venience of the observer. The length of time elapsing between each step or jump of the pen can be read on the strip by means of a decimally divided scale when determining the time of each movement.

The motor is spring-driven clock work, and is sturdy enough to give continuous operation. Since the machine is not dependable on any outside power, it can be easily moved to any desired position. The machine is more accurate than a stop watch, as observations of 0.001 min. can be recorded. Twenty-four steps or elements are obtainable on the moving strip of paper. The machine is 8 x 8 in. square and 6½ in. high. It weighs 9¼ lb., so that it can be very easily carried to the place where it is to be used.

Allen "Bay State" Wrench Set

The Allen Manufacturing Co., Hartford, Conn., has placed on the market a set of square and hexagon socket wrenches designed expressly for automobile and garage work. The set comprises reversible ratchet wrench, universal joint, extension bar, screwdriver and twelve sockets ranging in size from ⅛ to ¾ in. hexagon, and including ⅛, ¼ and ⅜ in. square sockets. The sockets are made by the same process of drawing as



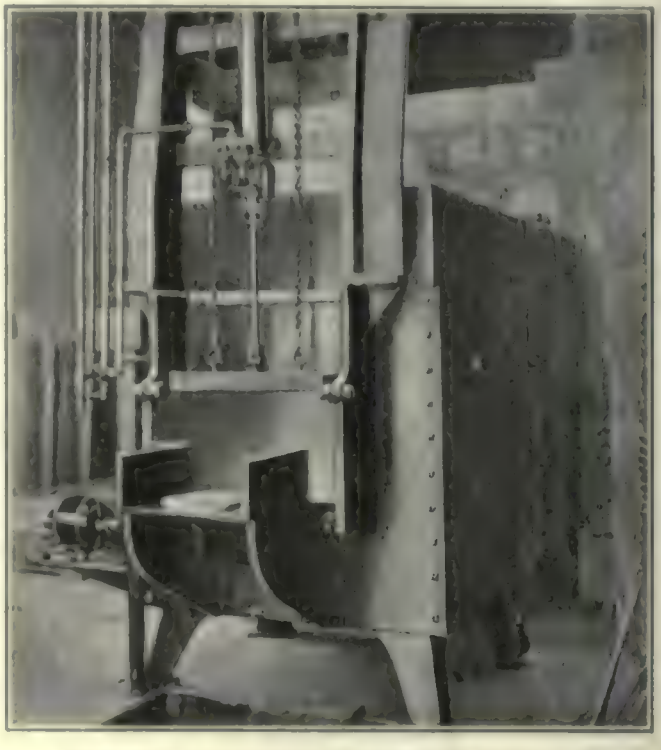
ALLEN "BAY STATE" WRENCH SET

are the Allen hollow head setscrews and subjected to the same heat-treatment. They are claimed to be proof against breakage. The set is put up in a hardwood case, as shown in the accompanying illustration, and it is designated as the No. 19 box set.

Gleason Automatic Hardening Furnace

The American Industrial Furnace Corporation, 10 Post Office Square, Boston, Mass., has undertaken the handling and installation, for commercial purposes, of the electric furnace developed by the Gleason Works of Rochester, N. Y., for hardening gears for automobile transmissions. An end view of the furnace is shown in the accompanying illustration. The control panel is mounted on the side not shown.

The furnace in every way conforms to the latest engineering practice, with respect to electric furnaces, and is adaptable to the hardening of all small and medium size machine parts. It is automatic and continuous in action. The hearth is made up of a series of "thermalloy" rolls, these rolls being geared together and driven by a variable-speed motor. It is designed to



GLEASON AUTOMATIC HARDENING FURNACE

operate at temperatures from 1,000 to 1,800 deg. F. There are fourteen changes of speed to the rolls, thus insuring heating periods to conform to the requirements of a wide range of work.

The furnace hearth has a width of 17 in. and a standard length of 132 in., though this latter dimension is susceptible to variation in order to meet special requirements. Its electrical capacity is 65 kw. and it is capable of delivering to the quenching tank from 450 to 700 lb. of work per hour.

A Time Saver

By Frank Harazim

If we cut the tables of contents out of all the magazines and bind them together between two stiff covers with brass paper fasteners, we will not have to look through all the magazines that are filed away to find a reference. Looking through a magazine is bothersome, especially when the table of contents is located several pages from the front as it is in some cases.

News Section

Little Improvement in Call for Freight Equipment

Freight cars idle because of business conditions totaled 529,658 cars on April 30, compared with 529,884 on April 23, or a decrease of 226 cars, according to reports just received from the railroads of the United States by the car service division of the American Railway Association.

Of that total, 371,538 were surplus freight cars, that is cars in good repairs in excess of current freight requirements, while the remaining 158,120 were freight cars in need of repairs in excess of the normal number unfit for service.

Surplus coal cars totaled 235,077, an increase of 5,185 within a week, while an increase of 1,718 was reported for coke cars within that period, bringing the total to 5,387. Surplus box cars numbered 94,653, a decrease of 3,753 cars since April 23. Reports showed 15,191 surplus stock cars, which was a decrease of 923 within a week. Miscellaneous freight cars also showed a decrease of 1,449 within the same time, the total being 4,891.

Foreign Trade Lists Available for Manufacturers

The commercial intelligence division of the Department of Commerce has recently compiled a number of new and revised trade lists from information submitted by American consuls and trade commissioners. A number of these lists are starred to indicate the relative size and importance of each firm in its community. The nationality of the firms is also indicated. These lists have been mimeographed and copies can be obtained from the bureau or its district and co-operative offices by referring to the title and file number:

Motor cars, trucks, tires, and accessories — Importers and dealers — Belgium EUR-1014-A

Bicycles, motor cycles, and accessories—Importers and dealers—Norway EUR-9002-A

Motor cars and trucks—Manufacturers—Spain. EUR-11015

Agricultural implements and machinery — Importers—Sweden EUR-12012-A

Automotive products — Importers and dealers —Sweden EUR-12034

Motor cars and trucks—Manufacturers—Austria EUR-15002

Motor vehicles and accessories—Importers and dealers — Siam..... FE-17002-B

Motor cars and accessories — British Malaysia FE-18002-B

Motor vehicles and accessories—Importers and dealers—Ceylon FE-22003-B

Hardware importers and dealers — Venezuela.. LA-22004-B

Substitute for Stanley Patent Bill

Realizing that compulsory working of patents along the lines suggested in the Stanley bill is too strongly opposed to permit of its becoming a law, Henry Howard, president of the American Institute of Chemical Engineers, and chariman of the executive committee of the Manufacturing Chemists' Association, has suggested a substitute. The substitute has been accepted by Senator Stanley. The text of Mr. Howard's bill provides that two years after the issuance of any United States patent, or at any time after the expiration of that period, if it is shown that the invention covered by such patent is being worked in a foreign country, and that the owner has failed to work it in the United States, and has refused to grant licenses upon such reasonable terms as would make it practicable to practice the patent in the United States, then on the petition of any reputable American citizen, corporation or partnership, exclusive jurisdiction is granted to any United States circuit court of appeals in the district to investigate all the pertinent facts, and the burden of proof shall be upon the owner of the patent to show that he has been and is using reasonable diligence in bringing about the bona fide working of said patent on a scale sufficient to show a bona fide establishment of the industry.

Upon failure to make such showing, the court shall order a non exclusive license granted to the petitioner upon such terms as it shall determine to be equitable.

Academy of Political Science Studies Europe

The part which America is playing and will continue to play, in the rehabilitation of Europe, was the general topic of the twenty-sixth annual meeting of the Academy of Political Science, held on May 12 and 13, at Philadelphia.

The subject was debated and discussed from all sides by speakers from all walks of life. Legislators, executives, ambassadors of foreign nations and educators all joined thoughts in this all absorbing question.

The first session dealt with the industrial and financial situation and its remedies. Speakers included the governmental representatives of the important continental European countries.

Another session took up the question of the relation of America's prosperity to the rehabilitation of Europe. Speakers included Senator Sterling of South Dakota; Albert Strauss, of New York; S. M. Vauclain, of Philadelphia; W. S. Culbertson, of Washington and Dr. George B. Roorbach of the Department of Commerce.

The European debts to the United States were discussed at another meeting. Senator Owen of Oklahoma, and E. R. Platt, of the Federal Reserve Board, were the speakers.

Southern Metal Trades in Savannah

The annual convention of the Southern Metal Trades Association will be held on June 19 and 20, at the Hotel Savannah, Savannah, Ga. Gus F. Meehan, of the Ross-Meehan Foundry Co., of Chattanooga, president of the Association, will preside.

While the program for the convention has not as yet been completed, there will be addresses on technical subjects and on the general business situation as it affects the metal trades industries of the South. One speaker will be Horace Lanier, of the West Point Iron Works, of West Point, Ga.; there will also be an address by J. R. McWane, president of the McWane Pipe Co., of Birmingham.

Weights and Measures Conference Next Week in Washington

The Fifteenth Annual Conference on Weights and Measures will be held at the Bureau of Standards at Washington, May 23, 24, 25 and 26. These conferences are attended by government officials interested in weights and measures and by weights and measures officials of states, cities and counties. The sessions are also attended by manufacturers of apparatus and by representatives of industries interested in the general subject. A feature of each of these conferences is the display of manufacturers' exhibits of weighing and measuring apparatus.

The program includes an address by the Secretary of Commerce. C. A. Briggs, of the Bureau of Standards' staff, has taken as his subject "The Metric System: How Would it Be Put Into Effect?" H. W. Bearce, also an official of the Bureau of Standards, will discuss "The Fundamental Standard of Length." John N. Mackall, the chairman of the Maryland State Roads Commission, will point out how portable weighing devices can be used to protect highways. George Warner, chief inspector of weights and measures of Wisconsin, will discuss equipment for testing heavy capacity scales. Other speakers scheduled to appear include: William F. Cluett, chief deputy inspector of weights and measures, of Chicago; J. J. Cummings, chief inspector division of standards, State of Massachusetts; W. T. White, director, Bureau of Weights and Measures, State of New York; Representative Albert H. Vestal, chairman, Committee on Coinage, Weights and Measures, House of Representatives; W. B. McGrady, chief, Bureau of Standards, State of Pennsylvania; P. C. Brooks, president, Scale and Balance Manufacturers' Association; J. J. Holwell, commissioner, Mayor's Bureau of Weights and Measures, City of New York; and John M. Mote, inspector of weights and measures, State of Ohio.

Ninth National Foreign Trade Convention

Outlook for Distribution of American Products Abroad Discussed by Experts—Transportation and Exchange Problems Studied

The Ninth National Foreign Trade Convention held its sessions in Philadelphia at the Academy of Music, May 10 to 12 inclusive. The first day's program included discussions on "A Foreign Loan Policy That Will Enable Idle Factors to Get Work," by J. T. Broderick; and "A Practical Method of Putting Our Surplus Gold to Work in Financing Foreign Trade," by Julius H. Barnes. These subjects were discussed from the standpoint of general farm products, manufactures, cotton and the foreign trade merchant.

"The Factor of Depreciated Currency" was discussed by Chas. M. Muchnic, vice-president of the American Locomotive Sales Corporation, who has just returned from an extensive trip in Continental Europe. He said in part:

"There are vast potential demands for all kinds of our products and there are in Europe vast potential means for production and the creation of wealth and consequently of purchasing power or capacity. What is required is faith and confidence in them and the supply of the necessary capital to hasten their general industrial revival. Before the world can again become a large purchaser of our manufactured products we must see a Europe prosperous, busy, producing; the sale of our manufactured products to Europe will follow the sale of our foodstuffs, copper, cotton and other semi-manufactured products.

Europe Not Prosperous

"The present depression in our export trade is not due to German, Austrian, Belgian, French or British competition but to a world lack of purchasing power. German exports, in spite of its depreciated currency, are, according to Dr. Walter Rathenau, only 75 per cent. of its pre-war records. There is unemployment in Belgium and in England; and French industry is largely engaged in the reconstruction of its devastated territories and industries," continued Mr. Muchnic.

"It is interesting to note that while in England, France, Belgium and in the United States wages and costs of living have been materially reduced during the year 1921, and the tendency is for still further downward readjustment, in Austria the reverse has taken place. I was quite surprised to find during my recent visit to Vienna that the costs of practically everything was from fifty per cent to one hundred per cent more than in Germany and nearly as costly as in London, Paris or New York. Austria reached the natural or the gold basis of cost of production. When we bear in mind that in the cost of production of any article in any part of the world enter, first, cost of the raw materials, second, cost of labor which is dependent on the cost of food, shelter and clothing, and third, the cost of plant and depreciation, we inevitably come to the conclusion that the costs of production of all similar manufactured products in all parts of the world must eventually be equalized on a gold basis with possibly the same differentials between various countries that existed before the war."

The other addresses of the session were "Why We Must Have Foreign Trade," by James S. Alexander and "The Effect of High Taxation on Exchange," by J. C. Ainsworth.

The attack on our educational system by Dr. R. S. McElwee, Dean of the School of Foreign Service at Georgetown University attracted attention. Among other things Dr. McElwee stated that the deficiency in knowledge of modern languages, place geography, English composition, beaux arts and the principles of economics was deplorable.

Methods All Wrong

"The deficiency in modern languages is too well known. It seems that all language teaching, almost without exception, is approached from the wrong angle in our national language teaching. Until any individual has mastered the spoken language to a sufficient extent to have some feeling for the language to have it ring in his ears, it seems to me almost worse than useless to drag him through the very meticulous refinements of grammar and difficult classical literature. On the other hand, if a student can read the daily papers and magazines and speak with a good accent and in the usual phrases and idioms, not just words, he can be brought to feel the actual living language of a people—as they use it in their daily lives of business, religion and pleasure. We commence at the wrong end—for instance, imagine teaching a Frenchman English by beginning with a minute examination of all the finest phases of grammatical construction, by learning columns of isolated words and then a text from Shakespeare, Milton, or Browning.

"The knowledge of Geography of high school and college graduates alike, who enter the School of Foreign Service, is almost entirely a cipher. We have found it necessary to put in a clause in the Catalogue to the effect that, 'Before graduation candidates for certificates or degrees must pass a special examination in geography, and that no student who is deficient in Place Geography will be graduated.'"

The topic for the main session of the second day concerned shipping in its various forms. The topics were: "The American Merchant Marine," by W. C. Conlen; "Inland Waterways as Developers of Traffic," by W. H. Stevenson; "Shipbuilding Prospects," by J. I. Ackerman; and "Marine Insurance," by Charles R. Page. The question of transportation costs was discussed by William H. Stevenson, president of the Lake Erie & Ohio River Canal Board of Pennsylvania, as follows:

"At the present time the most important business question to be settled for the American people is that of the early provision of cheap, regular and adequate transportation facilities.

"We cannot hope to properly meet foreign competition for exports unless we have a much lower rate for our products to our coasts, for we have to contend with the much cheaper foreign labor within other countries and also with cheaper carriage on foreign ships, as well as the shorter hauls to their seaports on the internal waterways of other countries.

"The figures for March, 1922, show that while our exports were $55,000,000 less than for March, 1921, our imports were $6,000,000 greater. As I have said, our capabilities for production at present are much greater than the demand for our products, and we must therefore greatly increase our foreign trade. We realize now that the saying that 'no one can live unto himself alone' applies with even greater force in the case of nations and so it is necessary for us to cultivate as much as possible our trade relations with other countries.

"The railroads thus being unable to adequately supply the cheap and prompt transportation from the interior to the coasts so requisite for the securing of our proper share of the foreign trade, to what other agency must we look?

"The one great vital connecting link in this nation-wide system of waterways is the Lake Erie and Ohio River Canal. This will connect the Ohio River with Lake Erie.

"The canal with double locks will have a capacity of at least 76,000,000 tons annually. Great industries of the district have already specifically promised it 50,000,000 tons of traffic, five times the traffic on the Panama Canal, and the smaller ones will supply an equal amount. The canal will traverse the greatest tonnage district in the world, through which there has been moved about 400,000,000 tons in one year. Every ten years the traffic has doubled. So you can see the vast possibilities of this waterway, the bulk of the traffic on which will be iron ore coming south and coal going north. Of both these materials there are supplies to last four hundred years."

Ocean Carriage and Marine Insurance

Under the general heading of "Ocean Carriage," W. H. La Boyteaux presented a paper on the vital points in marine insurance policies. He said in part:

"Although in the United States all insurance companies are subject to state regulation and supervision in respect to their financial status, this, however, does not prevent insolvency, and is no protection against bad management. The 'morale of the company is quite as important as the financial position.'

"Great care should be taken in the placing of marine insurance in foreign markets," continued Mr. La Boyteaux. "The English market is generally recognized as a world's market. For years it has done a world-wide business. Orders for marine insurance are sent there daily in large volume from every country in the world. The capacity of the market is almost, if not quite, as large as the combined capacity of all the outside markets. Its underwriters

have realized the necessity of conducting their affairs on broad and liberal lines and have established an enviable reputation in respect to security and fair dealing. The marine insurer doing business in the United States is the equal of the insurers in England in every way. Also, that entirely apart from sentimental considerations many business reasons exist why American merchants should always give every preference to the American market. This market deserves your loyal support, and that it will get it I have no doubt.

"The marine insurance policy is the contract between the insurer and the insured. The protection afforded by the policy depends entirely upon its terms just as in any other contract. It may furnish a broad and comprehensive protection, or a narrow and restricted one. It is a contract dealing with a complicated subject requiring special knowledge of the rules of law laid down by the courts and of established customs and usages. Few who take out marine policies will trust themselves to make their own contracts with the insurer. They want expert advice and guidance, and for this they go to a broker whose business it is to act for the assured and upon whom they can depend to prepare and negotiate with insurers a contract suited to their needs. There are many such brokers who are not the agent of the companies but act entirely as expert advisers to the buyers of insurance in all matters pertaining thereto, including the handling of their losses.

"The cost is important, but the character of the protection and the security is more so. If you are buying protection you want good, conservative protection,—Class A bonds, not speculative security. The first cost may be slightly higher, but the final cost is less."

South American Business

At the same time another group discussed market conditions abroad, these including "European Business," by C. J. Warren; "South American Business," by F. de St. Phalle; and "Far Eastern Business," by E. G. Anderson. Regarding South America, Mr. de St. Phalle said:

"While South Americans do trade with Germany, they have experienced many disappointments connected with late deliveries, inferior material, and, recently, by increases in invoice values of accepted prices. This tends to bring about greater consideration and better feeling towards the United States.

"The future holds out bright prospects for South America and for the United States. South America will develop at an increasing rate because it is the most attractive and richest of the thinly populated sections available. In addition to the future Development of South America being greater, a larger proportion of this development will be financed and carried out with the assistance of the United States. Economic factors governing the movements of exchange are now better understood in South America and the many loans recently issued from New York to South American countries, coupled with the rising tendency of exchange, have greatly improved the feeling. In the future South America looks to increasing growth carried out to an increasing extent with the assistance of American financial, engineering and business co-operation, all of which is being prepared for at this time.

"With the general recovery of trade, South American exchanges may be expected to rise; some of them have already done so materially. The Argentine will unquestionably return to gold exchange within a comparatively short time. The fall of exchange usually caused by excessive buying and insufficient selling carries within itself its own remedy. By cutting down the country's buying power it reduces imports and lowers prevailing wages by comparison with outside standards which should in time foster exports. The reason for the activity of the copper mines in Chile while the mines in the United States were idle, was the low cost of Chilean labor in terms of gold."

The Exchange Situation

The last day had a very full program beginning with the "Interest of Agriculture in Foreign Trade," by Harvey J. Sconce; "Need for Imports to Pay for Exports," by Walter Lichenstein; "Factors That Will Help the Exchange Situation," by Fred I. Kent; and "A Foreign Trade Policy for Americans," by James A. Farrell. Regarding exchange Mr. Kent offered the following suggestions:

Co-operation with Russia along lines aimed to reduce the menace of the Red Army; Eliminate the menace of the vicious propaganda of its present rulers;

Obtain recognition of the rights of the Russian people to have a free press, a free expression of opinion, free elections of government officers and definite property rights;

A quick settlement of the German reparations with terms of payment compatible with existing conditions even though they recognize, as they should do, that Germany should pay a real penalty.

A cancellation after agreements as to co-operation of some percentage of the Inter-Allied loans that can fairly be estimated to represent a direct and legitimate war charge to the nations taking part in the cancellation;

Reduction of governmental waste;

Stoppage of inflation caused by the issuance of new currency and increase in floating loans;

The removal of trade barriers by means of special commercial treaties and agreements between nations;

Greater co-operation between capital and labor so as to allow for the increase of production as rapidly as concurrent developing conditions enable its absorption; a better world morale working toward the elimination of class and national hatreds and the increase of integrity and square dealing.

Financing Exports

The group session dealing with the problems of the exporter included addresses on "Financing Export Shipments," by W. H. Knox; "Co-operation of Export Merchant and Manufacturer," by C. W. Beaver, and a paper of similar nature by G. R. Parker. Export advertising aimed to reduce the cost of export selling was discussed in "Practical Use of Available Information," by Wm. Menkel; "Organization and Management of Advertising Forces," by Jas. S. Martin: and "Co-operating with Dealers," by D. L. Brown.

Another group on foreign credits and credit information had three interesting papers: "The Three C's in Foreign Credit Guaranty," by A. T. Richards; "Practical Safeguarding of Foreign Credits at Minimum Cost," by M. H. Hopkins; and "Guide Posts in Foreign Credit Guaranty," by L. R. Browne, who said:

"One whose province it is to administer foreign credits should bring vision and understanding to its problems, striving to look into the future, not permitting himself to be bound by a too narrowly restricted consideration of the one problem before.

"The aim of the credit manager should be: To build a foundation for future business that will endure. He should be actuated by larger motives than the desire to invariably and above all things play safe no matter what may fall.

"Granted the vision and understanding which success in his field of endeavor demands he will perhaps at times assume risks which, if measured solely by a rigid application of any set of hard and fast credit rules, would seem to carry more than ordinary business hazards but with supreme faith in the people with whom he deals, in the fundamental soundness of their country and the worthiness of their motives—all these, the offspring of knowledge—he will take his risk confidently, sure, even in the face of a conviction that conditions may require the granting of extensions or that drafts may not be paid exactly on maturity dates that time and results will bring justification. He will build good-will and confidence and inculcate in the minds of his foreign customers that priceless asset—an unshakable confidence born only of the highest type of intelligent, dependable and sympathetic service."

Importance of Credit Supervision

Mr. Browne then went on to describe in detail the ideal credit manager whom he pictured as one knowing as much about other countries, the lives and habits of other people as he should concerning those of the country in which he lives and whose language he speaks.

"There is a fairly general and mistaken impression that credit information is limited to such facts as may be found only in a financial statement, analyzed according to fixed rules, coupled with a summary of expressed opinions as to character and capacity," said Mr. Browne.

"In its broader aspects, credit information goes far beyond any such narrow limits, especially to one whose responsibility it is to determine the measure of the risks involved in foreign transactions. There are few known or ascertainable facts bearing on the lives of the people of countries with which he deals, whether of a political, traditional, historical, phychological, social, economical, physical, geographical, climatic, commercial or of even a religious character that should be lacking in interest to the foreign credit grantor or be considered of no value to him or by him. The greater store of such knowledge he possesses or is in position to command, coupled with ability to apply it with judgment, the more efficient he becomes."

A banquet, at which Gov. Sproul of Pennsylvania spoke on "Foreign Trade and Domestic Prosperity," closed the convention.

Manufacturers See Prosperity Ahead

Twenty-four Hour Report from Industrial Centers Shows Great Improvement—Favor Greater Navy and Merchant Marine—Edgerton Re-elected

A decidedly optimistic outlook for American business and a greater faith in the future of our industrial life, was the keynote of the twenty-seventh annual convention of the National Association of Manufacturers, held in the Waldorf-Astoria Hotel, New York City, on May 8, 9 and 10. The convention was attended by over five hundred of the most prominent manufacturers in the United States. Practically all lines of business were represented and the general spirit of the meeting was one of restored optimism and an awakening of business men to a greater responsibility of their relation to the needs of the industry.

The outstanding feature of the three-day meeting was the twenty-four hour report of business conditions which was presented at the afternoon session on Tuesday. This report gave a first-hand resume of business conditions as they were during the first twenty-four hours during which the convention was in progress. In announcing the result of the survey, President Edgerton said that business was shown to be on the upgrade in practically all the basic industries and that "we have not only turned the corner, but are now leaving it very far behind." The survey was compiled within twenty-four hours of its presentation and was based on more than 50,000 answers from a questionnaire sent to all members of the association, and represented an immediate summation of conditions in every section of the country.

Among key industries the survey showed conditions in the iron and steel trade classed as excellent in 6 per cent of the plants reporting; 25 per cent were stated as good; 52 per cent as fair and 17 per cent as poor. For the fall this industry reported prospects of excellent business in 4 per cent of the replies; good in 50 per cent of the replies; fair in 43 per cent of the replies and poor in only 3 per cent. Compared with last year, 75 per cent of these factories and mills reported conditions better than last year, 15 per cent report conditions lower and 10 per cent of the cases report no change. Stocks were reported normal by these industries in 60 per cent of the cases, low on 33 per cent and over in only 7 per cent. As to employment, a large increase was reported in 23 per cent of the cases; a small increase in 47 per cent of the cases; a large decrease in only 6 per cent and a slight decrease in 23 per cent. For the fall the outlook is for a large increase in 32 per cent of the factories, a small increase in 68 per cent, and not a single one reported no increase.

Eighty Per Cent Normal

In the machinery and tool industry, 80 per cent of the replies reported present conditions from fair to excellent and the remainder reported less encouragingly. Ninety per cent look for fine business in the fall. In 70 per cent of the replies, business is reported better than last spring; 16 per cent seeing no appreciable change, and 14 per cent finding a decreased business. They have increased their factories' forces, but for the fall 90 per cent look for a decided increase in the working forces and less than 1 per cent look pessimistically for a large decrease in employment.

In his annual address to the association, President John E. Edgerton urged the members to lend their influence and effort to the combating of syndicalism and socialism, "and other mental and moral diseases with deceiving names" which are invading our schools, churches and legislative bodies. He concluded with an expression of his belief that the country would soon be on a normal production basis.

More Production Needed

He said: "The chief of all the economic problems of this hour is a world production sufficient for a world's needs, and a simplified system of distribution that will reach to every human being. The proportion of consumers to producers is too large, and the energies and talents of too many people are engaged in the process of distribution. When you add to the superflous number of the distributors of the products of the producers the countless host of those whose chief activities are to reform, regulate, inspect, denounce, tax, plunder and otherwise live upon those who are trying to produce something, it will not be difficult to discover the principal factor in the continuing high cost of living.

"But we have in America all of the materials and brains necessary to the restoration of a wholesome condition throughout the country, and a large amount to spare to other more unfortunate peoples. And in spite of the innumerable obstacles ahead of us at the beginning of our march toward stable conditions, and of the many yet unsurmounted, I am one of those who believe that we have made all of the progress that we could have reasonably expected to make in so short a time after the world cataclysm, and that we shall continue with probably occasional halts to the heights of a national and world greatness not hitherto known."

The Monday evening session was devoted to a discussion of foreign trade, its present status and its future possibilities. Edward C. Plummer, commissioner, United States Shipping Board, spoke on the relation of the merchant marine to our foreign trade. He said that it was a recognized truth that only through its own ships can a country properly develop its foreign trade and that it was evident that only through such a merchant marine as we propose that the foreign trade of this country could be properly developed, and the industries of this country be given their proper opportunities. Shipping is a means and not an end.

In pleading for a nationwide support of a greater merchant marine he said in part: "One very common plan apparently adopted for the purpose of misleading the public appears in the statement so often made that the United States aims to become commercially supreme upon the seas. No intelligent American aims at that. What thoughtful Americans desire is that the United States shall have a merchant fleet sufficient to enable this country to handle a similar proportion of its foreign commerce, and the proportion which England has insisted on carrying of her own foreign commerce, viz., from 60 per cent to 75 per cent is good enough for us—but we should insist upon carrying as much in the interest of the people of this country.

"To claim anything else is merely to say in effect that we don't want American ships to carry any material part of the commerce of this country—that we don't want to enlarge the markets for American products or give increased employment to American labor."

F. C. Schwedtman, vice-president of the National City Bank, New York, spoke on the financial side of the foreign trade question. He devoted the greater part of his address to an analysis of foreign loans and the position of American banks in the upbuilding of foreign trade. The stabilization of the principal currencies of the world, he declared, was a pre-requisite to the prosperity of world trade, and he explained the extent of and the limitations on aids to exporters by American banks.

He said: "World trade can never prosper until the principal currencies of the world are stabilized. The credit structure must be built on factors that are reasonably certain. The world's desire for a fixed gold standard by which goods may be valued and business carried on is shown by the widespread desire in every country for dollars."

While he gave an emphatic affirmative to the question whether foreign bond issues sold here were beneficial to our foreign trade, he was equally emphatic in declaring against restricting the spending of the proceeds of these flotations to American merchants and manufacturers.

Governmental Regulation

The afternoon of Tuesday was given to a business revival session. The main speaker was Senator Walter E. Edge, of New Jersey, whose subject was "The Duty of Government to Business." The Senator gave a brief summary of his resolution, recently introduced in Congress, providing for governmental regulation of trade association activities. He said:

"I recognize that business doesn't like governmental regulation and I sympathize with business in that viewpoint, but my friends you must take one thing or the other: You must either take, under present conditions continued investigations and efforts of grand juries, to indict business representatives (because they in many cases innocently trespass upon the present acts regulating business and that is happening today as you well know); or you must accept the official co-operation of some governmental body which has delegated power to talk to your representatives and to discuss the limit to which you can go, in their judgment, in the way of publishing information, statistics and all the other activities that trade associations indulge in."

Other speakers at this session were: J. R. Howard, of the American Farm Bureau, on "The Farmer and Industry"; R. C. Marshall, Jr., Associated General Contractors of America, on "The Greatest Revival in the Construction Industry"; J. D. A. Morrow, National Coal Association, "The Outlook for Coal"; W. Averell Harriman, United American Lines, on "The Future of Our Shipping Industry"; C. M. Ripley, General Electric Co., on "Interpreting the Corporation to the Worker."

On Tuesday afternoon the officers and directors of the association were invited to the Brooklyn Navy Yard by Admiral R. E. Coontz, chief of Naval operations, U. S. N. The party was entertained on the battleship "Wyoming," flagship of the Atlantic Fleet. Rear Admiral John D. McDonald, commander of the fleet, welcomed the guests on board, and in a brief after-dinner speech asked them to give some thought to the proposed cut in the Navy personnel. He said that ships do not fight ships, but that men fight ships. The guests were conducted on an inspection of the vessel by the staff officers of the Admiral.

At the annual banquet held in the grand ballroom on Tuesday evening James A. Emery, general counsel for the association, was toastmaster. The speaker of the evening was Admiral R. E. Coontz, U. S. N., who made a stirring appeal for a greater and better navy. He dwelt at some length on the value of the Navy as a factor in foreign trade, detailing its work in the past in opening foreign ports and keeping the seas open to American traders. He said that $300,000,000 a year was not much to spend on a Navy that aided so materially in maintaining an annual foreign trade of over eight billion dollars.

He said, "If we spend $300,000,000 a year on the Navy, and thereby maintain an open market throughout the world for $8,000,000,000 worth of exports, is this not a good investment? Money spent on the Navy serves the dual purpose of insurance in time of peace and a fighting force in time of war. We should have a Navy of sufficient strength to support our policies and our commerce, and to guard our continental and overseas possessions. Our foreign policies are as strong as our fleet and no stronger.

Fallacy of Disarmament

On the subject of disarmament he had this to say: "It is a popular fallacy to think that a holiday in battleship building will bring a great reduction of taxes. A slight study of history is sufficient to show that disarmament will not prevent war. Many of the pacifists seem to think that military forces are only bent on destruction. As a matter of fact they are really constructive. Wherever they go, they better local conditions, establish schools and improve public health. Panama at one time before we went there was a fever infested place where human beings died like flies. It can truly be said that our armed forces have saved more lives than they have taken."

The subject of trade associations which has occupied the minds of public officials and business men of late was thoroughly discussed at the Wednesday morning session. Secretary of Commerce Herbert Hoover was chairman of this session and delivered the opening address. Mr. Hoover gave an intelligent analysis of this question. He praised the work of legitimate trade associations and said that their assistance has been invaluable to the Department of Commerce in its reorganizing work.

Referring to the recent governmental investigation of the purpose of certain questionable practices in trade associations, he said:

"It is my belief that if trade associations are to grow in beneficent directions they should have some definition in law that will remove the uncertainties of their situation.

"The proposal that I should like to put forward for your consideration is a simplification of the proposals recently made by Senator Edge. I claim



JOHN E. EDGERTON

no originality in them, for similar suggestions have long been under discussion. Without entering upon legal formulation, my suggestion is that there should be enacted a minor extension to the Clayton Act to the effect that interstate trade associations should be permitted to file with some appropriate governmental agency the plan of their operations and the functions they propose to carry on. That upon approval of such of these functions as do not apparently contravene the restraint of trade acts, they may proceed with their operations. If, upon complaint, however, either of individuals or the law officers of the Government, that these functions do restrain trade, then after a hearing and proof the right to continue these particular functions shall be suspended, and if continued they shall be subject to prosecution. Also, if it shall be proved that they have extended their activities beyond the functions in their original proposals they shall be subject to prosecution from restraint of trade violations. Associations which do not wish to secure this limited interpretation of the law with its assistance to confidence should not be required to do so; they, however, necessarily assume themselves the job of interpreting the law with the risks such interpretation entails. All who know the situation in these associations will realize that in the main their membership comprises a smaller business. Such measures will serve to protect small business, for big business takes care of itself.

"I need not refer here to the beneficent results that have been attained to the community by the legitimate associations in the safeguarding of quality of goods, in reduction of waste in manufacture and distribution, in promotion of foreign trade, and a score of directions that make for the upbuilding of our commerce and industry. These are the sort of things that we must preserve in American life."

Other speakers at this session were: Alfred L. Reeves, president, Trade Association Executives of New York; Morris L. Ernst, counsel, Jewelers Board of Trade, New York; H. B. Thompson, counsel, Proprietary Association, Washington; C. R. Stevenson, of the Stevenson Corporation.

On Wednesday afternoon the convention was addressed by the Secretary of Labor, James J. Davis, who devoted his remarks to an explanation of the work of his department in its relation with the employer and the working man. He asked for the co-operation of the manufacturers in making the Department of Labor a greater force in curing industrial ills. He declared that unemployment was a piece of "needless stupidity," and wound up with a plea to employers to give every opportunity to the younger generation to learn a trade, which he declared was the foundation of a good education and a good business training.

Against the Bonus

Several important resolutions were presented and adopted at this session. One called upon Congress to maintain a Navy of the United States at a ratio in keeping with the national dignity and of sufficient strength to assure adequate defense. Another resolution condemned a cash bonus for World War veterans, but commended the work of the U. S. Veterans' Bureau in its work of rehabilitation and vocational training. The convention also approved by resolution the proposal of President Harding in asking Congress to support an adequate American Merchant Marine. Still another resolution asked for substantive changes in the present tax laws, so as to provide a better recognition of business enterprise by assuring a greater return on capital invested. The association went on record as opposed to the Stanley patent bill (S-3410), "because it introduced in our patent system an obligation on American patentees to work their inventions within a limited period and subjects them to the grant of compulsory licenses, both of which provisions are an unwise innovation in the American patent system . . . this will discourage invention and impair the value of American patents and will impede, instead of promote, the progress of the useful arts in this country."

The election of officers resulted in the unanimous selection of John E. Edgerton, of the Lebannon Woolen Mills, Nashville, Tenn., to serve another term as president. Vice-presidents were chosen from each of the states represented. George S. Boudinot, of New York was elected secretary and Henry Abbot, treasurer.

The closing number on the program was a motion picture showing of industrial films. As the pictures were thrown on the screen, they were explained by men from the field of industry which they illustrated. Mining, farming, electrical phenomena, railroad operations, and radium production were some of the subjects covered.

Supply and Machinery Men Hold Conventions

Manufacturers and Dealers Talk Over Business Problems—Legislation to Unfetter Business Urged by Manufacturers—Spirit of Sane Optimism Shown

Very interesting and profitable conventions were held on May 8 to 10 at the Marlborough-Blenheim Hotel, Atlantic City, N. J., by the American Supply and Machinery Manufacturers' Association and the National Supply and Machinery Dealers' Association.

Business conditions were fully discussed and ideas as to the future exchanged. The needs of an intelligent interest in world problems and of the application of sound economic principles to business were quite generally expressed. The keynote of the manufacturers' meeting was the liberation of business from the legislation that now hampers its activities. The dealers were interested primarily in ways and means to reduce overhead expense, so as to enable them to do business under present conditions.

The American Supply and Machinery Manufacturers' Association began on Monday morning with an executive session that was largely a continuation of the meeting held at Birmingham on April 24 to 26. President N. A. Gladding, of E. C. Atkins & Co., Inc., Indianapolis, in his opening address laid stress on the importance to the business man of keeping well posted on developments of importance to the community and to business in general. After citing cases such as the proposed Edge law and the bonus bill now before Congress, he stated that business men must make themselves felt in Washington in order to affect the legislation on problems in which they are so vitally interested.

Capt. John W. Gorby, of the Cyclone Fence Co., Waukegan, Ill., told in a very interesting way how some concerns have solved the post-war business problems. He said that the best means at the disposal of the business man for meeting the present conditions are the use of advertising, better salesmanship, and the more rapid turnover of goods. Captain Gorby believed that our problems would all eventually be solved through the great and varied resources of America and her people. His closing remarks dealt with the need of faith in the future, centering about the words, "As your faith is, so be your prosperity."

The need of applying sound economic principles to business was brought out by A. T. Simonds, of the Simonds Manufacturing Co., Fitchburg, Mass. He said that we needed the ability to better predict the future of business, in order to cut out the valleys and the peaks of the business curve. To do this a man must have a broad knowledge of the factors entering into the problem, and he cannot limit his knowledge to one line of work. Mr. Simonds said that he thought business in general too much hampered by legislation, and pointed out the advisability of putting business men in position to make our laws. He predicted that the wave of activity now beginning would be short, being broken by a depression and followed by a long period of falling prices.

In the afternoon the session was held jointly with the National Supply and Machinery Dealers' Association. President Gladding opened the program, treating chiefly with business as related to affairs at Washington. He decried class legislation, but advised close contact with the law-making machinery of the country. He asked that support be given to Secretary Hoover and to others who are doing constructive work for business in general.

An excellent address was delivered by Rev. James E. Crowther, D.D., of Philadelphia, on "Theodore Roosevelt—American." In telling of the qualities and the varied activities of our late president, Dr. Crowther showed that



IRVING W. LEMAUX
President of Manufacturers

Roosevelt was the very embodiment of the idea of Americanism.

The necessity of "seeing things as they are" was brought out by G. A. O'Reilly, vice-president of the Irving National Bank of New York. He applied this necessity particularly to conditions abroad and to our relations with other countries. It is useless to attempt to hurry developments, such as the financing of export trade, until the country at large realizes the importance of such steps and is ready to take them. For this reason general education on the value of foreign trade is necessary before any attempt is made to create a mechanism for carrying on such trade. Mr. O'Reilly said that he believed we would never "go back to normal," because we are constantly progressing. Our problems, however, will work themselves out just as they have been doing.

The dealers' and jobbers' problems and viewpoint, with particular reference to the South, were presented on Tuesday afternoon by Alvin Smith, of the Smith-Courtney Co., Richmond, Va., and secretary of the Southern Supply and Machinery Dealers' Association. He treated such subjects as discounts, wholesale prices and the cost of doing business. Mr. Smith urged manufacturers to maintain definite sales policies, so that dealers are afforded greater protection. He spoke of the value of the dealer to the manufacturer and asked for better acquaintance and closer co-operation between them for their mutual advantage.

The keynote of the whole convention was struck by the Honorable Felix H. Levy, of New York, who addressed the association on the subject of "Anti-Trust Laws." He stated that business men were too greatly hampered by legislation, which interferes with the very details of their daily business. The Sherman Law has fallen from its original purpose of breaking the big trusts, and is now restricting business in a way that is detrimental to its growth. Mr. Levy believes that the recent decision in the Mennen case is a mis-interpretation of the Clayton Law. He believes that historians will consider as very unique our laws governing business, as they are opposed to those existing in all other countries. Business men are prevented from employing through their trade associations the greatest means that could be used for stabilizing business, that of agreeing on terms of sale and prices. The efforts of Senator Edge and of Secretary Hoover deserve commendation, Mr. Levy said, although the passage of laws to unfetter business must mean also a revision of the Sherman Law.

The last session, held Wednesday morning, was primarily executive. A resolution was adopted supporting Senator Edge of New Jersey in his attempt to relieve the hampering of trade associations by the existing anti-trust laws. The resolution "earnestly recommends to Congress enactment of suitable legislation which will remove the hindrances and obstacles placed by the anti-trust laws upon trade associations, whereby co-operation by them in many important fields of activity is prevented."

Cincinnati was chosen as the place of the next convention.

The officers elected for the coming year are: President, Irving W. Lemaux, Indianapolis Brush and Broom Manufacturing Co., Indianapolis, Ind.; first vice-president, Dave C. Jones, Lunkenheimer Co., Cincinnati, Ohio; second vice-president, C. W. Machon, Brown & Sharpe Manufacturing Co., Providence, R. I.; third vice-president, M. B. Skinner, M. B. Skinner Co., Chicago, Ill.; executive committee, A. T. Simonds, Simonds Manufacturing Co., Fitchburg, Mass.; Joseph M. Hottel, Delta File Works, Philadelphia, Pa.; John C. Ruf, T. B. Williams & Sons, Dover, N. H.; W. H. Glatt, Victor Balata and Textile Belting Co., New York, N. Y.; W. H. Fisher, T. B. Wood's Sons Co., Chambersburg, Pa. F. D. Mitchell, New York, N. Y., continues as secretary-treasurer.

The attendance at the convention was quite large, and great interest was shown in the program. In the evenings entertainment was provided for members and their guests, a dance being held on Monday and a concert on Tuesday.

National Supply and Machinery Dealers' Association in Seventeenth Annual Convention—Reduction of Overhead Expense the Greatest Problem of the Dealer

The National Supply and Machinery Dealers' Association devoted its opening session largely to discussing the business situation with relation to machinery and supplies. President Crannell Morgan, of the Hardware & Supply Co., Akron, dealt in his address with the problems that now face the machinery dealer. He spoke of the activities of the dealer during the war and the period immediately following it. Although expenses incurred in selling were very high during that period, the margin on which business was conducted was held practically constant because of the large volume of the business. Now, however, the volume is so small that reduction of the overhead expense is necessary in order to make business again profitable. More rapid turnover and conditions of trading with the manufacturers that are at least as favorable as must be extended to the customers, are the chief means of making trading safe in the near future.

The report of the secretary, Thomas A. Fernley, gave a résumé of the year's work and the prospects for the future. The attitude of the government toward the work of trade associations was given attention, as well as Federal tax problems. The price position in the industry and the matter of overhead expense received particular mention.

A discussion and interchange of information that brought out many interesting facts regarding business conditions then followed. Most of the members have now greatly reduced their stocks of merchandise, and have consequently reduced overhead expense. A faster turnover seems necessary in order to survive the existing conditions. Although most of the dealers aim to handle, in the main, goods on which the investment can be turned over four times a year, few of them have been able to obtain this rate.

The members as a group stated that business had improved somewhat, and they believed that it would continue to do so for some time. However, because of the condition of the market and the smallness of margins, averaging only 10 per cent on most lines, inventories and overhead must be watched with the greatest care for several years to come. Although it was believed that a reinstatement by the manufacturers of pre-war selling terms and conditions was desirable for stability, it is not now possible of attainment.

On Monday afternoon a session was held jointly with the American Supply and Machinery Manufacturers' Association, as just related.

The session on Tuesday morning was devoted to talks by manufacturers giving information regarding such business conditions as supply and demand, raw material, labor, present consumption and the prospects for consumption and prices in the future. J. H. Williams, president of J. H. Williams & Co., Brooklyn, spoke of conditions in the drop-forging industry. Mr. Williams urged co-operation between dealers and manufacturers in order that a firm basis for transactions could be developed. He stated that the drop-forging industry was at present greatly disorganized. He expected that the deflation that remains to be done would occur gradually and that further revival would be necessary before additional liquidation would occur. He expressed the belief that the next tendency in prices in his line would be upward.

Conditions in the twist-drill industry were described by Robert S. Carter, sales manager of the Whitman & Barnes Manufacturing Co., of Akron. It was shown by the speaker that present prices of twist drills are below the cost of manufacturing and selling them, and that the next price movement must logically be upward in order that the industry may survive. The volume of sales at the present time is increasing. Mr. Carter advocated a bigger margin



W. J. RADCLIFFE,
President of Dealers

on which to do business, as well as very liquid stocks for the jobber. He spoke favorably of the European plan of selling goods, in which the buyer pays directly for each extra service that is given him, instead of caring for all service costs in the original price.

Irving W. Lemaux, president of the Indianapolis Brush and Broom Manufacturing Co., Indianapolis, stated that since manufacturing costs are rising, it was logical to expect an increase in selling price. Business is increasing in volume at the present time, so that Mr. Lemaux was optimistic as to the future.

A general survey of business was given by Wallace L. Pond, domestic sales manager of the Nicholson File Co., Providence. Mr. Pond pointed to the large sums now being released by the railroads for supplies, to the better conditions prevailing in the agricultural regions, and to the improvement in business conditions and employment quite generally. The advantages of simplification of stocks were brought out by an example taken from his own concern.

W. W. Sanderson, general sales manager of the Carborundum Co., Niagara Falls, said that conditions in the abrasive industry seemed somewhat better in 1922 than they were in 1919. Since there is too much of a gap between manufacturing and sales organizations, Mr. Sanderson urged greater co-operation. He recommended that business conditions and prospects be carefully analyzed, in order to arrive at a safe basis for continuing operations.

The session was closed by A. T. Simonds of the Simonds Manufacturing Co., Fitchburg, Mass., who told of the value of applying sound economic principles to the conduct of business.

On Tuesday afternoon the subject of the readjustment of overhead expense to meet changed conditions incident to lower prices and slow business was discussed by the members at large. It developed that one of the principal means of modifying the current difficulties lay in the simplification of the variety of goods manufactured. It was recommended that information be exchanged locally in credit matters, so as to mutually protect the dealers. The giving of cash premiums also received attention.

The association desired to call to the attention of government bodies such as the Federal Trade Commission, the right of the supply trade to be recognized in its service of distributing goods. It adopted a resolution to ask for a setting aside or a modification of the order given recently in the Mennen case. The sentiment was that the manufacturer should be free to set selling prices for his dealers, provided that he does not enjoy a monopoly in his field.

In the closing session on Wednesday morning the dealers talked chiefly on the compensation and the handling of salesmen. It developed that, in general, city salesmen do not receive credit for sales to their customers unless they actually take the orders, although country salesmen receive credit for all sales made in their territory even if they do not actually write the orders themselves.

The following officers were elected for the ensuing year: President, W. J. Radcliffe, of E. A. Kinsey Co., Cincinnati; first vice-president, L. H. Swind, Swind Machinery Co., Philadelphia; second vice-president, B. H. Ackles, of the T. B. Rayl Co., Detroit; executive committee, F. Alexander Chandler, of Chandler & Farquhar Co., Boston; H. C. Ellsworth, of the White Tool and Supply Co., Cleveland; and George F. Root of Root, Neal & Co., Buffalo. Thomas A. Fernley of Philadelphia continues as secretary-treasurer and T. James Fernley as advisory secretary-treasurer.

Post Office Gets $376,500 for Canceling Machines

The House and Senate conferees on the postoffice appropriation bill for the next fiscal year have agreed on $376,500 for canceling machines for the postal service, instead of $350,000 as originally provided by the House. Of this amount it is specified that $26,500 shall be used for the purchase and installation of a letter distributing machine, if on test such a machine is found to be satisfactory and efficient. The conferees eliminated the provision that postal funds shall not be expended for the purchase or repair of any commodity which can be manufactured or repaired at the nearest available government arsenal or navy yard for less.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

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All the markets moved logically last week. Commodities, which are just commencing to reflect the general recovery of confidence, were firm with an upward tendency, but stocks and bonds, some of which were from 30 to 50 per cent over the lowest prices reached, were reactionary.

This was entirely natural. The strongest man grows weary and must rest. No market can advance uninterruptedly and a period of quiescence for the digestion of the enormous bond issues recently placed was long overdue. It appears to have arrived last week and the $71,000,000 Federal Land Bank 20-year bonds which were sold on a 4½ per cent basis in a day seem to have been the drastic bromide that created a consciousness of satiety. Subsequent offerings were smaller and were not so well taken and it is said that other issues planned for the near future have been put in cold storage for a while. Concurrently and consequently there was some liquidation of speculatively held stocks which was perhaps accelerated by failure of two relatively unimportant brokerage houses. But in so far as the security markets are concerned the halt was perfectly normal and is not to be construed as indicating any change in fundamental conditions. The course of prices on the Stock Exchange generally foreshadows a commercial revival or contraction.

Revival to Last

The revival in general business that is just beginning has been indicated in the stock market for the last three months. Even if it were destined to be short lived it would continue through the summer and there are many reasons why it should last much longer. Of these the most important is that the nation's shelves are bare and many of its people inadequately housed.

The ease of money has started a movement to correct these conditions that cannot possibly be completed within a year and for that time at least activity will continue and labor will be employed. The stock market will meanwhile go up and down, but no disastrous break is probable until bank reserves and the money market signalize a prospective shortage of credit and even then it is likely that the signals will be for a time ignored.

As justifying this prognosis, there is to be noted continued strength in cotton and cotton goods, wool and woolen goods, wheat and corn, iron, steel and copper, burlaps and jute, silk, linen and flax, hides and leather, and several other less important staples. Coffee is lower because the bearish significance of the Brazilian coffee loan is commencing to be understood, but sugar and rubber, though stationary, are daily getting into a stronger position.

As was the case last week the firmness in each instance is attributed to some technical trade influence or development, but the movement is too inclusive to be adequately explained by technicalities. The broader basis upon which it rests is the abundance of credit that first made it possible to sell billions of bonds and is now reflected in the expenditure of the money received for these bonds for the construction, equipment and goods of which society was in need and in the fabrication of which labor is employed.

A Boom Coming

The cycle that embraces these sequences extends far beyond that within which the stock market moves and as it is altogether unlikely that it will be completed within the year I see no reason to doubt that the business activity due about July 1 will continue through next winter. It is, indeed, quite possible that we may have a secondary boom in the stock market as the money spent gets into circulation and passes back into the banks through the channels of trade.

The possibility of such a boom is perhaps increased by the gain of $10,500,000 in gold shown in the weekly statement of the Federal Reserve System. As a result the reserve ratio is slightly higher at 77.3 per cent against 76.7 at the end of the previous week. This renewed influx of gold is a distinct surprise and if it continues, which seems hardly possible, the advance in interest rates that some expect is likely to be deferred. The merger of Mr. Schwab's Bethlehem Steel Corporation with the Lackawanna Steel Company, involving as it does properties capitalized for nearly $400,000,000, is another incident that may excite the speculative imagination.

For the present the financial world seems a little less disposed to ignore the muddle at Genoa and the various other clouds to which I have previously called attention. Their passing may therefore end the hesitancy that now prevails among the mercurial speculators in the security markets.

For we must never forget that even the blackest clouds are dissipated in time and it is in order to observe that the textile strike seems nearer an end than for some weeks and that an advance of $1 a ton in the price of bituminous coal has already reinvigorated the previously languid effort that the Government was making to settle the coal strike. There is also some reason to hope that President Harding's fabian policy of opposition to the bonus bill may defeat it, though this is doubtful. As to Genoa all that can be said is that the inconclusiveness of the conference leaves things about where they were and that some good and no harm has been done by the exchange of views.

The relative strength of sterling as compared with francs and marks would indicate that the shrewd judges of international credit who dominate the market for foreign exchange do not consider that Great Britain's financial position has been impaired by the imbroglio at Genoa, and in the United States despite the "ancient grudge" there is a feeling that Europe will somehow muddle through if the British Empire stands.

In Germany the complete demonetization of the mark seems only a question of a short time unless she can get a large foreign loan, for according to the statement of May 6 the paper currency outstanding amounted to 141,000,000,000 marks. This is an increase of 10,000,000,000 marks in the last fortnight.

No review of the week would be complete that did not include an allusion to the dinner to which President Harding has invited the chief railway executives of the country. It is reported and believed that he intends to urge an immediate and substantial reduction in freight and passenger rates. If this be true and his recommendation is accepted the effect upon business will probably be electrical, for modern commerce is directly dependent upon transportation and its cost. It is in fact doubtful whether either the business men or the railway officers realize what an increase in both the volume of goods handled and the carriers' net and gross revenue would follow a substantial reduction in rates.

Would Stimulate Business

The earnings of the roads are largely dependent upon the density of traffic and the consumptive power of the country is mainly a question of the cost at which its products can be distributed to its markets.

A reduction in railway rates sufficient to be really appreciable would give a stimulus to business that would be nation wide and it is to be hoped that the President will continue to use the influence of his great office to secure it.

In some cases the present tariff penalizes the enterprise of those pioneers who are trying to develop the remoter sections of the country, by freight charges that exceed the value of the article carried.

The result has been bankruptcy for some of those who are distant from the consuming centers where there is congestion, unemployment and unrest because the cost of transportation is a centripetal influence that prevents the distribution of the population.

Navy Wants Brass

The Navy Department has called for bids covering the following: Naval rolled brass bar, 36,618 lb.; commercial brass bar, 4,976 lb.; cast brass billets, 50 lb.; brass welding rods, 146 lb.; bronze rivet rod, 13,405 lb.; bronze phosphor bar, 20 lb.; bronze manganese bar, 6,062 lb.; copper bar, 1,776 lb.; copper, phosphor ingot, 485 lb.; muntz-metal bar, 3,749 lb.

The Trend of Business Improvement—Plants Resuming

The Commercial Steel Casting Co., Marion, Ohio, manufacturer of open-hearth steel castings, is operating at maximum capacity under the greatest volume of business ever experienced. Work has been commenced on an addition to double the present capacity.

The Motor Products Corporation, Ann Arbor, Mich., has adopted a night schedule of operation at its plant, in addition to regular day work.

The Delaware & Hudson Railroad Co. has resumed operations at its shops at Carbondale, Pa., following a shut down for several weeks.

The Maxwell Motor Co., Detroit, Mich., has added about 1,000 men to its working force during the past fortnight, bringing operations at the plant up to full capacity on an increased working basis of 300 cars a day.

The Perry-Fay Co., Elyria, Ohio, manufacturer of capscrews, bolts, etc., has adopted a full time operating schedule at its plant, giving employment to the regular working force.

The Reading Iron Co., Reading, Pa., has resumed operations at its plant at Birdsboro, Pa., devoted to the production of nails, etc. The mill has been closed down for about twenty-four months.

The Michigan Screw Co., Lansing, Mich., is advancing production at its plant and adding a large number of men to the working force. About 100 automatic screw machines, idle for more than fifteen months, have been placed in service.

The Gardner Motor Co., St. Louis, Mo., has increased production to a basis of 1,500 cars during May, as compared with an output of 1,050 automobiles during April. Additions are being made to the working force.

The Hoover Steel Ball Co., Ann Arbor, Mich., is increasing operations at its plant and about fifty men have recently been added to the working force.

The Dort Motor Car Co., Flint, Mich., has increased production to a basis of 100 cars per day, as compared with an output of 40 cars daily in March. Large additions have been made in the working force and all departments are running full.

The Western Automatic Machine Screw Co., Elyria, Ohio, has adopted a full time operating basis at its plant, giving employment to the regular working quota.

The Railway Steel Spring Co., New York, is increasing production at its plants at Depew and Hudson, N. Y., and at other points. A night shift has been inaugurated in a number of departments and additions made to the working force.

The Slatington Iron and Steel Co., Slatington, Pa., has reopened all departments at its plant, some of which have been closed for more than two years.

The Fox Furnace Co., Elyria, Ohio, has adopted a capacity schedule at its plant, with orders on hand to insure this basis for some time to come.

Dodge Brothers, Detroit, Mich., have increased the working force to about 13,000 men, with all departments running full time, on an average basis in excess of 600 automobiles a day.

The Production Foundries Co., Ann Arbor, Mich., has increased operations to a 100 per cent basis, with full time, full working force employment in all departments.

The Atchison, Topeka & Santa Fe Railway Co., has advanced operations to a full time, six-day week basis at its car shops at Cleburne, Tex., following a five-day week schedule for some time past. Production has also been resumed at the locomotive shops of the local plant.

Jones, MacNeal & Camp have started operations in the new factory at Warsaw, Ind. The company moved from Chicago about a month ago and has been busy setting up machinery and arranging equipment for several weeks. The plant will manufacture electric drills. It is expected that the working force will be gradually enlarged.

Chicago Letter

In general, business conditions in the Western machine tool industry continue to show an improvement and the outlook is very optimistic. Inquiries continue to out-number the amount of orders booked. The recent activities on the part of the automotive industries in buying machine tools, and a report which comes from a reliable source that the Santa Fe Railroad will place a number of orders by June 1, are two of the facts which help make the outlook optimistic at the present time.

Although most plants have not even given a thought to the present coal strike a few of them have stated that they will not be able to continue to sell at the present prices if they are forced to get their coal from the East.

The Chicago, Indianapolis & Louisville is inquiring for a 5-ft. radial drill. The Chicago, Milwaukee & St. Paul is inquiring for a 44-in. vertical boring mill, and a 36-in. lathe. To date the Illinois Central has not made a single inquiry for machine tools, but at the present time is asking for bids on five passenger cars 72-ft. long and has placed an order for 110 tons of bridge steel with the Truscon Steel Co., for use in a bridge at Homewood, Ill. There is also a report that the C. I. & L. has ordered 3,000 tons of rails from the Illinois Steel Company.

The Board of Education of Chicago recently awarded a contract to A. & E. Anderson, 19 South La Salle St., for the construction of a $3,000,000 addition to the Crane High School.

The Bates Valve Co. recently purchased eight hundred feet frontage on 83d St., South Chicago, Ill. They are contemplating the erection of a factory and will consolidate their four plants now located at various points.

The Strongheart Company, 1516 South Wabash Ave. recently purchased from the Stringer Brothers Foundry Co. the two-story factory building at 2944 West Lake St., which will be used for their business.

The Mt. Vernon Car Manufacturing Co., Mt. Vernon, Ill., has awarded a contract to the Hughes-Foulkrod Co., Pittsburgh, Pa., for the construction of a one-story foundry for the production of iron and other metal castings; it is estimated to cost about $250,000 including equipment.

Heald Machine Co. Salesmen Hold Conference in Worcester Plant

A three-day conference of salesmen was held at the office and plant of the Heald Machine Co., Worcester, Mass., May 8, 9 and 10, which was attended by the company's salesmen from all parts of the country. The objects of the conference were to promote a mutual understanding between the men and management, to get a line on business conditions by direct contact with the representatives, and to demonstrate to the men the new machines recently added to the Heald line.

Business sessions were held morning and afternoon, at which the executives of the company addressed the men with reference to the business of the past year, and prospects for the future. Individual problems of the men and their relations to the company were discussed and a general plan of campaign mapped out for the ensuing year and covering all sales problems.

The intervening periods were taken up with tours of inspection about the plant and in detailed study of the construction and capabilities of the new machines. The machines were run under test upon regular commercial work in order that the men might become thoroughly familiar with the set-up and operation of them and thus be in position to advise prospective customers as to what to expect in the way of output.

Recommendations for Education of Engineers

A closer co-operation between schools and colleges of engineering, and the industries which depend on them for educational support, was the recommendation made by the committee on Commercial Engineering of the United States Bureau of Education. The committee held its second conference in the Carnegie Institute of Technology, Pittsburgh, Pa., on May 1 and 2. Three group sessions were held. The first was presided over by George W. Dowrie, dean of the school of business, University of Minnesota; the second by Fred M. Feiker, vice-president of the McGraw-Hill Co., Inc.; and the third by L. W. Wallace, executive secretary of the Federated American Engineering Societies. At the close of the discussion the conference adopted the following report:

"The Conference recommends that colleges of engineering and of business adopt the following procedure in developing business training of engineers and the engineering training of business men;

(a) Secure the co-operation of industry in defining standard terminology and specifications of the requirements of industry.

(b) Analyze the specifications of the requirements of industry to determine what are the fundamentals that must be taught, and organize the instruction accordingly.

(c) Study and experiment with ways and means of discovering native bent and of measuring proficiency, that every student may be guided into a career of maximum achievement.

Business Items

The control of the Republic Truck Co., Cleveland, Ohio, has been acquired by J. O. Eaton and a group of associates, who will operate the factory. The transaction includes the control of the Twinsaxon Axle Co., also of Cleveland.

The New York office of Etablissements Hautmann, of Paris, France, has been discontinued.

Metal & Thermit Corporation, New York, announces the removal of its Pittsburgh branch office from 1427 Western Ave., to 801-807 Hillsboro St., Carnegie Station, Pittsburgh.

The Steel Tank and Pipe Co., capitalized at $250,000 has filed articles of incorporation with the county clerk at Oakland, Cal., and will do a general business in steel, iron and other metal products. Directors are: C. H. Ramsden, 769 Santa Ray Ave., Oakland; W. F. Fuchs, Piedmont, Cal.; and Claire A. P. Duffie.

Perrine & Maloney, Railway Exchange Bldg., Chicago, have been appointed to handle the products of the Lancaster Steel Products Co., of Detroit, in the Chicago district. The Maynard French Steel Co., Mercantile Library Bldg., Cincinnati, has been appointed representative in that city.

The Auto Diesel Piston Ring Co., New Haven, Conn., has recently been incorporated under the laws of Connecticut, to manufacture and sell piston rings, auto and gas engine accessories and devices. The capital stock of the new concern is $25,000, and the incorporators are: J. E. Megson, Catskill, N. Y.; R. D. Smith, Cleveland, Ohio; L. Austin, New Haven. A meeting will be held shortly and the company will begin production soon.

We have received a copy of the first volume of the "Jasco Driller," house-organ of the James Clark, Jr. Electric Co., Inc., of Louisville, Ky. Mr. Clark, who is president of the company, writes an interesting message to users of portable drills; the paper also contains some useful hints on ordering such drills.

Dwight P. Robinson & Co., New York, has been awarded the contract for the construction of a building to accommodate the American exhibits at the Brazilian Centennial Exposition, to be held in Rio de Janeiro beginning Sept. 7. The building, which will be the "permanent" exhibit building, will be constructed of American materials as far as possible.

The United States Steel Corporation has started the construction of a tube mill at Gary, Ind., which it is reported will cost $15,000,000. It is expected that the plant will be operating by the end of 1922.

Employees of the Deane plant of the Worthington Pump and Machinery Corporation, Holyoke, Mass., celebrated April 21 the forty-first anniversary of entrance of the manager, Charles L. Newcomb, into the employ of the concern.

The Canton Rim Co., has purchased the plant of the F. R. Fortune Tool Co., at Wooster, Ohio. An addition will be made to the present buildings, increasing the production capacity at least 50 per cent.

The American-LaFrance Fire Engine Co., with manufacturing plants in Elmira and Bloomfield, N. J., has moved its offices in New York City from 250 West 54th St., to the Fisk Building at 57th St. and Broadway.

Shipments from the factory of the Franklin Automobile Co., Syracuse, N. Y., during the first twenty days of April were not only greater than those for last year, but also set up a mark that has not been reached before during the same period in the history of the Franklin car.

The Hammond Steel Co., Syracuse, N. Y., has been sold for $50,000 to the Sizer Steel Co., of Buffalo, N. Y., at a receiver's sale. The new company is to be known as the Syracuse Steel Co., but is to be merged with the buying corporation. The Sizer company produces high-grade steel tubing. The Syracuse plant is to be equipped for the production of smaller tubing than the Buffalo plant of the concern.

The Patterson-Kelly Co., manufacturers of heating apparatus, has removed its New York City office to 101 Park Ave.

The Shanklin Equipment Co., Springfield, Mass., has contracted to supply cars of the London Tramways, Ltd., London, Eng., with their machines for the issuance of zone tickets and automatic adding of the fares collected. Alfred L. Chase, chief mechanic, will go to England to install the device, the first lot of which will be shipped in a few weeks.

The McKeesport plant of the National Tube Co., of Syracuse, N. Y., has resumed operations on a 100 per cent production schedule.

Following the merger of the Hudson Motor Car Co. and the Essex Motors, Inc., into one company under the Hudson name, a production schedule has been arranged calling for 24,000 Hudson automobiles, and 25,000 Essex cars during the year. Plant operations will be at capacity.

Personals

FRANK ADAMS, of the Whitin Machine Works, manufacturers of textile machinery, Whitinsville, Mass., has left for a business trip into Mexico.

WILLIAM FERGUSON, of the Whitin Machine Works, Whitinsville, Mass., left recently for Europe, where he will be engaged in the interests of the company for the next three months. Mr. Ferguson, will journey through France, Italy and Spain.

W. W. BRASIER, has been appointed general manager of hardware sales of the Yale & Towne Manufacturing Co., Stamford, Conn. Mr. Brasier has been with the company since 1906.

ROBERT H. NEWMAN, of Bridgeport, Conn., has been appointed temporary receiver of the Morris Metal Products Co., Bridgeport, Conn.

ROBERT C. MORRIS, of New York City, purchased the assets of the Hartford Automatic Parts Co., Hartford, Conn., at the auction held May 3. The purchase price was $350,000, and it is understood Mr. Morris represented the creditors of the company.

HORACE ARMSTRONG has been appointed sales manager of the Armstrong Bros. Tool Co., Chicago, Ill.

W. M. SHEETS, formerly of the Miami Cycle Works, has been made sales manager of the Lomar Manufacturing Co., Middletown, Ohio. Mr. Sheets is well-known in automotive fields.

L. S. LOVE, formerly vice-president and general manager of Barbour, Love & Woodward, New York, has resigned. No announcement of Mr. Love's plans for the future has been made.

R. M. BARWISE, who for the past twelve years has been the Eeastern representative of the Diamond Chain and Manufacturing Co., Indianapolis, Ind., has opened an office and storeroom at 18 Hudson St., New York City. Mr. Barwise will be a distributor for Diamond block and roller chains, custom made sprockets and special chains; also for Philadelphia gears and sprockets.

Obituary

GEORGE M. HOWE, metallurgic expert and author of many books on that subject, died at his home in Bedford Hills, N. J., on May 14. Mr. Howe had been honored by the British Iron and Steel Institute and by Franklin Institute. He was president of the American Institute of Mining Engineers in 1893.

JOHN H. PATTERSON, founder of the National Cash Register Co., Dayton, Ohio, died suddenly on May 7, while enroute to Atlantic City. Mr. Patterson was president and manager of the company which he organized in 1884 and was best known among manufacturers for his industrial philanthropy.

Catalogs Wanted

The Iron City Machine Works, Pueblo, Col., would like to receive catalogs and circulars from manufacturers of iron and steel products, machinery, tools and machine shop equipment. This company recently acquired the plant of the Main Street Machine Shop, in Pueblo.

Forthcoming Meetings

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

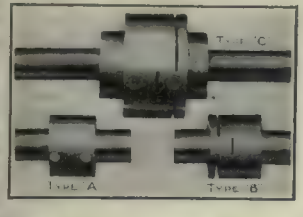
Vise, Machinists', Swiveling Base, "Nutyp"
Atlas Vise Co., Inc., Lowville, N. Y.
"American Machinist," January 26, 1922

The jaws of the vise are 3 in. wide and have an opening of 3½ in. On the opposite side of the screw from the plain jaws is mounted a pair of pipe jaws with a capacity of 1⅝ in. diameter. There is a shearing device for cutting stock ¼ in. in diameter. The jaws can be swung about the axis of the screw and locked in any position. The whole vise can be swung about a vertical axis and locked in position. Weight, 40 pounds.



Couplings, Shaft, Flexible, Bartlett
C. H. Breaker, 4226 Broadway, Indianapolis, Ind.
"American Machinist," January 26, 1922

The flexibility of the coupling is derived from a turning motion around pins, and from a sliding motion in a tongue-and-groove construction. The coupling maintains a uniform angular velocity ratio between the two shafts, no matter what the degree of angular or parallel mis-alignment. End float is also allowed. The coupling is made in three types. Type A has one collar pinned directly to one shaft end. Type B has a collar or ring pinned to each shaft end, connected by a groove and slot. Type C has a hub keyed to the end of each shaft; it is made for heavy service, high torque and high speed.



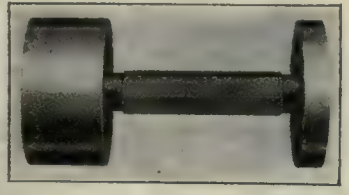
Wrench Set, Socket, Ratchet, H. & G.
Eastern Machine Screw Corporation, New Haven, Conn.
"American Machinist," January 26, 1922

Ten sockets for hexagon nuts from ⅛ to 1 in. in size are provided. A hexagon head is provided on the top of each socket for turning it, all of the wrench parts fitting over this head. An adjustable T-handle is provided. The crossbar in it can be used in a central position for fast work or slid to one side to obtain greater leverage. The ratchet is compact, and may be made either right- or left-hand. An extension piece and a universal joint are furnished. A drop-forged box wrench is included in the set. Each outside part of the wrench attachment has a spring-steel split screw for holding the parts together.



Gages, Plug, Reversible, Large, "Trilock"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922

The two gage disks are forced into the ring on a taper before grinding, and grip the central tube. Three prongs on the handle are forced into three grooves in the bushing, providing a three-point, self-centering support. The washer at one end and the handle at the other bear on both the stay-tube and the disks. The gages can be supplied either single- or double-ended, the threaded ones in all sizes above ½ in. and the plain cylindrical gages ⅝ in. and above.



Chuck, Lathe, Steel-Bodied
Cushman Chuck Co., Hartford, Conn.
"American Machinist," January 26, 1922

The chuck is made in sizes from 10 to 30 in. All parts, finished to master gages, are interchangeable. The screws have a greater length of bearing than in the former design. The thrust bearing is made in two parts and completely encircles the screw midway of the screw length. The stem of the thrust bearing is round, is driven into a round hole in the chuck body, and is self aligning. It provides a firm bearing against thrust in either direction. Weight, from 64 to 452 lb., according to size.



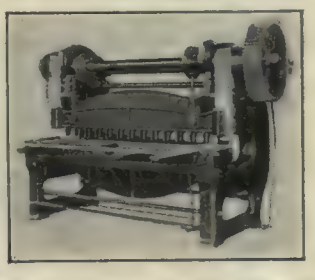
Screwdriver, Lever-Operated, Ratchet
William Roberts, 457 Main St., Springfield, Mass.
"American Machinist," January 26, 1922

By the device, considerable torque may be applied in turning slotted-head screws. The auxiliary handle has a cam-shaped bearing against the shank of the screwdriver. It acts as a ratchet, binds the shank when tightening the screw, and can be operated in either direction. The device is made in several styles, one of which may be attached to and removed from any screwdriver. A split taper collet placed on the shank is clamped by a tapered nut screwed down on it. The ratchet and lever fit on a collar on the collet. The device may be furnished with a hollow head for fitting bolt and socket-wrench heads.



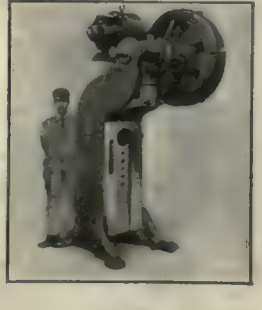
Shear, Gap, Power-Driven
Streine Tool and Manufacturing Co., New Bremen, Ohio.
"American Machinist," February 2, 1922

The machine has a capacity for cutting ¾-in. and lighter annealed steel plates, and can be furnished in any size. A 15-hp. motor gives a gear reduction of 16 to 1. The flywheel speed is 280 r.p.m., giving 18 strokes per minute of the cutter bar. The cutter bar or crosshead is of box-type construction. The clamp operates automatically. The machine has front, side and back gages and can be arranged for motor drive. Graduations in sixteenths of an inch are marked from the edges of the shear blades to the ends of the front gage supports. With 6-ft. shear blade: floor space, 84 x 120 in.; height, 88 in.; weight, 18,500 lb.



Horning Press, Motor-Driven
Ferracute Machine Co., Bridgeton, N. J.
"American Machinist," February 2, 1922

The press is driven by an electric motor. The motor shaft carries a raw-hide pinion that meshes with teeth cut in the periphery of the flywheel. The horn hole in the frame is 7½ in. in diameter, and 43 in. from the floor. The horizontal distance from the center of the ram to the front of the frame is 11 in. Guides in the vertical front allow the adjustable bed to be affixed at various heights and square with the bottom of the ram. The press is made in five sizes.



The Weekly Price Guide

Rise and Fall of Market

Advances—Sheets, blue, black and galvanized, New York, are quoted 10c. higher throughout the list, Cleveland and Chicago prices remaining firm. Electrolytic Copper is given a higher price of 13.75c up to carlots, at New York. Linseed oil is firm at 95c. New quotations place open hearth spring steel at 4c.; spring steel at 8c., and coppered bessemer rods at 7c.

Declines—Copper sheets fall to 19.25c. when demand becomes slack. Brass and zinc sheets remain firm.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.50
Northern Basic	23.50
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17 50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	25 40
Virginia No. 2	28.24
Basic	23.50
Gray Forge	24.46
CHICAGO	
No. 2 Foundry local	22.00
No. 2 Foundry, Southern, sil 2.25@2.75	23.92
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.30
Basic	23.00
Bessemer	23.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9 0	6 0	3.0
Philadelphia	8 5	5 0	3.0
Atlanta	5.5	4 5	4.0
Detroit	7 0	4 5	3 0
Birmingham	12 0	6 5	3 0
Denver	8 9	6 0	5 0
New Orleans	6 0	4 5	3 5
Minneapolis	9 0	6 0	4 5
New York	9@10	6 0	3.0
Cincinnati	6 0	5.0	4.5
Cleveland	6.75	4 5	2 6
Chicago	5.0	4 5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
Blue Annealed				
No. 10	2 40	3 45	3 15	3 18
No. 12	2 45	3 55	3 20	3 44
No. 14	2 50	3 58	3 25	3 48
No. 16	2 70	3 68	3 35	3 58
Black				
Nos. 17 and 21	3 00	4 15	3 55	4 10
Nos. 22 and 24	3 05	4 20	3 60	4 15
Nos. 25 and 26	3 10	4 25	3 65	4 20
No. 28	3 15	4 35	3 90	4 30
Galvanized steel sheets:				
Nos. 10 and 11	3 15	4.35	3.75	4 30
Nos. 12 and 14	3 25	4.45	3.85	4 40
Nos. 17 and 21	3 55	4.75	4 15	4 70
Nos. 22 and 24	3 70	4 90	4 45	4 85
No. 26	3 85	5.05	4 60	5 00
No. 28	4.15	5.35	4.90	5 30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	⅜ to 1¼	44¼	29¼
LAP WELD					
2	64	51½	2	39¼	25¼
2½ to 6	68	55½	2½ to 4	42¼	29¼
7 to 8	65	51½	4½ to 6	42¼	29¼
9 to 12	64	50½	7 to 12	40¼	27¼
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	69	57½	⅜ to 1¼	44¼	30¼
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	57	50½	2	40¼	27¼
2½ to 4	66	54½	2½ to 4	43¼	31¼
4½ to 6	65	53½	4½ to 6	42¼	30¼
7 to 8	61	47½	7 to 8	35½	23¼
9 to 12	55	41½	9 to 12	30½	18¼

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2 58	2.41	2.38
Soft steel bars (base)	2 48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
½"	8.00		12@13
⅜"	6.50		11@12
⅛ to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.75
Tin, 5-ton lots, New York	31.50
Lead (up to carlots), St. Louis, 5.40; New York	5.75
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19 20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.25	19.50	23.00
Copper wire (carlots)	14@14.25	16.00	16.25
Copper rods (ton lots)	17.75	21.00	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	15.75	17.00	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15.00	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	11.75	10.25
Copper, heavy, and wire	9.50	10.75	9.25
Copper, light, and bottoms	8.50	9.00	8.25
Lead, heavy	3.75	4.50	3.65
Lead, tea	2.75	3.25	3.00
Brass, heavy	5.75	6.00	8.00
Brass, light	4.25	4.50	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.50	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	1.04
White lead, dry or in oil	100 lb. kegs.	New York,	12.25
Red lead, dry	100 lb. kegs.	New York,	12.25
Red lead, in oil	100 lb. kegs.	New York,	13.75
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	55%	60–10%	60%
1¼ and 1¼x3 in. up to 12 in.	40%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	..$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	55%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60-10%	50–5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, hex. heads	+10–15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.50	3.50	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	$3.25	$3 00
Cone heads, ditto (net)	3.80	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Cal., Los Angeles—The Mission Co., 743 South Main St.—complete line of small machine tools for machine shop.

Col., Pueblo—The Iron City Machine Wks.—shapers and complete assortment of machine tools and materials for use in machine shop.

Ill., Chicago—The Detachee Steel Products Co., 2nd floor, Jefferson St.—radial drilling machine 2 in. capacity; shearing and forging machines, capacity 2½ to 4 in. and 4 in.

Kan., Baxter Springs—W. A. Goodwin—drill press, pedal type, of Armstrong

Kan., Cherokee—C. Brown—power trip hammer, 25 lb. for machine shop.

Kan., Colony—J. F. Byrd, 216 Short St.—power units for garage.

Kan., Colony—Cott & Livingston, 217 West 7th St.—C. N. Cott, Purch. Agt.—power drill press and lathe.

Mass., Worcester—The G. C. Whitney Co., 42 Union St.—one 6 x 16 in. die stamping press, Watts preferred, (used).

Mich., Detroit—Lamb Co., 1935 Franklin St.—punch presses, No. 2 or No. 3.

Mich., Pontiac—The Nelson Needle Trap Co.—two punch presses, one large and one medium.

Mich., Wyandotte—Diamond Spring Bumper Co., manufacturers of automobile bumpers—combination punch and spotting shear for punching ¾ stock, ¾ in. hole.

Mo., Joplin—Belcher & Pettit, 2nd-Joplin Sts.—power units, drill press, emery wheel and cylinder grinder for garage.

Mo., Joplin—F. Boyer, East 4th St.—one power lathe.

Mo., Joplin—Cather & Lauderbaugh, 207 Main St., C. Cather, Purch. Agt.—equipment for garage including power lathe and drill press.

Mo., Joplin—F. & P. Garage, 114 Virginia Ave., W. A. Adams, Purch. Agt.—one 40 ton arbor press.

Mo., Joplin—T. S. Maitland, P. O. Box 603, Joplin—power lathe.

Mo., St. Louis—Brown Mchy. Co., 2323 N. 9th St.—keying machine.

Neb., Lincoln—The Bowling Iron Wks., 204 South 9th St.—punch and shear for structural sections also overhead carrier system.

Neb., Lincoln—The Lincoln Plating Co., 1119 N St., (sheet metal works), C. F. Wurn, manager, cylinder grinder, 18 in. swing, one.

Neb., Lincoln—The Taylor Electric Co., 141 South 14th St., P. E. Taylor, Purch. Agt.—lathe, 16 in. swing, 5 ft. bed, bench legs, large spindle and head stock bearing with compound rest and draw in collet.

N. J., Perth Amboy—The Seaboard Refractories Co., Valentines St.—18 in. x 8 ft. lathe.

N. Y., Binghamton—Eagleye & Son, 396 Chenango St.—power driven sheet metal working tools including formers, edgers and [illegible]

N. Y., Buffalo—The Neal Buggy Co., 217 Delaware St.—tools and equipment for the repair of auto bodies at garage, 212 to 216 Elmwood Ave.

N. Y., Buffalo—[illegible] & Sanders, 114 Lathrop St.—sheet metal working machinery.

N. Y., Charlotte (Rochester P. O.)—H. C. Carnell & Co., machinery and equipment for small machine shop on Lighthouse St.

N. Y., Gloversville—H. H. Lamphere, 51 Fremont St., manufacturers of leather, machinery and sheet metal—sheet metal working tools and equipment, power operated.

N. Y., Jamestown—C. T. Chandler, 175 Madison Ave.—small tools and equipment for proposed garage and repair shop.

N. Y., Jamestown—Jamestown Metal Furn. Co., C. H. Lindner, Purch. Agt.—drill presses, punch presses, one lathe and other small equipment for metal furniture plant.

N. Y., Romulus—The Troutman Garage Co., H. Troutman, Purch. Agt.—complete machinery and tools for motor repair, incl. forge and blower.

O., Columbus—Suisse Battery & Equipment Co., 296 East Long St., L. E. Suisse, Secy. and Genl. Mgr.—equipment for auto service including lathe, press and grinder.

O., Columbus—The Columbus Auto Brass Co., 767 North 4th St., T. Ash, Supt.—machinery for repair shop including lathe, shaper, two drill presses and two grinders.

Okla., Hockerville (Kansas P. O.)—The State Line Garage, W. H. Hogen, Purch. Agt.—power lathe, drill press and emery wheel.

Okla., Picher—The Big Four Garage, H. W. Jameson, Purch. Agt.—power lathe.

Okla., Picher—The Tri State Motor Co., A. L. Kinney, Purch. Agt.—power lathe and drill press.

Pa., Canton—The Keystone Garage Co., R. Brann, Purch. Agt.—complete machine tool equipment for service garage and for repairing gasoline motors.

Pa., Carnegie—The Union Tool Co.—one 72 in. vertical boring mill and one 5 ft. radial drill.

Pa., Erie—H. C. Cowley, 1139 East 28th St.—one 14 in. lathe and one small grinder.

Pa., Johnstown—The Cosgrove Coal Co.—horizontal boring mill, 20 in. engine lathe, hexagon turret lathe, centerless grinder, drill grinder, 24 in. shaper, 4-5 ft. radial drill, 2 wheel grinders, 200 ton hydraulic wheel press, Universal milling machine 2 or 3 spindle sensitive drill press, 2 head wheel turning lathe to swing 36 in. Above equipment to be purchased for Cherry Tree Machine Co., Cherry Tree, a subsidiary company.

Pa., Meadville—The Champion Tool Co.—machinery and equipment for new plant on South Main St.

Pa., Pittsburgh—Acme Stamping & Mfg. Co., 207 Corliss St.—one double crank geared press—size 3A, Bliss; one Toggle press, size 3½A Bliss, (used).

Pa., Sharon—The Sharon Pressed Steel Co.—one large die grinder.

Pa., Waynesboro—The Frick Co., Inc., West Main St.—24-26 in. type C Libbey turret lathe, 4½ in. hole through spindle with countershaft; No. 0 Avoy high speed ball bearing sensitive drill, 3 in. spindle, capacity 1 in. bored for No. 1 Morse taper.

Tenn., Chattanooga—M. B. Parker, 1921 Oak St.—motor driven drill press about 42 in.

Tenn., Knoxville—The Sanford Day Iron Wks.—one double end punch and shear.

Wis., Eau Claire—J. Everson, 311 West Madison St.—equipment for auto repair shop.

Wis., Green Bay—W. J. McGinnis, 338 South Adams St.—equipment for auto repair shop.

Wis., Hartford—The International Stamping Co., c/o A. F. Schauer,—stamping machines.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St.—equipment and machinery for proposed machine shop on 17th and Franklin Sts.

Wis., Milwaukee—The Arpe Motor & Sales Co., 39th and Fond du Lac Ave., E. A. Arpe, Purch. Agt.—lathe, drill press and two motors.

Wis., Milwaukee—A. Schwope, 557 California St.—drill press and 4 in. machinist's vise.

Ont., Welland—The Lackawanna Tubes, Ltd., P. L. McCallum, Purch. Agt.—lathes, planers, shapers, drill presses and large roll lathes.

Que., Montreal—The Bramon Taxi Service, Phillips Pl., L. Bramon, Purch. Agt.—machinery and equipment for garage.

Machinery Wanted

Col., Colorado Springs—A. J. Kiser, Burns Bldg.—power press for newspaper plant.

Col., Salbert—Settler the Printer, 6 column newspaper press.

Conn., East Norwalk (South Norwalk P. O.)—The Norwalk Mfg. Co., 214 East Ave.—one silk doubling machine, one 64 spindle winding machine and several braiding machines for silk goods.

Fla., Ft. Meade—The Ft. Meade Development Bd., L. A. Morgan, Mgr.—machinery, equipment, etc., for canning plant.

Fla., Wauchula—H. Stansfield—ice manufacturing machinery for cold storage plant, (new or used).

Fla., West Palm Beach—The Palm Fibre Co.—machinery for cleaning fibre, spinning, twisting and bailing also for weaving into mats and burlap.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—one 10 ton York ammonia compressor, with or without condonser and coils; and one single drum, 6,000-lb. hoist, with 3 phase, 60 cycle, 440 volt motor, direct current.

Ill., Chicago—The Royal Auto Body Co., Inc., 3727 Cottage Grove Ave.—cutoff saw and other woodworking machinery.

Ill., Chicago—The Self Adjusting Spring Co., 4925 South Halstead St., A. Allen, Purch. Agt.—additional machinery for the manufacture of automobile springs.

Ill., Chicago—The Western Newspaper Union, 210 South Desplaines St.—Ludlow press, (used).

Ill., Rockford—J. Rodin, 1026 Charles St.—one chain hoist.

Ill., Rockford—The Rockford Electric Co., 114 South Wyman St.—condenser and small crane.

Ia., Ft. Dodge—Bd. Educ., P. E. Gustafson, Dir.—will receive bids until May 22 for print shop equipment, woodworking machinery and sheet metal shop equipment for new high school.

Kan., Baxter Springs—The Baxter Springs Herald, P. L. Keener, Purch. Agt.—power newspaper press and job paper cutter for power equipment.

Kan., Baxter Springs—Chanute Smelter Co., D. Peck, Purch. Agt.—belting, shafting, pulleys, hangers, bearings, ore grinders, etc., for new ore concentration mill. Estimated cost $50,000.

Kan., Baxter Springs—F. M. Congdon & Sons, 1323 Park Ave., F. M. Congdon, Purch. Agt.—power band saw.

Kan., Baxter Springs—W. P. Howard—oil drill rig.

Kan., Baxter Springs—J. Keith—power lathe and drill press for blacksmith shop.

Kan., Galena—C. Graham—power lathe for machine shop.

Kan., Galena—The Standard Oil Co., H. C. Porter, Purch. Agt.—oil filtering machinery.

Kan., Galena—M. S. Stillson, 10th St., planing mill—one 10 in. planer and cut off saw for power equipment.

Kan., Nicholasville—The Farmers Dairy Co., c/o J. T. Edwards—machinery and equipment for new dairy.

Kan., Scammon—The Skidmore Pump Co.—crushing machinery and coal crusher.

Ky., Mt. Sterling—The Hon Packing Co., E. T. Hon, Purch. Agt.—machinery and equipment for packing plant.

Ky., Princeton—The Princeton Tobacco Co., Inc., J. Ross, Pres.—machinery and equipment for the manufacture of tobacco products.

Md., Towson—The Baltimore Printing & Bindery Co.—stereotyping outfit and printing equipment.

Mass., Taunton—The H. J. Collis Co., manufacturer of athletic and sporting goods, etc.—two rivet machines, tubular rivet and stud machines that can be used for attaching ice skates on skating shoes, (used).

Mass., West Stoughton—French & Ward, manufacturer of worsted and woolen goods—stretching machine for 40 in. and up heavy fabric material, (used).

Mich., Cadillac—D. Catts, printer—sawing equipment for sawing metal by power; mailer and 10 x 15 Gordon Press.

Mich., Detroit—A. T. Tubbs, 5233 Tillman Ave.—one 8 in. sticker, one tennon machine and one sander.

Mich., Wyandotte—The All Metal Products Co., Labadie St.—one wood band resaw for machine shop.

Minn., Princeton—The Princeton Co-operative Creamery Assn.—power machinery and equipment for new creamery.

Mo., Butler—The Higley Printing Co.—10 x 15 job printing power press for motor equipment.

Mo., Joplin—J. Bangher, 715 Virginia Ave.—power combination planer and a band saw, Sidney machine preferred.

Mo., Joplin—The Braeckels Planing Mill, 1201-1203 Wall St., M. J. Braeckel, Purch. Agt.—Morgan camera lock—corner machine for power machinery.

Mo., Joplin—W. T. Hadley, 817 Main St., mining machinery—2 switches, one Y, 16-20 lb. rails, belt driven hoist, 20 sets wheels and axels, 36 in. gauge, 20 set 12-16 in. wheels, 60 hp. fire box boiler, 40 hp. steam engine, 800 ft. belting and shafting.

Mo., Joplin—Joplin Pleating & Button Mfg. Co., 721 Main St., H. T. James, Purch. Agt.—one cutting and one clinching machine for power equipment.

Mo., Joplin—Joplin Overall Co., 2nd and Joplin Sts.—belting, shafting, sewing machine and cloth cutter for power factory.

Mo., Joplin—The Ozark Magazine, 820 Pearl St., L. J. Mane, Purch. Agt.—power folding and power stapling machines.

Mo., Joplin—Shafer-Cave Creamery Co., 13th and Main Sts., C. C. Shafer, Purch. Agt.—creamery equipment including belting, shafting, hangers, pulleys, and other supplies. Estimated cost $5,000.

Mo., St. Louis—R. W. Baskeville, 2316 Walnut Street—Printing press.

Mo., St. Louis—The Campbell Printing Co., 206 Oliver St.—power 26 in. paper cutter for job printing work.

Mo., St. Louis—The Censor Co., Suite 1273 Arcade Bldg.—equipment for a daily newspaper plant.

Mo., St. Louis—Downing & Co., 405 Equitable Bldg.—one power buffer and one grinding machine.

Neb., College View—G. W. Hudson, shoe repair shop—welt roller, stitching impression machine and crow nailer.

Neb., Lincoln—Graham Printing Co., 118 South 15th St., C. H. Graham, Purch. Agt.—one 12 x 18 printing press and a 26 inch hand cutter.

Neb., Lincoln—The Shamp Filling Station. 13th and High Sts., C. E. Shamp, Purch. Agt.—small compressor.

N. Y., Adams Center—W. Alexander, Main St.—swing cut off saw and table, also shingle making machinery.

N. Y., Binghamton—Binghamton Limestone Co.—complete equipment for saw mill and grist mill.

N. Y., Brooklyn—L. Mundet & Son, 65 South 11th St.—mixing machine, Day preferred.

N. Y., Buffalo—W. Hill, 134 Claremont Ave.—machinery for manufacturing auto parts, proposed factory at 2211 Elmwood Ave.

N. Y., Buffalo—The Martha Washington Laundry, 1468 Main St.—laundry machinery and equipment for proposed building at 1462 Main St.

N. Y., Buffalo—H. Wolcott, 3042 Main St.—charging machinery for small shop to be erected on Main St.

N. Y., Cohoes—F. Gilbert Paper Co., Saratoga and Spring Sts.—wood pulp grinding machinery (3 or 4 pocket grinders).

N. Y., Croghan—The Adirondack Garment Co., F. J. Nortz, Purch. Agt.—shafting, pulleys, transmission equipment and dye house machinery.

N. Y., Edwards—The Northern Ore Co.—electric haulage equipment for underground mine material transportation.

N. Y., Franklinville—The Ontario Cutlery Co., Inc.—machinery and equipment for proposed cutlery plant.

N. Y., Gouverneur—The Gouverneur Limestone Co., H. H. Hodgkin, Purch. Agt.—electrically operated stone saw.

N. Y., Long Island City—The Manhattan Box Co., Nelson Ave.—lifting truck and platform.

N. Y., Massena—The Northern Coca Cola Bottling Wks., F. Pellagrina, Purch. Agt.—bottle filling, washing and capping machinery.

N. Y., Newark—Phillips-Werth Optical Co., Willow Ave. and Main St.—machinery for proposed optical factory.

N. Y., New York—Drydock Fixtures, 359 Bowery—combination saw table with borer attachment, a.c. motor.

N. Y., New York—The Liberty Dry Dock & Repair Co., 16 Bridge St.—hoisting engine, upright boiler, air compressor and stiffleg.

N. Y., New York—The Logan Constr. Co., 15 Park Row—compressor, single stage, horizontal, about 125 ft. long.

N. Y., North Collins—The Auto Steamulator Co., Inc., c/o F. A. Diadato—machinery and equipment for the manufacture of engines, etc.

N. Y., Ogdensburg—E. J. Boyer, Natl. Bank—machinery and equipment for the manufacture of metal curtain rods.

N. Y., Olean—The Acme Milling Co., Inc.—machinery and equipment for new feed mill at Allegany.

N. Y., Oneida—The Van Wheel Corp.—woodworking machinery and equipment.

N. Y., Phelps—The Phelps Fruit Growers Assn.—machinery for proposed fruit packing plant on Ontario St.

N. Y., Rochester—The Empire Welding Wks., 1387 Dewey Ave., C. G. Zimmerman, Purch. Agt.—acetylene welding, brazing and cutting tools and equipment for shop.

N. Y., Rochester—B. Kovalski, c/o Weiss-Knopf Clothing Co.—machinery and equipment for proposed clothing factory at Williamson.

N. Y., Rochester—The Northeast Electric Co., 348 Whitney St.—No. 10 American variety saw table, (new or used).

N. Y., Sackets Harbor—C. Gamble Co., Ambrose St.—double surface planer and electric sanding machine.

N. Y., Schenectady—Mary Ann Creek Mining Co. Inc., 469 State St., W. F. Wellman, Purch. Agt.—Ball (or equal) fine grinding machines, cyanide oil flotation eqiupment, rock drills, air compressors and rock handling equipment.

N. Y., Sherman—D. M. Bockcock—tinsmithing tools for new plant.

N. Y., Syracuse—Hayes & Whitbread Foundry, 136 Richmond Ave.—machinery and equipment for foundry.

N. Y., Watertown—F. A. Jessine, 870 Arsenal St.—special machinery for the manufacture of hair clippers.

N. Y., Watertown—The Wright Bros. Co., 518 Mohawk St., C. Wright, Purch. Agt.—machinery and equipment for splitting, curing, tanning, cutting and pressing leather, also all machinery for the manufacture of leather.

N. C., Akron—The General Stone Co.—rotary crusher for limestone.

N. C., High Point—The Ellison Furniture Co., C. H. Ellison, Secy.—several mortising machines, (used).

N. C., Raleigh—J. D. Whitaker, 220 E. Park Dr.—one double drum hoisting engine and one boiler, about 15 horse power, in good condition, (used).

N. C., Warsaw—E. B. Hinman, box manufacturing machinery for the manufacture of boxes, barrels, etc., (new or used).

O., Cleveland—The Kirk-Latty Co., 1971 West 85th St., S. D. Latty, Pres.—coal and ash conveying machinery, also two 150 hp. and 60 hp. water tube boilers and two 150 hp. stokers.

O., Cleveland—C. J. Pfeil Co., 1976 West 3rd St.—additional machinery for woodworking plant addition.

O., Columbus—Continental Clay Co., Ferris Bldg., C. E. Berridge, Secy. & Treas.—dryer and other brickmaking machinery for plant No. 2, at East Greenville.

O., Columbus—Franklin Brick & Tile Co., Ferris Bldg., R. S. Dingledine, Secy. and Treas.—continuous kiln equipment.

O., Columbus—E. A. Prentice Lumber Co., Vine and Armstrong Sts., E. A. Prentice, Pres.—several kinds woodworking machines.

O., Piqua—W. R. Howe, 618 North Wayne St.—five automatic knitting machines, 20, 24, 26 and 28 in. needle bed, 12 cut, Dubied, Lamd, or Grosser make, (used).

Okla., Apache—J. C. Nagel (Apache Review)—power press for newspaper plant.

Okla., Chickasha—The Daily Express, G. Evans, Purch. Agt.—linotype and other newspaper equipment.

Okla., Hockerville—The Blue Ribbon Mining Co., H. Hawkens, Purch. Agt.—shafting, pulleys, belting and rock crushers for concentration zinc mill.

Okla., Picher—The Picher Planing Mill, H. A. Brocksmith, Purch. Agt.—complete line of planing mill equipment, including power planer, band saw, and sander for plant at Baxter Springs, Kan.

Okla., Picher—The Picher Times, E. E. Sanders, Purch. Agt.—newspaper cylinder press and job press for power equipment.

Okla., Tulsa—The North American Car Co. (manufacturer of railroad cars)—air compressor and motor.

Pa., Erie—W. Blesser, 142 East 12th St.—good size air compressor.

Pa., Marienville—The Marienville Glass Plant—machinery and equipment for proposed glass plant.

Pa., Phila.—The City—ash and coal handling equipment for Queen's Lane plant. Estimated cost, $25,000.

Pa., Phila.—The Pooley Furniture Co., Inc., 17th and Indiana Sts., M. Pooley, Purch. Agt.—36 in. band saw for power machinery.

Pa., Pittsburgh—Pittsburgh Reinforced Brazing & Machine Wks., 2525 Liberty Ave.—two 10 ton cranes.

Pa., Sharon—The Sharon Furniture Mfg. Co., J. Canteloupe, Vice Pres.—full machinery and equipment for furniture manufacturing.

S. C., St. George—The County Record Co., W. S. Stoke, Mgr.—equipment for small newspaper plant, also job printing press, (new or used).

S. C., Union—The Bailey Undertaking Co., T. E. Bailey, Pres.—light woodworking machinery for making caskets, such as rip and cutoff saws, scroll saws, jointers, sanders, tenoners, and small oil burning boiler (new or used).

Tenn., Knoxville—The Appalachian Marble Co., Inc., Marblebrooke Park—300-500 cu. ft. capacity, motor driven, air compressor.

Tenn., Knoxville—The White Oak Corp., H. T. Spencer, Pres.—complete woodworking machinery, metal working lathe, shaper or planer, radial drill, power hack saw and oxy-acetylene cutting and welding outfit.

W. Va., Beckley—The Raleigh Register, (newspaper and job printers), C. Hodel, Purch. Agt.—one 17 in. backing machine.

W. Va., Iaeger—The Pocohontas Red Ash Coal Corp., J. G. McGowan, Mgr.—mining machinery including No. 6 figure 8 incline drum, electric scraper loaders, electric hoists and smaller tools, (new or used).

W. Va., Princeton—The Princeton Bldg. Material Co., Inc., N. J. Jenkins, Genl. Mgr.—single end tennoring machine with copies; hand-feed rip saw or variety saw with expansion mandril; Phillps window frame machine No. 3; glue jointing machine, solid heads; (new or used).

Wis., Glendale—The Glendale Milling Co., J. Slodek, Purch. Agt.—flour mill machinery.

Wis., Manitowoc—A. Fischl Dairy Co., 1421 Marshall St.—ice cream machinery and equipment.

Wis., Merrill—W. Savidusky—complete laundry machinery, belt driven.

Wis., Milwaukee—The Milwaukee Hosiery Co., 520 State St., W. J. Zens, Purch. Agt.—power operated looping machines.

Wis., Milwaukee—The Milwaukee Wet Wash Laundry, 1515 Cherry St., F. Lukuf, Purch. Agt.—laundry machinery, driven by steam power.

Wis., Milwaukee—C. Stolper Cooperage Co., 3300 Fond du Lac Ave., C. Stolper, Purch. Agt.—one saw table complete with gasoline engine.

Wis., Milwaukee—B. A. Weserski, 583 15th Ave., (carpenter and woodworker)—door polishing machine equipped with 2 or 3 drums.

N. B., Frederickton—The Chestnut Canoe Co., J. Walker, Purch. Agt.—sawing, moulding and planing machinery and other equipment.

Ont., London—The International Creamery Co., Detroit, has purchased local abattoir and will install complete equipment for the manufacture of dairy products and ice cream. Estimated cost, $40.000.

Ont., Port Arthur—Richardson & Sons, Ltd., elevator manufacturer, J. Richardson, Purch. Agt.—complete equipment for 1,-500,000 bushel elevator.

Ont., St. Williams — McCall Bros. — special wood working machinery for furniture factory.

Ont., Simcoe—The Non Freeze Battery Mfg. Co., R. W. Wallace, Pres.—machinery and special equipment for the manufacture of non freeze batteries.

Ont., Toronto—The Canada Ruler & Novelty Co., W. Hunt, Mgr.—additional woodworking equipment for proposed factory at Galt.

Cal., W. Good—The Empire Cotton Co., Ltd., A. D. Payne, Secy.—machinery and equipment for new knitting addition to cotton mill noted.

Que., Montreal—Miller Frères, 245 Queen (and) St., manufacturer of nails and fences, J. Miller, Pres., Agt.—complete machinery for foundry noted.

Metal Working Shops

Cal., Gilroy—A. Uhl is having plans prepared for the construction of a 1 story garage. Estimated cost, $10,000. W. D. Wilson, 100 Post St., San Francisco, Archt.

Cal., Oakland—The Magnavox Co., 1701 East 11th St., has awarded the contract for the construction of a 2 story, 60 x 100 ft. factory on East 14th St. for the manufacture of telephones and will operate the plant. Estimated cost, $40,000. Noted May 4.

Col., Redwood—The Santa Fe Pipe Co. and Clinton Sts., has awarded the contract for the construction of a 1 and 2 story foundry on D and Clinton Sts. Estimated cost $100,000. C. W. Penning, Mgr.

Col., San Francisco—The Brookhurst Electric Sign Co., 11 7th St., plans to build a 2 story plant for the manufacture of electric signs. Estimated cost, $12,000. Architect not selected.

Col., San Jose—Temple & Styer, c/o Wolfe & Higgins Archts., Anderson Bldg., is having plans prepared for the construction of a 2 story, 24 x 127 ft. garage on 2nd St.

Col., Stockton—F. A. McCan, c/o David-Gardner Corpn., Archts., Hollis Bldg., has awarded the contract for the construction of a 2 story, 75 x 100 ft. garage on California St. Estimated cost, $50,000.

Col., Vallejo—The Western Die Casting Co., 2041 Newbury St., Berkeley, plans to build a plant here for the manufacture of [illegible] carburetors. Estimated cost $[illegible].

Col., Pueblo—The Iron City Machine Works have acquired the business formerly conducted by the Main St. Machine Shops and plans to improve and enlarge its shop.

Conn., Springdale—The Segal Metal Products Co. will receive bids for the construction of 1 story, 40 x 45 ft. foundry and a 3 story, 30 x 120 ft. machine shop. Lockwood-Greene Co., 101 Park Ave., New York, Archts. and Engrs.

Conn., Waterbury—The Connecticut Light & Power Co., Lakeville St., will build a 4 story, 48 x 133 ft. garage and storage plant on Freight St. Estimated cost, $100,000. Noted May 11.

Ky., Louisville—H. Madler and M. J. Tuohy, Bullitt Bldg., are promoters of a new company which is having plans prepared for the construction of a 4 to 10 story, 150 x 200 ft. garage on 5th and Chestnut Sts. Estimated cost, $250,000. Address J. H. Hutton Co., 416 West Jefferson St. D. X. Murphy & Bro., 714 Louisville Trust Bldg., Archts.

Mass., Springfield—S. J. Cordner, 22 Taylor St., has awarded the contract for the construction of a 1 story, 60 x 220 ft. garage on North Main St. Estimated cost $[illegible].

Neb., Lincoln—The Bowling Iron Works, 201 South 7th St., plans to build an addition to its plant containing 1,000 sq. ft. floor space.

N. J., Hoboken—Fischer-Sweeny Brass Co., 317 Adams St., will soon receive bids for the construction of a 1 and 2 story, 100 x 200 ft. foundry on 13th and Grand Sts. Estimated cost, $50,000. Lockwood-Greene & Co., 101 Park Ave., New York, Archts. and Engrs.

N. Y., Binghamton—T. H. Wilbur & Son will build a 1 story, 24 x 36 ft. machine shop at 22-25 Wall St. Estimated cost between $10,000 and $12,000.

N. Y., Buffalo—The Cleveland Cold Drawn Steel Co., 503 Leader News Bldg., Cleveland, O., plans to build a 1 story steel plant along the tracks of the South Buffalo R. R. Estimated cost $[illegible]. C. H. Hopkins & Son, Texas Prudential Bldg., Archts.

N. Y., Buffalo—A. Esperanza, 244 East Ferry St., plans to build a garage and office on Ferry St., E. Estimated cost, $40,000. Architect not announced.

N. Y., Buffalo—McKaig & Hatch, Inc., 1284 Niagara St., plans to build a machine shop on Hudson and Ontario Sts. Estimated cost, $16,000. Architect not announced.

N. Y., Hornell—The Erie R. R., 50 Church St., New York, plans to build an addition to its repair shop here. Estimated cost between $200,000 and $225,000. Address J. Gruen, Hornell Asst. Div. Engr.

N. Y., New York—The 36th St. Garage Corp., c/o Block & Hesse, Archts., 18 East 41st St., will soon award the contract for the construction of a 3 story, 75 x 100 ft. garage at 103 West 108th St. Estimated cost, $150,000.

O., Cleveland—Alexander Szalo, 1603 Woodward Ave., Lakewood, will soon award the contract for the construction of a 1 story, 40 x 120 ft. garage at 4122 Lorain Ave. here. Estimated cost, $40,000. W. H. Nichlas, 1900 Euclid Ave., Archt.

O., Toledo—J. Ryan has awarded the contract for the construction of a 1 story, 100 x 100 ft. garage and store on 20th and Adams Sts.

Pa., Erie—The Odin Stove Mfg. Co., Inc., is receiving bids for the construction of a 1 story, 36 x 132 ft. stove factory on West 12th St. Estimated cost, $10,500. Architect not announced.

Pa., Phila.—The Central Constr. & Supply Co., 2020 Arch St., will soon receive bids for the construction of a 1 and 2 story [illegible] x 100 ft. plant on 52nd and Florence Sts., for the manufacture of builders and contractors supplies. Estimated cost, $80,000. Private plans.

Pa., Phila.—L. B. Rothchild, Archt., 1225 Sansom St., is receiving bids for the construction of a [illegible], 55 x 160 ft. sales and service [illegible] at 1409 North Broad St., for [illegible] Greenberg, Morris Bldg. Estimated cost, $200,000. Noted May 4.

Pa., Phila.—C. Zeisloft has awarded the contract for the construction of a 1 story, 100 x 117 ft. garage on Ridge Ave. and Lyceum St. Estimated cost, $60,000. Noted March 2.

Wis., Eau Claire—J. Everson, 311 West Madison St., has awarded the contract for the construction of a 1 story, 50 x 65 ft. garage. Estimated cost, $40,000.

Wis., Green Bay—W. J. McGinnis, 338 South Adams St., has awarded the contract for the construction of a 1 and 2 story, 50 x 95 ft. garage on North Adams St. Estimated cost, $45,000.

Wis., Madison—W. F. Clark, 2105 Keyes Ave., has awarded the contract for the construction of a 1 story, 60 x 186 ft. garage, etc., on University St. Estimated cost, $40,000. Noted May 4.

Wis., Manitowoc—The Hamacheck-Illeser Co., 11th and Franklin Sts., has awarded the contract for the construction of a 1 story, 50 x 139 ft. garage. Estimated cost, $50,000.

Wis., Manitowoc—K. O. Muehlberg, Co., 209 North 9th St., has awarded the contract for the construction of a 2 story, 35 x 70 ft. machine shop on 17th and Franklin Sts. Estimated cost, $45,000.

Wis., Wausau—D. J. Murray Mfg. Co., manufacturer of saw mill machinery, will soon award the contract for the construction of a 1 story, 82 x 228 ft. machine shop. E. C. Hall, 221 Grand Ave., Engr.

Ont., Ft. Colburne—The International Nickle Co. is receiving bids for the construction of a 90 x 140 ft. nickle plant. Architect not announced.

General Manufacturing

Cal., San Francisco—L. R. Lurie, Flatiron Bldg., has awarded the contract for the construction of a 2 story baking oven plant on Howard St. near 4th St. Estimated cost, $11,000. Bake-Rite Oven Mfg. Co., lessee.

Cal., San Jose—J. F. Pyle & Sons, King Rd., have awarded the contract for the construction of a pre-cooling plant on 5th and Lewis Sts. Estimated cost, $7,500.

Cal., San Jose—The Stewart Fruit Co., Wells Fargo Bldg., has awarded the contract for the construction of a 1 story addition to its fruit packing plant on Bassett St. Estimated cost, $5,000.

Conn., Hamden—The Natl. Filter Cloth & Weaving Co., 57 Hope St., Brooklyn, N. Y., has awarded the contract for the construction of a 1 story, 70 x 192 ft. factory on Dixwell Ave. and Mather Sts., here. Estimated cost, $60,000. Noted March 16.

Conn., Hartford—The Capitol City Glass Co., Chapel St., is receiving bids for the construction of a 2 story, 40 x 150 ft. addition to its factory. Estimated cost, $40,000. P. C. Wais, 407 Trumbull St., Archt.

Conn., Norwalk—C. H. Harris, Inc., Main St., has awarded the contract for the construction of a 1 story addition to glass factory on Main St. Estimated cost, $40,000.

Ind., Fort Wayne—The Craig Biscuit Co., 115 Montgomery St., is having plans prepared for the construction of a 4 story factory. McCormick Co., Inc., 41 Park Row, New York City, Archt. and Engrs.

La., Perryville—J. A. Perry and C. E. McKerson, Monroe, plans to build a carbon and gasoline extraction plant here.

La., Shrewsburg—Armour & Co. plans to build a acid phosphate and fertilizer plant to replace the one which was destroyed by fire. Estimated loss, $300,000. W. E. Turner, Div. Mgr.

Me., Springvale—The Goodall Worsted Co., Sanford, has awarded the contract for the construction of a 5 story, 24 x 280 ft. mill and storehouse. Estimated cost, $700,000.

Mass., Clinton—The Bigelow-Hartford Carpet Co., Thompsonville, Conn., has awarded the contract for the construction of a 1 story, 100 x 275 ft. dyehouse and 4 story, 100 x 114 ft. headhouse. Estimated cost, $250,000. Noted May 4.

Minn., Mankato—The Mankato Co-operative Dairy Assn. has awarded the contract for the construction of a 2 story, 50 x 122 ft. creamery. Estimated cost, $37,419. A. L. Voigel, Mgr. Noted April 27.

N. H., Laconia—Lockwood, Greene & Co., 60 Federal St., Boston, is receiving bids for the construction of a 3 story, 65 x 100 ft. hosiery dyehouse for the Pitman Mfg. Co. Estimated cost, $80,000. Noted April 27.

N. Y., Mt. Vernon—The General Optical Co. has awarded the contract for the construction of a 1 story addition to its plant on Washington St. Estimated cost, $20,000.

N. Y., Phelps—The Phelps Fruit Growers Assn. plans to build a 1 story, 50 x 100 ft. fruit packing plant on Ontario St. Estimated cost between $5,000 and $10,000. Architect not announced.

N. C., Charlotte—The Textile Mill Supply Co., 51 South College St., is having plans prepared for the construction of a 3 story, 140 x 150 ft. mill supply building and warehouse. Estimated cost, $60,000. Lockwood, Greene & Co., Charlotte, Archts.

O., Cleveland—C. J. Pfeil Co., 1976 West 3rd St., has awarded the contract for the construction of a 2 story, 33 x 50 ft. addition to its woodworking factory on West 3rd St. Estimated cost, $40,000.

Pa., Erie—The Erie Metal Furniture Co. has awarded the contract for the construction of a 1 story, 120 x 200 ft. furniture factory. Estimated cost, $65,000. Noted May 4.

Pa., Phila.—The Roosevelt Worsted Co., 20th and Naudain Sts., has awarded the contract for the construction of a 1 and 2 story knitting mill on 20th and Naudain Sts. Estimated cost, $95,000.

Pa., Pittsburgh—The Newspaper Printing Co., Gazette Sq., will soon award the contract for the construction of a 3 story, 81 x 84 x 107 ft. newspaper plant on Gazette Sq. C. B. Lee, Chamber of Commerce Bldg., Archt.

R. I., Shannock—Lockwood, Greene & Co., Archts., and Engrs., 60 Federal St., Boston, are receiving bids for the construction of additions to textile plant, including 1 story, 45 x 100 ft. weave shed, 1 story, 50 x 105 ft. finishing plant and a 1 story, 17 x 45 ft. boiler house, for the Columbia Narrow Fabric Co. Estimated cost, $60,000.

Tenn., Nashville—The Union Ice Cream Co., Broad St., has awarded the contract for the construction of a 3 story ice cream plant on 12th and Broad Sts. Estimated cost, $200,000. Noted March 30.

Wis., Manitowoc—A. Fischl Dairy Co., 1421 Marshall St., has awarded the contract for the construction of a 2 story, 28 x 110 ft. dairy and ice cream factory. Estimated cost, $50,000.

Wis., Marshfield—Blum Bros. Box Co., 135 West 9th St., has awarded the contract for the construction of a 1 and 2 story, 96 x 120 ft. box factory on Main St. Estimated cost, $100,000.

Wis., Milwaukee—R. Gumz & Co., Muskego Ave., has awarded the contract for the construction of a 3 story, 45 x 52 ft. addition to its packing plant on Muskego Ave. Estimated cost, $25,000.

Wyo., Laramie—J. W. Dillon and J. H. Rousch plan to build a factory here for the manufacture of glass specialties, auto lenses, bevel and plate glass, etc. Estimated cost, $180,000.

Ont., Kingston—The Ontario Provincial Government, Dept. of Agriculture, Toronto will soon receive bids for the construction of a 2 story ice and cheese making plant, here. Estimated cost, $90,000.

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Modern Shop Practice in the Building of Revolving Flat Cards

Details of Special Machines Developed for the Work—Production Cost Per Unit Lowered by Efficient Shop Arrangement, Careful Machine Designing and Standardization

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BEFORE taking up the details of manufacture of the modern revolving flat card, it may be of interest to trace briefly the development of this machine in order that one may better appreciate the extent to which the art of its manufacture has been developed.

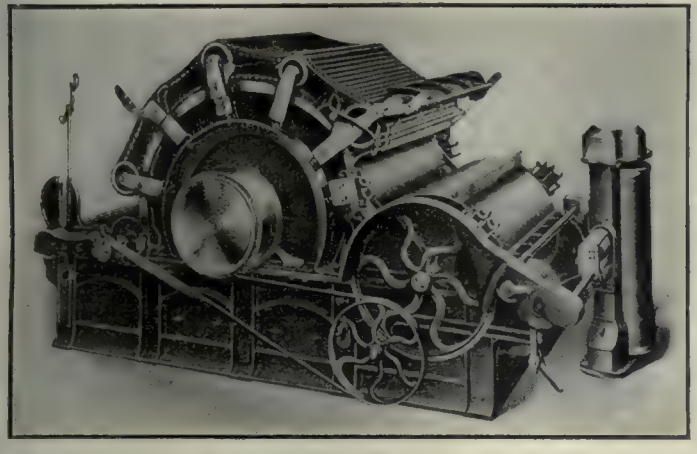




FIG. 1. MODERN REVOLVING FLAT CARD. FIG. 2. CYLINDER MOLDING FLOOR

The primitive method of carding or cleaning cotton fibers was by means of hand cards, which consisted of brushes made of short pieces of wire instead of bristles, the wires being fastened into a sheet of leather at a certain angle, and the leather fastened into a flat piece of wood about 12 in. long by 5 in. wide and provided with a handle. The cotton was spread upon the surface of one of these cards and then combed with another until all the fibers were straight, after which it was stripped off in the form of a roll.

The first attempt to card by the rotary motion of a cylinder was covered by the English patent taken out by Lewis Paul, in 1748, but it was not until 1790, when Samuel Slater, an Englishman who had settled in Pawtucket, R. I., built the first cards to be operated in this country, that carding or cleaning cotton fibers by machine was introduced here.

In 1857 Evan Leigh produced a card embodying all previous developments and having the additional advantage of being equipped with a mechanical device to automatically strip the tops or flats. This type, known as the revolving flat card, was destined to come into almost universal use and is today the standard of the world for carding cotton fibers. Although many modifications and improvements in the construction of this machine have since been made, its fundamental features remain the same.

In Fig. 1 is shown a revolving flat card as it is built today. While there are several different makes of these machines, varying somewhat in details of design, the essential features and characteristics are the same in all.

It was not until the year 1884-1885 that American manufacturers came to realize that the efficiency of this type of card was at least 100 per cent higher than the best of the wooden-top flat cards. As soon as this advantage was made apparent to mill owners the demand for these cards became large, and during the next decade English cards of this type were brought into this country by the shipload. It therefore became necessary for the American machine manufacturer to adopt this new design for his product in place of the old-style machine, in order to compete successfully with the English builders. He was not prepared to manufacture this radically different and highly developed machine. Many of its component parts were so designed that they were not readily adapted to machining on standard commercial types of tools. A start was made by purchasing from England such machines as were available, but it soon became apparent that it

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was up to the American manufacturer to devise and build special-purpose tools and equipment if he hoped to succeed against the English competitor.

It is the purpose of this article to show some of the results of the efforts in this direction by describing some of the more important machines which have been developed for this work. In designing these machines the one object which has been constantly borne in mind has been that they must not only do the work cheaper, but it must be of better quality.

One of the first requisites for economic machine shop production on a quantity basis is carefully molded uniform castings, otherwise satisfactory work cannot be obtained from the jigs and fixtures employed in holding the castings for the subsequent machining operations. For the average card casting with its more or less deep draws and flanges, the stripping-plate type of molding machine has been found best suited. An iron pattern once properly fitted to a stripping plate is good for almost a countless number of castings, and thus made their accuracy in no way depends upon the skill of the molder. In fact, an ordinary laborer can in a few days be taught to make as good castings from a stripping-plate pattern as a skilled molder who has served his time in a foundry.

Developments in molding machines in recent years have made it even possible to adapt the cylinder and doffer patterns to stripping-plate machines and in Fig. 2 we have a view of the cylinder floor showing some of these machines, and illustrating the method by which the molds are built up. This equipment consists of four jolt stripping-plate machines, the drag, the cope, the core and cheek, the first two being seen at the center and the right of the photograph. The molds are shown from the right to left in their successive stages of completion. To provide for the flanges on the inside surface of the cylinder, the core is built up in four sections, one of which is seen suspended from the overhead crane by which it is handled. Each section is built upon a cast-steel arbor which serves as a means for handling and also provides a support for the upper cores. After the cores are in place the cheek is lowered into position and the mold is then closed with the cope and ready for pouring. This is done through a central sprue passing down through the cores and thence through radial gates in the drag to the cylinder wall.

The Stripping-Plate Machine

A view of the card-side floor showing the pattern mounted on a stripping-plate machine at the right is seen in Fig. 3. The drags are made from this machine while the copes are rammed up on the plate at the left. In the foreground may be seen two drags ready for the cores to be set. Over 70,000 molds have been made from this pattern and it is still in serviceable condition.

After pouring, the molds are shaken out over gratings in the floor, through which the sand falls into hoppers located in the basement. Serving these hoppers is the sand-mixing machine or car, shown in Fig. 4. A hopper is located on the right from which a slow-moving feeder delivers the sand to the hopper of a bucket elevator mounted on the car. This elevates the sand to the mixing machine where it is riddled, tempered and mixed and then dropped on to a belt conveyor which delivers it to the bucket elevator at the left ready for the hopper over the molding floor above. This sand car is operated on a track, running the length of the foundry and so located that the car serves all of the hoppers in the bay in which it operates. This equipment does away with the laborious work of shoveling the sand and it also mixes and prepares it much more thoroughly than is possible by hand, thereby producing not only better but cheaper castings.

For transportation of materials, an electrically operated monorail system has been installed. Not only are the cars electrically driven but the switches are also operated in this manner, being controlled by a button in the operator's cab. Special cars are also arranged with ladles for carrying the molten iron from the cupola to the molding floors, and arranged so that the tilting of the ladle for pouring is done by the operator of the car. This system has aided materially in reducing the cost of transportation, as well as increasing the capacity of the foundry by speeding up the work.

Machining the Castings

Upon the solid construction, the true running and the perfect balance of the card cylinder, depends to a large degree the successful operation of the card. Its surface is covered with card clothing, which in turn is set to run but a few thousandths of an inch away from the surfaces of the lickerin, the flats and the doffer, and it is essential that this small clearance be accurately maintained, as otherwise serious damage might result to the clothing. This cylinder has a diameter of 50 in., a length of 40 or 45 in. according to the width of the card, and runs at a normal speed of 165 turns per minute. It is the largest of the parts entering into the assembly of the card and its machining operations are such as require the use of several of the special single-purpose tools heretofore mentioned.

The first operation on the cylinder consists of squaring up and boring out the ends to receive the spiders. For a long time this was done on boring out lathes designed and built for this purpose in England, several of which were purchased and brought to this country.

Then in order to obtain an increased production, and at the same time eliminate the possibility of inaccuracy, it was decided that a milling machine was the type best suited to produce these results. Accordingly the special machine shown in Fig. 5 was designed and built for this work. The cylinder is held on an expanding arbor or chuck, one end of which carries the feed gear corresponding to the rack of the ordinary milling-machine table. The cutters are mounted on the inner ends of two spindles, one on each side of the machine, these spindles, in turn, being driven by spur gears from a motor-driven cross-shaft at the rear. The spindles are mounted in quills so arranged that they may be fed into the ends of the cylinder to the desired depth after it has been rolled into place. A sliding-drive pinion is then moved into mesh with the feed gear on the chuck, this pinion being driven from the cross-shaft shown on the side of the machine. A tight and loose pulley on this shaft receives a belt from a pulley on the motor shaft, the feed being started and stopped by the shifting of this belt. The arbor on which the cylinder is mounted is held in position in the horizontal U-shaped bearings of the machine by means of the steel wedges shown. The photograph shows the cylinder ready to be rolled into position. The head carrying the cutter spindles is adjustable and when once

set for a certain diameter of cutter, work of uniform dimensions is produced and is not dependent on the care of the operator, who merely loads and unloads the machine. This machine is capable of finishing one



FIG. 3. CARD SLIDE MOLDING MACHINES.

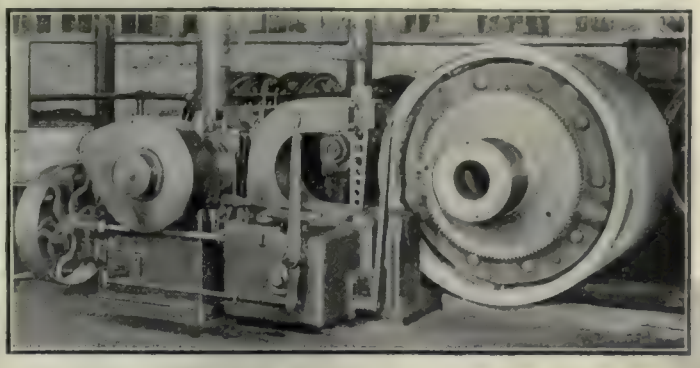


FIG. 5. CYLINDER-END MILLING MACHINE

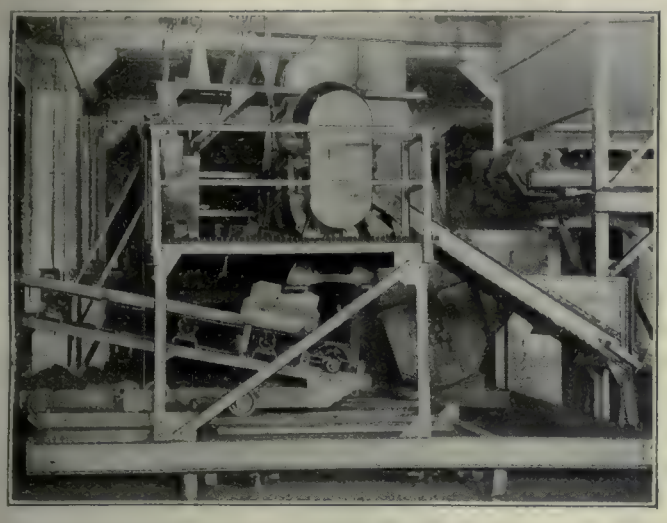


FIG. 4. SAND MIXING MACHINE

cylinder per hour, one-third the time required on the previous lathes.

When bored or milled out the cylinder is taken to the roughing lathe (Fig. 6) where it is held by the bored ends and a roughing cut is taken across its outer surface. To convey an idea of the size of this machine, it may be of interest to state that the head and tail-stock spindles are both 30 in. in diameter, the former carrying a driving gear 6 ft. in diameter. The spindles are of cast iron and run in cast-iron bearings, which have shown no appreciable wear during ten years of continuous service. The toolblock carries six tools spaced at equal intervals so that each tool travels but one-sixth of the length of the cylinder, the entire surface being finished by this movement.

A spider is then driven into each end of the cylinder where it is securely bolted and doweled in place. The holes are then line-reamed to receive the shaft, which is pressed into place in a heavy horizontal power press, 0.005 in. being allowed for the forced fit. As a further precaution, a ⅜-in. dowel pin is driven through the hub of the spider and shaft at the driving end. This method of construction obviates any possibility of the shaft becoming loose from long-continued operation and insures a true-running cylinder.

It is then mounted on its own bearings in a special finishing lathe where a continuous chip is taken from one end to the other with a single tool, after which it is ready to be drilled for the wooden plugs which are driven into its surface and to which the clothing is tacked. This drilling operation is performed in the horizontal gang-drilling machine shown in Fig. 7. The drills used here are of the flat type and so shaped as to drill and ream a tapered hole suitable for receiving the wooden plug.

After plugging, the cylinder is carefully ground on a special cylinder grinder. Operations on the spider,

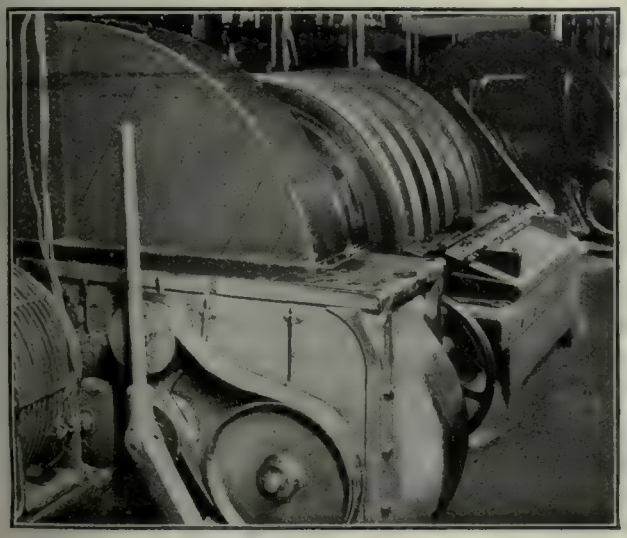


FIG. 6. CYLINDER ROUGHING LATHE.

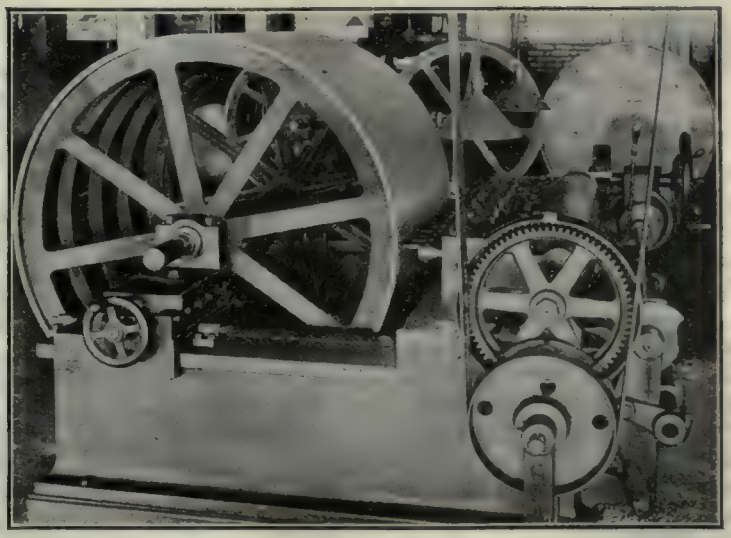


FIG. 7. CYLINDER DRILLING MACHINE

consisting of boring and reaming the hub, of turning the outside circumference to size and of facing one side of the rim, are done on a boring mill so equipped that all of these operations may be performed at one setting of the work.

The shafts used in the cylinders and doffers are of cast iron and each end is finished to three different diameters, one to fit the spider, one the bearing, and the third, or outer one, the pulley. For rough-turning these shafts the special machine shown in Fig. 8 was developed to turn both ends of the shaft at the same time. As will be seen, the central head carries a hollow spindle driven by a gear on the main driving shaft at the rear of the machine. On each end of this hollow spindle is mounted a special concentric chuck for centering and gripping the casting to be turned. The tailstock spindles, one at each end of the machine, are arranged in horizontal turrets or drums which may be rotated in their respective heads and whose axes are located below that of the driving spindle. These turrets are also fitted with a rotating center drill, the driving gears of which are thrown into mesh as it is moved up into line with the axis of the shaft. The third position of the left-hand turret carries a stop which locates the work in the machine, while the corresponding position of the right-hand one is provided with an opening through which the work is passed into and out of the machine. Each carriage is provided with a front and back toolblock, the former carrying two turning tools, while the latter carries a single inverted one. Thus, three tools are in operation at each end of the shaft, one for each of the three diameters.

The shaft then goes to a lathe equipped with two carriages, each of which is fitted with a toolblock arranged with tools for squaring the shoulders to length. It is then ready for the grinder where both ends are carefully ground to size. After cutting the keyway for the driving pulley with a vertical end mill, the hole for the oil screw is drilled and tapped in the end and the shaft is completed, ready to be pressed into the cylinder.

Finishing the Doffer

The operations of finishing the doffer follow closely those of the cylinder, the rough-turning being done on the machine shown in Fig. 9, which greatly resembles the cylinder roughing lathe (Fig. 6). After the spider and shaft are in place, the doffer is drilled, ground, and balanced in a manner similar to the cylinder.

The sides and arches of the framework of the cards are finished by special machines, since the successful manufacture of these parts requires close adherence to accuracy in order to insure interchangeability and to reduce to a minimum the fitting required in the erecting room. In order to secure a straight and even surface on which to erect the card and attain proper alignment of the bearings, the top surfaces of the sides are further finished on a special planer type of grinder carrying a vertically mounted motor-driven ring wheel.

The arch which is that portion of the frame carrying the stands that support the flats and their driving and adjusting mechanism as well as the sheet-iron casing below them, is by the nature of its design, the most awkward as well as one of the most important parts of the card to machine. The proper settings of the different parts require the accurate location of the various spottings on which the stands are mounted. The first operation after squaring off the bottom of the feet is the milling of the outer rim, this being done on the machine shown in Fig. 10. The rotating drum carries a pair of these arches, one right and one left hand. As this drum rotates slowly the circumference of the rim of the arch is carried past the cutter, plainly seen in the photograph, while below this cutter, but hidden from view, are two face mills so located as to mill the inner and outer sides of the rim. Means are also provided for automatically changing the space between these two cutters to allow for the thicker portion of the rim on one side of the arch.

Final Operations on the Arch

The final operations on the arch are accomplished at one setting on the machine shown in Fig. 11. The casting is clamped to the table in a horizontal position on its back and the pair of cutters mounted on the horizontal slide at the left side of the machine serve to mill the spottings to which the arch stands are bolted, while the pair of cutters carried on the vertical head in the center of the picture finish the spottings on both sides of the flange. In addition to these milling operations, the holes for the capscrews securing the stands in place are drilled and tapped. The table of the machine is revolved by hand to its successive positions under the horizontal cutters, while the vertical milling, drilling and tapping heads are free to swing about the central axis to any desired position. The locations of the various spottings and holes are all determined by tapered slots in the rim of the table into which plungers, mounted on their respective heads, are thrust to locate the spotting or hole to be finished.

Against the outer rim of the arch, the flexible bend, over which the flats travel, is held by its adjusting blocks. It is essential that this bend be close to the milled surface of the arch and its sides must therefore be true and even. The finishing of these sides is accomplished, as in the case of the rim of the arch, by feeding the bend between two properly spaced face mills and removing the scale from both sides of the casting at the same time. This operation is shown in Fig. 12. It will be noted that this machine is of a type similar to some of the continuous milling machines which have been recently developed, where the loading and unloading is carried on while the machine is in operation. A rough casting may be seen entering the cutters, while in the rear the finished one is just coming into sight. The cutters are hidden from view in the cut, but are mounted on the ends of the spindles, one on each side of the machine. Large-diameter pulleys for driving the cutters are mounted directly on the outer ends of these spindles. This method of driving a milling cutter directly by means of a belt has been found very efficient, in as much as it eliminates vibration and tendency to chatter caused by a gear drive, the belt producing a certain cushioning effect. Cutters thus driven require less frequent grindings and may be operated at a higher speed than those driven through a train of gears.

Power for driving the card is applied to the main cylinder shaft where a pair of 20-in. tight- and loose-webbed pulleys receive the belt. On the other end of the shaft an 18-in. pulley serves to drive the lickerin and flats. These pulleys require a considerable amount of machine work in as much as each is made with one or more grooves on one side for driving a round belt in addition to the crowned face. The outer



FIG. 8. SHAFT ROUGHING LATHE.

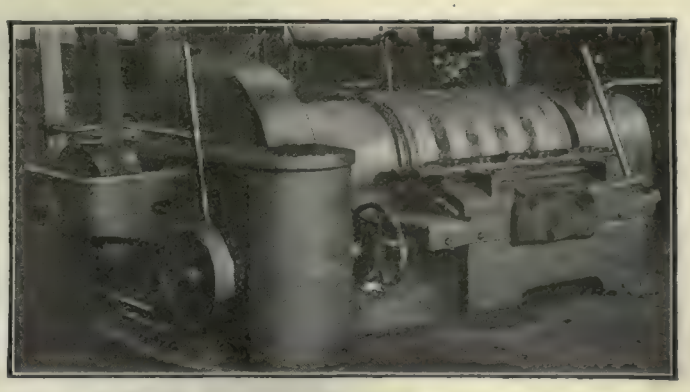


FIG. 9. DOFFER ROUGHING LATHE

sides of the webs are also turned. A special lathe, Fig. 13, was developed for doing this work by forming tools which carry cutters the full width of the surfaces to be finished. Special attention is called to the massive design of this machine, the headstock spindle being 16 in. in diameter. The heavy heads absorb

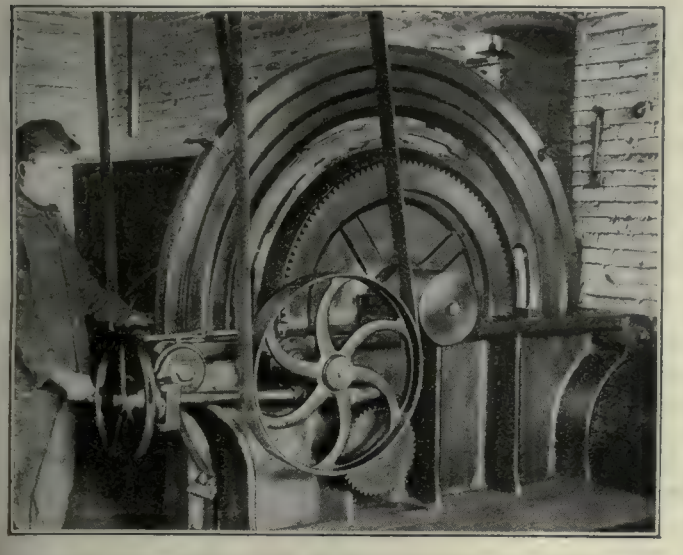


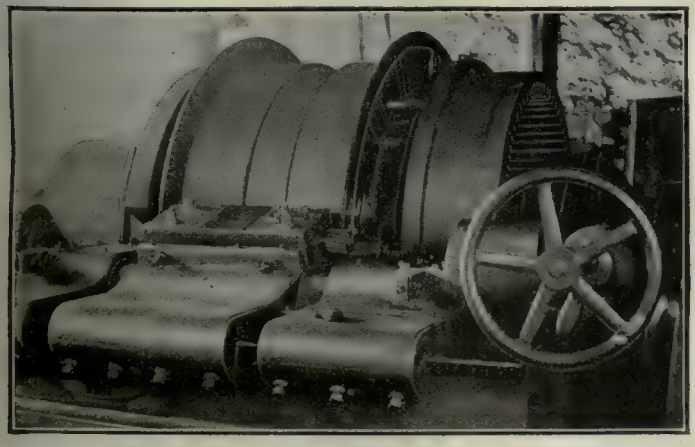
FIG. 12. FLEXIBLE BEND MILLING MACHINE

all vibration even under the heaviest cuts. A special toolblock is arranged for each operation, two of which are shown at the base of the machine; the one at the left being used for forming the web and rim, while that on the right blocks out the grooves and half of the crown, the other half being finished in a second operation by turning the pulley around. A spring chuck clamps the pulley securely in place while turning. This machine also carries a boring bar by which the hole is bored and reamed while the turning operation is going on. The average time for finishing the pulley shown at the left of the machine is 11 minutes.

The boring out of the ends of the lickerin shell also proved to be an operation which could not be readily or economically performed on a commercial type of tool and many of the milling operations on the various smaller parts of the card are such as to require the use of gang or form mills. This is also true of many of the milling operations on other textile machines. For this class of work a semi-automatic milling machine is used.

Coming now to the erecting room, the cards are set up here in rows of twenty-five each as shown in Fig. 14. They are completely assembled with the exception of the clothing and the flats and are then run off and carefully inspected before boxing. Dowel pins are provided wherever necessary so that the work of assembling at the mill is reduced to a minimum.

From the foregoing descriptions and machines which have been illustrated, there are several points to which attention should be called. First, the all-important problem is to get the actual labor cost per piece as low as possible, consistent with the high standard of quality required. This problem is somewhat different from that of most production shops where the low cost of production is arrived at by getting as large a production per machine per day as possible. Many of these special machines are capable of turning out two, three and even four times the amount of work required and are therefore often stopped from one-half to three-quarters of the time. It has therefore been found advantageous to arrange the machines in groups so that one man by operating the group will produce the amount of work required from his machines.



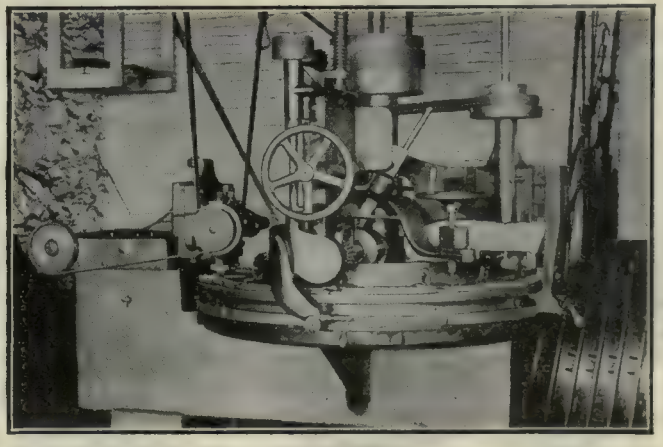


FIG. 10. ARCH MILLING. FIG. 11. ARCH MILLING, DRILLING AND TAPPING

Second, in designing the special machines it will be noted that extremely liberal dimensions have been allowed, and that the lathe and milling-machine spindles have been made to approximate as nearly as practical the diameter of the work to be turned, or the cutter carried by the spindle. In many instances these spindles are made of cast iron, running in bearings of the same material, the surfaces of which when glazed over are almost impervious to wear. The large masses of metal in these spindles, bearings and other parts have been provided so as to absorb all vibration and prevent any tendency to chatter even under heavy cuts and feeds.

Third, each machine is designed to do one or more operations on one special part and is suitable for no other purpose. Equipment of this kind is possible only where the product has been thoroughly standardized and is not subject to major changes in design.

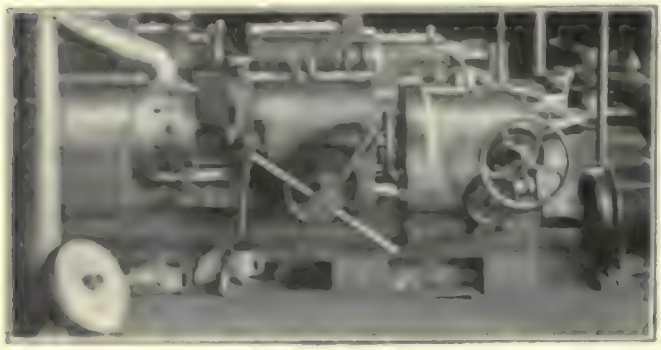


FIG. 13. PULLEY LATHE



FIG. 14. ERECTING FLOOR

Rewards for Suggestions—Discussion

By F. P. Terry
Belfast, Ireland

The contribution under the above heading by C. J. Morrison, on page 448, Vol. 55, of American Machinist, deals with a subject which I think has been somewhat neglected of late, but which at the same time is one of the most important under the present difficulties, and may be termed as making two blades of grass grow instead of one.

As Mr. Morrison suggests, it is a square deal that is necessary first and last. Many schemes have been tried, many have died almost at birth for lack of some little link. In some cases it has been a jealous manager or foreman who has been at fault, in others, the reward has been inadequate to the saving affected. But this would seldom kill a scheme where proper recognition is forthcoming, apart from the monetary element.

Money, Promotion and Increased Salary Popular Rewards

Some twenty years ago I was connected with a firm that had a very popular and successful scheme in operation. The money award was in most cases small, but promotion and increased salary were certain. In one case, a machinist who was milling brush parts for a motor developed a new design that was taken up by the firm. His reward was promotion to the position of foreman of the brush making department, a position practically created for him. Soon he came along with other suggestions and he eventually became head foreman of the electrical department.

A suggestion from a turner of a special chuck to allow for the machining of engine eccentrics at one setting brought as a reward an assistant foremanship in the machine shop, which resulted later in other improvements and the official position of jig and fixture designer. There were also dozens of other cases of men getting increased wages and better machines to operate.

Ten years ago the old manager died and the suggestion scheme lingered for a few months then passed away. The new manager had the idea that he could do all the suggesting himself, or at least take all the credit.

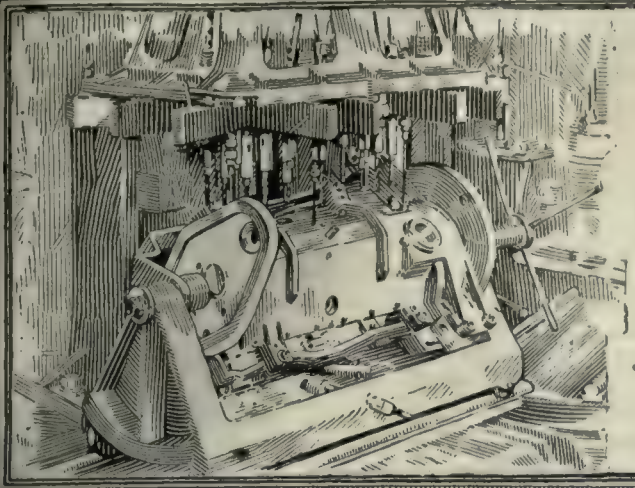
Mr. Morrison proposes a committee of judges. While this may be successful, I think the manager alone should have the necessary powers and be the sole judge. If the manager is not broad enough to carry out this important part of sucessful management, he should be replaced, as also should foremen who use their position to crib and claim the ideas belonging to others.

A Broad-Minded Manager

In the control of the successful scheme mentioned above, the old manager took full charge. Any ideas put before him were carefully considered and when adopted were often considerably improved by his own suggestions, for which he never claimed the slightest credit but gave all honor to the originator. All awards were recorded in the works magazine published quarterly. Anything especially good would be described fully with the inventor's photograph, or sometimes inventors would be invited to describe their inventions themselves. This added additional charm, quite apart from the money element, although these descriptions were paid for at liberal rates.

Human nature is very much the same the world over, and nothing is so annoying as being robbed. Many men would kick up more fuss if robbed of one dollar than they would if they were to lose fifty. It is the robbing of men's ideas that is the great drawback to so many suggestion schemes and that keeps work from being done on up-to-date lines, to the loss of the firm and the world at large.

If we had more broad-minded managers always ready to forget personality when it is to the firm's advantage, as in the case mentioned above, we would have many more successful suggestion schemes and contented workers. The pity is that such managers are so scarce.



Tool Engineering

By
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Methods of Designing Tools for Turret Lathes Continued—Different Ways of Developing the Design—Detailed Layouts for Pulley and Bevel Ring Gear

THERE are several methods of making turret layouts. Some factories show a simple yet complete set-up, with all the tools in place on the turret. Others go a step further and show the turret set-up with tools on one sheet, while on another each operation is shown in detail with the tools in their respective positions. There is still another method in vogue, which shows all the tools on the turret and each operation in detail on the same sheet. In addition to this, all tool numbers and reference numbers to drawings on which tool details appear are given on the sheet, and each operation is specifically noted by means of reference letters on the various surfaces which are to be machined.

In selecting a method, the tool engineer should be governed partly by factory conditions and the procedure in the past. Judgment must be used in the matter and a suitable method selected and standardized in order to obtain uniformity. If tool layouts are blueprinted and made up in book form for factory reference, the sizes of sheets should be uniform and of such shape that they can be easily handled.

In Fig. 379 is shown a turret layout of a plain pulley with all the tools in position on the turret. Figs. 380 and 381 show the various operations in detail. Referring to Fig. 379, the work *A* is a plain pulley which is to be turned, bored and faced on both sides. It is held by the inside of the rim in a set of special chuck jaws *B*, which are so made that the facing tools on the cross-slide can pass by the edge of the flange without interference. The toolholder *D* contains a boring bar, corner tool and turning tool for the outside diameter, all being used for the roughing operation.

The holder *E* is a duplicate of *D*, except that it is used for finishing, and the corner tool is left out because one cut is sufficient to do the work. Holder *F* contains a reamer which is arranged so that it will float and follow the hole generated by the boring tools. Tools *G* and *H* are standard slide tools, which are used for rough- and finish-facing the back of the pulley hub. The cross-slide in this machine has a turret toolpost *K*, in which are held the tools used to face the front of the hub and both sides of the flange.

For the authors' forthcoming book. All rights reserved.

The starting and completing of the first operation on the pulley is shown in Fig. 380. The cross-slide tool *L* is first used for facing off the end of the hub. After this cut has been started, the turret is brought up until the boring bar pilot enters the bushing and the boring tool commences to cut. Soon after this the turning tool *M* comes into operation. About this time the facing tool *L* has completed the work on the end of the hub; it is therefore withdrawn and the turret toolpost indexed to allow the two facing tools *O* and *P* to be used on the sides of the flange. Meanwhile the boring and turning tools continue to cut, eventually completing their work, at which time the "knock-off" stops the turret slide. Hand feed is then used to round the corner of the hub with the tool *N*.

In Fig. 381 is shown the remainder of the operations in detail. The cross-slide tools continue to face the flange while the finish-boring bar and turning tool *Q* in the holder *E* on the second turret face are brought up and set to work. The knock-off on the cross-slide stops the slide at the proper point and the facing tools remain in the position shown, or they can be run back out of the way if desired.

The hole is reamed with an adjustable reamer *R* in a holder of the floating type. On a cast-iron piece such as that shown, the reamer is usually fed by hand in order to size the hole more rapidly. If a slow machine feed is used, there is always the possibility of enlarging the hole slightly, due to the scraping action on the edges of the blades. The production is faster if the reamer is fed by hand, and the work is more uniform.

The last two operations on the work are rough- and finish-facing the back of the hub. A bar *S* inserted in the slide-tool *G* is operated by hand in a vertical direction. The turret is brought against a stop to obtain the correct longitudinal position, and held in place during the operation.

Many turrets have six sides, but there are also those with five, four and three. The majority of the machines in common use have either six or four sides, although on certain kinds of work the others are often used. Some years ago a certain type of turret lathe was made with an eight-sided turret; but this type was

not used very generally as its field was limited, due to the possibility of interferences of turret tools with others on the cross-slide of the machine. The six-sided turret occasionally causes trouble in this regard, so that the tool engineer must keep his eyes open in order to make sure of the necessary clearances.

A four-sided turret allows more tool clearance and there is little chance of trouble being caused by a lack of room for the tools. Fig. 382 shows a layout for a piece of work *A* which is to be handled on a machine having a turret with four sides. The piece is held by the inside of the rim in a set of special jaws *B* in a three-jaw chuck, in which the bushing *H* is fixed to act as a guide for the boring bars and reamers. The holder *C* is fastened to the first turret face and has an extension bracket *D*, in which are carried the turning tools *E* and *F*. Fine adjustment is provided by means of the backing-up screws shown.

The tools in the holder are set vertically, although for convenience they are shown in a horizontal plane in the layout. A rough-boring bar *G* is held in the same holder and used for boring the hole in the hub. The front of the cross-slide has a special toolblock *K* in which are held the facing and grooving tools *L*, *M* and *N*. These latter are roughing tools used for making the first cut on the flange, facing the end of the hub and roughing out the groove ½ in. under the finished size.

The toolholder *O* on the second turret face is exactly the same as that used on the first turret face, but it finishes the surfaces roughed off in the previous operation. While this tool is in use, the rear toolblock *T* on the cross-slide is brought up into position, so that the tools *U*, *V* and *W* perform the finished-facing and grooving operations. The third turret face carries

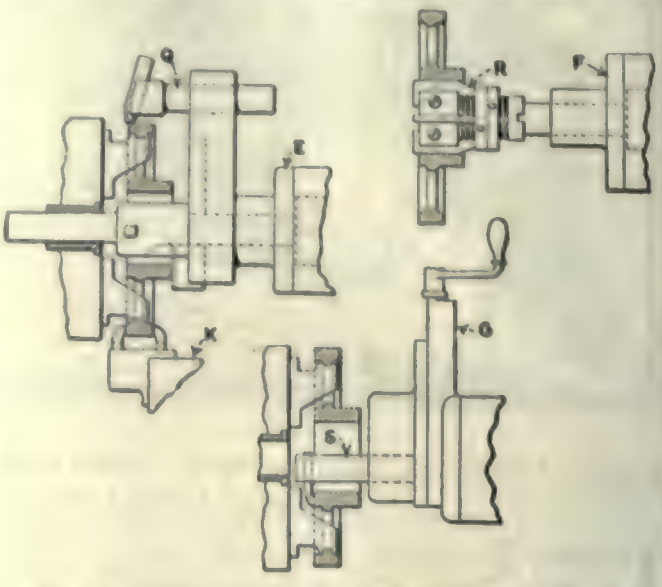


FIG. 381. REMAINDER OF OPERATIONS ON PLAIN PULLEY

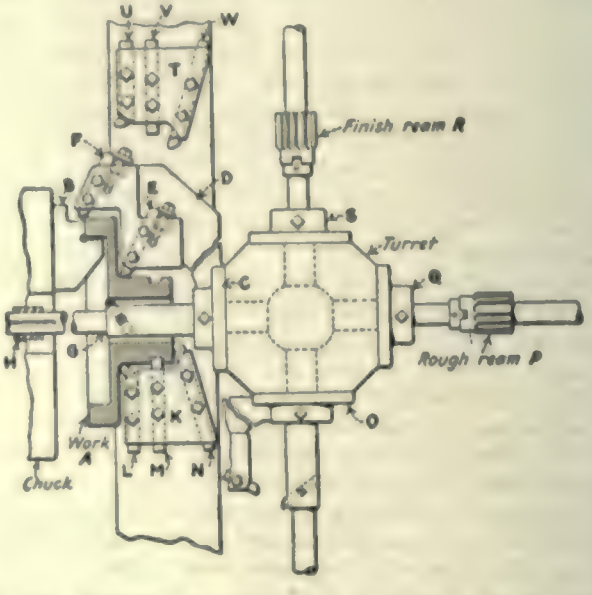


FIG. 382. TURRET LAYOUT FOR MACHINE WITH FOUR-SIDED TURRET

a roughing reamer *P* which is supported in a floating holder *Q*. The fourth and last turret face has a holder *S*, which is also of the floating type and carries the finishing reamer *R*.

This use of two reamers, one for roughing and the other for finishing, is not common, yet it is used occasionally when very accurate work is required. In this layout of tools the attention of the designer is called to the operation of the turret turning tools and the cross-slide facing tools, as the lengths of the various cuts are so nearly the same that the turning and facing operations are completed at practically the same time with the equipment indicated.

In order to illustrate the application of one of the methods of making turret layouts, we give a complete layout in Figs. 383, 384 and 385 of a special equip-

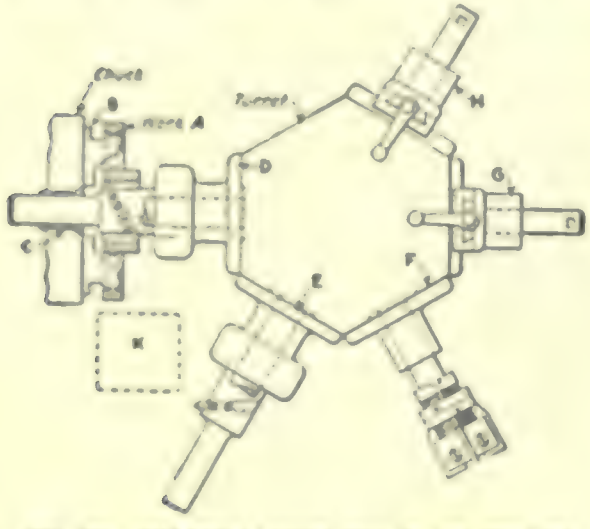


FIG. 383. TURRET LAYOUT FOR PLAIN PULLEY

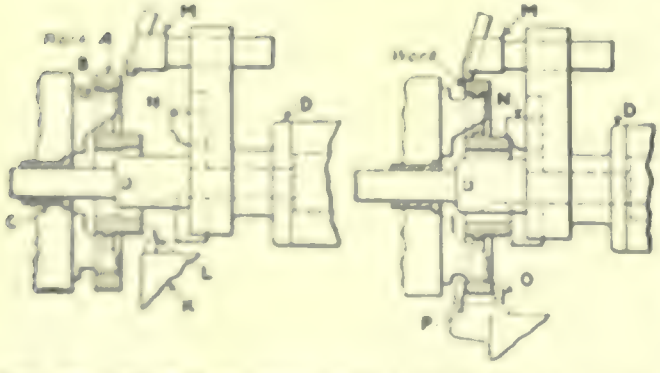


FIG. 384. START AND COMPLETION OF FIRST OPERATION ON PLAIN PULLEY

ment used in machining a bevel ring gear for the rear axle of an automobile. Fig. 383 shows the work *A*, which is a drop forging of alloy steel, held by the outside in a set of special chuck jaws *1*. These jaws are undercut, so as to grip the work firmly and prevent it from being pulled out of the jaws during the cutting. The surfaces which are being machined are lettered, and all tools used are numbered and listed at the bottom of the layout sheet.

A brief description of each operation, together with a reference to the portions of the work on which the cuts are being taken, is given with each layout showing details of the set-up. For example, the first operation consists of rough-boring the hole *G* with a special boring bar *4*, and rough-facing the surface *F* with tool *2* in the turret toolpost of the cross-slide. The remainder of the operations shown on this sheet are clearly specified and all tools used are listed with their drawing numbers at the bottom of the sheet, so that tool drawings can be easily found when wanted. The title of the drawing and other information as to the work and the machine on which the tools are used is given in the lower right-hand corner of each drawing, in the usual manner.

Between the first and second turret lathe settings, the bolt holes are drilled in the face *F* which has just been machined. This provides a means of driving the work during the heavy cutting of the beveled faces. In order to make this layout clear, a description of the holding device is necessary and some mention of the other tools used in Fig. 384. The work is located on a large special arbor *7*, which is fitted to an adapter on the spindle in such a way that it can be trued up when necessary if it does not run perfectly true with the spindle. The arbor is provided with a pin which enters one of the bolt holes and acts as a driver. A

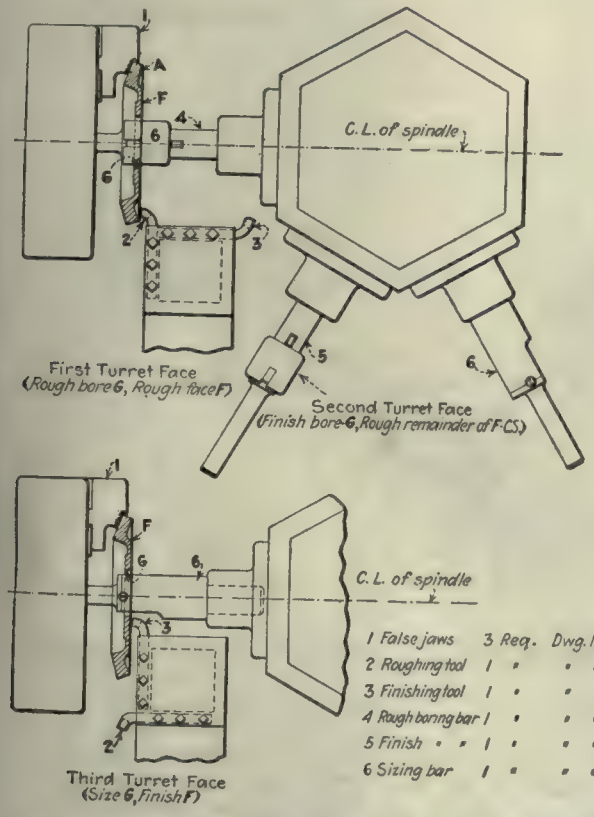


FIG. 383. TURRET LAYOUT FOR BEVEL RING GEAR—FIRST SETTING

taper plug in the center of the arbor acts upon three shoes which expand in the hole and grip the work and center it at the same time.

A locating device *8* is mounted on one of the turret

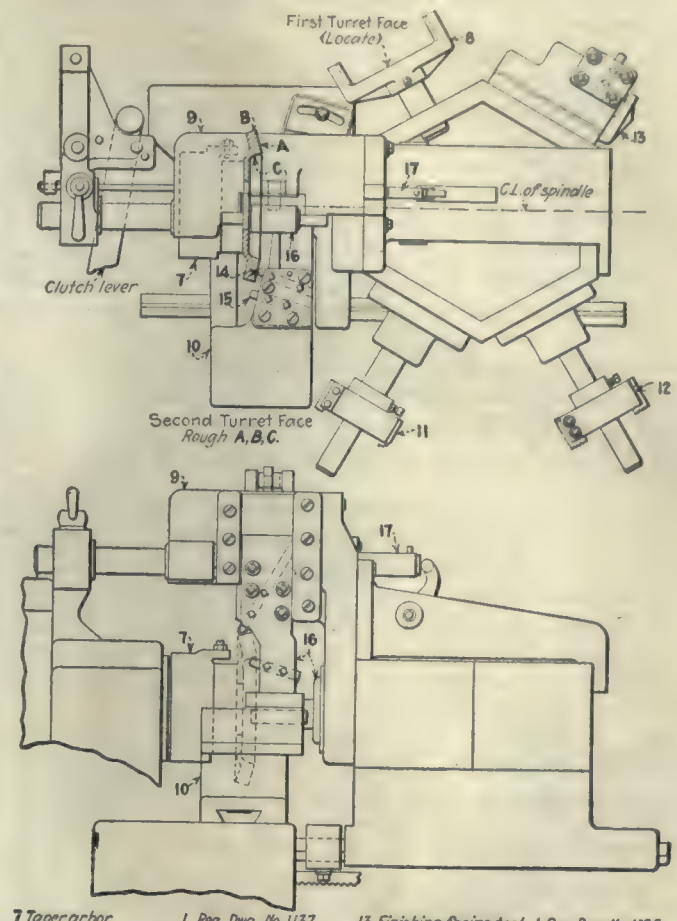


FIG. 384. TURRET LAYOUT FOR BEVEL RING GEAR—SECOND SETTING

faces and used when setting up the work on the arbor, in order to hold the piece up against the shoulder and preserve the correct location. In the first operation in this setting, a special taper turning attachment *9* (which was described in detail in a previous article) is used for turning the back angle and boring the inside angular surface of the gear blank shown as *B* and *C*. A special toolblock is mounted on the slide for this work, and because of the excessive overhang a support *16* is provided, in order to give the necessary stability and prevent any vibration.

A special taper cross-slide *10* is used for rough- and finish-facing the face angle of the gear *A*, the two tools *14* and *15* being used for the work. These tools are set far enough apart so that the roughing tool has completely finished its work before the finishing tool starts. The tools *11*, *12* and *13* are used for roughing the inside surfaces of the blank. The combination of a special cross-slide with a taper turning attachment on the turret increases the production greatly and gives very accurate work, as all the surfaces are machined by single-point tools controlled by accurately set taper forms.

The remainder of the operations are shown in detail in Fig. 385. The taper cross-slide continues to work after the turret taper attachment has been withdrawn. The turret is indexed and the radius cutter head *11* which is being cut is tough and "wirey" so that the radius at the cutting point of the tools is nicked to break the chip and make the cutting action easier. The grooves in one tool overlap those in the other, so

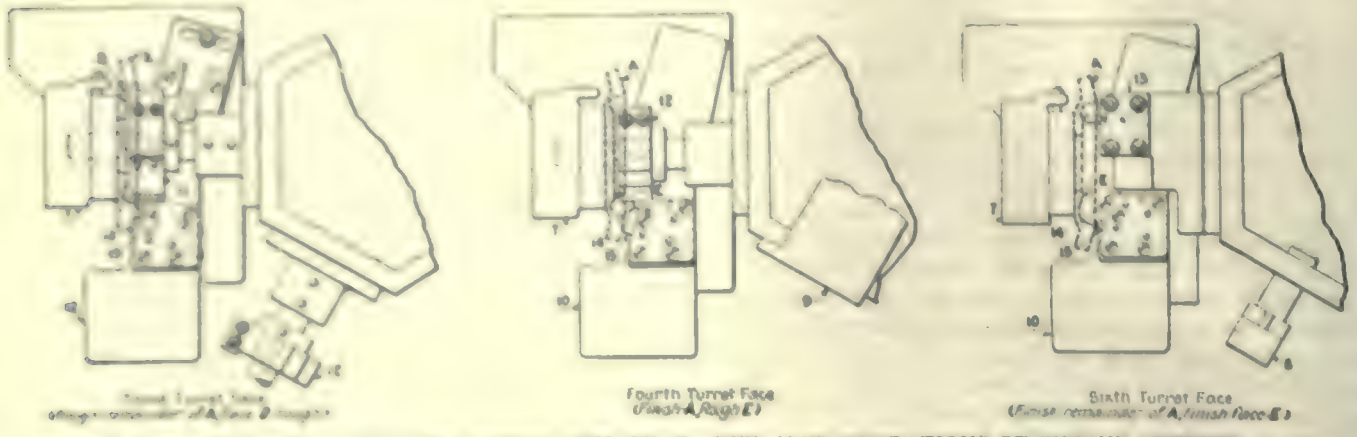


FIG. 383. TURRET LAYOUT FOR BEVEL RING GEAR—DETAILED OPERATIONS OF SECOND SETTING

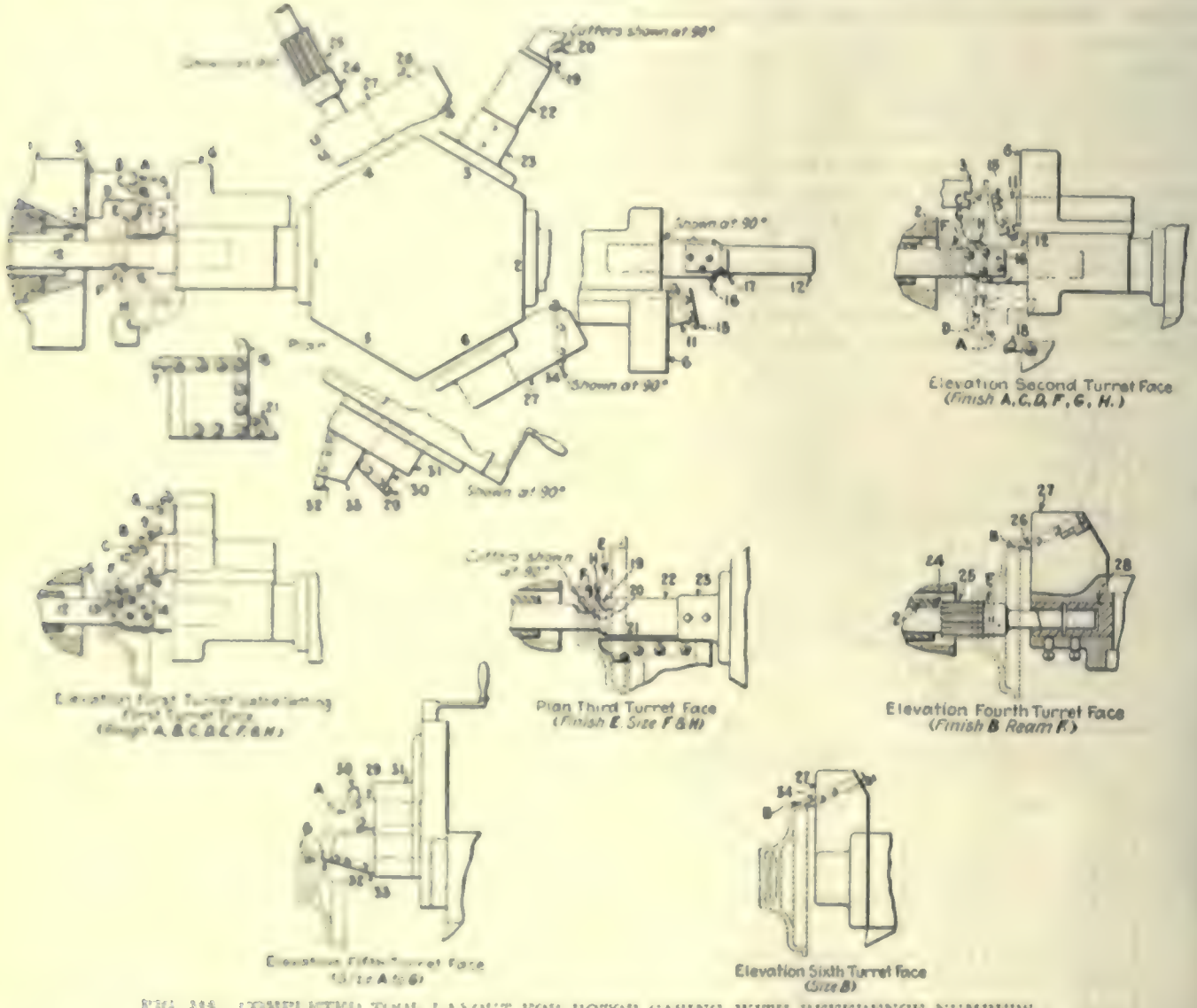


FIG. 384. COMPLETED TOOL LAYOUT FOR ROTOR CASING WITH REFERENCE NUMBERS

is used to remove the stock from the curved portion of the blank *D*. The tools in this cutter head are arranged so that they do not interfere with the continued action of the taper cross-slide. The material that the finished surface does not show any grooves.

The rough-facing head *12* is the next tool used for roughing the surface *E*. The toolbits are nicked the same as the radius tools to break the chip, and the

tool positions are such that the cross-slide continues to work on the facing of the angle without interference. The blank has now been completely roughed where necessary and finished on all important surfaces except the portion *E*, which has only been roughed.

To be sure of an absolutely true surface at *E*, the work should be faced with a single-point tool; but as the cross-slide is set at an angle it cannot be used, and as the turret has no crossfeeding movement it is evident that it is not available. In order to overcome the difficulty, a special slide tool *13* is mounted on the turret so that a single-point tool takes the position shown ready for the facing cut on the surface *E*. This tool is brought up to its place just as the angular facing cut is completed by the cross-slide. The feed of the latter is reversed and a block on the cross-slide engages with a slot in the under side of the sliding member on the turret, thus causing the single-point tool to move across the surface to be faced and producing a true and accurate finish.

The entire equipment shown in these layouts is considerably out of the ordinary and it is not by any means cheap; yet all of the tools are so designed that they can be adapted to a number of different pieces of work, so that the cost distributed over the various parts is not excessive. Furthermore, the work produced is of great accuracy, which is an essential item in the manufacture of bevel gears and pinions. The production is very rapid, and there is little time wasted either in setting-up or in machining.

Another Method of Making Layout

When it seems desirable to show a turret layout and details of the various operations on the same drawing, the arrangement must be carefully studied in order to avoid confusion. As these layouts are used in the factory, they should be as clear as possible so that the persons who use them will be able to understand the tooling methods readily. Fig. 386 shows a complete layout for a turret lathe operation on one-half of a rotor casing for a gyroscopic compass. This work required great accuracy and the tool equipment was designed with this point in mind, although a number of standard toolholders were used because the production required is not very high and only a few parts of any one kind are machined at one time.

The work is held by the outside in a set of special chuck jaws *3* in a standard three-jaw universal chuck. The casting is of an aluminum composition and somewhat fragile, so that the position of the jaws in their relation to the work was selected with care in order to avoid distortion. A universal turning and facing head *6* holding a boring bar *12* and various other tools designated by number, is used first on the work for roughing the surfaces *B*, *C*, *E*, *F*, *G* and *H*. The tool *7* in the cross-slide turret toolpost is fed outward and used in roughing off the surfaces *A* and *D*. The second operation is that of finishing *C*, *F*, *G* and *H* with another toolholder on the turret, and a final cut is taken across *A* and *D* with a tool *18* in the cross-slide.

The third operation finishes *E* and sizes *F* and *H* using a special boring bar *22* and a forming tool *21* on the turret toolpost of the cross-slide. In using the latter the cross-slide is located against a longitudinal stop and the tool fed outward by hand until the indicating dial on the crossfeed screw shows that the correct diameter has been obtained. The operators would allow the tool to dwell here for a moment in order to obtain a smooth finish.

The fourth operation is that of reaming the hole *F* with the reamer *25*, which is held in a special floating holder in the body of the toolholder *27*. This toolholder carries a tool *26* used for roughing the groove *B*, which is very important as it fits a bead on the other side of the case. Attention is called to the fact that this tool is held vertically instead of horizontally in order to obtain as high a degree of accuracy as possible. The importance of this arrangement has been mentioned previously.

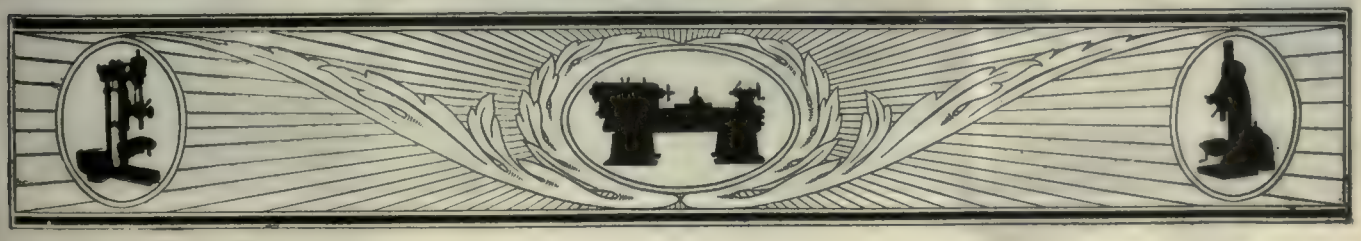
In the fifth operation a vertical slide toolholder *31* is furnished with two tools *30* and *32*, which are accurately set to preserve the accuracy of the distance from the face *A* to the surface *G*. The sixth operation is the final sizing of the groove *B* with tool *34* in holder *27*. This sizing is the last operation on the work, because it is of such importance that it is desirable to do it alone and thus make sure that no changes in relation can occur due to the possible shifting of the work.

The various examples of layouts given in this article cover a considerable variety of work, and the methods described are all in use in various factories. A decision as to the most suitable method for a given shop should be reached only after a discussion of the merits of each and a knowledge of conditions which affect the situation. Speaking generally, the writers favor the process shown in Figs. 383, 384 and 385, largely because the operations are shown so clearly, and the sheets are so proportioned that they can be photostated and bound up in a loose-leaf letter-size book for convenient reference.

The Foreman's Authority

By A. W. Brown

This is often an undefined thing; not exactly *x*, the unknown quantity, but at least a quantity of which the true value is not understood by those of whom he is in charge. Sometimes, indeed, the foreman himself has no sure comprehension of exactly where he stands and of how readily and how far the management will back him up, should he unwittingly overstep his authority. Nor does he know whether they will endorse his actions, should he exert his authority to the utmost. This matter should be made clear alike to the foreman and to those under him.



Reo Aluminum Alloy Pistons

Machining Methods Practically the Same as with Cast-Iron Pistons—Snap and Dial Gages Used for Inspection—Selective Assembly in Cylinders

By FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE Reo shop is one that has been successful in using aluminum alloy pistons, handling them in much the same way as cast iron. The first operations are to disk grind the ends, face and bore the open end and center the head, holding the piston from the inside so as to secure a wall of uniform thickness. A semi-automatic machine is used to rough-turn the outside and to rough out the ring grooves at the same time. This operation is shown in Fig. 1, which also shows the kind of chips that come from the alloy. The open end is then rebored, true with the roughed outside, and the inside chamfered.

The finish-turning and grooving is done on a similar machine at a second operation, after which the head is roughed and finished. Re-centering comes next, followed by three grinding operations which include the taper at the upper end.

Cross-boring for the piston pin is done in the chuck



FIG. 1. TURNING AND GROOVING ON SEMI-AUTOMATIC MACHINE.

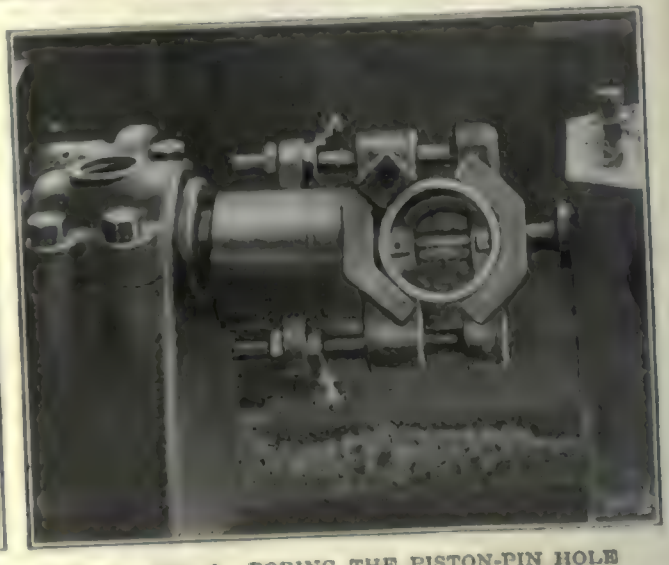


FIG. 2. BORING THE PISTON-PIN HOLE



FIG. 3. MACHINE REAMING OF PISTON-PIN HOLE.

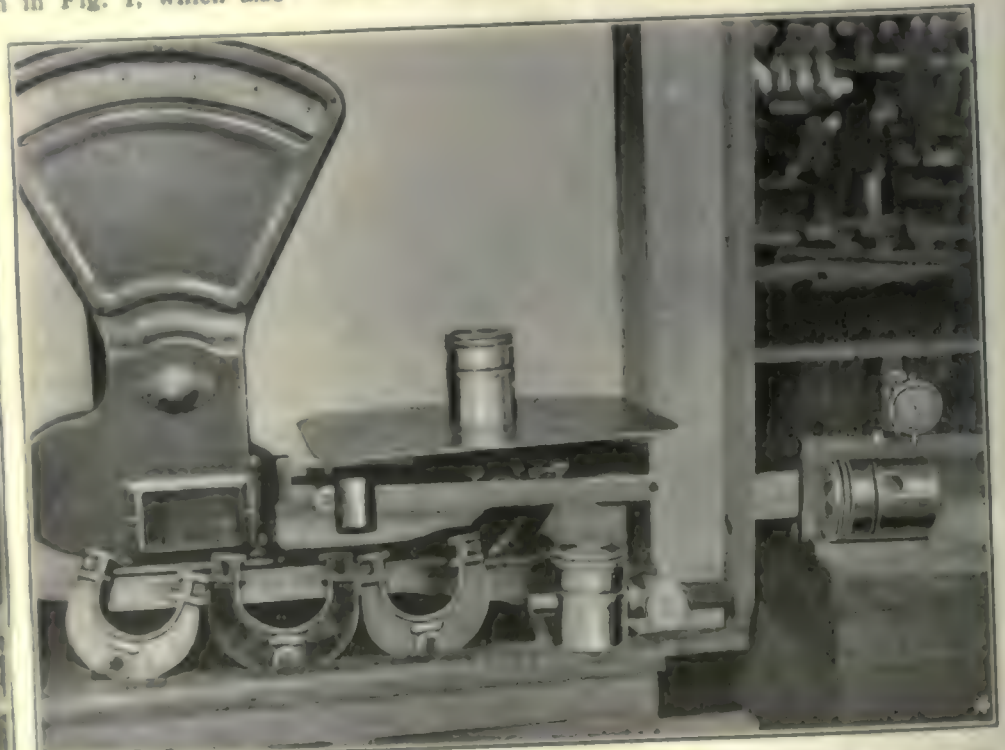


FIG. 4. SCALES AND INSPECTION GAGES

shown in Fig. 2. The check nuts on the back of the studs at *A* and *A* prevent drawing the outer clamp too tight and distorting the piston. The bosses are faced in the usual manner and the piston washed and carefully burred before inspection. The machine reaming is done in a special fixture, Fig. 3. The crossbar in front slides forward to release the piston.

The ring grooves are carefully inspected and the piston weighed on the scales shown in Fig. 4. The piston is again washed, the pinhole hand reamed to size and then washed a third time. The rings are fitted to the piston in the assembly line and returned to the bench for the rest of the operations.

In Fig. 4 are also shown a number of the inspection gages used on the piston. The snap gages test the diameter and the width and depth of ring grooves. The gage at *A* tests the squareness of the hole with the piston. The dial gage is fastened to the large diameter of the plug and when turned to indicate both above and below the hole, it tells the story of squareness of the hole with the body. Roundness is tested at *B* where the piston is revolved under the gage as it lies on the angle plate shown.

The method of fitting the pistons, or rather of selecting the pistons for any given motor, is shown in Fig. 5.

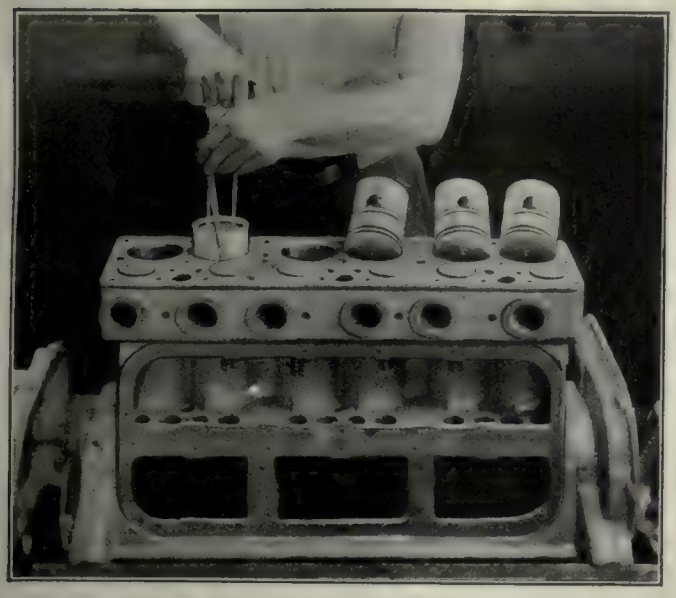


FIG. 5. TESTING PISTON CLEARANCE

A convenient wire handle enables the operator to get the "feel" of the piston in the bore when the feeler of proper thickness for the clearance is in place beside the piston. This view also shows the large exhaust valves; the inlet valves are in the removable head.

Planing Flat Gibs—Discussion

BY J. M. HENRY

The article under the above title, on page 219 of AMERICAN MACHINIST and the criticism thereof on page 408, led the writer to investigate the methods employed for planing similar pieces in our plant.

It seemed that the bending of gibs was not the proper method, as the correction made to overcome the springing tended to set up other strains that would have to be compensated for in some manner. Also, it seemed that considerable care was required to get just the right amount of bend to take care of the "wind."

Some time ago the planer department became dissatisfied with our methods on this class of work, both as to time and finished results. After some experimenting the following method was tried out and has proved so satisfactory that it has been practiced ever since in planing thin cast-iron gibs, both parallel and taper, and on work of similar character.

The castings as they come from the foundry are planed on one edge and then laid on the planer table in their natural position, shimming up where necessary to make them bear solidly. The planed edge is placed against a block or strap with a bunter against the opposite unfinished edge bearing just a little above the center of the piece, the object being to force the finished edge against the solid support without putting in a "wind" or "twist."

Careful clamping is, of course, nine-tenths of the job, but in this case it is comparatively simple. On long pieces, blocks and bunters are used near the ends only and no effort is made to clamp the piece down on the table, as the edge friction may be depended upon to hold it in place.

After clamping, the upper surface is roughed and *finished*. When released the gib naturally takes a "wind," that is commonly supposed to be caused by the scale pulling in on the unfinished side after the strain on the opposite side has been released by the removal of the scale. The piece is then laid with the finished side against the table, *forced* down flat and the remaining wide side *finished* to bring the piece to proper thickness. The result is that in the second operation the strains set up by the first are compensated for and the finished piece is found to be flat, parallel and free from twist or wind. Theoretically this seems reasonable and has been demonstrated to work out in practice.

No one would believe this to be true when it was first suggested, but when the inspector was handed a lot of pieces, half of which were finished by this method and the other half by the old method of roughing all over and then papering up for finishing, he could not tell the difference. In fact he picked out many pieces machined the new way as being the most perfect. The saving of time is obvious and it is a fact that very little scraping is found to be necessary, as all gibs are straight and to standard sizes.

Steel gibs and flat plates are generally finished on the vertical surface grinder, as oftentimes where size is unimportant it is necessary only to skim the surface. Cast-iron gibs or plates not to be held to a definite dimension are also ground. The only reason why the surface grinder and magnetic chuck is not generally used for thin cast-iron gibs lies in the fact that it is almost impossible to make thin flat castings with a surface good enough to supply a minimum allowance for grinding, and still leave enough stock to obtain an accurate thickness. For this reason it is found to be better practice to leave about $\frac{1}{8}$ inch for finish, and plane to size in this way. Large cast-iron tables, approximately $1 \times 24 \times 60$ in. have been successfully planed in the manner described, without a trace of wind.

In some cases long steel plates are milled and then finish ground to size following the method of holding at each end in a vise and depending upon side clamping only, bracing from the under side at the ends and center and allowing the piece to take its natural position.

There is not as much wind produced in milling as there is in planing, but when it appears the piece is forced down on the table before taking the second cut. When finished, the work is invariably flat and parallel.

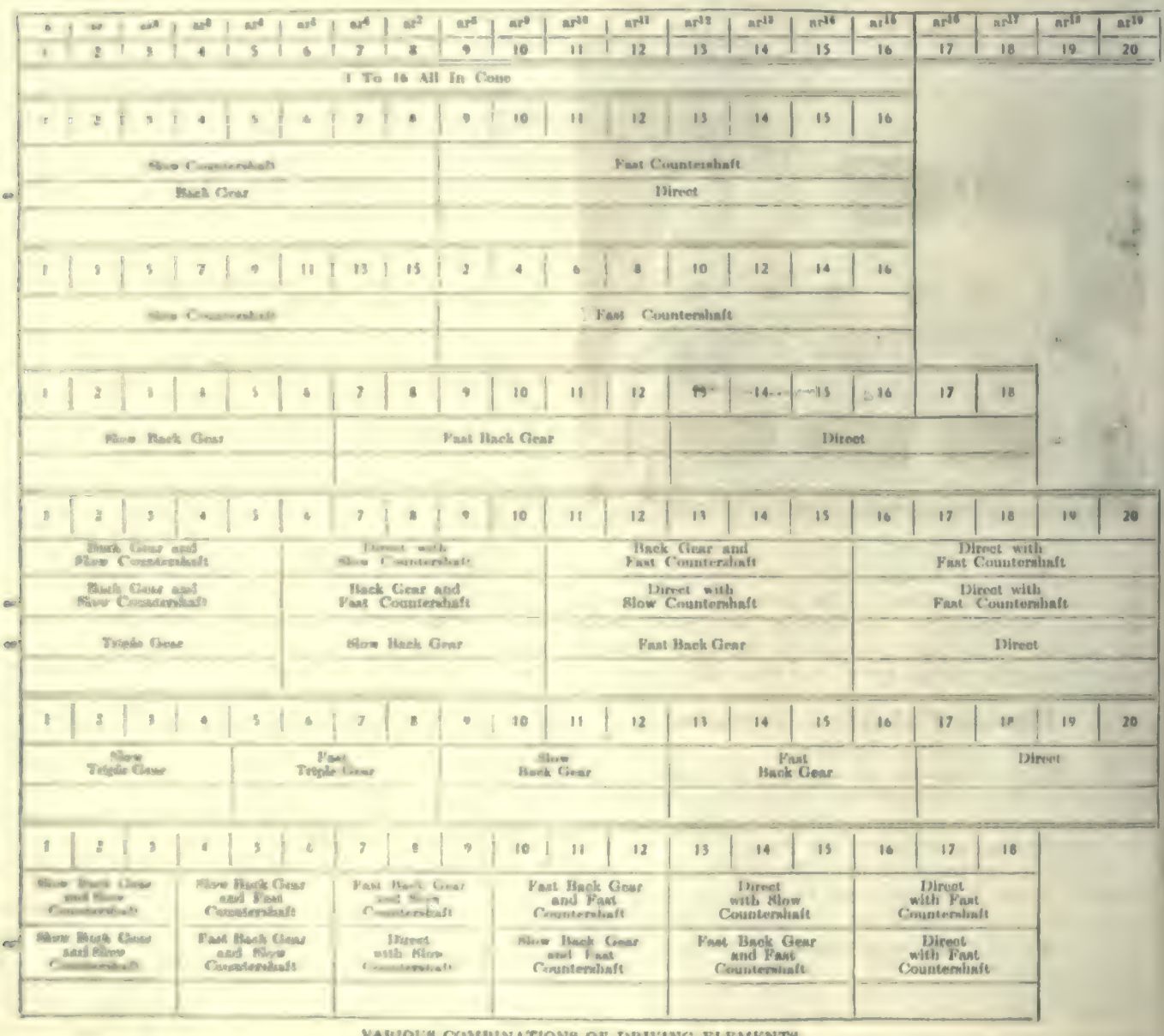
Methods of Machine Tool Design

Continuation of Third Article—Machine Tool Drives—Some of the Possible Combinations of Gears and Countershafts—Beginning a Problem

By A. L. DeLEEUW

AN UNLIMITED number of combinations is possible, using such elements as fast and slow countershafts, cone pulleys, fast and slow back gears, fast and slow triple gears. More than two countershaft speeds can be used, and have been used; it is possible to put a speed variator in the countershaft; it is also possible to have two cone pulleys in the countershaft. Such combinations have appeared from time to time; some have been discarded while a few still survive; and, where it is possible to use them, such combinations may produce very desirable results. However, there is one item which must be constantly kept in mind when we use more than one countershaft speed and even with the use of an ordinary set of cone pulleys, and that is, that the amount of power delivered to the machine is not constant. If, for instance, we have a machine cone and countershaft cone, each with a large step of 12 in. and a small step of 6 in. for, say, 4-in. single belt, and supposing the countershaft to run 300 r.p.m. then the large step of the countershaft cone is capable of delivering 5½ hp. If the belt had been on the small step of the cone, the amount of power delivered would be only half as much, or 2¾ hp. Not only have we here a wide variation in the amount of power which the countershaft can deliver, and consequently in the amount of work the machine can do, but, as a rule, we have the maximum amount of power when the minimum is required, and vice versa.

Supposing that the above-mentioned cones were used in a lathe, then we would have the high speed of the



VARIOUS COMBINATIONS OF DRIVING ELEMENTS

lathe when the belt is on the large countershaft step, and the low speed when it is on the small step. Now, as a rule, we do the heavier work when the lathe is running at the lower speeds and this is exactly when we obtain the least amount of power.

The same thing happens when we have variable-speed countershafts and this defect becomes more marked the greater the difference in the countershaft speeds. For that reason countershaft speeds widely varying in the number of revolutions per minute are not often used.

The table on the preceding page shows some of the combinations which are possible when we use such elements as fast and slow countershafts, cone pulleys, slow and fast back gears, and slow and fast triple gears.

As was mentioned before, many other possibilities exist, and some of the groupings given here would not be practical except in some extraordinary cases. The first line shows the various speeds we would obtain up to and including twenty speeds. The second line shows the numerals by which we refer to these speeds in the various groupings. The first possibility is that all of the speeds (16 and sometimes more) are obtained by the cone steps only. This, of course, is not a practical arrangement, though there are cases where as many as nine steps in a cone are used in very practical constructions—for instance, speed variators for a grinder.

The second group uses either a pair of cone pulleys combined with slow and fast countershaft or such cone pulleys with back gear or direct drive. Here, again, it is not very likely that eight steps will be used in the cone, but the general nature of the drive remains whether we use eight or only three steps in the cone.

The next group refers to a pair of cone pulleys and again slow and fast countershaft, of a somewhat different arrangement. In the previous arrangement the fast countershaft was not used until all the speeds of the cone had been exhausted with the slow countershaft speed. Such an arrangement is not very practical unless the speed variation obtained in the cones alone is relatively small. In the arrangement shown, the fast countershaft speed is $r^s \times$ the slow speed, and this would either mean an excessively high countershaft speed or an excessively low speed. In the present arrangement, however, the countershaft speeds alternate with the cone steps. For instance, if we have the belt on the third step and with the slow countershaft speed, we will obtain the next higher machine speed by leaving the belt on the third step but changing over to the high counter speed. The next higher machine speed will then be obtained by shifting back to the low counter speed and also shifting the belt to the fourth step of the cone. In this arrangement the ratio of the countershaft speeds is r. Such an arrangement is quite frequently used because we may use then the low counter speed for roughing and the high speed for finishing, obtaining these speeds without having to shift the cone belt and merely handling the shipper rod.

The next case shows a pair of cones, one countershaft speed, two sets of back gears and a direct drive; the next, two countershaft speeds, two cone pulleys and back gears. Here, again, we have a large difference between the two counter speeds, which makes this arrangement unsuitable except for very special cases. In general, the tabulation shows what arrangements are possible, though not necessarily desirable.

In Figs. 16, 17 and 18 a number of groupings were shown for two, three or four shifts. The number of shifts which should be selected for a machine depends on circumstances. If the work done by the machine calls for frequent shifting of speed within a narrow range, then it is well to control this entirely with one shift. If, on the other hand, there is a frequent shift,

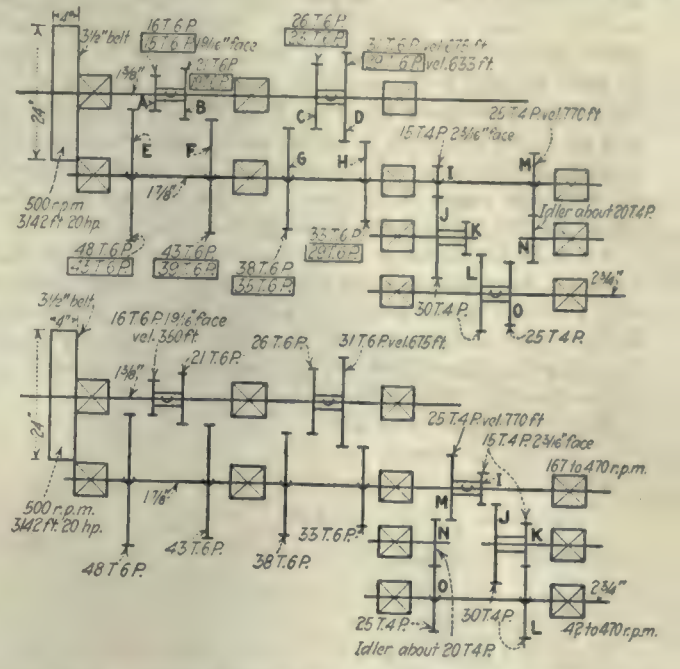


FIG. 20-A. FIRST ARRANGEMENT OF EIGHT-SPEED GEAR CHANGING DEVICE (ABOVE). FIG. 20-B. BETTER ARRANGEMENT OF FIG. 20-A

say from roughing to finishing feed (which is probably more than the variation one could get in one group), then it is well to bunch the finishing feeds and also the roughing feeds together, each in their own group, and have a single shift from roughing to finishing. No general rules can be given in regard to this matter and if we wish to illustrate the analysis of a gear-changing device, we must assume certain conditions and proceed accordingly.

In Fig. 20A a gear-changing device is shown with eight speeds. There is a driving pulley on the first shaft which, we will suppose, runs 500 r.p.m., giving a belt speed of 3,142 ft. per minute and capable of transmitting 20 hp. There are two pairs of sliding gears which can be made to mesh either with an idler or with a pair of compound gears which, in their turn, mesh with a pair of gears keyed to the second shaft. This arrangement may or may not be the best we can get. It is, however, the first one we happen to think of and is therefore the starting point of our analysis.

We will assume that we desire to run the last shaft

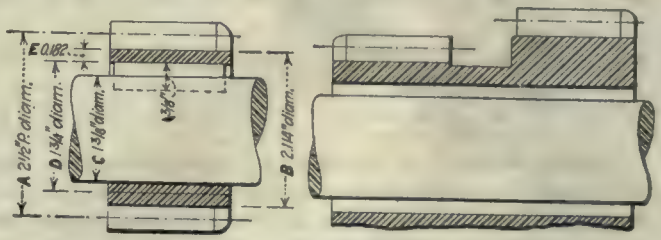


FIG. 21. STANDARD METHOD OF RECORDING PINION ANALYSIS

at a low speed of 42 and a high speed of 475 r.p.m. As we have two shifts we will have the same conditions as if we had a pair of cone pulleys and a set of back

gears, so that we can calculate at once what reductions we must make in the first shift and what in the second. The question remains whether we have the same as Case 1-A or Case 1-B. If we should make the sliding gears on the first and second shaft in the same manner as the cones in Case 1-A, we would have the same gears on both shafts, that is, gear A would be the same as gear H, and B the same as gear G. If we did so, we would have to speed up from D to H and from C to G, and as we do not wish to speed up in gear arrangements except under unusual conditions, we must naturally arrange our gears as in Case 1-B, that is, two cones but not with the same sizes of steps.

As it is desirable to have the gears as small as possible we start out making gear A with 15 teeth, and we will further make gears D and H of the same size. Under these conditions we find that the various gears have the numbers of teeth as indicated in the oblongs in the sketch. The calculations follow:

Desired speeds 42 to 470

No. of speeds = 8

Range = 470 ÷ 42 = 11.2

Ratio = $\sqrt[7]{11.2}$ = 1.412

Sequence of speeds

a	ar	ar²	ar³	ar⁴	ar⁵	ar⁶	ar⁷
42	59.3	83.6	118	167	236	333	470

SLOW COUNTERSHAFT — FAST COUNTERSHAFT

CASE 1

Range in cones = r^3 = 2.8166

Ratio of fast and slow counter = r^3 = 3.98 say 4.

Ratio of A and E = r^3 = 2.8166

A has 15 teeth

No. of teeth in E = $15r^3$ = 42.2

15 + 43 = 58 T. in pair A and E

$$B = \frac{58}{r^3 + 1} = \frac{58}{2.995} = 19$$

$$F = 58 - 19 = 39$$

$$C = \frac{58}{r^3 + 1} = 24$$

$$G = 58 - 24 = 34$$

$$D = \frac{58}{1 + 1} = 29$$

$$H = 58 - 29 = 29$$

$ar^3 = \frac{470}{1} \times \frac{15}{43} = 164$ $\quad a = 164 \div 4 = 41$

$ar^2 = \frac{470}{1} \times \frac{19}{39} = 229$ $\quad ar = 229 \div 4 = 57$

$ar^1 = \frac{470}{1} \times \frac{24}{34} = 332$ $\quad ar^2 = 332 \div 4 = 83$

$ar^0 = \frac{470}{1} \times \frac{29}{29} = 470$ $\quad ar^3 = 470 \div 4 = 118$

Before we can go further we must determine the pitch and face of these gears. We will assume that the reader is familiar with this process. We will make the gears of chrome nickel steel, heat-treated and hardened, because we realize right away that, in order to transmit 20 hp. at 500 r.p.m., we would need very large cast-iron gears of which the circumferential speed would be very much too high and soft steel gears would not be permissible on account of the tearing up of the metal under running conditions. We might have made these gears of mild steel and casehardened, or of tool steel and hardened, but the latter choice is unsuitable because hardened tool steel is brittle, and the former choice would be almost as expensive as chrome nickel steel and would not have nearly the same strength.

Making pinion A with fifteen teeth, six pitch, and therefore 2½ in. in diameter, makes gear D with twenty-nine teeth, six pitch. As gear D runs 500 r.p.m. its circumferential speed is 633 ft. per minute. *Without resorting to special care in gear cutting, hardened steel gears may run up to 700 ft. per minute, when running dry.* Our arrangement is therefore acceptable.

However, comparing the load which the pinion *must* stand and the load it *can* stand, we find that pinion A is not strong enough. There are two things we can do: We can either increase the pitch or increase the number of teeth. The smallest possible increase in pitch would make the pinion fifteen teeth, five pitch, and, as we cannot change the relative sizes of A and D, the diameter of B also will be ⅘ times greater, so that its circumferential speed will be 633 × ⅘ which is more than 700 ft. per minute, and therefore not acceptable.

If, on the other hand, we change the number of teeth of pinion A, we increase it only ⅐ or less than 7 per cent for every tooth added. Giving this pinion sixteen teeth reduces the load sufficiently to make such a gear strong enough, and, as this pinion is the smallest of the eight gears used in the set, all other gears are also sufficiently strong. The new figures thus obtained are placed immediately above the old figures in the oblongs. We find that the highest circumferential speed of any of the gears is now 675 ft. per minute, which is still below the maximum.

It might be remarked here that there are two shifts in the first group but this is only apparently so. The two sets of sliding gears can be handled with a single lever as is done in the gear-shift on automobiles. The reason why a single lever can be used for two pairs of sliding gears in one group is that only one of the four sliding gears is in mesh, all others run idle. If, on the other hand, gears A, B, E and F should belong to one group and gears C, D, G and H to another group, it would not be possible to handle these two sets of sliding gears with a single lever, because two sets of gears would be running at the same time.

The highest speed we have given to the second shift is 470 r.p.m. and the lowest speed 167 r.p.m. As the last shaft in the arrangement must have a low speed of 42 r.p.m., we find that we must reduce from 167 to 42, which is a ratio equal to 4. Such a reduction is very well possible with one pair of gears, but it would mean that the larger of the two gears would be of considerable size. In modern machine tool construction where gears are supposed to be inside of the frame of the machine (at least as much as possible), large gears are not desirable, and for this reason we will make this reduction by means of compound gears, indicated by I, J, K and L. The other side of this sliding gear arrangement, however, requires no reduction, so that we do not need any compounding. However, if we should drive directly from M to O, the last-mentioned gear would run in the opposite direction from gear L, so that we are compelled to insert the idler N.

As the highest speed of pinion I is only 167 r.p.m., and as it also has to transmit 20 hp., we must calculate the proper pitch and face for this pinion. We find that we will have the necessary strength by making it four pitch with 2½ in. face, using chrome nickel steel again

as our material. The real active face is only 2 in., as $\frac{1}{16}$ in. was allowed for the rounding of the teeth which is necessary where gears slide into mesh with each other. Similarly, the face of the first pinion, which was $1\frac{1}{16}$ in., has also an allowance of $\frac{1}{16}$ in. for rounding. It should be noted here that *the face of a gear should not be more than three times its circular pitch and, if possible, should be confined to two-and-a-half times the circular pitch.* There are cases where we deviate from this rule, but every case should be treated individually and carefully analyzed before we make the face wider.

The reason why it is not advisable to have wide faces for gears is the following: However carefully shafts may be aligned, there is always some small amount of error. Besides, the pressure on the gear tooth or possibly on the teeth of some other gear will cause the shaft to bend, thus bringing the teeth of two meshing gears out of alignment. This will cause excessive pressure on the corners of the teeth, which are liable to break out. Actual practice shows that in the great majority of the breakage of gears it was the corner of a tooth which first gave way.

We will now check up and see if there is anything in the arrangement, as sketched out in Fig. 20A, which should be modified. Looking at the first pair of sliding gears we see that when it is in mesh on either side the working gear is close to a bearing, which is as it should be. But this is not the case with the compound gears. Where the gear *L* meshes with *K* is quite some distance from its bearing. Furthermore we notice that the sliding gear *L-O* is on the last shaft, that is, the shaft subject to the greatest torque; and it would be better to have all gears on this shaft solidly keyed on. We further notice that the gear *L* receives heavier pressure from the compound gears than the gear *O* from the direct drive, and we should always aim to place the gear which receives the heaviest pressure as close to the end of the shaft as possible. In other words, we should reverse gears *L* and *O*. We make these corrections and obtain Fig. 20B, which meets all the objections mentioned above.

There is one other point to which we should pay attention, namely, the idler. It would seem desirable to have the compound gears *JK* and the idler *N* in line with each other so as to be able to run a single shaft between the bearings for the support of these gears. If we do so, we must make idler *N* with twenty teeth. As a rule, it is not desirable to have an idler between two gears smaller than the gears themselves, though this is not a serious matter so long as the difference in the number of teeth is not too great. Twenty teeth, therefore, will do. However, should we wish to make this number greater we can readily do so, for we must not forget that Fig. 20B does not show the gears in actual relation to each other, but shows them as if they were all rolled out until the centerlines of their shafts came in one plane surface.

Mention was made of the analysis of the fifteen tooth pinion, which showed us the necessity of changing this to sixteen teeth. As this kind of analysis should be carried out with every gear, clutch, etc., which we need in a driving arrangement, we show in Fig. 21 a standard way of making such an analysis rapidly and in such a manner that a record may be kept. The sketch on the left shows the fifteen tooth pinion which does not need to be sketched to size, as we will depend entirely on figures. We put down the various sizes in the order indicated by the letters. *A* shows the pitch diameter, *B* the root diameter, *C* the diameter of the shaft, *D* the diameter over the key (or over the bushing, if the gear should be running loose on the shaft), and *E* the thickness of metal between the teeth and the key. This amount of metal being insufficient we changed the pinion to sixteen teeth and drew a new sketch as shown on the right.

(Continued in next week's issue.)

A Difficult Die Casting

By Milton Wright

A rather difficult proposition in the way of a die casting is shown in Fig. 1. It is of an aluminum alloy and, except for tapping the small holes for the assembling screws, is complete when it leaves the die. The picture shows two identical castings, one of them reversed to enable the reader to see both sides. The depth of the casting, the extreme thinness of the walls, together with the various shoulders, crossholes, offsets,

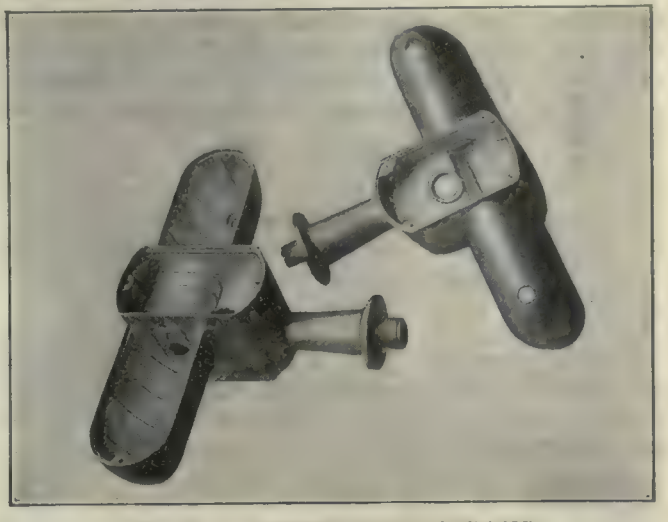


FIG. 1. A DIFFICULT DIE CASTING

and recesses, combine to render the task of design as well as construction anything but an easy one.

As anyone familiar with the art of die-casting need not be told, the difficulty of the process lies not so much in the making of a die that will produce the casting, as in designing it so that the casting may be removed from it without injury. In ordinary foundry practice where the molds are of sand, a mold is made and destroyed for each casting produced. Any shoulder, offset or recess from which the pattern may not be withdrawn without injury to the mold is taken care of by "cores" made up of sand and bonding material, and as many sets of cores are therefore required as there are castings to be made.

When the mold is a steel die, not only must it be so designed that the casting will come out but all cores must be so made that they can be withdrawn before the mold is opened, or must come out with the casting in such shape as to be ready for instant replacement for the next cast.

In the die for making this casting, both parts of which are shown in Fig. 2, there are two loose cores that come out with the casting when the latter is removed from the mold, as well as several others that are so arranged as to be withdrawn from the casting by means of levers and pinions.

The upper faces of the parts, as shown in the illustration, are the mating faces—the parting line—of the mold, and it will be noted that this does not lie in a single plane, but has an offset of about ¼ in. In casting position this face is vertical, the sides *A* being at the bottom, and the die is held between the anvil and ram of a horizontally disposed, pneumatically operated press that supplies the necessary resistance to keep the parts from being separated by the pressure of the incoming metal.



FIG. 2. DIE USED IN PRODUCING CASTING

The four pins *B* are dowels that insure the accurate mating of the dies, and permanently project above the surfaces. The stem of the casting is hollow and at *C* is a core that makes this hole. In casting position the core *C* is somewhat farther advanced than is here shown and meets the part *D*, which is also a movable core

At *E* are the two loose cores previously mentioned. They are dovetailed into the solid portion of the die and, when in casting position, become a portion of its contour, but in ejecting a casting these parts are pushed out with it and must be removed and replaced in the mold before proceeding. In Fig. 3 these parts, marked with the same letter, are shown as they have been set back in the mold but have not been pushed down to place.

In Fig. 3 it will be noted that many small pins that are not visible in Fig. 2 project from the parting surfaces of the die. Some of these are cores for the small screw holes but most of them are ejector pins for pushing the casting out of the mold. All of these pins are operated by the various levers that may be seen in Fig. 2. The ejector pins are, of course, flush with the surface of the die and form a part of it when a cast is made, while the core pins are left projecting to form the holes.



FIG. 3. DETAIL OF THE LOOSE CORE

The openings, marked *F* in both Figs. 2 and 3, together form the sprue through which the molten metal enters the die. When the two parts are together this, at the outer end, is a round hole the entrance to which is beveled or countersunk to match the correspondingly beveled spout of the pump.

The machine that does the casting was developed by the Atlas Die Casting Co. for its own use and cannot, therefore, be described. Suffice it to say that the spout of the pump, which is suspended in the pot of molten metal, is forced against the opening of the sprue and, while firmly clamped in position, air at 200-lb. pressure is admitted to the pump, shooting the molten metal into the die and effectually filling every crevice thereof.

Upon opening the die the first move is to withdraw all the cores by means of their respective levers. The operator then pulls forward the lever connected with the ejector pins, pushing the casting slowly and evenly out of the die. It will be noted in Fig. 3 that there are ejector pins under the loose cores *E*, so that these parts are pushed out with the casting and no strain is imposed upon the latter, which at this stage is very fragile because of its heat.

This die was designed by Nathan Lester, engineer of the Atlas Die Casting Co., as was also the casting machines used by this company.

Literal Obedience

By Robert Grimshaw

In certain classes of work there are reasons why instructions should be obeyed literally; other action would involve fruitless discussion and costly, even fatal delay. Whether all orders shall or shall not be obeyed to the letter; whether as the printer says, one must "follow copy, even if it goes out of the window"; whether, as the common phrase goes, one must "obey orders, even if it breaks owners,"—depends on the class of work, the type and experience of the worker, and the degree of emergency. One thing is certain:—where orders are in writing and are understood, responsibility for any undesirable consequence of following them to the letter is readily placed.

At the same time, if the foreman sees beyond all question that orders sent him are impossible to follow literally, or if so followed would bring about trouble, it is his duty to say so, at once; just as it is the duty of an apothecary who finds an error in a prescription, to communicate at once with the prescribing physician.

Erratum

We hasten to correct an error which appeared on page 688g in our issue of May 4. In the Clipping Index description of the portable automatic punch for hardness testing the word "scleroscope" was used in the title. Our attention has been called by the Shore Instrument and Manufacturing Co. to the fact that "scleroscope" is a registered trademark in the United States Patent Office and cannot be used except in connection with the device made by this firm. We wish to say that the Case Hardening Service Co., of Cleveland, distributor of the punch, is blameless in this matter as the word scleroscope was added to the title of the description through a clerical error in our own office. We shall publish in an early issue a corrected Clipping Index description to supersede the one in the May 4 issue.

The Grinding of Gear Teeth
and Its Future in the Industry

Conclusion—Application of Ground Gear Teeth in the Automotive Industry—Overcoming the Effects of Heat-Treatment—Elimination of Noisy Gearing by Grinding

By R. S. DRUMMOND
Vice-President, Gear Grinding Machine Co.

As a sample of the stock removed from gear teeth by grinding process, figures are given bearing on gears similar to those in automobile transmissions, varying in size from 2 in. in diameter to 8 in., of 6 or 7 pitch, and ⅝ to 1¼-in. face, either casehardened or oil-treated.

On such gears it is usual to correct the tooth curve and give a good finish to the tooth surface by the removal of approximately 0.003 in. from each side of the tooth. Where the inaccuracies of machine work or the distortion of heat-treatment is rather excessive, it sometimes becomes necessary to remove as much as 0.006 in. from the surface of the tooth on both sides. The removal of this amount of stock, 0.003 to 0.006 in., will remove from the thickness of each tooth from 0.006 to 0.012 in., adding that much to backlash in a given gear, or double this amount in a pair of gears meshing together. We find that on the average we can expect the backlash to increase 0.010 to 0.015 in. in commercial transmission gears, due to the removal of stock by the grinding process.

Permissible Backlash

This brings up the important subject of backlash and its effect on gear operation with respect to uniformity of transmission of power and noise. It has been our experience over several years that transmissions are normally helped by increase of backlash—for a long time manufacturers of this product held the backlash so close (0.004 to 0.006 in.) that a serious oil hammer was evident, especially in cold weather. As the backlash increased this disappeared.

In the normal operation of gears 0.022 in. backlash has been found highly satisfactory in high grade transmissions. The only unsatisfactory result of additional backlash comes from the accumulated backlash between a series of gears where the driven member over-runs the driver—as in a car coasting against the engine. This will accumulate the backlash, and cause the gears to tap against one another with a single distinct tap, which is normally not objectionable in automobile transmissions. It is unusual for drivers to continuously surge their cars backward and forward.

Casehardening

The depth of casehardening of such gears, which is usually specified 0.035 in. or more, is amply sufficient to permit of the grinding of gear teeth for salvage purposes, or for finishing gears with grinding stock allowed, without alteration of casehardened limits. A reduction of 0.006 in. from the specified 0.025 in. minimum will still leave ample case. Some manufacturers prefer to make the case 0.040 in. deep and this has proved entirely satisfactory.

Paper presented at Buffalo convention of the American Gear Manufacturers' Association.

In the rapid and economical operation of grinding gear teeth certain machine limits are important. We mention them as follows:

(a) Variations in the bore of the gear may be permitted in automobile transmissions to vary 0.000 to 0.001 in. over specified size.

(b) The hub face may be permitted to run out up to 0.001 in.

(c) Outside diameter may have a run out of 0.005 in. in gears from 2 to 8 in. in diameter.

(d) Index error may be permitted in a rough machine product up to 0.003 in.

Such discrepancies in the rough product are well within ordinary machine limits of machine production without need for special features and accuracy of gear tooth cutting or gear manufacture. The bore and the face of the gear as mentioned are important because it is customary to grind gears in groups of from 1 to 12, according to their size and general proportions.

The limits for grinding stock permit of the elimination of normal errors in run out or index error as mentioned.

Should these errors in run out or indexing or thickness of the tooth be exceeded, it is necessary in finish grinding of the teeth to remove additional material which in turn increases the backlash but otherwise does no harm in transmission gears.

Recommended Grinding Stock

In sleeve gears (main driving pinion and stem gear) it is desirable to fit the sleeve gear with great accuracy into the mating second speed gear with the internal tooth construction. We find on such sleeve gears in the rough the amount of stock desirable is 0.010 to 0.014 in. over desired tooth thickness. This amount of stock permits the grinding of the sleeve gear down to an exact size which will accurately and snugly fit the internal teeth on the second speed clutch connection which is used in direct drive on most cars.

It is usual to leave the teeth of other gears of a normal transmission with 0.006 to 0.012 in. over desired tooth thickness.

These limits of tooth thickness are in common use in the manufacture of several types of transmissions with a backlash in the main driving gears of 0.008 to 0.012 in. backlash and in other gear combinations from 0.012 to 0.020 in. backlash.

In discussing this general subject of removal of stock, it is important to state here that the minimum amount of stock which can be removed is microscopic.

The only tooth form of importance is the pure involute curve. Our experience has proven that the closer the form of the tooth is held to the accurate involute form without modifications the better the gears operate with respect to quiet and accurate operation. Ground gears with proper accurate tooth form will operate

silently unless other features of the construction produce noise.

It is true that certain lengths of tooth and certain involute curves are more particularly suited to a given class of work, as for instance, the development of gear teeth in automobile transmissions has today centered around the use of gears of 6 or 7 pitch and pressure angle of 20 deg. or more. These gears require relief for such interference as occurs from natural abutting of teeth due to the numbers of the teeth in contact. For instance, in 13 teeth running with 14 this abrupt butting of the teeth is due to the number of teeth and is relieved by increasing the pressure angle until the effect disappears. Where this increase in pressure angle is not desired, some transmission cases have been corrected for this defect by the reduction of the outside diameter of the gear tooth to the point which eliminates this interference.

No Universal Tooth Length

There is no one tooth length which is universally correct, although the normal standard full length tooth lends itself best to quiet operation, due to its long period of contact and the fact that one tooth is in full contact when the next tooth following takes hold.

In reading various papers on gearing, one is impressed with the number of times that the theory of action of the true involute is fully described and how little attention is paid to the action of curves which are usual on gear teeth. Examinations of hundreds of lots of gears totaling many thousands, show that the prevalent tooth curves are approximate involutes, but practically never within 0.002 in. of accuracy, unless finished after heat-treatment. As a sample, we would quote one concern whose standards and masters for the last five years have been a misplaced involute located 0.009 in. low on the drive side and 0.005 in. low on the coast.

Teeth accurately formed to the true involute curve will operate accurately and relatively quietly on spread center distance, but in gear cutting it frequently occurs that one of a pair of gears will be off in form and make noise. The action of gears operating with curves placed too high or too low is to cause the gears to move with a speed varying up and down with each tooth action.

Another effect is that the next mating tooth contacts with its mate at a different speed from the mate causing an impact. It is rarely possible to secure double tooth action. This has the effect of giving the full driving force as a wearing pressure on the tooth at the period of greatest sliding action.

Last year we salvaged 50,000 gears for one concern in Detroit. These gears had been previously cut to size and the grinding operation added an average of approximately 0.012 in. backlash, but the gears were quiet after grinding and very noisy before grinding. These gears had improper tooth form when they reached us and we simply ground down the surface of the tooth to a true curve and the gears became quiet. In another instance we ground for an automobile manufacturer during a three months period 35,000 gears which had been put on the shelf during the previous two years as rejected and scrap parts. These gears formerly passed the ordinary inspection as to size and appearance and rolled fairly well, but they were noisy when assembled into transmissions.

The most common error causing gear noise is the misplacing of curves so that after each tooth contact the mating gear is accelerated or retarded abruptly.

Irregular surface contact due to bad shape of the curve applied. This frequently causes the oil film between the teeth to be broken down, giving a metal to metal contact which is noisy.

Improper inspection of cutters or hobbs used in finish cutting gears. It is safe to estimate that 25 per cent of the cutters and hobbs offered on the market are sufficiently inaccurate to cause gear noise unless some master adjustment is made on the machine to modify their effect. When one considers the large number of rejected cutters it is uncomfortable to consider what becomes of these parts which are returned to the manufacturer.

The usual practice of locating the bore of the gear by use of pins between the teeth when the gear is required to operate on a splined shaft causes noise. The object of the number of pins between the teeth is to centralize the bore with the distorted or misformed teeth and at its best this practice only divides the error which is present in the teeth held by the pins. This method does not eliminate the error; it simply divides it. In gear grinding practice it is recommended that the gears be central from splined grooves when the bore is ground. This centralizes the bore with the splined grooves, the gear is then mounted on this ground bore and the error is removed from the teeth so that all three parts are centralized, the gear teeth, the bore and the splined grooves.

The fit of the main driving pinion into the second speed gear is another cause. This causes a very distasteful rattle when the fit is not accurately made. In gear grinding practice it is easy to grind the driving pinion to size not only within the proper limits, but so that it makes a close fit in the space provided in the second speed gear.

Undue stubbing of teeth is another frequent cause for noise. This arises from the adoption of a stub design because it is easy to say "stub," rather than because this combination of length or pitch is a good design. In a recent job handled by us stub teeth were recommended and used by a manufacturer where the shafts were normally spread up to 0.015 in. and the gears were made with a normal amount of undersize on the O. D. and normal amount of eccentricity. Although these conditions were known, the manufacturer supplied these stub teeth and a totally unsatisfactory job resulted. The teeth would not carry over properly from one to the next, there being bearing on the end of the receding tooth of only about 0.008 in. from the top when the next tooth came in contact.

Indicating Tooth Length

There would appear to be no reasonable basis for the present general practice of labeling 6-8, 7-9, etc. as the length of the teeth so indicated are not proportioned to one another. The ratio 6-8 being equal to 0.75 and the ratio 7-9 being equal to 0.77, etc. It is disastrous to design gear teeth so that one loses its load or takes it up before the other is in full contact, and by full contact we mean more than just edge contact on the end of the tooth.

Gear teeth must not only be long enough to reach from one tooth to the next, but for normal quiet operation they should be enough longer so that the next tooth following will reach a full satisfactory contact

before the receding tooth leaves contact. This must also be effective under normal errors in machining such as run outs, index error, undersize condition, etc.

Under certain conditions stub teeth can be produced faster than long ones. This may recommend the machines but it does not necessarily recommend stub teeth. We find the tendency of the market away from this design and transmission builders today are looking with favor on longer teeth and finding that the cost of manufacture is not necessarily greater when conditions of trouble and noise are taken into account. The full tooth gives ordinarily a longer period of contact and lends itself to an easier, less abrupt contact and an easier, less abrupt leaving of contact.

Another feature of design causing trouble is pressure angle. Our forefathers selected 14½-deg. pressure angle just as years ago they selected window glass 6 x 8 in. in size; we followed that practice for years afraid to change—some are doing it yet. All theory and practice point toward improved operation of gears when made with sufficient pressure angle. It is practical to recommend a pressure angle of sufficient degree to avoid modifications of tooth for natural interference. In most transmissions today 20-deg. pressure angle is adopted practice; in some we have used 22½, 24 and 27 deg. The so-called excessive pressure on bearings has not been proved to be an objectionable feature in automobile high speed transmission gears. The mating up of gears of 14½-deg. pressure angle in combinations approximating 14 teeth requires an extreme accuracy out of all proportion when it is considered how easy it is to make the same gears with a larger pressure angle.

Perhaps the chief causes of gear noise in transmissions lies in distortion due to heat-treatment. The cost of distorted gear teeth in rejected gears and tearing down transmissions is so great that it is fair to assume that the cost entailed in grinding the parts accurately after heat-treatment will not exceed the cost of rejections and troubles.

Cost of Gear Grinding

It has been proved that where accuracy or silence of operation are important factors in the gear product, the finish grinding of the gears after rough machining is more economical than the finish cutting of the gears.

The average cost as furnished by several manufacturers for tearing down and changing gears in transmission is $3 per transmission. The average cost as furnished by several car builders for tearing a transmission out of an assembled car entailing the removal of the car from production assembly, is $15 per car. The average cost of changing the idler gear where a cap is provided on the side is about 50 cents per gear.

Recently in an automobile shop the number of tear-downs of closed car transmissions exceeded sixty per day. In another shop recently the tear-downs involved 50 per cent of all transmission assembled. When gears are being produced in quantities exceeding 1,000 pieces of a kind per month, the finishing by the grinding process is in itself less than the cost of finishing by the cutting process.

In computing the item of cost, it is well to take into account the high cost of finish cutting of gear teeth. All the operations on the gear blank up to the finish cutting can be performed as machine shop operations, not as gear cutting, and it should be properly charged with machine shop overhead, not gear department overhead. Limits of accuracy on the gear teeth when prepared for grinding allow a leeway on the thickness on the tooth as much as 0.005 in.

The roughing operation can be performed at the maximum speed of the cutter and the machine, not as a slowed-up operation. There is no rolling of the gears, no remating of the gears; no rejection for runouts; no rejection for bad curve position, no rejection for index error; no rejection from running gears in power test; no cost of running in gears; no excessive cost of tearing out transmissions are involved when the gears are ground. The production of rough gear blanks finished on the bore and face is a machine operation with machine shop overhead, at least 150 per cent less in cost than gear department overhead.

You should realize further that the scrap gears which are accumulated in the gear shop are largely accumulated after finish cutting. The normal scrap loss in the gear grinding process does not equal 1 per cent.

Wear of Gear Teeth

It is quite improbable that you would accept bearings and shafts, the surfaces of which were as rough as the ordinary gear tooth. You realize that such uneven surfaces would begin at once to wear down the bearings. A recent article on the subject of gear tooth wear by E. R. Ross showed how it began at or near the pitch line, and how it progressed along the gear tooth, spoiling more and more of the surface of the tooth exactly as a rough shaft wears a bearing.

A great deal has been said on the subject of modifying the wear by the use of special steels and very little has been said of eliminating the wear by providing an accurate surface which will tend to avoid the beginning of wear. The ground surface on a tooth lends itself to the avoidance of tooth wear in exactly the same relation and exactly the same extent that a ground bearing on a shaft avoids the beginning of wear.

We have referred to the roughness of the tooth puncturing the oil film. In this connection you will realize that no wear can begin until the oil film between the parts has been punctured or squeezed out. Rough tooth surface punctures the oil between the teeth and starts the wear; also misplaced curves cause abrupt, sharp contacts between the teeth which will puncture the oil film and cause wear. The average surface condition of heat-treated gears would be rejected at sight for any use in a running bearing. When properly designed and made, gear teeth slide and roll on a film of oil with no more wear than is present in a shaft accurately made and operated under well lubricated conditions.

Can you imagine a manufacturer assembling any other power transmission bearing by rubbing it against its bearing with his eyes shut and determining totally by the touch of the finished product whether the parts are mated sufficiently close to operate quietly and without wear? Many times we have heard complimentary remarks about the "appearance of the tooth surface," just as if it were a miracle that it ever looked smooth.

We frequently hear of machine tools with wear on the gear tooth which causes inaccuracy of operation. We expect a big advance in the manufacture of machine tool gears by the introduction of hardening and grinding on these parts. Experience has proved that such gears can be made with great accuracy so that they will operate quietly and without the ordinary well known wear.

Automotive Service Methods and Equipment

X. Home-made Tools for Repairing Ford Cars—A Simple Method of Holding Transmissions for Repairing—A Safety Device—Other Tools

By HOWARD CAMPBELL
Western Editor, AMERICAN MACHINIST

MODERN business has come to depend so much on the telephone as a means of communication that any disruption of the telephone service is considered almost in the light of a catastrophe. Thus it is that immediate and sure transportation of men and materials is a necessity, for which the service station is largely responsible.

The Chicago service plant of the Illinois Bell Telephone Co. includes among its equipment a number of tools and devices that have been developed and made in the plant. One of these is the connecting-rod reaming jig shown in Fig. 1. The base *A* is a solid block of steel, to which the collar *B* is fastened with dowel pins and screws. A small block through which a hole is bored to serve as a guide for the reamer is clamped over the large end of the reamer as shown. A movable block *C* holds the pin *D*, which fits the piston-pin hole in the rod and serves to maintain the center distances between the large and small holes. The block *C* can be moved to accommodate the various sizes of connecting rods.

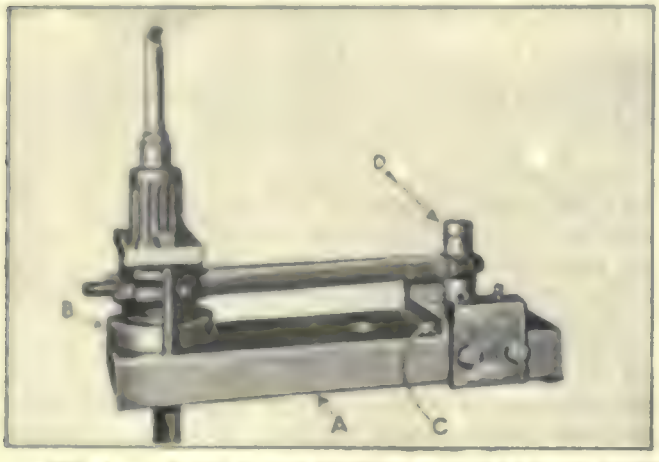


FIG. 1. A SIMPLE CONNECTING-ROD REAMING FIXTURE.

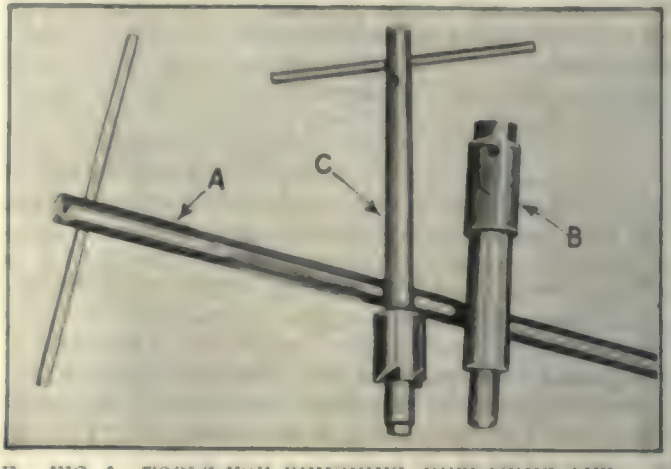


FIG. 2. TOOLS FOR REMOVING, REPLACING AND FACING FORD DRIVE SHAFT BUSHINGS

A tool for removing and replacing bushings in Ford pistons is shown in Fig. 2. The piston rests in the V in the block, and the screws shown at either side are screwed against the sides of the piston to prevent expansion while the old bushings are being removed. The lower part of the pin *A* passes through the bushing to serve as a guide, while the upper part is of the same dimension as the o.d. of the bushing. This pin is used both for removing and replacing.



FIG. 3. JIG FOR REMOVING AND REPLACING BUSHINGS

Tools for removing, facing and replacing Ford drive shaft tube bushings are shown in Fig. 3. Tool *A*, only part of which shows in the picture, is turned to a diameter that will allow it to pass through the bushing in the upper end of the drive shaft until the thread is reached. The thread is screwed into the bushing until it is quite solid, then the rod and bushing can be driven out of the tube from the opposite end. The tool is 66½ in. long and the thread is eight to the inch, the o.d. at the threaded portion being one inch.

After the old bushing has been removed, the new bushing is put on the small end of tool *B*, and is pressed or driven into place. The small ends of both tools *B* and *C* are turned to sliding fits in the bushing. When the bushing is in place, the tool shown at *C* is used to face off the end of the bushing to allow clearance for installing the universal joint.

Practically every repair man knows how difficult it is to hold a transmission while assembling or repairing it. The sketch, Fig. 4, shows a very simple fixture to which the case can be bolted while it is being worked on. The piece is bolted to the bench through the ½-in. holes in the flat part at the right-hand end, and the transmission case is bolted to the circular part. It is only necessary to use three or four bolts to hold the case, and several sets of holes can be drilled in the fixture, so that it will accommodate several different kinds or makes of cases. The case can be used as a templet in laying out the holes. The piece is of ½ x 8-in. steel, and can be forged to shape in a few minutes. It needs no machining other than the drilling.

We don't see as many broken arms resulting from cranking a car with the spark too far advanced as we used to, but it still happens that a man gets hurt now and then. In Fig. 5 is shown a safety device for Fords, by which the possibility of advancing the spark beyond

the safety point is precluded. The device itself is shown in Fig. 6. It consists of a piece of ⅛-in. sheet steel cut and bent to the shape shown, and attached to the commutator by means of a capscrew and a small machine or stove bolt and nut. The end which slips over the

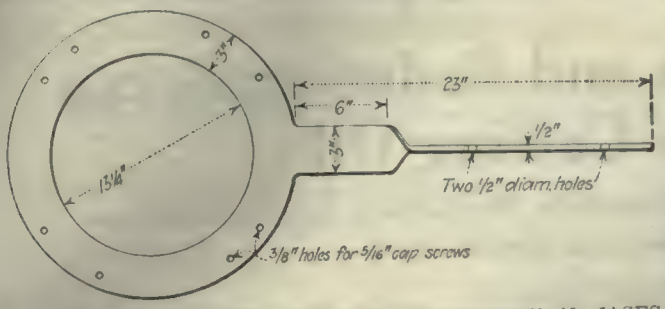


FIG. 4. FIXTURE FOR HOLDING TRANSMISSION CASES

small bolt is slotted, as shown, so that the device can be adjusted up or down. The device covers the depression in the end of the commutator case, but a similar depression can be drilled in the head of the capscrew, which takes care of that feature.

When the spark lever is advanced, the commutator case turns so as to lower the blade of the safety device,

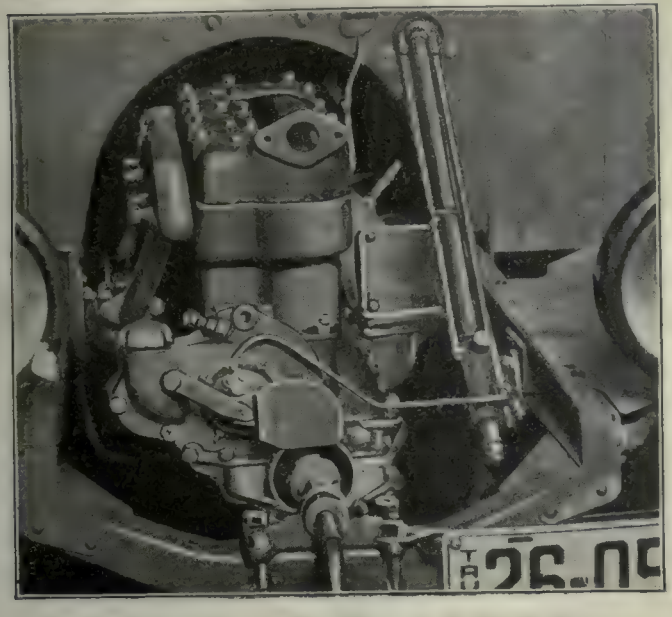


FIG. 5. SAFETY DEVICE ON FORD MOTOR

and when the spark lever is advanced past the point of safety, the blade is down low enough so that the starting crank cannot be engaged with the crankshaft.

A glance at Fig. 7 will show an extra bar extending from one end of the rear spring to the other, and apparently resting on the drive gear housing. This bar is made of ½ x 3-in. steel, ground off at a 45-deg. angle at each end so that it will fit into the curve formed by the end of the spring. This bar holds the spring in position while the

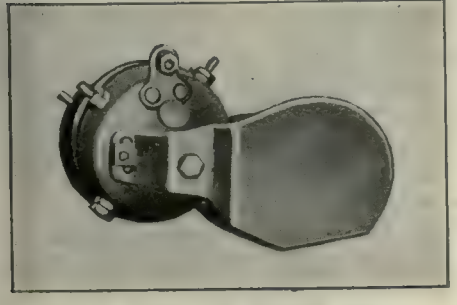


FIG. 6. VIEW OF SAFETY DEVICE

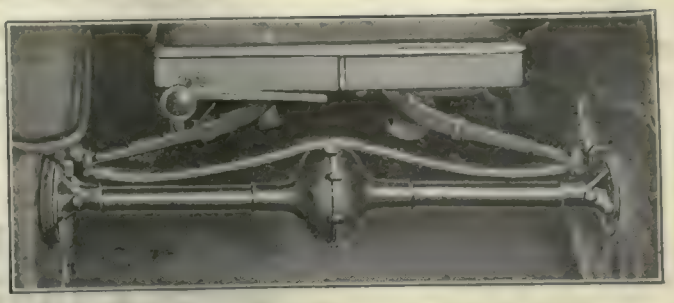


FIG. 7. BAR HOLDING FORD SPRING IN PLACE

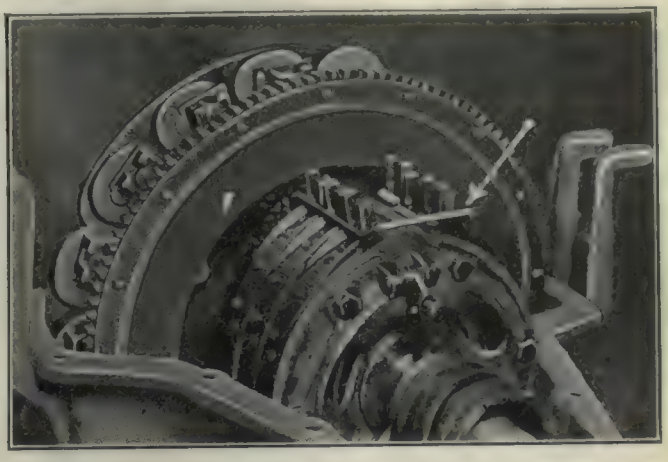


FIG. 8. HOLDING FORD TRANSMISSION BANDS WHILE INSERTING BOLTS

repair man is changing rear axles or spring shackles, or while doing other similar jobs. It should be just long enough so that it will slip in between the spring-eyes easily.

A very simple but time-saving contrivance is indicated by the arrow in Fig. 8. This is nothing more nor less than a piece of wire ⅜ in. in diameter, bent to a letter "U" and offset at the closed end as shown, and is used to hold Ford transmission bands in place until the bolts can



FIG. 9. MOTORCYCLE REPAIR STAND

be inserted, relieving the operator of trying to hold the handle with one hand and insert the bolts with the other.

The dimension between the two legs of the "U" is 2¾ in. and the length from the open end to the closed end is 5 in.

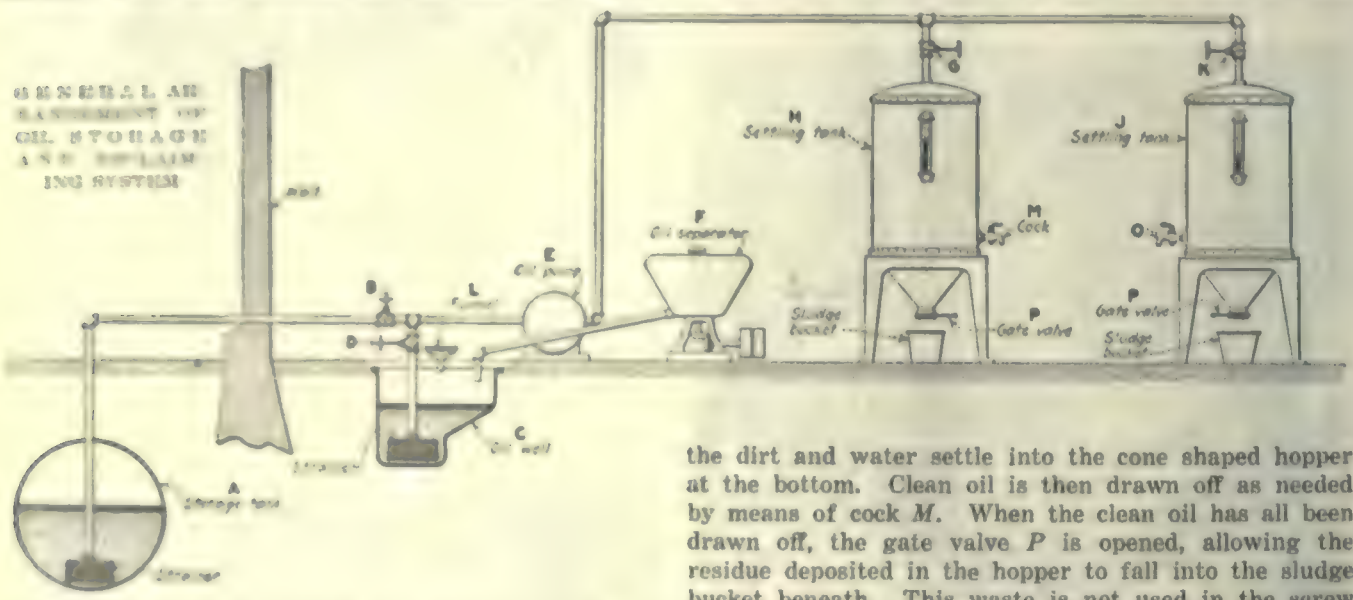
As this company uses a number of motorcycles for getting to the smaller "hurry-up" jobs, it became necessary to erect the stand shown in Fig. 9 so that repairs could be made quickly and easily. The picture tells the story

Increasing Production and Reducing Scrap with Clean Cutting Oil

An Efficient and Easily Built Plant for Handling, Reclaiming and Storing Oil—Its Effect on Production and Spoiled Work

SPECIAL CORRESPONDENCE

THE oil storage system herein described was designed to take care of cutting oil used in the screw machine department of a large automobile shop. Before this system was installed, the practice had been to allow the machines to run with the same oil until it was considered too dirty for further use. The machines were then cleaned out, the used oil thrown away, and new oil furnished to each machine in the department.



It was soon noticed that a large increase in production was made each time the oil was renewed, and as the quality of the oil went down, there was also a corresponding drop in production, an increase in the amount of scrap, and the tools wore out much more rapidly. This clearly showed that a very important relation exists between the purity and cleanliness of the cutting oil, and the production from the machines. The need of an oil purifying system was thus made evident.

The storage system illustrated was then installed and gave very gratifying results from the beginning.

The general arrangement shows the oil separator at *F*, the oil well at *C*, where the impure oil is collected both from the separator and by pouring through funnel *L*. The main underground storage is at *A* while the two setting tanks are at *H* and *J*.

Just as soon as the oil in the machines begins to lose its efficiency it is pumped out by the oil pump on the machine. The muddy oil and residue, which the machine pump will not remove, is cleaned out and discarded.

The used oil is poured into oil well *C* through funnel *L*. From the oil well it is pumped to one of the settling tanks *H* and clean oil taken from the other tank *J* is supplied to the machines.

The used oil is allowed to stand in the tank *H* until the dirt and water settle into the cone shaped hopper at the bottom. Clean oil is then drawn off as needed by means of cock *M*. When the clean oil has all been drawn off, the gate valve *P* is opened, allowing the residue deposited in the hopper to fall into the sludge bucket beneath. This waste is not used in the screw machines again. It may be used for oiling the road or similar purposes.

The oil from the separator *F* is also piped to the oilwell *C* and receives the same treatment as the oil taken directly from the machines. The flow of oil to the settling tanks is controlled by proper manipulation of the valves *G* and *K*.

The supply of oil is replenished as needed from the outside storage tank *A*. By closing the valve *D* and opening the valve *B* the oil can be drawn from the storage tank and delivered to the settling tanks by the pump *E*.

Before installing this system, oil was purchased in barrels and there was considerable oil lost by leakage and careless handling. The storage tank *A* was made of such capacity that it was possible to buy the cutting oil in bulk, and the waste incidental to handling the oil in barrels was eliminated.

It would, of course, be possible to purify the oil by the use of a filtering system, but the method described above is much quicker, and in practice, has proved very satisfactory.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Setting Up and Laying Out Templets

BY S. H. DRAKE

An angle plate, designed for use in connection with the laying out of a large amount of templet work on which the reading of a good protractor was sufficiently accurate, is shown in the accompanying illustrations. It has a number of advantages over the ordinary angle plate, not the least of which is that it is not necessary to machine a straight edge on the work in order to get an accurate angular setting.

It is possible with this device to lay out centers at points on a line at any angle to a given center line by means of a height gage, and the setting from one position or angle to another is very quickly accomplished.

In Fig. 1, *A* is a regular angle plate of cast iron mounted upon four legs of sufficient height to allow the auxiliary plate *B* to swing. Tapped holes in the latter plate furnish convenient means of attaching work.

At the center of the auxiliary plate is a fixed stud projecting through, and having a bearing in, the main plate. Upon this stud, back of the main plate, is keyed the disk *C*, which is graduated in degrees over the full circle and provided with a vernier *D* from which a reading to five minutes of arc is readily obtainable.

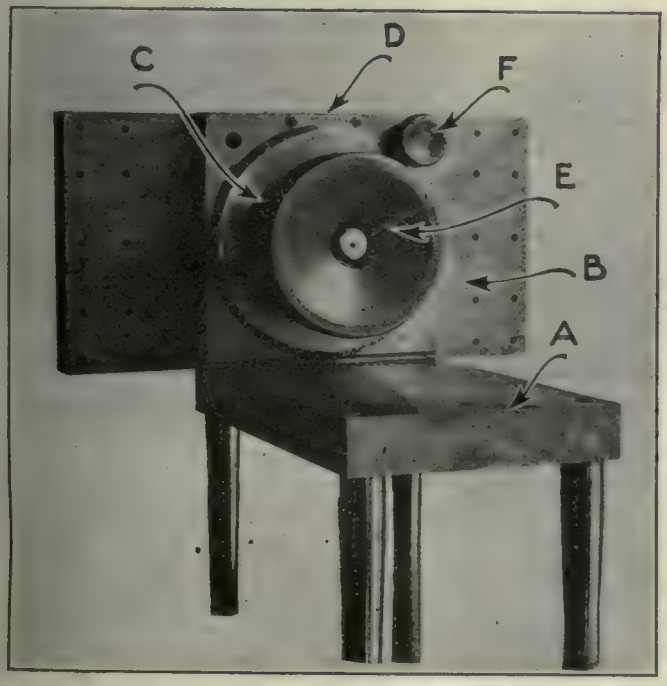


FIG. 1. REAR VIEW OF DEVICE, SHOWING GRADUATED DIAL

The large knurled nut *E*, threaded to the stud, serves to clamp the plate firmly in any position. A tapered locking pin *F*, passing through the main plate and entering correspondingly tapered holes in the auxiliary plate at the four major positions and also at angles of 30, 45 and 60 deg., provides means of setting the device quickly to these positions. Other angles are determined from the dial readings.

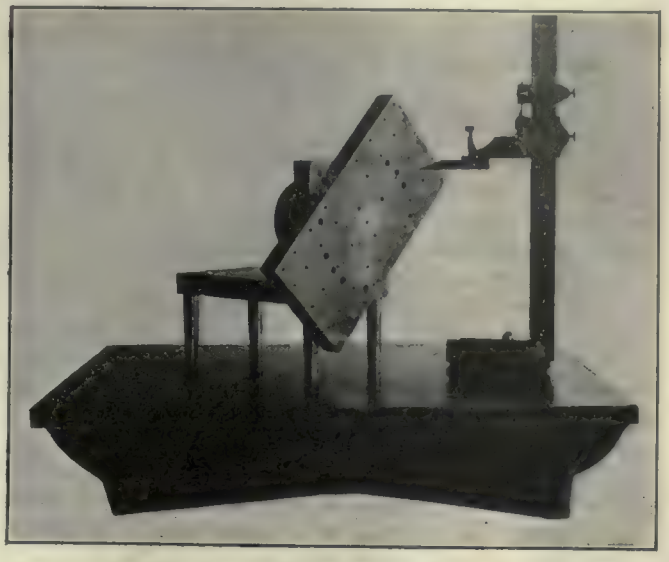


FIG. 2. FRONT VIEW SHOWING HOW DEVICE IS USED

In Fig. 2 the face of the device is shown with the auxiliary plate set to an angle of 45 degrees.

Keeping a Belt Tight

BY J. T. TOWLSON

The interesting article under the above title, published on page 227 of AMERICAN MACHINIST, was not intended, I hope, to instruct the readers as to how a belt should be kept tight. When any belt drive is in need of such a belt destroying device as the one mentioned in that article would seem to be, it is high time for the boss to look around for some other means of driving.

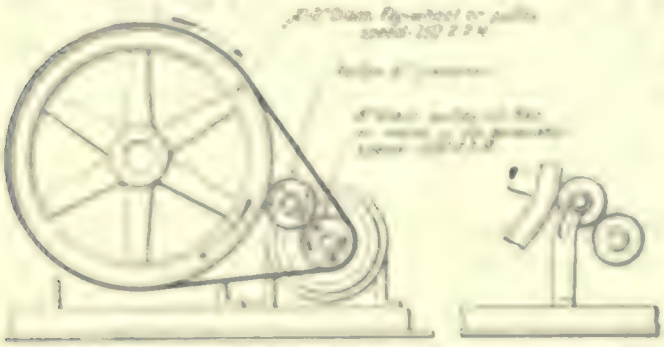
The method defeats the purpose it is intended to effect for the reason that the continual rolling of the pulley on the outside of the belt tends not only to lengthen the latter but to destroy its flexibility, and when that is done the desired result of non-slip drive is more remote than in the beginning.

Correct diameters of pulleys, proper center distances, and a reasonably tight belt of ample width are, in the writer's opinion, far more to be desired than any of the belt-tightening contraptions in use.

Mr. Raworth, sometime editor of *The Engineer*, designed a simple and (then) novel application of a short belt where one pulley is very small and the other relatively large; as, for instance, a low speed engine driving a fan or dynamo, or when a slow moving machine is to be driven direct by a motor.

Referring to the illustration we have, let us say, a

gas engine with a 4-ft. flywheel running 250 r.p.m. belted direct to a generator that has no outboard bearing. Though this is a very convenient set-up where



AN INTERMEDIARY PULLEY ON A SHORT DRIVE

space is at a premium, it is most destructive to the belt because of the short center distance and the extreme tension made necessary by the short arc of belt contact upon the smaller pulley. Even were these factors not considered, the excessive side strain upon the generator bearing would render such a drive impractical.

Mr. Raworth's scheme was to interpose a pulley, or roller, between the main members of the drive in such a way that it would bear upon both, thus assuming the responsibility of carrying the load imposed by the belt tension, no matter how great the latter might be, and relieving the side strain upon the generator bearing.

It will be noted that the intermediary pulley is placed in such a position as to be slightly above a line drawn between centers of the main members, for the purpose of providing a little margin of adjustment. It should be mounted upon ball bearings.

Having used this method on several occasions where the necessity for a close-up drive existed and finding it most serviceable and efficient I can recommend it for all similar drives.

Straightening a Milling Machine Table

BY A. W. FREEMAN

It has been my experience to find that the tables of milling machines become warped after years of service under average conditions, because of the peening effect of the numberless small dents in the upper surface. Some years ago I had occasion to repair a table that was thus warped, the surface showing a comparatively

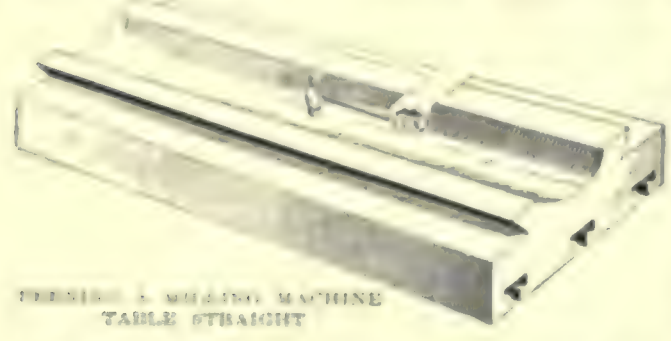


TABLE STRAIGHT

uniform curve from end to end and being about ⅛ in. high midway of its length.

We put this table on a planer and took off just enough stock to clean up, and then scraped the table and saddle together. When the fitting was complete we found that the table set ⅛ in. lower in the saddle than before so we were obliged to elongate the holes in the end plates, or screw hangers, in order to bring the screw in line.

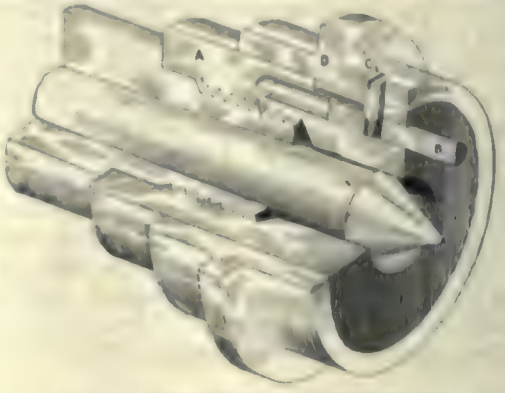
Having a similar repair to make recently, we profited by our earlier experiences and instead of planing the table straight we peened the under surface between the V's and straightened the table as shown in the sketch before any planing was done. This we accomplished in about ten minutes with an ordinary ball-peen hammer, keeping track of the progress by means of a straight-edge and feeler gages.

After the table was straightened in this manner we took off about 0.005 in. from the upper surface to make it smooth, and the job was done. There was no necessity for rescraping the bearing surfaces or readjusting the screw hangers for the reason that practically no stock had been removed and the table was in its original condition.

A Convenient Driver for the Lathe

BY C. E. STEVENS

In operations in which parts are to be turned on centers or on arbors that are held between centers, considerable time is lost in removing and replacing the



HANDY DRIVER FOR LATHE WORK

work because of the time required to stop and start the machine. The device shown in the accompanying illustration allows the operator to change his work without reaching for the shipper, and has resulted in increased production.

The body *A* is made of machine steel and is fitted to the spindle nose of the lathe in the usual way. The center hole in *A* is large enough to clear the regular lathe center, which projects about ½ in. beyond the device.

The driving pin *B* is made of ¾-in. drill rod and is an easy sliding fit in the body. It has a ¼-in., 24-thread tapped hole for the shouldered screw *C*, that slides in an elongated slot in the body of the device. This slot is milled parallel to the sliding pin, and is just long enough to allow the latter to project about ⅜ in., or to be pushed in flush with the body.

The sliding ring *D* is also made of machinery steel and is an easy sliding fit on the body. The shouldered screw *C*, passing through it, prevents it from coming off. It is necessary to have this piece smooth and free from sharp edges in order to prevent injury to the operator's hands.

With this device the operator simply pushes back the sleeve, and with it the driving pin, when he wishes to remove the arbor or work from the centers. When it is again in place the sleeve is pushed out and the pin engages the tail of the dog.

What Is the Best Way to Show Sections Through Ribs?

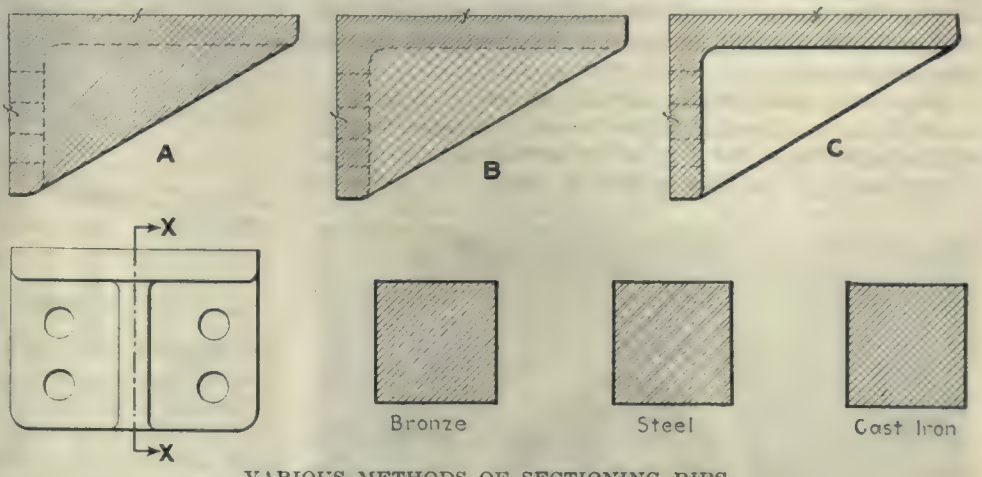
By Aloysius Wilks

Away back in 1915 the late Prof. John E. Sweet started in American Machinist (Vol. 43, page 936) a series of articles or discussions on the "Best Way to Do Certain Things."

The response was not what it should have been. The lack of interest displayed was due, no doubt, to the rush of business in connection with the war then in progress, and everyone was forced to be content with just doing things—without worrying himself much about whether or not he was doing them in the best possible way.

Times and conditions have changed indeed, but the spirit of conservation of material and energy engendered by that trying period still prevails, and its influence is shown in the existence and work of various bodies and committees of standardization. The writer is, therefore, of the opinion that the revival of Prof. Sweet's series would be timely, and to start the exchange of ideas he is submitting for discussion the best way of presenting the cross-section of ribs, spokes, etc., where such are to be shown on drawings.

During the war period I had charge of a class of foreign-born workers to the members of which I was trying to impart a knowledge of the art of reading mechanical drawings. Studying several books upon the subject in the endeavor to establish the best line of attack, I found that most authorities gave three ways of showing cross-section through ribs, as displayed in the illustration herewith, which shows a section taken on the line *x x* of a shelf bracket.



VARIOUS METHODS OF SECTIONING RIBS

At *A* is the oldest, orthodox and theoretically correct way; something that the up-to-date drafting-room novice might call "according to Hoyle." Notwithstanding the backing of antiquity this method presents serious objections by reason of giving a deceptive appearance of solidity. To remedy this defect, some teachers recommend omitting each alternate line of the section over the rib area, as at *B*; the less dense hatching calling the reader's attention at once to the fact that he has to do with a section through a rib and not with solid material.

This method seems to be much in favor of instructors of mechanical drawing and the majority of students fresh from the schools are familiar with it, but the writer gave it a fair trial and found it wanting. If cast iron were the only material to be designated on drawings this method would serve the purpose, but when we come to adapt the same scheme to the standard sections for steel, bronze, aluminum, etc., we get some very funny results.

I am, therefore, forced to the conclusion that the method shown at *C* is the best; do not cut the rib. It is not exactly or theoretically correct, but may be excused for the same reasons as not cutting through shafts, keys, pins, bolts, and similar parts when there is nothing to be gained by cutting them.

As we have so many conventions in our art, why not add one more? Besides, if you want to keep in the good graces of the efficiency expert, use this method and "slip one over" on old Father Time.

How Can Hindley Gearing Be Gaged?

By Andrew J. Schwartz

The article entitled "Notes on Worm-Thread Formulas" by P. A. Fredericks on page 1043, Vol. 55, of American Machinist, I have found very interesting, and following out the suggestions, I have noted the formulas in my handbook, with reference to the helix angle, limiting it to 3 deg. These formulas, however, apply to straight worm thread; but what about a system for measuring the threads on a so-called Hindley worm? I repeat the appeal of Mr. Fredericks, and solicit the confidence of the makers of the Hindley gearing, to let us know how to measure, or rather how to gage with go and no-go gages the Hindley gears and worms.

It has been suggested that the only way to gage a Hindley worm is to test it against a master gear, and to test the gear against a master worm. By this system it is possible to tell whether or not a gear is perfect and if it will run satisfactorily. But if the gearing is not perfect, this system will not tell the workman how and where to correct the faults, and guesses are often made that result sometimes in ruined work.

Incidently, I have been unable to find a statement of any good points for the use of Hindley gearing, but in numerous books reasons are given why it is not superior to the straight worm gearing. Some of the reasons for not using this class of gearing are:

Its efficiency is no better than that of a straight worm. Hindley gearing is harder to assemble and to adjust, since the worm must be located exactly in three planes.

The worm cannot be ground by mechanical devices on any of its working surfaces.

The hob is expensive as it is difficult to make and cannot be ground.

The worm cut for a given number of teeth in a wheel cannot be used with a wheel of a different number of teeth, although both have the same pitch.

One of the points given in its favor is its superior strength, but a light analysis will show that Hindley gearing is very deceiving in regard to strength. The

threads on the worm do not entirely fill the thread space on the gear, but only a small portion of the threads are in contact. This statement is the result of observations made after blueing a worm and running it in contact with the gear. From these observations it would seem that there is greater strength in a straight worm gearing than in the Hindley type.

The foregoing is getting away from the original subject, but the designing, dimensioning (including tolerances), and the gaging of this type of gearing are very much related. Any information in favor of the Hindley gearing and the methods followed in manufacture and gaging will be greatly appreciated by a large manufacturing plant.

Two Unusual Planer Jobs

By N. L. Pollard

We recently had two rather difficult planer jobs to do and we accomplished them with the devices shown. The castings are cutter-heads for suction dredges used in the Williamette and Columbia Rivers, and are used to loosen up the soil on the river bottoms so that it may be pumped.

The cutter-head shown on the planer in Fig. 1 is about 6 ft. in diameter and of about the same length, with a taper hole 6 x 7 x 14 in. located nearly central in the casting. A keyway 2½ in. long by 1 in. deep

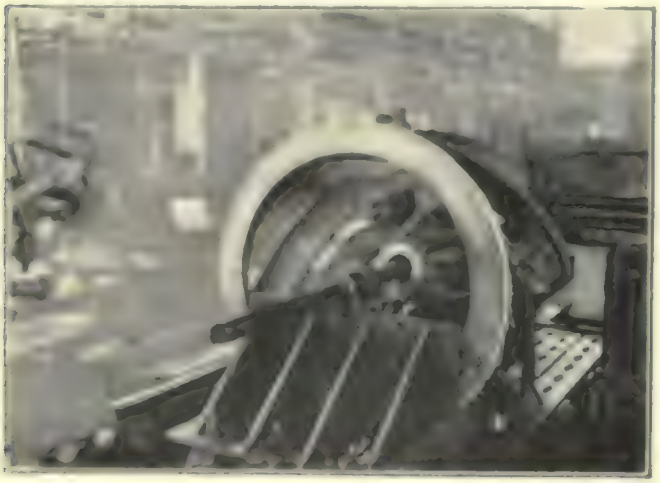


FIG. 1. SET UP FOR PLANING KEYWAYS

had to be cut in this hole. Owing to its location it could not be cut on the keyseater, so by rigging a bar with a bearing clamped to the angle plate as shown, and feeding the tool by tapping it with a hammer, a very good keyseat was planed. Two cuts were taken with a narrow tool and then finished with a tool of the proper width.

The other cutter head, a part of which may be seen in

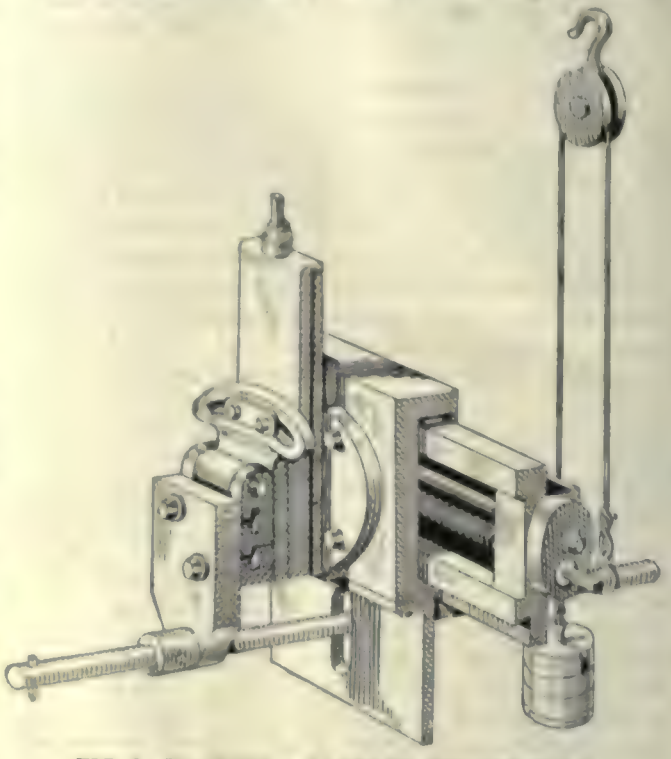


FIG. 2. PLANING A TAPERED SQUARE HOLE

the background at the left in Fig. 1 was larger than the one previously mentioned and had a square tapered hole which had to be machined to 9 x 11 x 18 in. in length, as the head was to be held on its shaft by a draw key. The work was done in a reasonable time by rigging a special tool carrying bar as shown in Fig. 2. The guiding plate was made of 1-in. boiler plate with the slot milled to a nice fit on the bar, and held to the bottom of the planer head by capscrews. The tool was held to the cut by a counterweight hung in the rear of the planer rail.

The hole was first bored to the diameter for about ½ in. on each end to locate it with reference to the other machining operations. Four set-ups were necessary in forming the square; but by planing down the side and across the bottom as far as possible the greater part of the hole was finished in two set-ups, leaving but a small amount in two corners so that the last two set-ups were easy.



Editorial

"They" and "We"

IN DISCUSSING the relation of sales management to industrial engineering at the convention of the Society of Industrial Engineers in Detroit recently, Norval A. Hawkins brought out a point that is as valuable as it is simple and concise. He said that when the salesman refers to the firm that employs him, he always says "we," while the average workman refers to his employers as "they," and that when the employers get that defiant "they" changed to a co-operative "we," better results will be obtained both as to quality and quantity of product, and the differences between the employer and employee will begin to fade. Mr. Hawkins also said that in the institutions with which he has been connected, he has always tried to make the commonest laborer feel that he (the laborer) is a salesman, and that the success of the institution depends just as much on him as on the salesman who delivers the finished article to the ultimate consumer.

A world of thought is contained in Mr. Hawkin's remarks. The difference between "we" and "they" is the difference between co-operation and indifference, and even, in some cases, antagonism. When the employee is brought to realize that his own job, as well as everybody else's from the general manager down, depends on the success of the firm; when he is satisfied that his working conditions have been improved as far as possible; when he is convinced that the firm is paying him the highest wages that will allow a fair margin of profit; when he has been shown that every man who has any part in the manufacture of the product is a salesman, because future sales depend largely on the quality of the work that passes through his hands; when he has learned that he is getting his share of the profits just as surely as any stockholder or officer of the company—then he will discard the "they" when referring to the company or its product and say "we."

Those who are wise will lose no time in doing what they can to hasten the coming of such a day in industry.

Time To Amend

IF ANY further evidence were necessary to prove the need for amendment of the Sherman Anti-Trust Law the present deadlock in the coal situation should supply it. As pointed out in the AMERICAN MACHINIST several weeks ago, one of the decisive factors in the dispute between the coal operators and the miners is the list of indictments hanging over them for violation of the Sherman Law at the time the last wage agreement was negotiated.

The assurances that the operators could meet with the miners' leaders without fear of prosecution were quickly withdrawn after the Attorney-General's visit to Judge Anderson. It is understood that the Justice very properly pointed out that it is not within his power to change the law, and that under the terms of the law as it stands, the representatives of both operators and miners would be liable if they got together to make an agreement. If we admit that a wage agreement is desirable in the coal industry it would certainly appear that some steps should be taken by our lawmakers to permit such an agreement to be arrived at legally.

We have seen the evil effect of the strict interpretation of this somewhat ambiguous law on trade associations. Unfortunately, it seems to hit the good ones as often as the bad ones and gives rise to a feeling of uncertainty as to what can be done legally and what cannot, that is disconcerting to say the least.

Combination in business is not the unmixed evil that certain reformers would have it. It may be abused and result in injury to the community just as other things not inherently bad or dangerous may be made so through abuse. In foreign trade we have the anomalous situation of a government urging the formation of trading groups, and at the same time so hampering their actions that they can hardly function.

One of these days we are going to be badly in need of coal, of business information, of foreign trade; and there will be an awakening as to the reasons for their absence. Then perhaps we shall take time to find out what is wrong with some of our laws and fix them up. Let us hope that it will not be too late.

Standards and Tolerances

ONE of the essentials in all standardization work is the adoption and use of standard tolerances as well as dimensions. The lack of this was the chief defect in the adoption of the Sellers or Franklin Institute or U. S. S. thread. But the oversight was perfectly natural and excusable as the use of definite tolerances had not been recognized at that time.

A very common difficulty along this line is to be seen in wrench fits on bolt heads at the present time. We have standard bolt heads and wrenches made in conformity with this standard. But it too frequently happens that the tolerance on the wrench is minus and on the bolt head or nut is plus, and the result is far from satisfactory.

There is, fortunately, a committee at work on the standardization of bolts, nuts and wrenches, which is, of course, working with the question of tolerances in view. The multiplicity of sizes now found on toolposts and other parts requiring adjustment, together with the lack of standard tolerances, makes the number of necessary wrenches altogether too great. This frequently results in a resort to the time honored screw or monkey wrench with the usual damage to the nuts or bolt heads.

The standardization of bolt heads should appeal to every builder of machine tools as well as to users. Such standardization will eliminate some sizes now used, will reduce the number of wrenches to be furnished with each machine and will make it easier to keep the machine in proper adjustment.

Standardization is in the air. Let us all work for rational standards for such parts as do not hamper future development of design.

Shop Equipment News

Hartness Comparator for Gaging Gears

The Jones & Lamson Machine Co., Springfield, Vt., has recently developed an attachment for use on its Hartness comparator when gaging gears. In order to permit the operator of the projecting lantern to have the projected and magnified image shown on a screen within his reach, a mirror is employed at some distance from the lantern so as to throw the image on the back of a ground-glass screen. The arrangement is shown in Fig. 1. The mirror is made especially for the purpose and has a deposit of silver on its front surface, in order to provide the highest degree of reflection. The arrangement is stated to give great accuracy, so that at a magnification of 100 diameters differences of 0.0001 in. can be detected.

With the set-up shown, parts having sharp outlines without burrs can be thrown clearly on the ground-glass screen. However, it is the usual practice to round or chamfer the ends of gear teeth, so that it is not possible to focus clearly on the edges of the tooth and thus obtain a sharp outline on the screen. To overcome this trouble, the instrument is focused at some point along the face of the tooth rather than on the very end of it. The gear is tilted very slightly, so that the light rays strike the side of the tooth.

Since the microscope has a very thin focal plane, it can be focused to show clearly points in one plane



FIG. 1. HARTNESS COMPARATOR FOR GAGING GEARS

and to leave other outlines blurred. If a needle is placed in the plane to be explored, it gives a very sharp projected point and shows the outline of the tooth. This outline lies in the image on the screen between the point of the needle itself and the reflection of it in the face of the tooth. In order to obtain this reflection, it is not necessary to polish the tooth face more than ordinarily done.

The method of mounting the gear and the needles in order to give the contour of the tooth is shown in Fig. 2. The effect produced on the image projected on the screen has already been noted in the previous figure. With this set-up, the comparator can be em-

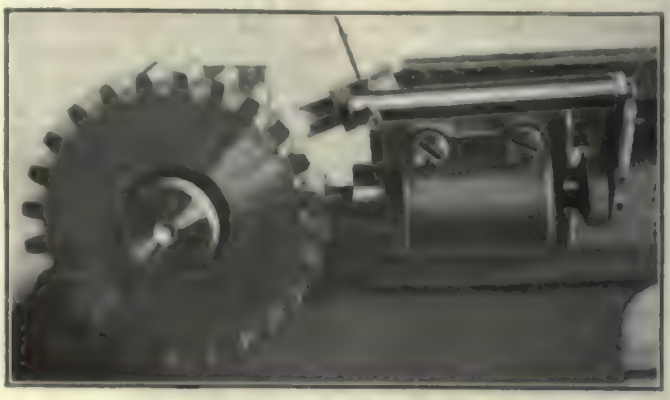


FIG. 2. ARRANGEMENT OF WORK AND NEEDLES ON COMPARATOR

ployed to show tooth shape very accurately. It should be noted that it is possible for several men to work simultaneously around the ground-glass screen without interfering with the image on it.

McCollum Electric Hoist

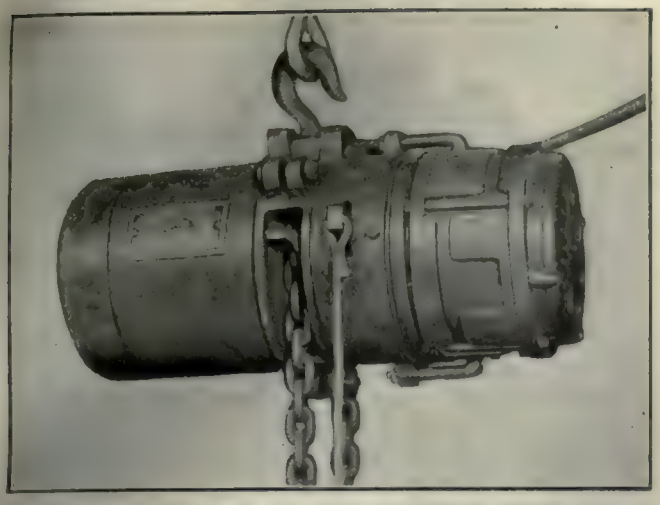
The Joslyn Manufacturing and Supply Co., 3,700 South Morgan St., Chicago, Ill., has placed on the market the McCollum electric hoist shown in the accompanying illustration. The speed-reducing gearing consists of three internal ring gears, three planetary pinions, and a high-speed pinion that is mounted on the motor shaft. The three internal gears are of the same diameter. The outer ones are housed in the frame so that they do not rotate; the middle gear has one more tooth than the outer gears, and is keyed to the chain sheave.

The planetary pinions have long faces, so that they mesh with all three internal gears. The driving pinion is in the center. A reduction of speed of from 100:1 to 350:1 is obtainable between the driving pinion and the sheave which carries the load. A great amount of bulk and weight is eliminated by the ability to use a high-speed motor, due to the large speed reduction.

The use of brakes is eliminated, since the action of the mechanism is not reversible. The speed-reducing gearing can be operated from the motor end only, and no load can be applied at the sheave that will cause the gears to rotate and thus lower the load.

The chain sheave is carried on roller bearings. The only strain on the motor shaft is that of the driving torque. A ball-bearing motor is used, and it can be tipped or turned in any position without spilling the oil. Either alternating- or direct-current motors using from 110 to 440 volts can be employed.

All gears are of machine cut, heat-treated steel, with



McCOLLUM CHAIN-LIFT ELECTRIC HOIST

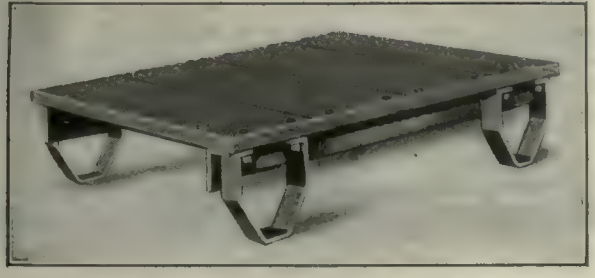
the exception of those used in the smallest hoist, which are of cast iron. The hoist is supplied with either rope or chain lift, although the latter is recommended because of safety and durability. With the chain hoists, a hook can be used on either end of the chain; and for certain classes of elevating work, one load can be unloaded at the top while another is being loaded at the bottom. Only a small amount of head room is necessary for the hoist.

Cowan Steel-Frame Lift-Truck Skid

A steel-frame platform or skid for use with hand-operated lift trucks has recently been placed on the market by the Cowan Truck Co., 7 Water St., Holyoke, Mass. The frame of the skid consists of two 2½ x 2 x ⅜-in. angle irons. Pine planking is secured to the angles by four countersunk bolts, two at each end of each plank.

The shoes or feet on which the skid rests are of malleable iron 1½ in. wide and ¼ in. thick, their shape being shown in the accompanying illustration. They are secured to both the top and the sides of the angle-iron frames, so as to prevent shaking of the platform. The feet are sufficiently rigid to prevent bending under the load, so that the platform retains the proper height. It should be noted that the feet are fastened at the very ends of the platform, so as to give it stability, and also to provide the greatest road clearance when the truck is approaching or leaving a grade. The durability and rigidity of the skid is particularly emphasized.

The skids are made in eight lengths from 24 to 80 in., and in nine widths from 24 to 48 in. All sizes can be furnished in heights of 6½, 7½ and 9½ in., and the larger sizes in 11½ in. height. Special sizes and forms of skid can be furnished to suit special requirements.



COWAN STEEL-FRAME LIFT TRUCK SKID

Becker No. 2 High-Speed Vertical Milling Machine

The Becker Milling Machine Co., 677 Cambridge St., Worcester, Mass., has recently made some changes in its No. 2 vertical milling and routing machine, in order to fit the machine for high-speed work. The principal change consists in equipping the machine with an auxiliary ball bearing to take the belt pull, so that the machine can be run at speeds at least 50 per cent in excess of those employed on the standard machine. The main bearing of the spindle is bronze with a babbitt lining. The thrust washers on the spindle are hardened steel.

The spindle itself is made of machine steel, and the collars and nuts that it carries are balanced. Two sizes of pulleys are provided for the spindle, a 3-in. pulley being supplied for obtaining high speed, in addition to the 5-in. pulley ordinarily used. To change pulleys, it is only necessary to lift one pulley from the sleeve on which it rests, and substitute the other pulley. The belt slack is taken up by means of the adjustable



BECKER NO. 2 HIGH-SPEED MILLING MACHINE

idler-pulley bracket. The high speed is found particularly useful for manufacturing stamps and stencils.

It is stated that the machine has been successfully run at speeds above 6,000 r.p.m., largely because the proper oiling facilities are provided to care for the high speed. When the maximum speed is 6,000 r.p.m. the other speeds obtainable with the 3-in. pulley are 3,240 and 1,800 r.p.m., and with the 5-in. pulley, 3,540, 1,920 and 1,060 r.p.m. The countershaft speed for such operation is 540 r.p.m. A canvas belt is employed for the high speeds. When lower speeds and larger cutters are employed, a leather belt may be used.

Another improvement in the machine is the use of a full box-form knee, which gives great rigidity. A steel chip guard is provided in the knee in front of the carriage, in order to protect the crossfeed screw.

Reliance Wheel Hoist for Tire Press

A hoist intended for use on a press to lift automobile truck wheels into place when changing tires has recently been brought out by the Reliance Trailer and Truck Co., Inc., 1642 Howard St., San Francisco, Cal. The device is known as the pressman's helper, as it enables one man to operate the press. The illustration shows the operator attaching the hook to the wheel.

Two clamps are secured to the upright frame of the press. The clamps carry brackets in which the trunnions of the swinging arm are fastened. Since the brackets are adjustable on the clamps, it is possible to position the device so that the center line of the chain will cross the center line of the press platen.

Hoisting is accomplished by hand, through a gear reduction connected to the crank at the pivoted end of the device. Turning the crank operates the small chain pulley at the outer end of the arm, so that the chain and load are lifted. When not in use, the arm can be swung back clear of the opening in the press.

The wheels are secured by means of cones placed in the hubs. When the upper cone is placed on the shaft of the lower cone, the wheel is prevented from slipping sideways. By placing the new tire on top of the wheel



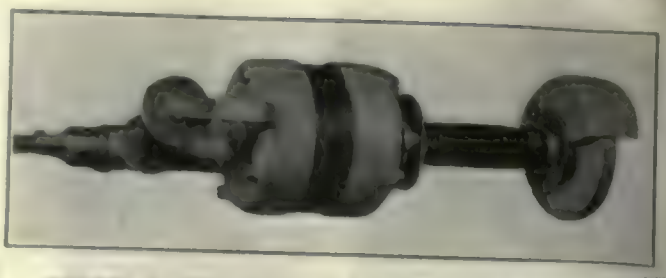
RELIANCE HOIST FOR TRUCK TIRE PRESS

carrying the old one, and swinging both of them in the press at one time, the old tire can be removed and the new one applied in one operation. Centering and positioning the tire before lifting the wheel into the press is easily done.

The device saves time and labor on the part of the operator and greatly lessens the chance of injury in handling the wheels. Besides being used on a tire press, the hoist is adaptable to general work around the shop. Different brackets can be furnished for securing it. Its lifting capacity is 1,200 pounds.

Forbes & Myers Model 35 Portable Electric Grinder

The portable electric grinder illustrated herewith has recently been brought out by Forbes & Myers, 172 Union St., Worcester, Mass., and is designated as the Model 35. The device is of the squirrel-cage induction type and has fire-proof windings. The insulation is asbestos that has been given a special treatment to bind



FORBES & MYERS MODEL 35 PORTABLE GRINDER

the fibers into a tough, flexible mass capable of withstanding a red heat indefinitely.

The motor has ¾ hp. It maintains its speed under load better than the universal type of motor. It very quickly regains speed after slowing down due to heavy load. The normal speed is 3,600 r.p.m., and the wheel ordinarily carried is 6 x 1 in. in size. The bearings are self-lubricating and of the metal-graphite type.

In order to prevent the possibility of the operator receiving an electric shock from the tool while handling it when standing on a damp floor or when making contact with metal, a grounded wire is employed. This wire adds but little weight to the cable, and can be attached to a water pipe or some permanent ground while the tool is in use. The wheel is equipped with a guard, and convenient grips are provided for the operator. The switch is within easy reach in the handle.

Gammons-Holman "Parob" Expansion Reamer

The Gammons-Holman Co., Manchester, Conn., is introducing a form of expansion hand reamer, known as the "Parob" because of the fact that the cutting edges are alternately parallel and oblique.

The reamer is of the type that is expanded from the center by means of a tapered plug, adjusted by a screw in the end. The end of the pilot is recessed to a considerable depth for the double purpose of protecting the head of the screw, and to allow the reamer to be placed upon centers for regrinding. A hole of generous size in the squared end admits oil to the central cavity, from which it may flow through the slots to the cutting edges.

The advantage claimed for the peculiar disposition of the cutting edges is that as each parallel blade is followed by one obliquely disposed, chatter is eliminated. It is also claimed that the blades are more easily honed, without danger of rounding over the cutting edge, than is the case with helical fluted reamers.

A feature of the reamer is the placing of cutting edges upon the extreme end of the pilot portion for the purpose of removing burrs and permitting the reamer to enter the hole easily. This feature is called the "burr cutter."

The reamers are made in one piece, with blades cut from solid stock, and receive a special heat-treatment designed to insure long life and retention of keen cutting edges. They are made in standard sizes from ¼ in. to 1½ inches.



"PAROB" ONE-PIECE EXPANSION REAMER

Ramsdell Hand Vise-Lathe

The Campbell Manufacturing Co., Slater Bldg., Worcester, Mass., has recently placed on the market a device known as the Ramsdell hand vise-lathe. The tool is intended to enable accurate cutting from bar stock without the use of a lathe or screw machine such work as screws, studs and pins. With it wire springs can be wound to any desired pitch. The tool is made

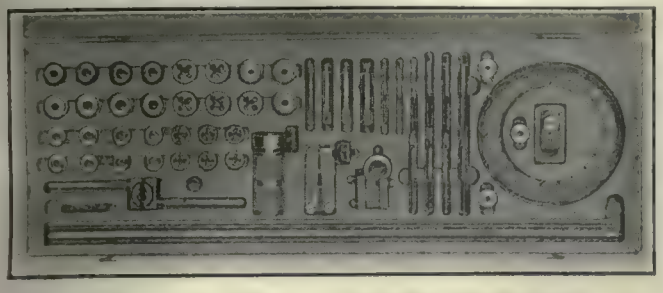


FIG. 1. RAMSDELL HAND VISE-LATHE SET

especially for garage men, automobile owners, farmers and those who have occasion to repair machinery without having machine tools available.

In Fig. 1 the tool is shown packed in a box with the necessary taps, dies, bushings, cutting tool and spacers, all readily accessible. Any combination of bushings, dies and taps in U. S. S. or S. A. E. standard threads can be furnished. By means of the dies and wrench, bars can be threaded in the ordinary manner. For turning, however, the set-up shown in Fig. 2 is employed. It is necessary to have in addition to the tool only a vise in which to hold the stock.

Bar stock up to and including 1 in. in diameter can be handled, thus enabling the operator to make hexagon-head capscrews up to $\frac{5}{8}$ in. in size, square, fillister and round-head capscrews up to $\frac{3}{4}$ in., flathead capscrews up to $\frac{7}{16}$ in. and button-head screws up to $\frac{5}{8}$ in. Each set is furnished with centering bushings from $\frac{1}{4}$ to 1 in., by $\frac{1}{16}$-in. steps. Any required length of screw, stud or spring can be made.

The combined die and toolholder is shown with a cutting tool in position and removing a chip from the work. Hand feed is provided, so that the operator may

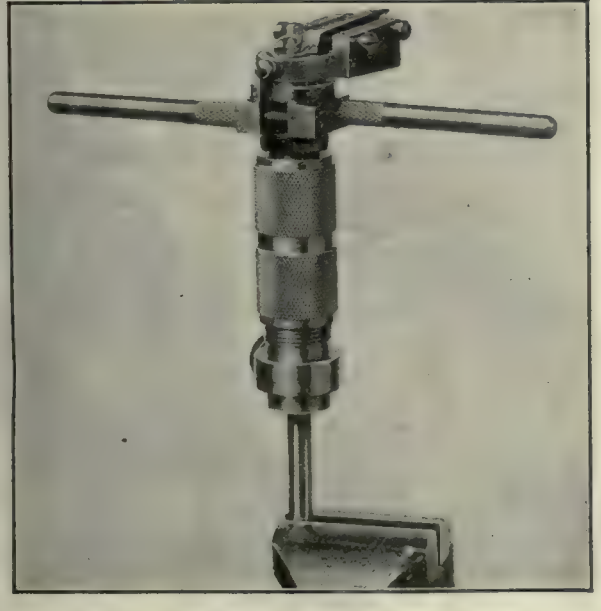


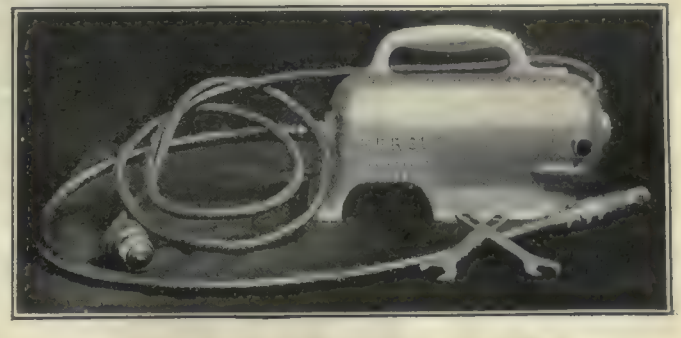
FIG. 2. TURNING WITH HAND LATHE

take either a light or heavy chip. The required size of die can be fitted in the upper portion of the holder, and a centering bushing secured in the lower portion. Since the stock must first pass through the centering bushing, the thread cannot be cut off center. The arrangement also prevents screws and studs from being turned eccentrically. A knurling attachment is provided in the equipment. All wearing parts of the device are casehardened.

Hergi H-250 Flexible-Shaft Outfit

The illustration shows a motor-driven flexible-shaft outfit recently placed on the market by the Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn. A high-speed motor, of $\frac{1}{8}$ hp. and capable of operation on 110-volt alternating or direct current, is inclosed in an aluminum casing having a base and handle integral with it. It is thus possible to easily pick up the entire unit and carry it to the work.

A ventilating fan is provided to keep a current of air passing between the field and the armature windings. Since the air current also passes between the spokes of the front bearing and through a series of



HERGI H-250 FLEXIBLE-SHAFT OUTFIT

holes around the bearing in the end cap, both bearings are cooled.

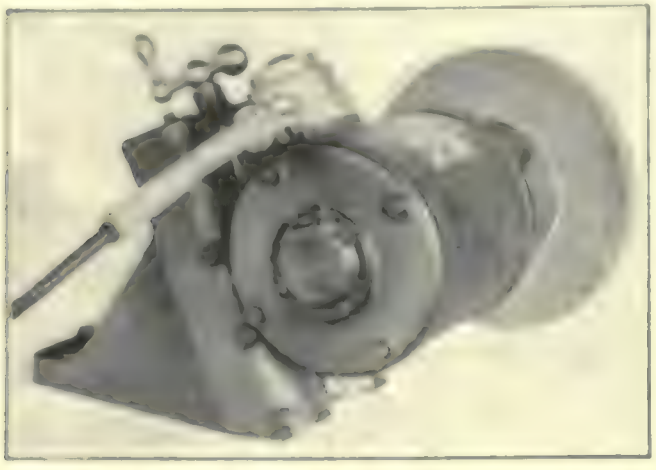
The shaft is $\frac{1}{4}$ in. in diameter, 3 ft. long and wound with wire. The sheath is metal inside and is covered with whipcord. A ball-bearing handpiece with a $\frac{1}{8}$-in. chuck is provided. The No. 4 or 5 shaft, sheath and handpiece are interchangeable on the motor unit.

Six feet of drop cord with an attachment plug are provided with each motor. Since the cord is fastened inside the end plate, no external binding post is necessary. The unit is simple and has but few parts; and it is known as the Type H-250 or 1922 model. It is adaptable to the all work ordinarily handled by flexible-shaft equipment.

Van Dorn Angle-Plate Grinding Attachment

The Van Dorn Electric Tool Co., Cleveland, Ohio, has just placed on the market the 12-in., motor-driven, angle-plate grinding attachment that is shown in the accompanying illustration. The principal feature is the inclined slide, which permits of movement in one plane for both feed and adjustment of the height of the spindle. The effect of both horizontal and vertical slides is thus obtained, with the simplicity and rigidity of a single slide. The rigidity of the machine is greater than that of the type with a vertical slide, as the machine can stand firmly on its base without fastenings.

The shaft is 1¾ in. in diameter through the motor and 1 in. through the wheel. The heavy-duty ball bearings are mounted in dust-proof housings and are grease lubricated. Motors for alternating or direct



VAN DORN ANGLE-PLATE GRINDING ATTACHMENT

current are interchangeable in the same housing. These motors are designed and built by the concern for grinding service; they are tested and rated to meet the standards of the A. I. E. E. and the Electrical Power Club. The normal continuous capacity is 1½ hp., with a peak capacity of 2½ hp. The speed is 1,800 r.p.m.

It is stated that under test a roll 7 in. in diameter was ground in a large lathe at a speed of 60 ft. per minute and a longitudinal feed of the carriage of ¼ in. per revolution, a cut 0.002 in. deep being taken continuously. The net weight of the attachment is 175 pounds.

Stimson Internal Lapping Tool

In the accompanying illustration is shown a device for lapping the bores of automotive cylinders. The tool has recently been placed on the market by the Stimson Engineering Co., 598 Sixty-Eighth Ave., Milwaukee, Wis. It will be noted that shoes which make contact with the cylinder bore are held by flexible connections at one end of a shaft. The shoes can be easily removed; two sets are provided, one to fit bores 2½ to 3½ in. in diameter, and the other for bores from 3½ to 4½ in. In order to fit the shoes to the size of the



STIMSON INTERNAL LAPPING TOOL

cylinder, a nut operating the taper adjustment is provided. A locknut clamps the adjusting nut, so that the tool can be held at any particular size.

The disk mounted on the shaft is adjustable in position, so that it acts as a stop and prevents the tool from feeding too deeply into the cylinder. The tool is ordinarily operated by an electric- or air-driven portable drill, or by a drilling machine, although it can be attached to the tailstock of a lathe.

It is not necessary to remove the cylinder block from the chassis of the automobile, in order to finish the bore. The tool requires no lining up with the cylinder, as the shoes can swing to adjust themselves to the work. It cuts the carbon and roughness from the surface of the cylinder, a grinding compound being employed to facilitate this action. The bore can be finished both round and straight. Points where the diameter is smaller can be felt by the resistance offered to the tool when feeding it through the bore, and they can be given special attention. The tool is expanded as the work progresses.

The tool may be employed without the shoes for holding pistons when filing them to size. The shaft is held in bearings and rotated by means of a portable drill, or it can be secured in a lathe chuck and supported by a steady rest. Thus a new piston can be finished to the size necessary to fit the reground cylinder.

How Shall We Designate Tolerances?

By Frank C. Hudson

The problem of designating tolerances has several angles. There is no question as to the advisability of unilateral tolerences, so far as basic dimensions are concerned, but a very practical engineer of my acquaintance brings up some interesting points as to the best way of showing tolerances.

He believes in the one-way or unilateral tolerance but not in the unilateral designation of it. Suppose the basic dimension for a hole in a bushing is 1.790 in., with a permissible maximum of 1.792. The usual method of dimensioning the drawing would be $1.790^{-0.000}_{+0.002}$ or 1.790 in. + 0.002. The shaft dimension would perhaps allow for a minimum of 0.002 clearance and would read $1.788 \pm^{0.000}_{0.002}$ or 1.788 — 0.002, giving a maximum of 0.004 in. clearance.

His experience shows that as men endeavor to work to the dimension they see plainly, at the same time playing safe on the tolerance side, there will be a tendency to get maximum clearance instead of a medium between the two. His preference is for dimensions as follows: 1.791 ± 0.001 and 1.787 ± 0.001. He believes that while this gives a maximum possible clearance of 0.005 in. you will get much nearer an average of 0.003 in. than in the other case.

Other ways of designating tolerances also have advocates. One way is to give both maximum and minimum dimensions such as $\frac{1.792}{1.790}$ or $\frac{1.788}{1.786}$.

Another way which is unusual, but which has its good points, is to give the basic dimensions as 1.790 and use two minus tolerances for the shaft and two plus tolerances for the hole. This gives $1.790^{-0.001}_{-0.003}$ for the shaft and $1.790^{+0.001}_{+0.003}$ for the hole. This shows clearly that the basic dimension is 1.790 and that the shaft size can vary between 7.789 and 1.787. The hole can vary from 1.791 to 1.793 with no clearance less than 0.002 permissible.

Pet systems have no place in this question. We want a method which will show the workman just what is wanted with the least chance for confusion and error. This is a vital part of standardization and standard tolerances and should be carefully considered by all those interested in shop and drafting room practice, in order to promote accuracy, speed and uniformity.

News Section

Government Revives Patent Convention with Germany

After an extended study of all the ramifications of the proposal that the Patent Convention of 1909 with Germany be allowed to lapse, the State Department decided to revive the convention, and notice to that effect was transmitted to the German authorities prior to May 11, which was the time limit for such notification. The revival of this convention gives the holders of American patents, registered in Germany, immunity from the working clause in the German patent law. Strong pressure was brought by the War Department and the chemical industry against the revival of the convention. The War Department is anxious to secure the enactment of a working clause to apply to all patents registered in the United States. The American chemical industry has comparatively few patents registered abroad. On the other hand Germany has a large number of patents registered in this country which are not being worked. The effect is to preclude the development in this country of numerous branches of chemical manufacturing.

Manufacturers of machinery in tne United States were among those who were most strongly in favor of reinstating the convention with Germany. It was stated that it would cost machinery manufacturers millions of dollars to undertake the manufacture of their patents in Germany. The electrical industry also would have been affected adversely had the convention not been continued.

Nominations for A. S. M. E. Officers Announced

The nominating committee of the American Society of Mechanical Engineers, headed by W. W. Varney, of Baltimore, has made its report to the society on the choice of candidates for officers in the association.

The committee offers the following names: For president, John Lyle Harrington, of Harrington, Howard & Ash, Kansas City, Mo.; for vice-presidents: W. S. Finlay, Jr., American Water Works and Electric Co., New York, W. H. Kenerson, Brown University, Providence, R. I., Earl F. Scott, Earl F. Scott & Co., Atlanta, Ga., and H. H. Vaughan, Montreal, Quebec, Canada (to fill unexpired term of L. E. Strothman). For managers: A. G. Christie, Johns Hopkins University, Baltimore, Md.; James H. Herron, James H. Herron Co., Cleveland, Ohio; Roy V. Wright, Simmons-Boardman Publishing Co., New York. For treasurer: William H. Wiley, John Wiley & Sons, New York.

For delegates to American Engineering Council: John Lyle Harrington, L. P. Alford, A. M. Greene, Jr., Fred J. Miller, Max Toltz, Fred R. Low, S. W. Stratton, Edward R. Fish and Edwin B. Katte.

Industries of Southeast Show Improvement Over 1921

A steadily increasing demand for iron and steel products during the past two months, with every indication that business will continue to grow more healthy during the remainder of the year, has served to materially brighten the iron and steel outlook in the Southeastern territory, and especially in the Alabama and Birmingham district.

During the past five or six weeks this demand has brought about the resumption of operations at a number of furnaces in the Birmingham district that have been closed for several months, some of them for more than a year. Others in the district are preparing to start operations again as soon as business reaches a point that will merit steady activity.

One of the largest industries in the district that is now operating at 100 per cent capacity is the Tennessee Coal, Iron & Railroad Co., in steel production, while the structural mill is on a double turn. The other mills of this company, while not running at 100 per cent of capacity, are in active operation.

Outside of Alabama, iron and steel conditions over the Southeast are noting the general improvement, but not to as great an extent as in the Alabama district. Activities are at a lower ebb in Georgia, North Carolina and Tennessee than in Alabama, but the outlook promises much greater activity before the end of summer.

General business conditions are steadily improving and industrially at least the section is rapidly assuming an era of normal activity.

Because of the depression of last year the manufacturing companies of Georgia were not nearly as prosperous in 1921 as they were in 1920. It is stated that Georgia has a total of 5,123 manufacturing industries. The total capital invested in the industries of Georgia during 1921 was $441,505,757, which was less by $7,000,000 than the previous year.

Machinery Exports Exceed Pre-War Figures Says Dr. Klein

In an address before the U. S. Chamber of Commerce convention in Washington last week Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, said that exports from the United States of industrial machinery are now 60 per cent above pre-war level, with expanding markets in India, Japan, Dutch East Indies, Brazil, Argentina, and a tendency toward basic improvement in Cuba and Mexico. Reports from some smaller countries also show that conditions of trade are improving and that prospects for further trade are better.

Freight Loadings in April Increase in Volume

Reports just received by the car service division of the American Railway Association show that 758,286 cars were loaded with revenue freight during the week ending April 29, compared with 714,088 during the previous week, or an increase of 44,198. This was the largest number of cars loaded during any one week in April and was an increase of 37,202 over the corresponding week in 1921.

Increases compared with the preceding week were reported in the loading of all commodities. Merchandise and miscellaneous freight, which includes manufactured products, totaled 534,651 cars, an increase of 18,631 over the preceding week and 81,889 in excess of the total for the corresponding week last year.

Coal loadings totaled 75,632 cars, 12,187 more than were loaded during the previous week and the largest number loaded during any one week since the coal strike began. This was, however. 68,228 below the corresponding week last year and 93,086 under the total for the same week in 1920. Coke showed an increase over the week before of 343 cars which brought the total to 7,952 cars. This was 3,175 more than were loaded during the same week last year. Tabulations showed 14,053 cars loaded with ore, an increase within a week of 4,283 cars and an increase of 6,277 over the corresponding week in 1921. During the corresponding week in 1920, however, 28,814 cars were loaded with ore, which is nearly twice as many as this year.

Swope Elected President of General Electric

Following a meeting of the board of directors in the General Electric Co., held in New York on May 16, Gerard Swope, president of the International General Electric Co., was elected president to fill the position vacated by the resignation of E. W. Rice, Jr., who in turn becomes honorary chairman of the board of directors. At the same meeting, C. A. Coffin retired as chairman of the board and was succeeded to that position by Owen D. Young, long associated with the company as vice-president. Anson W. Burchard, for many years the vice-president in charge of public utilities and foreign investment was elected vice-chairman of the board. Additional directors added to the board are J. R. Lovejoy and G. F. Morrison.

Mr. Swope, the new president, is a graduate of the Massachusetts Institute of Technology and received his early technical practice in the shops of the Western Electric Co., at Chicago. He was elected president of the International organization in 1919.

Mr. Coffin will continue as a director and as consulting engineer.

The Trend of Business Improvement—Plants Resuming

The Standard Foundry Co., Anniston, Ala., has resumed production at the steel plant of the Lynchburg Foundry Co., and expects to develop capacity operations at once. The other plants of the company are also running at regular output.

The Willys-Overland Co., Toledo, Ohio, is increasing production to a basis of 400 cars a day of Overland and Willys-Knight models. Employment is being given to about 8,000 men, and it is proposed to advance this quota at an early date. A call has been issued for skilled mechanics.

The Maxwell Motor Car Co., Detroit, Mich., is running on a full production basis at its plant, averaging 300 automobiles a day. The company has recently added another 100 men to the force, totaling over 1,000 additional during the last three weeks. Production is being increased at the Dayton, Ohio, plant, and it is planned to place this works on a capacity schedule at an early date, giving employment to about 1,000 men.

The American Locomotive Co., is scheduling a portion of recent orders for production at the Brooks plant, Dunkirk, N. Y., including 50 engines for the Chicago & Northwestern Railroad Co. The working force will be increased at once.

The Anchor Concrete Machinery Co., Adrian, Mich., manufacturer of concrete block and tile-making machinery, has developed maximum output at its new local plant, comprising the former works of the Adrian Steel Castings Co., and has plans under way for immediate expansion, including the erection of a new addition. The plant now operated at Rock Rapids, Iowa, formerly the main factory, will be removed to Adrian.

The New York Central Railroad Co. is arranging for the immediate resumption of operations at its Hobson repair shops near Middleport, Ohio. Former employees will be engaged on a piecework basis.

The Bessemer & Lake Erie Railroad Co. is planning to resume operations at its Greenville, Pa., shops by the close of May. The works were recently closed down. Employment will be given to about 1,500 men.

The White Motor Co., Cleveland, Ohio, has added about 750 men to the working force during the past few weeks, increasing the quota to 3,000 employees. Motor truck production has been developed to a point of over 900 cars a month.

The Newport News Shipbuilding and Dry Dock Co., Newport News, Va., is arranging for immediate increase in operations, with employment of additional men. The company has received an order from the Chesapeake & Ohio Railroad Co., for 3,000 gondola cars and 1,000 steel cars for general service.

The Farrell Works plant of the Carnegie Steel Co., at Farrell, Pa., has started eight open-hearth furnaces.

The Steel Products Company, Cleveland, Ohio, is adding steadily to its operating staff. About 400 men are being employed. The force at the Detroit plant, local officials assert, is also being increased. February business increased in volume 50 per cent over January. The company is making principally bolts and valves for the automotive trade.

Inquiries for low-priced motor car bodies have increased to a considerable degree in the last few weeks, according to announcement made this week by officials of the Fisher Body Co., Cleveland, Ohio. The plant is operating nearly to capacity, turning out 200 bodies a day. The company plans to put on more men, in order to take care of the business that has come in lately.

Six more hot mills of the American Sheet and Tin Plate Co., at Pittsburgh, Pa., were reopened on March 20.

The Morgan Engineering Co., Alliance, Ohio, has received an order from the Wheeling Steel Corporation, of Wheeling, W. Va., for twenty-two cranes up to 125 tons capacity; also for three sheara up to 900 tons capacity. Additional men will be employed at the Morgan plant to take care of this and other orders.

The Nash Engineering Works at South Norwalk, Conn., is reported working on full-time with a normal production force.

Automotive Engineers Meet at White Sulphur Springs

Plans are fast being formulated for the summer meeting at White Sulphur Springs, Va., June 20 to 24, of the Society of Automotive Engineers. Reservations have already totaled over five hundred. Special railroad rates have been secured for members and guests and the certificates will be ready for applicants on June 10. Special trains have been arranged to transport the Eastern and Western contingents to White Sulphur. The Mid-West section will have a special train out of Chicago; the Detroit and Cleveland sections will also have special trains.

The technical program for the meeting is practically completed. The meeting has been divided into five sessions as follows: Research Session; Fuel and Engine Session; Passenger Car Session; Aeronautic Session; and Motor Bus Session. A report from the research department of the society will be presented by Dr. H. C. Dickinson. This report will treat principally of the volatility of motor fuel. Fuel tests will be described by W. S. James of the Bureau of Standards. Several papers will be presented at the Fuel and Engine Session; among them will be a compilation of data on the characteristics of blended fuels by Thomas Midgley, Jr. Speakers at the Passenger Car Session will be H. M. Crane, P. M. Heldt and J. B. Bray. The Aeronautic Session will include papers on several phases of aircraft progress. Two of the papers will be by Capt. G. E. Hallett, of the Air Service, McCook Field, and Prof. E. P. Warner. In the Motor Bus Session papers will be presented by G. A. Green and R. E. Plimpton. The entertainment committee has planned several events of a social and sporting character to offer some diversion from the technical sessions.

Carnegie Tech Students Form Chapter of S. I. E.

A chapter of the Society of Industrial Engineers was recently organized among students at Carnegie Institute of Technology, Pittsburgh, to be known as the Carnegie Industrial Engineers Society.

The department of machine construction, under Prof. Charles C. Leeds, organized the chapter, which includes 108 members. Prof. Joseph W. Roe, president of the Society of Industrial Engineers, was present at the initiation and spoke to the members. Dr. A. A. Hamerschlag, president of Carnegie Tech, also gave an address and was made honorary chairman.

The officers are: President, R. W. Marshall, of Pittsburgh; vice-president, J. V. Foster, of Latrobe, Pa.; secretary, J. K. Matter, of Harrisburg, Pa.; treasurer, B. N. Greenlaw, of Ridgewood, N. J.

Engineers To Continue Campaign for Public Works Department

Warning that President Harding is encountering opposition so strong that his efforts at government reorganization may be defeated, the American Engineering Council of the Federated American Engineering Societies has announced that the engineers of the nation will start afresh a nation-wide movement for the establishment of a National Department of Public Works.

In a statement saying that the public works question would come up at a meeting of the executive board of the council in Pittsburgh, May 26 and 27, it was asserted that government reorganization is being blocked by "the petty jealousies and conceits of men in high official position."

L. W. Wallace, of Washington, executive secretary of the Federated American Engineering Societies, through whom the statement was issued, said that Dean Mortimer E. Cooley of the University of Michigan and president of the council, recently visited President Harding, to whom he tendered the support of the organized engineers of the nation in matters affecting engineering and allied service.

One part of the statement reads as follows:

"Men in high official positions, accustomed to the handling of large affairs prior to the beginning of their official life, and whom one would naturally suppose must be above the petty jealousies and conceits of the average man are now exhibiting jealousies and animosities that one might expect to come from a group of children quarreling over the distribution of sweetmeats. Various organizations of high repute, led by men of high character, are supporting these absurdities with an intensity almost unbelievable.

"The country needs right now the voices of those who look and think beyond the outer skin. We always have with us the voice of the crowd, too often impelled by unwise leadership and mob psychology. Every little while it is incumbent upon the thinking portion of our citizenship to render public service."

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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While the speculators in securities are merrily buying stocks and bonds that can be instantly resold if the tide should turn, the merchants and manufacturers of the country are still considering the policy that they ought to follow in preparing for the autumn trade that should normally follow the harvest season.

This problem is a difficult one, for the articles that compose a retailer's or a jobber's stock cannot be resold like stock exchange securities and an error in calculating the prospective demand often means a ruinous inventory loss. Similarly a manufacturer runs great risks when he puts his capital into the production of goods that are not sold before they are made, but these are risks that many are taking today.

Buyers Are Cautious

It is undeniable that the advance in most basic raw materials far exceeds that which is obtainable for their manufactured equivalent from consumers, and the intermediary distributor, remembering the experience of two years ago, is wondering whether another "buyers strike" might not follow an effort to equalize retail prices with production costs.

It is generally believed that stocks are small and shelves bare. This belief is confirmed by the relatively small amount of first-class commercial paper offering and the question that nearly every merchant is now asking himself is "shall I buy or wait?" Cotton, for instance, is well over 20 cents a pound, but the trade in cotton goods, though better than it was, does not fully reflect the advance in the raw material. The same thing is true of wool and woolen goods, hides, leather and shoes, silk and silk fabrics, hogs and hog products, wood pulp and paper.

The disparity between retail prices and the cost of production is of course appreciably increased by high freights, high wages and heavy taxes, and although it is hoped that at the dinner he gave them President Harding may have persuaded the railway executives to slightly reduce the cost of transportation, there are few who expect any reduction in wages or taxes. This being the case it is plain that unless the price of agricultural products can be lowered there is not much chance of a further decrease in the cost of living.

Those who believe that the farmer can be forced to accept substantially less than he is now getting for the fruits of his toil disregard his newly acquired political power and self-consciousness. I cannot expect any substantial decline in farm products and am therefore impelled to conclude that the trend of retail prices will be upward during the balance of this calendar year and until the crops that mature in 1923 are far enough advanced to have an influence upon the markets.

This is a rather long distance view to take of a profoundly important question, but after studying it from every angle I cannot reach any other conclusion. We have in the first place an abundance of credit. The ease of money is rapidly thawing out and liquifying the frozen loans of which we had heard so much. The enormous bond sales of the past six months have made it possible for many corporations to buy the new equipment of which they are in need. Its fabrication will provide employment for those formerly unemployed. A scarcity of labor is in fact already reported from some points in the Middle West. An increase in the consumptive demand will be the result and when this occurs an advance of four or five cents a yard in the cost of cotton cloth or four or five dollars in the cost of a suit of clothes will not deter those who have the money with which to satisfy a long felt want.

There may be some reason to doubt whether further advances in some agricultural products can be maintained, but with cotton at twenty cents, wheat at $1.25 and corn at over 50 cents on the farms the position of the farmer is greatly improved and he will be able to buy much that he was compelled to deny himself a year ago.

The idleness and loss caused by the textile strike in New England and the coal strike are not disregarded in this prognosis, but the cotton operatives are gradually returning to work and there is good reason to hope that after President Harding has finished with the steel men and the railroad officials he and Mr. Hoover will turn their attention to the coal industry and find a way to start it going again.

A Loan to Germany

The Genoa Conference has been a fizzle, it is true, and no one expects much of the gathering that is to be held in June at the Hague, but sterling exchange reached a new high record last week and America regards this as more important and significant than a trade agreement with Russia, which country, as Mr. Hoover points out, took only one per cent of our pre-war exports. It is, however, reported from Berlin that Mr. Morgan will head an international syndicate that will lend Germany 5,000,000,000 gold marks, equal to $1,250,000,000. If this should be true the effect in England and France would be electrical, but the resulting deflation in Germany might be depressing and would put an end to the abnormally cheap production which now enables German manufacturers to undersell the rest of the world.

All this would of course be to America's advantage and the effect would be to inflame speculation here, particularly on the Stock Exchange, where an appreciation of the possibilities was expressed by great activity last week.

The bond issues were, however, less numerous, and in accordance with precedent more attention is now being given to stocks. The consolidations, effected and rumored, in the steel industry have been used to advance the stocks of the corporations involved and others indirectly affected, but there is still a fear that the Department of Justice may thwart one or more of the proposed combines. This fear would seem to be unwarranted for the present Administration is not opposed to big business and the reports of President Harding's dinner to the steel men last Thursday evening indicate that its purpose was an abolition of the 12 hour day in the mills rather than an interference with the proposed combinations.

Large Industries Busy

In the steel industry itself there is a constant and noticeable increase of activity. Many mills are now working up to capacity and the average is put at 70 per cent of maximum. Prices for both iron and steel are higher and copper is up to 13¼ cents. The automobile industry is also booming and it is asserted that the May production of passenger cars will be the largest on record. This means an increased demand for tires later on. It ought to have its effect on rubber, which still hangs around 16 to 16½ cents for the standard grades.

The railroad earnings for April thus far reported are encouraging, but the buying of railway stocks was checked by the thought that the President may demand more of a reduction in rates than the roads can afford at present. If this apprehension proves to be unfounded higher prices for many railway securities will probably be recorded as the various combinations talked of take more definite shape. The weekly statement of the Federal Reserve System shows no important changes. The reserve ratio is 77.6 per cent as compared with 77.3 a week ago.

In America nearly all the indicia of business indicate greater activity. The chain stores report a large increase in sales and the mail order houses are now running ahead of last year. Bank clearings tell the same story.

The figures of our foreign trade for April show a decrease in both exports and imports, which is not surprising, but the excess of exports over imports was $104,000,000 as compared with $86,000,000 a year ago, which is better than was expected.

The trade reviews are generally cheerful and everywhere on this side of the Atlantic the barometer appears to be rising. It may, of course, go so high that a further rise would be impossible. Then it will be well to shorten sail, but for the present this seems unnecessary provided the commercial mariner does not relax his vigilance in scanning the horizon for signs of a change in the weather.

Germany's Labor Problem

Cheap Labor the Basic Factor in Present Economic Condition—Relation of Wages to Depreciation of Currency—Labor Legislation in the Factories

BY OUR BERLIN CORRESPONDENT

Germany represents to-day, as far as business is concerned, an oasis within a vast desert. Situated in the midst of countries which are all more or less suffering under a prolonged and extensive business depression, Germany affords a contrast which perhaps was never more striking than now, when the intensity of production has reached its utmost limit. The reason for this remarkable condition is well known, and there is probably no one in the country who deludes himself into the belief that the excellence of Germany's products has procured for her the exceptional position she enjoys among other nations.

The truth is that Germany presents to her own inhabitants and to the rest of the world a huge warehouse where wares can or are supposed to, be had at bargain prices. As almost everyone in the world is concerned in the question why such a state of affairs exists, and how long it can be maintained, Germany's economic conditions have become the subject of the closest scrutiny of all sides. When a foreigner comes to the country, one of the first questions he asks is, "How can Germans sell their products so much cheaper than other nations?" The reply he invariably receives can be condensed into the one word "valuta"; meaning the exchange, an all powerful word which is supposed to solve every puzzle that may present itself to the foreign mind, expressing all that there is to be said.

The discerning mind can, however, receive no satisfaction from such reply. The problem is much more complicated, and cannot be explained in a few catch words. It is not controlled by one economic function, but by a number of them. Their relations to each other and the sequence of actions and reactions they produce have never before been experienced in the history of mankind, which makes the situation hard to be understood by outsiders as well as by Germans themselves. The understanding is in no way facilitated by the fact that part of those economic functions are a product of natural development, and others are caused by deliberate manipulation. It can be said that even those most concerned, Germany's economic and political leaders, are not free from the confusion thus created. If they were, they would have succeeded in keeping the current of developments under control. The part that the administration plays is confined to producing some bends and twists in one place or straightening out some in other places, as seems advisable in the interests of the country.

Off Her Equilibrium

Germany represents to-day a territorial unit in which the economic atmosphere, if this figure of speech is permitted, is out of equilibrium with that of countries living under normal or nearly normal conditions. It may be compared to a vessel from which the greater part of its substance has been ejected, causing a partial vacuum. The suction thus created is the force which constitutes Germany's chief motive power. As this vessel is not a self-contained unit but subject to intercommunication with its surroundings, diffusion of course takes place through its walls, varying according to the difference between the inside and outside pressure, with the tendency to restore the equilibrium. In this simile, pressure is synonymous with prices. Granted free inter-communication, prices in Germany would adjust themselves automatically to those of other countries. The exchange has in truth nothing to do with the level of prices. It can change only figures, but not the value they represent. The explanation of the problem, which the low prices in Germany represent, is to be found on the one hand in the fact that the effects of the diffusion have always been counterbalanced, and more than that, by further evacuation, and that on the other hand the process of the diffusion is by a most elaborate and intricate economical system been retarded considerably.

Government at Fault

During the war and almost two years after its end, this system consisted chiefly of enforcement of maximum prices on all commodities of every-day life. Since their abolishment the control has become much more difficult and also more intricate, hardly being recognizable from outside. Even such close and painstaking students of Germany's economic life as the foreign commissions of control residing in Germany are attributing the low level of prices in Germany to the government's maniplation of the price of grain, and to the low price of coal and transportation. The first is comparatively so insignificant that its influence on the general level of prices is almost nil. The cost of coal and transportation, on the other hand, is not an absolute quantity but a function of a factor which in truth is the basic factor in the whole problem—the cost of labor.

The question to be asked, and which indeed is asked incessantly without finding a suitable reply, is how in so nearly a socialized state as Germany is, the cost of labor can be kept down so far below the pre-war standard. At present a skilled workman receives on the average 140m. for a working day of eight hours, which is only 2m. gold, or a third part of his pre-war earnings.

That the increase of the wages above the pre-war standard is an entirely fictitious quantity is now realized by everybody concerned, even the most unsophisticated workman. It is true that the high figures which wages have reached are not devoid of exercising some fascination, creating some self-deception in the mind of the workingman. This fact, no doubt, has been responsible in some measure for the working classes' acquiescence in the disparity between their present and pre-war income.

The discontent thus produced has always been at the bottom of the labor problem, and its allaying was one of the chief tasks of the administration since it took the labor problem firmly in hand after the Revolution. The handling of the labor problem by the government and by the industrial associations has seldom found favorable comment, and has been grossly abused from both sides, the employers as well as the employees. When looking back to the revolution and reviewing the whole route transversed since then, there can be no doubt that the performance has so far been a very creditable one, deserving admiration rather than abuse.

The Labor Problem

The two main phases of the labor problem are the unemployment question and the task of keeping the cost of labor down at a level which would enable the industry to recover the foreign markets and to maintain there a strong foothold. The unemployment problem was comparatively easier to deal with. It stands, of course, in direct relation to the other problem, as its best solution is to have employment for every one. From the rather haphazard way in which the unemployment problem was at first handled, consisting mainly of treasury stipends toward unemployed, it has soon taken a course of system and order, reflecting the organizing power which is one of the chief virtues of the Germans. The following figures show the percentage of unemployed in the main groups of workmen during the years since the revolution. These figures demonstrate clearly how effectively the matter has been dealt with.

	1919	1920	1921	1922
January	7 9	3 6	3.7	1.7
February	8 0	3 6	4.1	.
March	4 8	2 1	3.2	.
April	6 8	2 2	4 4	.
May	5 0	3 8	4.4	.
June	3 8	5 9	3 4	.
July	4 2	10 0	2 8	.
August	4 8	8 7	2.3	.
September	4 1	5 9	1.4	.
October	3 9	4 9	1 4	.
November	3 8	3 8	1.2	.
December	3 6	3 4	1.3	.

The great business boom starting in 1919 helped to absorb a large number of the unemployed, and cleared the field for the systematic work which the government had undertaken. The system of public stipends has not been abolished, and will probably have to be maintained for many years to come, in view of the number of war invalids. These stipends increased in the course of time with the growing cost of living. A family with three children, for instance, receives now 49.75m. per day. This is approximately 40 to 50 per cent of the pay this family would receive if its bread-winner were employed. It is not supposed to satisfy normal wants, but to keep the wolf from the door. It harbors sufficient dissatisfaction to make its receiver keen for obtaining employment. The government is, however, applying some more forcible means in the latter direc-

tion. An entirely new organization of the labor exchanges has been brought into existence for such purpose. The private labor exchanges have been nationalized, and the offices dealing with unemployment stipends put into close relation with the public labor exchanges. Regular reporting of receivers of stipends at the labor exchanges is compulsory. Although there are still some laggards who succeed in circumventing these regulations, their number is insignificant. The number of stipendiaries on March 1 was 209,000, of which 179,000 were male and 30,000 female. The number of family members of unemployed was 301,000. The total of stipends amounted in February to 114 million marks.

As it cannot be hoped that the labor exchanges will remove all the unemployed from the payrolls, and a certain residue has to be taken care of even under the most favorable circumstances, the aim of the government has been to make the huge outlay for unemployed subsidies productive. A special government department was drafted off for the organization of what is called "Productive Arbeitslosen Fürsorge"—or productive providential care of workmen. The main object of this institution is to provide work of a temporary character for unemployed on enterprises financed by the state treasury or other public funds; this work includes irrigation, hydro-electric power stations, building houses for agricultural laborers, improvement of highways, water works, river regulation, quarries, building and house-wrecking. Over 400,000 unemployed have in 1921 been given work of this kind, and nearly three-fifths of the stipends have in this way been made productive. The scope of this organization has in the course of time been extended, chiefly in the direction of transferring workmen from one calling to another, according to the dictates of demand. Courses of training are maintained for such purpose. A great number of workmen who have crowded into the cities during the war have in such way been led back to the country, chiefly into agriculture. Financial assistance is even extended from means at the disposal of this organization to support private enterprises whose maintenance lies in the public interest.

Unemployment Insurance

A project has been under contemplation at an early date to develop this organization into an unemployment insurance. A law was drafted for this purpose but has apparently been shelved for the present. The object of it is to provide subsidies in the case of unemployment and sickness, also toward workmen not fully employed. The present organization, especially the public labor exchanges, play an important part in this scheme. The funds for this purpose are to be raised, one-third by the insured, one-third by the employers, and one-third by public means, that is, one-sixth part by the state, one-ninth part by the province, and one-eighteenth part by the municipalities. The claims for insurance are established if the insured has, for 26 weeks in the two years previous to his unemployment, paid his insurance fees. The subsidies granted are fixed by the Labor Ministry. They commence seven days after the beginning of unemployment. Earnings from odd jobs are deducted. Every unemployed person has to report at a labor exchange at least three times a week. During the first two weeks he has to apply to the labor exchange of his profession, thereafter at the general labor exchange. Subsidies cease if the insured refuses to accept work offered him by the labor exchange, provided this work is paid by the usual wages and is in keeping with his education or training. The latter proviso ceases after eight weeks, after which time he cannot claim relief on this account unless he can make plausible that his future career would be jeopardized by the acceptance of inferior or inadequate work.

The insured can be compelled to undertake a course of training for a different profession or an additional training in his calling. If he refuses, subsidies will be stopped for the next four weeks. The same applies to employees who voluntarily give up their jobs, or lose them by their own fault. It is a peculiar fact that the proposed law also provides for subsidies to strikers, but only after the first two weeks of the strike. In a similar way, ill people or short time workers are taken care of. If the unemployed want tools for a job offered them, which they cannot pay for themselves, such tools can be loaned them from insurance funds.

Keeping Wages Down

The second and most important task of the labor problem, to keep the level of wages down as low as possible, has two sides, a mental and a material one. The first is frequently overlooked by foreign students of the matter, although it can easily be understood that the workingmen would not acquiesce in a state of affairs which, in spite of appearances, implies for them privations, at least a lowering of their living standard, without some potent agency working upon their minds. This agency consists in the main in the belief that German goods are at a discount in foreign countries, and could not be sold abroad except by cutting prices considerably. Systematic and extensive propaganda was made demonstrating this "discount of hatred" as it is called, with the result that it is now deeply rooted in the mind of the whole population. Foreign legislation against dumping, establishing high import taxes which could easily be traced to discrimination against German goods helped to maintain this belief and strengthen it.

The workmen fully convinced by the same propaganda that the future of the country depends on the export, and aware that a cutting down of the export would materially react upon their own welfare, see no help but to moderate their own claims, not willingly, but as something inevitable. They would probably offer greater resistance than they do, even show fight, if they could refute the contentions brought forward by the employers, that they are greatly handicapped in comparison with their foreign rivals, by the so-called socialistic achievements, the eight-hour day, shop council law, and all the other parts of more or less socialistic labor legislation. Even under such circumstances it would be doubtful if the workmen would submit to the pressure exercised on the level of wages, in the comparatively resigned spirit which they are showing, were it not for the conciliatory influence of the trade unions. The latter have since the revolution gained largely in importance. They have become part and parcel of the govern ment, exercising a strong influence on legislation. Knowing well that by lending help to a contest which would react upon the country's most vulnerable spot, the export, they would largely lose influence on both sides, they are following a policy of temporizing, acting as intermediaries in the conflict between the interests of employers and employees. Storm and stress have put some able leaders at the head of the trade unions, and they no doubt have in mind the welfare of the country as a whole.

The material side of the problem is taken care of by a whole network of regulations drawn around the adjustment of wages, organizing to a nicety the whole procedure. Claims of the workmen for higher wages are subject to strong influence, having a tendency to tone them down to the best possible compromise. This procedure is very successful, and if it is not, it is at least a lengthy one, giving employers the benefit of a level of wages long after claims for their rise have been brought forward.

The regulations created since the revolution have also tackled the problem of strikes. From the original conception of a rebellion, strikes have been moved into an atmosphere of law and order. A nicely defined distinction is now drawn between justifiable strikes and so-called "wild strikes." A strike is considered justifiable only after all means of settlement have been exhausted, and in such cases the unions will back the strikers. In the other instance, it would be a "wild strike" and the strikers could expect no assistance from the trade unions. It will be remembered that the recent railroad strike broke down on the latter account, having been declared a wild strike by the associated trade unions, with the result that help from this quarter was refused.

(To be continued next week)

Smelting Company Loses Suit

The American Smelting and Refining Co. has lost its case against the Government for recovery of $512,515 on account of the sale of copper to the Ordnance Department during the war. The company had a contract with the Government for delivery of copper at 23½ cents a pound, made in March 1918. Before deliveries were completed thereon the Government raised the price of copper to 26 cents. The smelting company sought to obtain 26 cents a pound for copper deliveries after this price advance. The Court of Claims ruled against its contention and the company took the case to the Supreme Court. In a decision announced by the court last week by Justice Holmes, the decision of the Court of Claims was affirmed, although the court said there was doubt as to whether the company could sue the Government for damages arising out of the contract.

The Co-ordinating Machinery of Government

Last year the expenditures of the Federal Government totaled $5,538,040,-000.20. The routine work in handling such a vast sum is enormous. By the introduction of a unified plan and policy into the business organization of the Government large savings have been effected. The total expenditures during 1922 will be more than $1,000,000,-000 less than those of 1921. A part of that reduction must be credited to the economies effected by the clearing house organization within the Bureau of the Budget, over which the chief co-ordinator presides. The chief co-ordinator is Col. H. C. Smither, of the General Staff of the Army, who has been thrice cited for distinguished military service and who holds the Distinguished Service Medal for his work in organizing the supply section during the period of the arrival of American troops in France.

The co-ordinating machinery which the Government has set up is simply the plan which has long been in successful operation among the very large industrial enterprises, modified to suit the special needs of the executive departments. The working of this machinery was described by Col. Smither on May 17, when he addressed a large gathering of industrial engineers at Philadelphia. The meeting was conducted under the auspices of the Atlantic Chapter of the Society of Industrial Engineers.

Col. Smither said that there are few business organizations within the United States whose operations are of sufficient magnitude to be comparable with the business of the Government, and those few have recognized that on a scale so large, the central direction of operations can be conducted successfully only by co-ordination instead of consolidation. The suggestion is being offered continually as a business principle that the similar business routine functions of Government should be consolidated in a single body that shall serve all departments. Those who propose such amalgamation of functions are influenced by a desire to conform to the usual practices of single business institutions in the commercial world. They seldom have the information at hand to enable them to recognize whether these functions are sufficiently alike in character to make possible a homogeneous organization or whether the advantages to be gained, if any, are sufficient to offset the loss of initiative to which the separate subdivisions of the Government inevitably would be subjected.

An organization, while influenced in the efficiency of its operation by the fact that the individuals composing it are subject to human emotions and are possessed of varying degrees of intelligence, is none the less a machine and its capacity to perform its work is measured by precisely the same units that determine the potentiality of a mechanical power unit. The potential energy of which it is capable is a function of its solidarity as a body, coupled with flexibility in arrangement such as will facilitate the transaction of business by the separate elements of the organization with the desired dispatch. There must be sufficient compactness in the body of the Federal organization to permit of the efforts of its separate business elements being directed without either dispersion or congestion of their working forces and at the same time permit of the deployment of each department of its own particular forces with a speed commensurate with the need of the department in the accomplishment of its mission.

It is apparent that the underlying principle of co-ordination is to bring into the Federal organization as a whole that quality which corresponds to the mass of a power unit and to permit dispatch in the transaction of



COL. H. C. SMITHER

business at a rate commensurate with its needs. Too rigid a control may act to depreciate the speed factor to an extent so great as to interfere materially with the separate elements of government in the accomplishment of their respective missions. It follows as a corollary that the principle of organization on a large scale is a flexibility in the organization as a whole, coupled with freedom of action by its units all directed harmoniously to a common end.

Unless every act contemplated in securing co-ordination is carefully considered as to its effect upon these two factors of mass and speed, there is always danger that mere personal opinions may be mistaken for principles.

Government Cuts Ordinary Expenses in Half

Ordinary expenditures of the Government for the ten months period from July 1, 1921, to April 30, 1922, amounted to $2,819,876,115.40 as against $4,277,863,186.23 in the corresponding period ending April 30, 1921.

Expenditures for the month of April amounted to $242,560,-961.82. The largest item was the interest on the public debt which amounted to $121,822,-074.35. The Treasury expended $46,616,328.82, the War Department $35,241,287.96, the Veterans Bureau $33,760,477.19, and the Navy Department $23,-481,074.86. The expenditures under the Transportation Act were $43,537,901.60.

Chamber of Commerce of the United States in Convention at Washington

At the close of its four-day convention held in Washington last week, the Chamber of Commerce of the United States elected Julius H. Barnes, of Duluth, Minn., president for the next year. Vice-presidents elected were A. C. Bedford, of New York; Thomas E. Wilson, of Chicago; Harry Black, of Galveston; and Thomas B. Stearns, of Denver.

One of the most important addresses of the convention was that delivered on Tuesday morning by Arthur Balfour, vice-president of the Association of British Chambers of Commerce, and a prominent steel manufacturer in England. Mr. Balfour's words touched on many of the problems which are facing the industrial world both in Europe and in America today. On the question of exchange rates he remarked that the less politicians and governments have to do with attempts to adjust the exchange, the sooner we are likely to reach a safe and steady basis on which we can trade.

Speaking of labor conditions in England he said: "I am able to report to you many distinct and hopeful signs in Europe and particularly in Great Britain. We have had great labor disturbances in England and so long as the government interfered between the employer and employee no settlement was ever reached which the particular industry could support from an economic standpoint. It is an impossible situation for a government which depends on votes to endeavor to adjust wage questions between employer and employee, and the government of Great Britain has now realized this fact and has definitely stepped out of the arena. The consequences are that wage adjustments are now being made between the two interested parties."

Mr. Balfour declared that in his opinion attempts by some countries to shut out German goods were poor business economics. In the first place, as Germany has to do some export trade it is much better to let her spread this trade normally over the world rather than to control specific markets. In the second place, if she is to pay reparation she can only do so by trading, as in this way only can she secure currency acceptable to the Allies.

The attempt to run Russia on Communistic or Bolshevik ideals has proved a vast and complete failure, according to Mr. Balfour. He explained how Bolshevik propaganda had been spread throughout Europe in an attempt to force other countries to come to the aid of Russia, as a return for the withdrawal of this propaganda.

In closing his address Mr. Balfour said: "I can say to you that in England certainly, and in some of the other countries, we have seen the worse. We are reaching economic conditions where trade on a proper basis will again be possible and I am hopeful that before the end of the year trade will begin to flow in its normal channels and the disastrous unemployment will gradually pass away."

At the Wednesday morning session John R. Delafield of New York gave an interesting discussion of the allied war debt to the United States. He discussed the effect of the payment of principle or interest of this debt upon the United States exports and on the home market. "Where there is unem-

ployment," he said, "the purchasing power of the people becomes limited correspondingly, for it is the workers who are also the consumers. Prosperity requires the greatest number of consumers at home as well as abroad, and by cutting down on the industrial and agricultural activity of the country through any cause, we also diminish the home market by impairing the purchasing ability of our own people.

"The effect of the repayment of these loans and of the interest upon them will therefore, be cumulative, and will, in itself, not only diminish our export trade, but also cut down our home consumption. The less exports, the less domestic trade, for the buying power of our people is diminished.

"It is for us, then, to do all we can to overcome this handicap, and certainly not to do anything to increase the disadvantage under which we labor. What is the amount of these foreign debts to us, repaid as they will be over a long series of years, beside our prosperity and the well-being of our people? Even the amount of these loans is but small compared with the great increase of wealth our country would create in a period of great economic prosperity."

In his address "American Relations to Russia," Secretary of Commerce Hoover analized this problem from an economic standpoint. He offered strong arguments against frequent assertions that the United States is responsible for the situation in Russia today. His remarks, backed by his intimate knowledge of the situation, created a strong impression on his audience. In concluding his address he said: "When all is said and done, the great problem still stands out. Russia is slowly dying because the dynamic forces of production and foreign confidence have not yet been restored. We, a great Christian people, look with horror and deepest sympathy upon her untold miseries. We wish to find foundations in realism for assistance to the Russian people. To extend this help requires a vast restoration of confidence. It requires a restoration of the processes of business and commerce. Russia is making progress in these directions. We wish to help but where does lasting help lie except in the firm and final re-establishment of those basic fundamentals that we have already stated?"

On Tuesday afternoon the cornerstone for the chamber's new home was laid in the presence of over five thousand business men and government officials. The building is situated in Lafayette Square, facing the White House.

During the course of the convention the chamber passed several resolutions expressing its opinions on questions of moment. One of the resolutions urged that the United States take steps to be represented officially at the deliberations of the reparations commission: Another resolution expressed the desire that the United States take its place with the other nations of the world in the International Court of Justice. The chamber also, by resolution, urged Congress to enact legislation which would aid in the speedy settlement of war claims against the governments of Germany, Austria and Hungary. Resolutions also repeated the recommendations in favor of government aid to the merchant marine, and requested congress not to reduce the authorized personnel of the Army and Navy below the strength conservatively requisite for national safety.

Business Items

The Hoggson & Pettis Manufacturing Co., New Haven, Conn., has taken over the six-story building, of which it has occupied part, and is equipping it to take care of expanded lines including the Sweetland lathe chuck, marking devices and rubber molds.

The Bristol Company, of Waterbury, Conn., manufacturer of recording instruments, has opened a branch office in Philadelphia at Room 1311 Widener Bldg. C. C. Eagle, Jr., service engineer, is in charge.

The Pryibil-Genzlinger Machine Co. has been organized in New York City with offices at 220 West 42nd St. P. Lester Pryibil, formerly vice-president and general manager of the P. Pryibil Machine Co., of New York, and Frederick M. Genzlinger, mechanical engineer, are the partners.

Gaston & Co., Inc., of 165 Broadway, New York City, has purchased the business of Gaston, Williams & Wigmore, Inc., of New York. The personnel of the old company will not be changed. Through this New York branch, and that of Gaston, Ltd., of London, the organization will continue to represent manufacturers and aid them in marketing their products.

The J. M. White Motor Co. has been appointed distributing agents in the Sioux City, Iowa, district, for the Wills-St. Claire Motors Co.

The Sigwart & Ralston Machine Works, Inc., Pittsburgh, Pa., has been sold to the Luster Coated Sheets Co.

The Hofius-Hudson Machinery Co., has been incorporated at Tacoma, Wash., with a capital stock of $40,000. Directors are R. S. Holt, 1115 Fidelity Bldg., Tacoma; George J. Danz, Hill Hudson and Phillip Kitchin.

The R. C. Hyde Company has opened offices in the Security Mutual Bldg., Binghamton, N. Y., and is prepared to handle general power plant and mechanical engineering commissions, including electrical installations, power plant equipment, testing and machine design.

The William H. Wilson Iron Works of Rochester, N. Y., manufacturer of structural iron, fabricated steel shapes for bridges and buildings, etc., has opened an office in the Powers Building in Rochester. This office will handle the designing, estimating and engineering work and will be under the direct supervision of L. M. Sanford, who for several years has been in charge of the structural department of the plant.

The Westgate Metal Products Co., has been organized at Oakland, Cal.; capital stock reported $2,500,000. The concern will manufacture castings, tools and fixtures. Directors are A. T. Burch, B. I. Marshal, A. L. Stedebaker, D. S. Riggs, Antone Weber and J. M. Shaw.

The National Steel Barrel Co., of Cleveland, Ohio, has established a plant at 1500 Tchoupitoulas St., New Orleans, for the manufacture of steel barrels. The district manager is S. H. McAllister. The plant has a capacity of 1,200 steel barrels a day and is intended primarily to look after the increase of oil for export from this city.

Plans for a new commercial and passenger car axle factory for Cleveland, Ohio, were announced last week by Viggo V. Torbensen, former president of the Torbensen Axle Co. The new concern will be known as the Vig-Tor Axle Co., and Mr. Torbensen will be president. Associated with him will be A. L. Kroesen, vice-president and general manager; W. N. Jackson, treasurer; Carl R. Harrison as secretary.

The Babcock Printing Press Manufacturing Co., New London, Conn., manufacturer of printing presses, etc., has increased the capital stock of the company from $650,000 to $800,000, to be utilized for business improvements.

The Lux Clock Manufacturing Co., Inc., Waterbury, Conn., manufacturer of clocks and time systems, has increased its capital stock from $150,000 to $300,000.

The Hartford, Conn., office of the Detroit Steel Products Co., Detroit, Mich., was discontinued on May 1, and was consolidated with the New York office of the company, at 110 West 42nd St. D. C. Sullivan, manager of the Hartford office, will become affiliated with the New York branch.

The Graham Manufacturing Co., of Torrington, Conn., has filed papers of incorporation under the laws of Connecticut to engage in the manufacture of metal goods, etc. The capital stock is $150,000, and the incorporators are: James H., Joseph F., and C. A. Graham, of Torrington. The concern recently obtained a lease on space just opposite the Torrington Railroad station, and will begin operations.

Personals

DAVID B. RUSHMORE, chief engineer of the power and mining department of the General Electric Company, has been appointed to the staff of consulting engineers of the company.

COL. ARTHUR HATCH, president and general manager of the Canada Steel Goods Co., Hamilton, Ont., has been elected president of the Canadian Manufacturers' Association.

ARTHUR JENNER, factory superintendent of the Noiseless Typewriter Co., Middletown, Conn., has resigned that position. He will take a trip to Europe, returning to the United States late in July.

DR. CHARLES E. A. WINSLOW has been appointed health supervisor of the new department of the Safety Institute of America. This department will study the influences which affect the health of industrial workers and will make such recommendations for curing them as may seem fit. Dr. Winslow is professor of public health at the Yale School of Medicine, and has been prominently identified with health organization in the United States and Europe.

MARVIN E. MONK has been appointed assistant sales manager in charge of general sales of the U. S. Ball Bearing Manufacturing Co., of Chicago. Mr. Monk was formerly special sales engineer for Manning, Maxwell & Moore,

Condensed-Clipping Index of Equipment

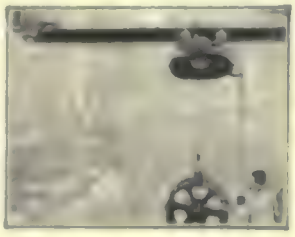
Patented Aug. 20, 1918

Grinding Machine, Valve-Facing and Tool, Collins
Fred C. Chase Co., Inc., 1 Hanover Street, New York, N. Y.
"American Machinist," February 2, 1922



The Axmax is used for precision work on engraving valves and valve seats of reproducers and records. A chuck carries a wax grinding wheel at each end of the spindle. The master wheel is for right hand, for either direct or a reversing current. The left wheel is for grinding cutting tools and the right wheel is for facing the outside surfaces of the valves and for grinding the reamers used in cutting the valve seats. A transverse screw adjusts the valve for the proper depth of cut. Longitudinal motion is given to the work by the feed screw crank.

Crane, Electric, Hand-Power
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
"American Machinist," February 2, 1922



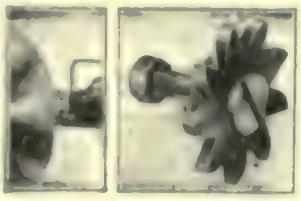
The crane is equipped with an overhead beam, controlled by a push button at the bottom of a pipe carrying the handle, or can be furnished with a chain block suspended from a trolley for hand operation. In the former the operator controls with one hand the raising, lowering and moving the load, and with the other hand steadies the load. The crane has a capacity up to 1 ton. The outfit can be furnished in different lengths with a maximum distance between runways of 24 ft. The I-beam depth varies from 7 to 10-in., but a 24-ft. I-beam can be furnished.

Buffer and Grinder, Motor-Driven, Floor Type
Valley Electric Co., 3157 S. Kingshighway, St. Louis, Mo.
"American Machinist," February 2, 1922



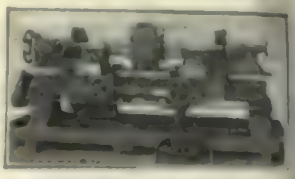
The machine is adapted to use in the shops, enabling quick buffing and polishing jobs. The motor shaft is extended and threaded at both ends. The machine motor is mounted on a heavy cast-iron pedestal on the front of which is a safety switch. A tool-rest, guards and a driving pulley may be furnished. The motor, furnished with ½ to 6 hp. and either single-phase or two- or three-phase, operates on the regular current of either 110, 220 or 440 volts and has a speed of 1,800 r.p.m. Floor space, 14 in. in diameter. Weight, 130 to 330 pounds.

Chip Remover, Saw-Tooth, Automatic
Henry Disston & Sons, Inc., Philadelphia, Pa.
"American Machinist," February 2, 1922



This device consists of a special toothed wheel made to fit any type of saw, and a stud to carry the wheel, as shown in the illustration at the right. It keeps the saw teeth and gullets free from chips, as the chips from the cut are apt to stick to the sides and points of the teeth and score the work, or even cause breakage of the teeth. This trouble is particularly noticeable when cutting soft steel. The application to the saw is shown at the left.

Lathe, Center-Driven, Axle
Reed-Prentice Co., Worcester, Mass.
"American Machinist," February 2, 1922



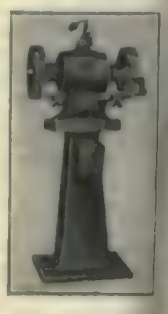
This machine turns both ends of the rear axles of automobiles and mine-car axles. The center portion of the work is gripped to provide the necessary torque, and cannot be machined. The drive to the headstock spindle is from a motor of at least 7½ hp., controlled by a treadle at the front of the machine. Each carriage has its own automatic feed trip, although both are driven by a single set of gearing. The machine will turn shafting up to 2⅞ in. in diameter, with slight modifications to 3¼ in. in diameter. Bed, 9 ft. Distance between the centers, 72 in. Length, 10 ft. Width, 4ft 4½ in.

Reamer, Expanding, Heavy-Duty, "Bull-Dog"
Wetmore Reamer Co., 62 South 27th St., Milwaukee, Wis.
"American Machinist," February 2, 1922



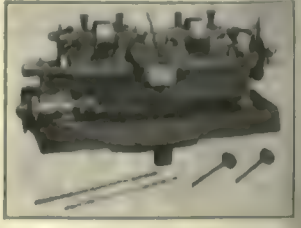
The tool can be furnished with either six, eight or ten blades, according to the reamer size. The blades are set at a left-hand angle, with the front cutting edge on a 3-deg. angle. All threads are milled on centers, and the blade seats are ground with the threads as the locating points. The cone nut and graduated screw give adjustment to a thousandth of an inch. An adjustment wrench is furnished with each reamer. The tongue driver relieves the strain on the coupling nut.

Grinder, Electric, Alternating-Current, Bench and Floor
Standard Electric Tool Co., Cincinnati, Ohio.
"American Machinist," February 2, 1922



The machine is fitted with double-row ball bearings and has a Westinghouse motor equipped with a circuit breaker and furnished for either 110 or 220 volts, in single, two or three phases. The wheels used are 8 in. in diameter, have 1-in. face and ½-in. hole, and extend in front of the body of the motor for grinding long and irregular castings and bars. One coarse and one fine wheel and a 10-ft. reinforced cord and plug are furnished. A make-and-break switch is located on top of the motor. Weight, bench machine, 110 lb.; floor machine, 225 pounds.

Milling Machine, Valve, Duplex
Dale Machinery Co., New York, N. Y., and Chicago, Ill.
"American Machinist," February 2, 1922



The machine is intended for milling key-slots in automotive valve stems and similar work. It has two heads, each with its own spindle and pulley and collet chuck for holding the end milling cutter. A device holds the heads stationary while cutters are changed or adjusted. The work is held in a V-block. The cutters operate simultaneously. Feed is obtained through a ratchet operated by mechanism at the rear. The machine handles work up to ⅝ in. in diameter, and will mill slots up to ¼ in. in diameter and ⅝ in. long. Bench space 20 x 16 in.

Inc., New York City. J. J. Torpey will continue as assistant sales manager in charge of bearing distribution.

J. MARTIN DUNCAN, follow up engineer of the Detroit Steel Casting Co., Detroit, Mich., has been promoted to be general sales manager. He is being succeeded by E. R. Young. Mr. Allen, formerly sales manager, has been made assistant general manager.

DAVID WING, who has been associated prominently with many of the Government's activities touching coal, has been designated by Secretary of Commerce Hoover to act as the department's point of contact with trade associations desirous of discussing plans for submitting their statistical data to the department.

GEORGE W. SANFORD has been chosen general manager of the Bristol Brass Co., Bristol, Conn., brass manufacturers. He is at present engaged as purchasing agent for the City on the new High School building in Bristol, and will take over his new duties just as soon as he is completed with this work. Mr. Sanford was at one time with the Marlin-Rockwell Arms Co., New Haven.

HARRY W. BLIVEN, general sales manager of Harvey Hubbell, Inc., manufacturer of electrical goods, machine screws, machine products, etc., of Bridgeport, Conn., has recently been elected vice-president of that company. Mr. Bliven has been associated with the Harvey Hubbell Co. for over twenty years.

GARRETT W. B. BLANCHFIELD, of Hartford, Conn., has been appointed New England manager of the Peerless Weighing Co., of Detroit, Mich., manufacturers of weighing machinery.

Obituary

WILLIAM J. HENIFER, assistant chief of the reclamation department of the Aluminum Company of America, was killed by a locomotive in the yards of the company at Massena, N. Y. He was 33 years old.

SAMUEL L. MINER, a director of the Morris Machine Tool Co., Cincinnati, Ohio, died in that city on May 3. He was 82 years old.

FRANK W. EDWARDS, sales engineer for the Dayton Engineering Laboratories Co., died at his residence in Dayton, Ohio, from an acute attack of pneumonia. He had been associated with the Delco organization for more than a decade.

JOHN J. BRUCE, president and treasurer of the John J. Bruce Foundry Co., Cincinnati, Ohio, died in that city on May 16. He was 72 years old.

FRANK D. CHRISCADEN, assistant sales manager of Wicks Brothers, Saginaw, Mich., died at his home in that city on May 15.

LEGRAND SKINNER, founder of the Skinner Engine Works, Erie, Pa., died last week in his home in that city.

H. ZURCHER, JR., secretary-treasurer of the Canton Bridge Co., died last week at his home in Canton, Ohio. He was 42 years old. He had been associated with the Canton concern for the past 21 years.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

An agency is desired by a company in Sweden for the sale of technical novelties, electro-technical material, machinery, and other such articles. Quotations preferred c.i.f. Swedish port. Reference No. 2020.

A mercantile firm in Sweden desires to purchase packings, beltings, wood-working and iron-working machinery, and foundry machinery and requisites. Quotations should be given f.o.b. American ports or c.i.f. Swedish ports. Terms: Cash against documents or upon receipt of goods. Reference No. 1865.

The purchase is desired by a firm in Spain of piping for ships, copper plates, steel wire bound with hemp, raw steel for making tools, steel files, machinery for repairing ships and ship's motors, etc. Quotations should be given c.i.f. Spanish port. Correspondence desired in Spanish. Reference No. 2074.

A business man in Italy desires to open several quick shoe repair shops similar to those in the United States, and wishes to purchase machinery and full equipment for them. Terms: Cash against documents. Reference No. 2075.

An inquiry has been received from a firm in India desiring to purchase crude-oil engines of 10 to 50 horsepower, suitable to run flour mills, rice hullers, oil presses, sawmills, etc.; structural materials, such as beams and girders; and hardware, such as hinges, bolts, screws, nails, plates, bars, and needles. Quotations desired c.i.f. port of India. Terms: Cash with order. Reference No. 2048.

The purchase is desired by a firm in England of steel tubes and electrical accessories in large quantities. Quotations preferred c. i. f. English port. Shipment should be made via Liverpool or Manchester. Reference No. 2022.

Trade Catalogs

Cold-drawn Steels. Pittsburgh Tool Steel Wire Co., Monaca, Pa. A 24-page booklet describing a line of cold-drawn steels,—tool, alloy and high-speed steels, keystock, needle bar stock, Norway iron and welding wire.

Colt Autosan. Colt's Patent Arms Manufacturing Co., Hartford, Conn. A circular describing the recently perfected No. 21 washing machine for metal parts. The machine is illustrated in its various phases of operation.

Flexible Shafts. N. A. Strand & Co., Chicago, Ill. Catalog No. 22, describing and illustrating a complete line of flexible shafts and equipment. Several types of machines are shown, equipped with this shafting, for drilling, tapping, grinding, reaming and other operations.

Shapers and Milling Machines. The John Steptoe Co., Cincinnati, Ohio. A large and well-prepared catalog describing and illustrating the line of Steptoe shapers and milling machines. Various models are shown, with their special features described in detail.

Newark Gear Cutting Machines. Newarg Gear Cutting Machine Co., Newark, N. J., Catalog No. 3, describing a line of Newark spur gear cutting machines. The pages are profusely illustrated with photographs of the machines and their parts. Specifications for several models are included.

Sprague Electric Drive for Newspaper Presses. Sprague Electric Works, New York City, N. Y. Bulletin No. 48,717, describing some recent improvements in electric motor drives for all sizes and types of newspaper and other printing presses. Types of motors and controlling apparatus are shown, as well as actual installations of the systems.

Book Reviews

The Engineering Index for 1921. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York City. About six hundred pages, 6½ x 9½ in., bound in red cloth-boards. Price $6.

A carefully selected summary of articles taken from over six hundred engineering and technical publications. Each item contains the exact title of the article indexed; the author's name, if given; the name of the periodical in which the article appeared; the volume, number and date of publication. There is also included a brief note summarizing the contents of the article. The items are arranged alphabetically and are cross-referenced, making it easy for the reader to locate any article wanted. The index contains over 1,400 such items.

Tensile Properties of Some Structural Alloy Steels at High Temperatures. Technologic Paper No. 205, of the Bureau of Standards, Department of Commerce, by H. J. French. Complete copy of the paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price five cents.

In the production of ammonia by the Haber process, gradual elongation and ultimate fracture of bolts in converter chamber heads have introduced serious operating difficulties, indicating the need for exact information on the high temperature tensile properties of various alloy steels. The paper gives the determination of tensile strength proportional limit, elongation, reduction of area and strength at fracture throughout the range 20 to 550 deg. C. for four steels containing about 0.38 per cent carbon, as follows: plain carbon steel; 3½ per cent nickel steel; 3 per cent nickel; 1 per cent chromium steel; 1 per cent chromium; 0.2 per cent vanadium steel.

Microphotographs of the fractures, as well as tables and curves illustrate the results. Of the four steels tested in normalized condition, the two alloys containing chromium showed greater resistance to weakening by increase in temperature to about 550 deg. C., and at this highest temperature the chromium-vanadium steel was preferable from its high tensile strength and limit of proportionality. Carbon and 3½ per cent nickel steels behaved alike with rise in temperature, and at about 550 deg. C., the addition of nickel had small effect on tensile properties of carbon steel. At 550 deg. C., the strength and limit of proportionality of chromium-vanadium steel were more than twice that of carbon steel, while the ductility of the former, as measured by elongation and reduction of area, was half the latter, though still quite high. Below 475 deg. C., the strength of nickel-chromium steel was greater than chromium-vanadium and both showed higher strength values from 20 to 550 deg. C. than carbon or 3½ per cent nickel steels. The fractures of carbon and 3½ per cent nickel steels at about 550 deg. C. showed a tendency to follow the grain boundaries, while the fractures of chromium-vanadium steel appeared largely transcrystalline.

Forthcoming Meetings

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Reamer, Taper, "Colonial"
Greenfield Tap & Die Corporation, Greenfield, Mass.
"American Machinist," February 2, 1922.



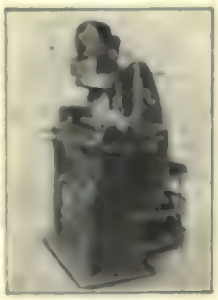
The reamer has three cutting lands. Two of the lands are relieved about 90 deg. on the cutting edge, while the third land is relieved for only about two-thirds of its width, leaving the remainder of circular section to act as a steadyrest. The reamer can be best driven by power. A shoulder or land reamer for parallel-sided holes is made with three equally spaced and fully relieved cutting lands midway between one of which is a narrow unrelieved land which acts as a steadyrest.

Drill Stand, Bench, Lever-Feed
United States Electrical Tool Co., Cincinnati, Ohio.
"American Machinist," February 2, 1922.



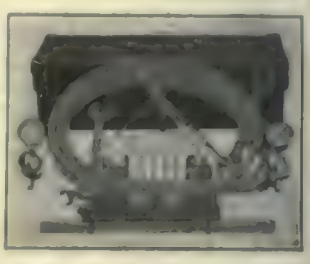
The stand holds portable and electric drills so as to adapt them to precision work. The drill may be easily clamped on the sliding head of the stand, and fed to the work by means of a hand lever. The height of the drill above the table is adjusted by sliding the head on the vertical column. The base is provided with T-slots. The stand is adapted to automobile garage and repair shop work, and holds ¼ or ⅜-in. portable electric drills. Weight, 68 pounds.

Grinding Machine, Hob, Automatic, Motor-Driven, No. 815.
H. E. Harris Engineering Co., Bridgeport, Conn.
"American Machinist," February 2, 1922.



The machine grinds either right- or left-hand helical, spiral and sharpens form cutters. Curved cutters of great variety in shape can be ground. The head and motor can be swiveled about the wheel center line. Because the 1-hp. motor driving the spindle and the motor driving the table the indexing mechanism, the work-rotating mechanism, and the pump. A hob 8 in. can be cut on work 1 in. in diameter to 47 deg. either right or left. The indexing head is heavier than formerly, with longer bearings farther apart. The machine will index from 2 to 24 divisions. Controls located at the front can be adjusted while the wheel is running. Table feed, 40 ft. per minute.

Welding Outfit, Garage, Acetylene, "American," No. 55.
Alexander Milburn Co., Baltimore, Md.
"American Machinist," February 2, 1922.



The outfit is intended for both welding and carbon burning and is packed in a fiber carrying case. The "American" torch is 16 in. long, and of the balanced-pressure type. The gas tubes are made of seamless tubing, while the torch head is made from solid wrought brass. All mixing of the gases occurs in the tip. The torch is provided with five tips of different sizes. The outfit includes hose and connections, welding rods and flux, goggles, gloves and a lighter.

Reamer, Expansion, Spiral-Fluted
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922.



The adjustment provides a range of sizes for each reamer. The helical flutes give free and clean cutting action. The helical flutes also safely carry the burrings of keyways. The reamer is equipped with a handle to hold the plug and a safety stop which prevents over-expansion and indicates the maximum limit. The reamers are made in all the regular sizes.

Engraving Machine, Motor-Driven, No. 1-8
George Gorton Machine Co., Racine, Wis.
"American Machinist," February 2, 1922.



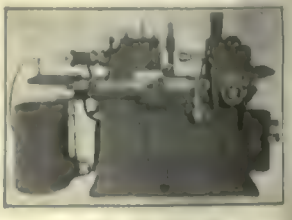
The machine is heavier and has a greater capacity than the former machines; it cuts dies, steel stamps and large-size letters in steel, brass and cast iron. The pantograph is adjustable to give a ratio of reduction of from 1:1 to 6:1, or a larger pantograph may be furnished having a reduction of 2:1 down to 8:1. Longitudinal table travel, 17½ in. Saddle crossfeed, 8½ in. Speed 1,800 to 8,000 r.p.m. Table, 10 in. wide, 30 in. long. Depth, 48 in. Width, 60 in. Height, 68 in. Weight, 1,800 lb. Export box, 148 cu. ft.

Gages, Square-Anvil, "Truform"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922.



In the adjusting and locking device two opposed headless set-screws in the frame roll against each other. Square anvils permit of working up to a shoulder and give a larger bearing surface. This type of anvil is interchangeable with the round-head type and two anvils may be substituted at any time.

Grinding Machine, Internal, "Hydroll"
Greenfield Tap and Die Corporation, Greenfield, Mass.
"American Machinist," February 2, 1922.



High traverse speeds are employed on the machine. The wheel spindle is carried on a slide controlled by a feed screw calibrated for feed increments of 0.00025 in. The work table reciprocates upon ways and carries a work head for holding and rotating the piece. The table traverse speed is controlled by the regulation of a sensitive throttle valve. For large bearing races with straight holes, a special workhead is provided. A single hand lever controls all table motions. A pedal is used to stop and start the work. Table speeds, 2 to 20 ft. per minute.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Fla., Lake Wales—The Johnson Motor Co., (automobile repairs), A. Johnson, Mgr. —machine shop equipment and machinery, (used).

Fla., Oldsmar—Oldsmar Mfg. Co.—machine shop and foundry equipment.

Ga., Columbus—T. Huston Mfg. Co.—30th St., C. R. Medley, Pres.—one 24- to 30-in. engine lathe, equipped with taper attachment, four-jaw chuck, steady rest, etc. (used.)

Md., Baltimore—C. E. Stevens Bros., Inc., 124 Hopkins Place, (manufacturer of bags)—lathe, 12- or13-in. swing (used).

N. Y., Falconer—Progressive Machine Co., West Main St.—lathes, drilling machines, power presses and other machine shop equipment.

N. Y., Gouverneur—The Gouverneur Welding & Machine Wks., Park St., F. Scozzafava, Purch. Agt.—acetylene welding outfit suitable for heavy work, also small used 18 in. hand lathe.

N. Y., Jamestown—Third & Lafayette St. Garage, S. G. Robbins, Pres.—machinery, tools and equipment.

N. Y., New York—Hopp Bros., 132 West 14th St.—3 power shears and 1 36 in. square.

N. Y., Niagara Falls—F. Tanbellini, 2461 Cudaback Ave.—tools and machinery for proposed garage and repair shop.

N. Y., Olean—Lucas & Marra, 33 North 1st St.—machine tools and equipment for improved auto garage and repair shop.

N. Y., Sacket Harbor—R. Gowing Co., Main St., (boat manufacturer), R. Gowing, Purch. Agt.—14-16 in. back geared engine lathe and upright post drill, (new or used).

N. Y., Westover—Boland & Bartlett, (machine shop and garage), C. Bartlett, 131 Hawley St., Binghamton, Purch. Agt.—complete machine tool equipment for motor repair station.

O., Columbus—The Carroll-Thompson Co., 555 East Long St., J. L. Thompson, Pres.—one grinder for service station.

O., Columbus—Snyder Auto Co., 70 South 4th St., H. B. Snyder, Purch. Agt.—one drill press, one grinder and 2 or 3 raised racks for turning over autos for repairing.

O., Columbus—C. Zimmerman & Sons Co., 269 Broad St., P. Seeds, Service Mgr.—lathe, grinder and new equipment for service garage.

O., Painesville—The Ohio Mfg. Co.—small circular shear.

Pa., Grove City—P. Hassel—machinery and equipment for garage on Mercer-Grove City Pike.

Pa., Phila.—C. B. Leonard, 2429 West Allegheny Ave., (machinist)—lathes, boring machines, milling cutters, etc.

Pa., Phila.—The Pennsylvania R.R., 18th and Filbert Sts., S. Porcher, Purch. Agt.—small machine tools and number of riveters.

Pa., Pittsburgh—The Flannery Bolt Co., Vanadium Bldg.—1½ in. Landis bolt cutter.

Pa., Sharon—New Bell Garage, South Irvine Ave.—machinery and equipment for garage.

Pa., Sharpesville—L. Moderella—tools, machinery, etc., for small auto shop, also air compressor and tire shop equipment.

Va., Richmond—A. Reeves, 311 West Broad St.—grinding machines and lathe.

Wis., Osse—C. J. Amundson—equipment and machinery for auto repair shop.

Wis., Milwaukee—American Sheet Metal Works, 255 Lake St., C. Koch, Purch. Agt. —power punch for 19 gage plate.

Wis., Milwaukee—F. R. Dengel Mfg. Co., 336 4th St., plumbing supplies—additional machine tools including lathe and drill press.

Wis., Milwaukee—Wisconsin Grey Iron Fdry. Co., 39th Ave. and Burnham St., J. A. Burke, Purch. Agt.—several electric power molding machines.

Wis., Plymouth—The Central Garage, C. C. Arndt, Secy.—small power machinery and equipment for auto repairs.

Ont., Chatham—Weaver Mfg. Co., Richmond St., W.—tools and machinery for the manufacture of garage equipment.

Ont., Kingston—T. Watson Co., Ltd.—equipment for machine shop and foundry and for the manufacture of concrete mixers, crushers, and road machinery, including steel working machinery, lathes, drills, etc.

Ont., Kitchener—R. Kleinschmidt, Frederick St.—equipment for new garage and repair shop.

Que., Montreal—A. Brabant, 88 Shannon St., equipment for garage and repair shop.

Ont., Ottawa—The Board of Control, City Hall, A. F. Macallum, Engr.—Will receive bids until May 30, one variety saw, one Buzz planer or joiner, one Ball threading machine, one Universal tool and cutter grinder, one power forcing press, one Scleroscope, one combination gas furnace, one kerosene asphalt tool heater, two 2¾ in. diameter Ingersoll-Rand drills, one small portable gasoline operated air compressor, one quarry jackhammer or hammer drill.

Machinery Wanted

Fla., Loughman—The Everglades Cypress Co., J. W. Tucker, Mgr.—engines, sawmill equipment and machinery.

Fla., Tilton—Thorn Reed Lumber Co., address, H. P. Thorn, Martinsburg, W. Va., Purch. Agt.—woodworking machinery for the manufacture of spokes, axe handles, etc.

Ga., Macon—Willingham Sash & Door Co., O. P. Willingham, Jr., Vice-Pres.—one 48-in. or 49-in. sander, late type.

Ga., Savannah—Georgia Cane Syrup Co., 103 West 43rd St.—machinery for bottling syrup, hot syrup filters, etc.

Ill., Elksville—The Journal, (newspaper) —power paper cutter.

Kan., Neosha Falls—The Post—newspaper press, job press and equipment.

Ky., Sadieville—New Eva Milling Co., W. W. McCabe, Pres.—machinery and equipment for mill (feed, grain, etc.).

Mich., Cathro—L. Austin—shingle mill.

Mich., Detroit—The Curtis Co., Lafayette Blvd.—miscellaneous presses and printing machinery.

Minn., Minneapolis—Bd. Educ., 305 City Hall, G. F. Womrath, Business Supt., will receive bids until May 25, refrigerating machinery for Northeast, Roosevelt Junior and Jordan Junior High Schools.

Minn., Walker—The Walker Creamery, C. E. Rausch, Prop.—5 or 7 hp. motor, lineshaft, hangers, pulleys and belting; 2 galvaninzed iron storage tanks, 4 x 2 x 10 ft. and 2 x 2 x 8 ft. respectively, also one water pump with motor.

Mo., Joplin—C. L. Clark, 2402 Empire St., (machinery dealer). H. Johnston, Purch. Agt.—heavy belting, shafting for concentration mill for mines.

Mo., Joplin—The Labor Tribune, 4th and Joplin Sts., D. Grafton, Purch. Agt.—8 column power press for daily newspaper also 3 linotype machines.

Mo., Kansas City—Fuller & McClintock, Produce Exchange Bldg., J. R. McClintock, Purch. Agt.—traveling cranes, water tube boilers, water wheels, large high duty air compressors, crank and fly wheel pumping engines, radial block stacks, stokers, centrifugal pumps and coal handling equipment.

Mo., Kansas City—J. M. Pate, Andover 7—Universal woodworking machine.

N. C., Goldsboro—The Utility Mfg. Co., J. L. Borden, Pres.—new machinery for proposed veneering plant.

N. C., High Point—Ellison Furniture Co., O. H. Ellison, Purch. Agt.—woodworking machinery, including carving spindle, mortising machine and dove-tailer.

N. C., Mt. Pleasant—A. M. Haithcock—flour mill machinery.

N. C., Shelby—A. P. Weathers—ice making and cold storage plant machinery and equipment.

N. J., Clayton—C. Haegle, (machinist)—one nickel plating outfit with attachments complete.

N. J., Newark—Kraeuter & Co., Inc., 563-585 18th Ave., attention of W. H. Hall, "Hawker" adjustable rod and dowel machine complete with regular equipment, range of cutter head ¼-in. to 2-in. diameter.

N. Y., Binghamton—F. E. Harris Co., Stack Bldg.—machinery and equipment for extract factory on Griswold St.

N. Y., Buffalo—Republic Light Heat & Power Co., 173 Winspear Ave.—drilling machinery, cables, etc., for use in extensive drilling operations at Forestville, N. Y.

N. Y., Buffalo—Webb Clean Sweep Co., Inc., 87 Troup St.—machinery for the manufacture of sweepers, brooms, etc.

N. Y., Buffalo—J. Zwelling, 222 Mulberry St.—equipment for sheet metal works.

N. Y., Catskill—The Recorder—flat bed press for power equipment.

N. Y., Endicott—Interstate Limestone Corp., E. E. Kellogg, Little Meadows, Pa., Purch. Agt.—machinery for making concrete blocks and bricks; special forms and shapes for building tiles; mixer and tamper.

N. Y., Forestville, (Chautauqua Co.)—Arkwright Natural Gas Co.—well-drilling machinery, bits, cables, pipe and other miscellaneous equipment for drilling operations.

N. Y., Gouverneur—The Love & Love Co., Barnes St., manufacturer of truck bodies, H. Love, Purch. Agt.—woodworking machinery for the manufacture of automobile truck bodies, also forge and blower.

N. Y., Harrisonville—The Gazette—one 17 column newspaper power press.

N. Y., Margaretville—The News—newspaper power press.

N. Y., Mount Morris—Mount Morris Canning Co.—semi-automatic apple and fruit paring machines, also other canning factory machinery and equipment.

N. Y., New York—Young & Hyde, Produce Exchange Bldg., (contracting engineers)—2 hand power shears, portable, to cut 12 in. beams.

N. Y., Niagara Falls—E. V. Nutting, 449 10th St.—machinery, tools and equipment for plating works.

N. Y., Pike—C. Ellis—cooling machine, 8 x 6 x 10-ft. for market.

N. Y., Pulaski—J. W. Bonney—$1,500 worth of wood working tools and equipment.

N. Y., Rochester—The Rocnester Gas & Electric Corp., Clinton Ave., N., J. P. Haftenknapp, Engr.—miscellaneous equipment for proposed liquid gas pumping station.

N. Y., Watertown—The International Burr Corp., 500 Newell St., F. W. Aiken, Purch. Agt.—special machinery for the manufacture of newly patented pulp stone grinding burr.

O., Cleveland—City of Cleveland, c/o Purchasing Dept., is receiving bids until June 1, for 2 industrial trucks and charging apparatus for the new public hall.

O., Cleveland—King Tool Grinding Co.—small machinery and tools.

O., East Columbus—W. C. Hardy & Co., James Pike—concrete block making machinery.

Pa., Phila.—J. B. Connors, 603 East Indiana Ave., (dryers and weavers)—additional machinery for new dye house.

Pa., Phila.—Fay, Kaiser & Sailer Inc., Front and Clearfield Sts., silk and wool manufacturers, L. A. Fay, Mgr.—carders, looms, feeders, drawing frames and other machinery.

Pa., Phila.—The Hensel Colliday Co., 12th and Wood Sts, manufacturer ribbons, silks, etc.—delivery systems, conveyors, chutes, feeders, looms, roving frames, improved twisters, etc

Pa., Phila.—I. J. Horstman Co., 315 Fitzwater St., manufacturer of woolen goods—carders, roving frames, improved twisters, etc.

The Weekly Price Guide

Rise and Fall of Market

Advances—Metals show added demand and prices move up along the list, electrolytic copper now quoted at 14c., lead at 6c., copper sheets at 19.75c., and babbitt metal, fair grade, at 30.80c. Pig iron is quoted from $1 to $4 higher. Brass rods at Cleveland, advance 50c. Old metals show large gains in New York and Cleveland, heavy copper at 1.75c. higher, and tea lead quoted at 4c. Washers advance 50c. to 1.25c. at New York. Castings are firm.

Declines—A leading dealer in shop supplies cuts quotations on machine bolts, lag screws and rivets.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Lower Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Boston	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Rochester	12.0	6.5	3.0
Buffalo	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.60	3.48	3.15	3.38
No. 12	2.65	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21	3.00	4.15	3.55	4.10
Nos. 22 and 24	3.05	4.20	3.60	4.15
Nos. 25 and 26	3.10	4.25	3.65	4.20
No. 28	3.15	4.30	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11	3.15	4.35	3.75	4.30
Nos. 12 and 14	3.25	4.45	3.85	4.40
Nos. 17 and 21	3.55	4.75	4.15	4.70
Nos. 22 and 24	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No. 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅛ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	69	57½	⅛ to 1¼	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅛"	8.00		12@13
¼	6.50		11@12
5/16 to ½	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.00
Tin, 5-ton lots, New York	32.25
Lead (up to carlots), St. Louis, 5.40; New York	6.00
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.25	7.50	6.25
Copper sheets, base	19.75	20.00	23.00
Copper wire (carlots)	14@14.50	16.50	16.25
Copper rods (ton lots)	18.25	21.50	19.50
Copper tubing (100-lb. lots)	21.75	23.00	23.00
Brass sheets (100-lb. lots)	16.25	17.50	18.75
Brass tubing (100-lb. lots)	19.00	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	13.75	15 50	15.75
Brass wire (carlots)	16.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J .	39.00	.....	
Solder (½ and ½), (caselots)	23.00	22.00	19 00
Babbitt metal (fair grade)	35.00	40.75	36.00
Babbitt metal (commercial)	15.50	15.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	11.75	11.75	10.25
Copper, heavy, and wire	11.00	11.00	9.25
Copper, light, and bottoms	9.50	9.00	8.25
Lead, heavy	4.50	4.50	3.65
Lead, tea	4.00	3.25	3.00
Brass, heavy	6.25	5.00	8.00
Brass, light	5.25	4.50	4.75
No. 1 yellow brass turnings	5.75	5.50	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.95	.95	1.04
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1½ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	..$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60–5%	.....	60-5%
Square and hex. head cap screws	....75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50–5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, hex. heads	+10–15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3 25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3 25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1¼ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0 15	.....	0.15
½ in. diameter *EXTRA*	0 50	.....	0.50
1 in. long, and shorter *EXTRA*	0 50	.....	0.50
Longer than 5 in. *EXTRA*	0 25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	....	1.49
Cloth	3.02	....	3.20

Pa., Phila.—The Kaufman Plush Co., ... Lane and Venice St.—...machine, a machine cleaning, ... finishing flat cards and other machinery.

Pa., Phila.—E. Nason Baking Co., Emery and ... Ave.—...ery system and ... machinery.

Pa., Phila.—The Phila. Chair Exchange, 9th and Vine Sts., manufacturer of chairs and ...—one stover and one large ... press.

Pa., Sharon—A. Hosannah—air compressor, tools and machinery for small automobile repair station.

S. C., Florence—L. Tyler—box making machinery (new or used).

S. C., Liberty—Beverly Stone & Sand Co., ... drilling drum, air compressor, approximately ... 6-in. and 8-in. pressure.

Tenn., Knoxville—...ance Machy. Co., ... bldg., 121 South Central Ave.—...hardwood flooring machine, and ... for hardwood flooring; 42-in. band ... machine; 100 cu.ft. belt-driven ... compressor, 2 to 10 h.p. 60-cycle, 3 phase, 440-volt motors and 100 and 150 h.p. ... phase 2300-volt motors. (Motors rebuilt or used, in good condition.)

Tex., Beaumont—Stedman Fruit Co., E. Stedman, Pres.—two 10 x 10 cold storage ... with connections.

Va., Front Royal—C. A. Ford, flour mill ...—milling machinery for small flour mill. (New or used.)

Va., Lynchburg—Lynchburg Pigments Corp., W. A. Rutherford, Secy. and Mgr.—paint grinding machine. (New or used).

Va., Norfolk—Florida Bottle Mfg. Co., F. P. Brunet, Pres.—bottle manufacturing machinery.

Va., Staunton—C. W. Mongold, (manufacturer of ... brick, etc.)—machinery for grinding lime, (new or used).

Va., Tremont (Nora P. O.)—The Sutton Lumber Co.—lumber mill machinery and equipment.

Va., West Point—Chesapeake Corp.—W. C. Gochenour, Secy.—$75,000 to $100,000 worth of machinery for manufacture of pulp board and paper specialties.

Va., Wytheville—Gay-Cla Bottling Co., J. L. Porterfield, Secy. and Mgr.—complete line of soda bottling machinery and equipment.

W. Va., Bluefield—Amer. Fruit Co., H. Chapman, Vice Pres. and Genl. Mgr.—machinery for cold storage plant addition.

W. Va., Piedmont—North Branch Coal Co., P. S. Fahey, Secy.—complete line of coal mining machinery.

Wis., Kenosha—Buick Garage, 915 Salem Ave.—gasoline storage tank and pump.

Wis., Kenosha—P. Pizzangell, 803 ...—equipment for blacksmith shop including forge, drill grinder.

Wis., Milwaukee—Electric Bag Co., 615 Cherry St.—special machinery for the manufacture of burlap bags.

Wis., Milwaukee—Lighthouse Superintendent, Federal Bldg.—one M. M. Works—two diesel engine machine.

Wis., Milwaukee—Sherman Produce Co., ... 6th St.—ice cutting machinery, 1 to 2 ton capacity.

Wis., Trippville—H. Wheeler—equipment for proposed blacksmith shop at Glendale.

Alta., Ft. McMurray—The McMurray ... & Oil Co., Petrolea, Ont., has ... and process for separating oil from ... sands and plans to manufacture ... and equipment and develop ... sands on a large scale. Receiving ... for separating equipment, power ... and refining equipment. Estimated cost ... T. Hewey, c/o owner, Engr.

N. S., Maccan—P. W. Fitzgerald—machinery and equipment for large dairy.

Ont., Beamsville—...—power equipment for manufacturing jam.

Ont., Dundas—The Crushed Stone Corp.—... for crushed stone plant recently ... by fire.

Ont., Dunnville—...—machinery and equipment for the manufacture of fancy toweling, overdrapes, etc.

Ont., Galt—...—special ... and ... equipment for the ... of ... goods of plush.

Que., Montreal East—The Hochelaga ... Co., Ltd.—...for cement plant.

Ont., Preston—...—sheet ... machinery and ...

Ont., Smith Falls—International Button Co.—machinery for the manufacture of buttons.

Metal Working Shops

Conn., New Britain—C. D. Ventiano, Church St., has awarded the contract for the construction of a 2 story, working shop, garage and service station, on Church St.

Ind., Ft. Wayne—International Harvester Co. has awarded the contract for the construction of several buildings for the manufacture of motor trucks. D. E. Zimmerman, 811 Chestnut St., Engr.

Md., Port Covington—(Baltimore P. O.)—The Western Maryland Ry., Hillen Sts., has awarded the contract for the construction of locomotive repair shops, here. Cost several hundred thousand dollars. W. C. Byers, Pres.

Mass., Springfield—E. J. Pinney, Inc., 374 Main St., will build a 1 story 100 x 100-ft. garage on Main St. Estimated cost, $40,000.

N. J., Melville—Thompson Machine Co. is having plans prepared for the construction of a 2 story factory—Estimated cost, $150,000. Fletcher Thompson, Inc., 542 Fairfield Ave., Bridgeport, Conn., Engrs. and Archts.

N. Y., Jamestown—S. B. Robbins, 31 West 5th St., has awarded the contract for the construction of a 2 story, 80 x 80 ft. garage and shop on 4th and Lafayette Sts. Estimated cost, $40,000. Noted Mar. 16.

N. Y., Johnson City—Boland & Bartlett have awarded the contract for the construction of a 1 story, 50 x 150 ft. machine and repair shop. Estimated cost, $20,000.

N. Y., New York—L. Gold, 2 Rector St., will build a 1 story garage on Columbus Ave. between 204th and 205th Sts. Estimated cost, $175,000.

N. Y., New York—Niewenhous Co., 316 East 161st St., will build a 21 story, 60 x 85 ft. garage on 3rd Ave. and 160th St. Estimated cost, $40,000.

N. Y., New York—T. F. T. Realty Co., c/o Seelig & Finkelstein, Archts., 44 Court St., Brooklyn, will build a 1 story garage on East 3rd St. Estimated cost, $75,000.

N. Y., New York—H. Weprin, c/o V. Mayper, Archt., 156 40th St., is having plans prepared for the construction of a 2 story, 100 x 100 ft. garage at 412 East 55th St. Estimated cost, $50,000.

O., Cleveland—D. S. Blossom, c/o A. Garfield, Archt., Natl. City Bldg., has awarded the contract for the construction of a 2 story garage and service station on Richmond Rd. Estimated cost $50,000.

O., Cleveland—The Champion Rivet Co., East 108th St. and Harvard Ave., plans to build a 1 story factory addition on Dunham Rd. Estimated cost $50,000. D. J. Champion, Pres. Architect not selected.

O., Cleveland—The Natl. Bronze & Aluminum Co., East 88th St. and Laisey Ave., has awarded the contract for the construction of a 1 story, 20 x 150-ft., addition to its factory on East 88th St. and Laisey Ave. Estimated cost $40,000. Private plans.

O., Cleveland—The Stone Improvement Co., Kirby Bldg., has awarded the contract for the construction of a 1 story 42 x 149 ft. garage on East 83rd St. and Carnegie Ave. Estimated cost $45,000.

O., Cleveland—G. W. Walters Transfer Co., 476 East 115th St., is having plans prepared for the construction of a 1 story, 50 x 80 ft. garage and warehouse at 887 East 140th St. Estimated cost $40,000. Private plans.

O., Massillon—W. E. Wagner has awarded the contract for the construction of a 2 story, 48 x 105 ft. garage. Estimated cost $50,000. Noted March 23.

Pa., Grove City—The Bessemer Gas Engine Co. plans to construct a large addition to its plant on Lincoln Ave. Estimated cost to exceed $25,000.

Pa., Phila.—A. W. Barnes, Archt., 10 South 19th St., is receiving bids for the construction of a 1 story, 94 x 180-ft., garage on Bellfield Ave. and Courtland St., for S. H. Marvel, 1607 Hunting Park Ave. Estimated cost $50,000.

Pa., Phila.—The Richter Machine Co., Van Kirk Ave., has awarded the contract for the construction of a 1 story, 50 x 100-ft., machine shop on Erdwick and Van Kirk Aves. Estimated cost $7,000. Private plans.

Pa., Reading—Reading Casting Co. plans to rebuild its casting factory, which was destroyed by fire. Estimated cost, $40,000.

R. I., Anthony—The Coventry Co. has awarded the contract for the construction of a 2 story, 60 x 100 ft. machine shop addition.

Tenn., Chattanooga—The Somerville Iron Wks. has awarded the contract for the construction of an addition to its plant. Estimated cost $750,000.

Wis., Glendale—H. Wheeler, Trippville, plans to build a 1 story 75 x 80 ft. blacksmith and repair shop, here. Estimated cost $40,000. Architect not selected.

Wis., Kenosha—Buick Garage, 915 Salem Ave., is receiving bids for the construction of a 1 story 50 x 125-ft. addition. Estimated cost, $40,000. Private plans.

Wis., Madison—The Bd. Educ. plans to construct a 1 and 3 story, 75 x 80 ft., manual arts shop, including shops for machine work, woodworking, etc., on 5th St. Estimated cost 55,000. Architect not selected.

Wis., Plymouth—The Central Garage plans to construct a 1 story, 54 x 120-ft. garage and repair shop on Division St. Estimated cost $50,000. Architect not selected.

Wis., Racine—The Walker Mfg. Co., Hamilton and Michigan Sts., has awarded the contract for the construction of a 1 story, 60 x 98 ft. addition to its auto accessory factory on Hamilton St. Estimated cost $9,000. Private plans.

Ont., Kingston—T. Watson Co., Ltd., is building a 70 x 100 ft. foundry and plans the erection of 4 other units. Estimated cost, $40,000.

Ont., Kitchener—R. Kleinschmidt, Frederick St., plans to build a garage and repair shop. Estimated cost $40,000.

General Manufacturing

Cal., Visalia—The California Packing Corp., 101 California St., San Francisco, is receiving bids for the construction of a 1 story, warehouse addition to its packing plant here. Estimated cost $20,000. P. Bush, 101 California St., San Francisco, Engr.

Conn., Hartford—The Fuller Brush Co., 547 Asylum St., has awarded the contract for the construction of a 4 story, 80 x 400 ft. plant with 80 x 100 ft. oil, also 120 ton coal pocket, on Windsor Ave. Estimated cost, $500,000. Noted April 6.

Cal., Hanford—The Hanford Ice Co., West 6th St., has awarded the contract for the construction of a 60 ton ice plant on Phillips St.

Cal., San Jose—The Security Warehouse & Cold Storage Co., 350 North 1st St., has awarded the contract for the construction of a refrigerating plant on North 1st St. Estimated cost $23,000. Private plans.

Ind., Indianapolis—Goodman & Co., 615 North Noble St., is having plans prepared for the construction of a 1 story, 100 x 190 ft. hosiery factory on North Noble St. Estimated cost $30,000. Lockwood-Green & Co., 38 South Dearborn St., Chicago, Engrs.

Ind., Indianapolis—C. E. Pauley & Co., 112 East Maryland St., has awarded the contract for the construction of a 5 story, 95 x 135 ft., printing plant on North New Jersey St. Estimated cost $225,000.

Mich., Detroit—The Curtis Co., Lafayette Blvd., has awarded the contract for the construction of a 2 and 3 story printing plant and office building on West Grand and Hamilton Blvds. Estimated cost $125,000.

N. J., Trenton—McCrillish Quigley Co., State St., has awarded the contract for the construction of a 3 story, 60 x 100-ft. printing plant on Wood St. Estimated cost, $75,000.

N. Y., Buffalo—Webb Clean Sweep Co., Inc., 87 Troup St., is receiving bids for the construction of a 40 x 48-ft. sweeper factory on Troup St. Estimated cost $5,000. Architect not announced.

N. Y., Newark—Phillips-Werth Optical Co. plans to build a 55 x 175 ft. optical factory on Willow Ave. and Main St. Cost to exceed $35,000. Architect not announced.

N. Y., New York—The New York Wet Wash Co., 732 East 144th St., has awarded the contract for the construction of a 3 story laundry on Concord Ave. and 144th St. Estimated cost $100,000.

O., Cleveland—Lockwood Greene & Co., Engrs., Hanna Bldg., is receiving bids for the construction of a 4 story, 80 x 140 ft., factory on East 40th St. along the tracks of the New York Central R.R., for Billings-Chapin Co., 1163 East 40th St., paint manufacturer. Estimated cost $200,000. Noted Nov. 24.

American Machinist

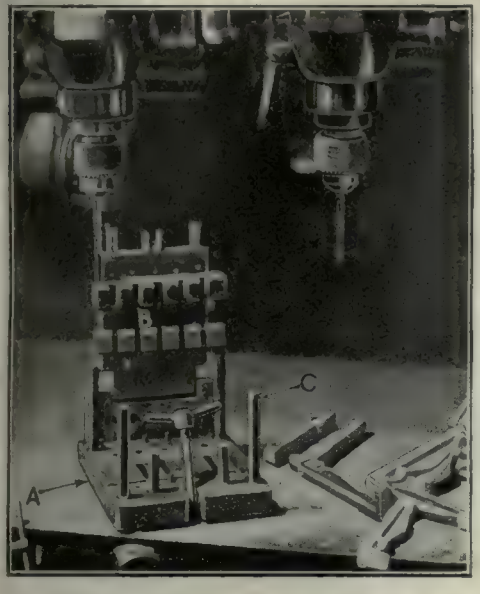
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Methods in a Radio Shop

Some Devices That Have Been Developed To Handle Small Parts Used in Radio Apparatus —Jigs, Fixtures and a Magazine Feed for an Engraving Machine

By FRED. H. COLVIN
Editor, *American Machinist*

THE devices illustrated herewith have been developed by the Acme Apparatus Co., Cambridge, Mass., for the rapid handling of small parts used in radio apparatus. A drilling jig for transformer frames is shown in Fig. 1. Five of the side bars shown piled on the bench are held between the pins shown in the baseplate *A*. The lid *B* is closed over the bars and is clamped by the screw shown. The bushings are carried in the plate and the jig is then turned upside down, resting on the feet *C*, so that the holes are all drilled from the flat sides of the bars. These bars are of aluminum and it is, of course, necessary to clean the jig between each loading, so as to insure the next pieces fitting evenly on the plate *A*. The operator found that by dipping the empty jig in a pail of gasoline, the chips were removed instantly.



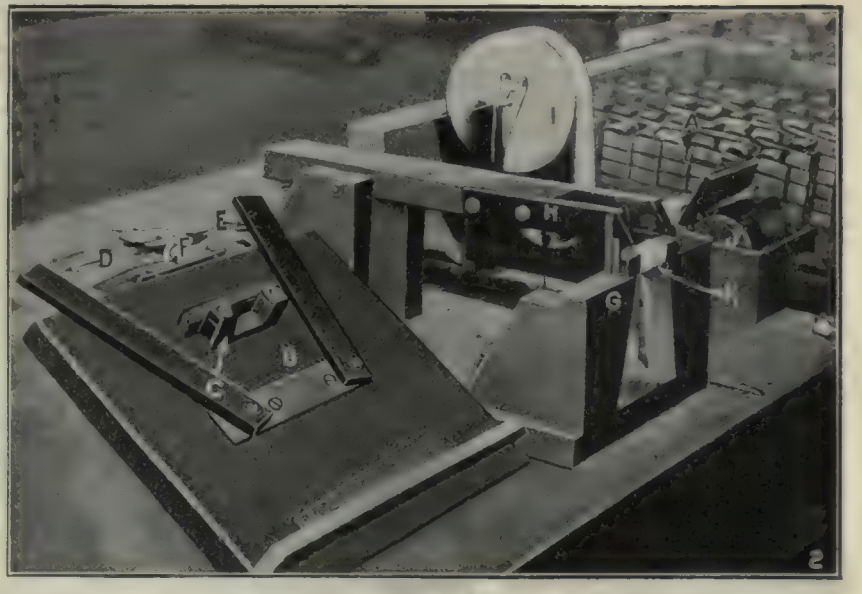


FIG. 1—DRILLING THE TRANSFORMER FRAME. FIG. 2.—ASSEMBLING KEEPERS FOR TRANSFORMER CORES

The cores for the transformers consist of a stack of U-shaped stampings, some of the assembled ones being shown at *A* in Fig. 2. The flat keepers that are placed over the ends of the cores are assembled in the fixture

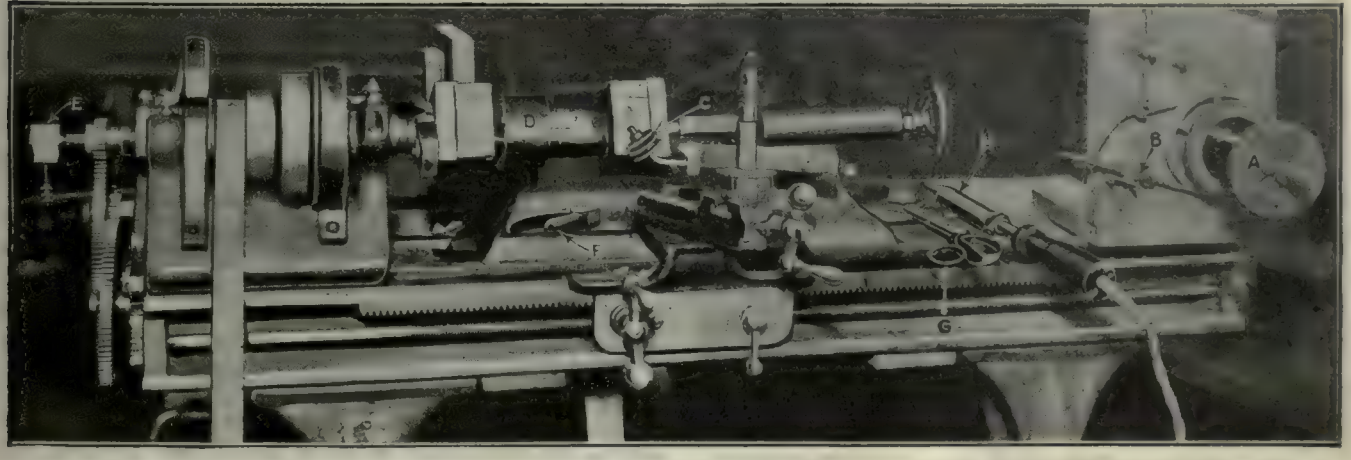


FIG. 3—WINDING SPECIAL COILS

shown at *B*. The required number of strips are laid on the two-pronged block, as at *C*, and the two arms *D* and *E* are brought together until they stop against the

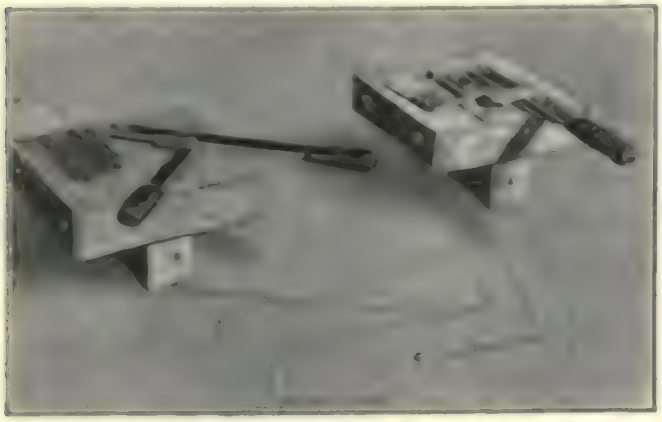


FIG. 4—BENDING FIXTURES FOR CONNECTING WIRES

ends of the plate *F* which indicates that the strips are in a central position. The package is then picked up by placing the thumb and finger between the prongs and placed in the binding fixture *G* while the arm *H* is brought down by a treadle to hold it in place until it is secured by the insulating paper. This paper is carried on the roll *I* and is threaded through the moistener at *J*. A sufficient length is torn off and wrapped around the center of the stack of strips at *K*. It will be noted that the open construction of the frame *G* and the arm *H* makes it easy to bind the strips.

An idea of some of the special windings required, and the method of doing the work may be had from Fig. 3. The lathe is fitted with a special chuck for holding the cores to be wound. The wire comes from the spool *A* which is kept under the proper tension by the spring controlled brake *B*. The wire is fed around the grooved roller *C* and onto the cores as at *D*. The counter *E* enables the operator to keep track of the number of turns in the coil, which is very important in this work. The wire cutter *F*, the shears *G* and the electric soldering iron *H* complete the necessary paraphernalia for this work.

Simple Bending Forms

Simple fixtures for bending some of the various connecting wires are shown in Fig. 4. They are made up of wooden blocks designed to be easily clamped in a vise by the tongues *A*, and are provided with sheet metal faces on which are mounted various bending levers and forms, as shown. The fixtures shown are only two of many different fixtures of this kind. Some of the wires bent to various shapes may be seen on the bench in front of the fixtures.

The device shown in Fig. 5 is a magazine feed for a Gorton engraving machine. The plates to be engraved are of standard insulating material and are stacked in the magazine at *A* and fed upward by the weighted chain *B*. The lever *C*, when in the position shown in the illustration, acts as a stop to prevent the upward feed of the pieces in the magazine. When it is moved from the stop position, it allows the pieces to rise,

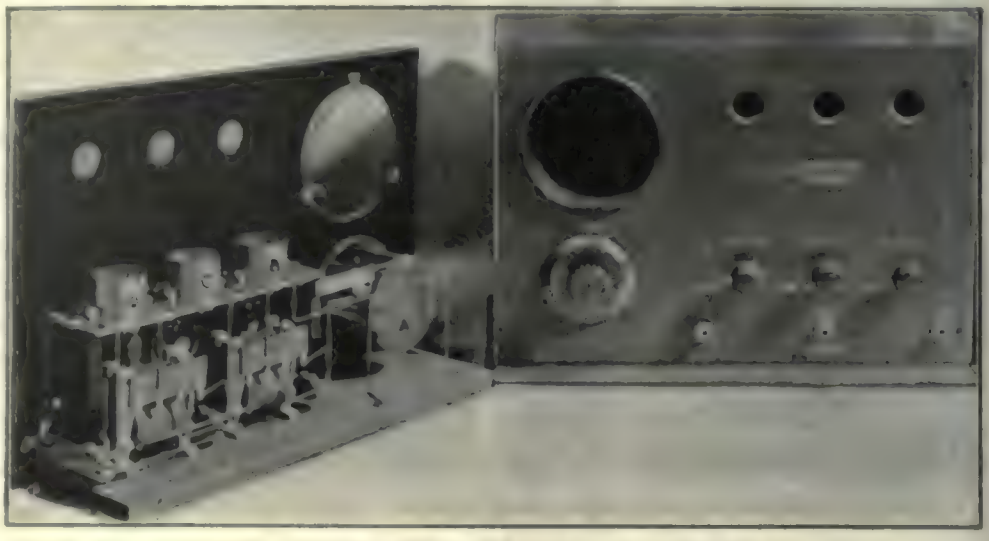


FIG. 6—COMPLETE APPARATUS AND ASSEMBLY

and when moved back to the stop position it pushes the top piece under the plate *D* and brings it into position so that the engraving will be done in the proper location and also pushes the last piece engraved from under the plate *D* and to the left away from the magazine. When the table is full of pieces that have been engraved each successive motion of the lever *C* pushes off the piece at the extreme left of the table from where it drops into a chute leading to a receptacle.

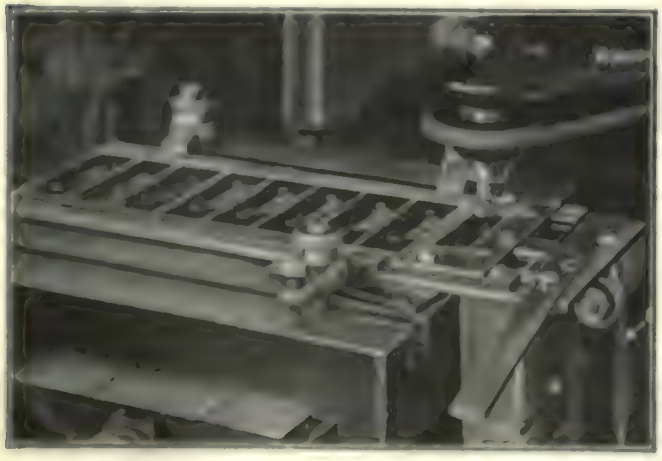


FIG. 5—A MAGAZINE FEED FOR AN ENGRAVING MACHINE

The Assembled Apparatus

Some idea of the appearance of the assembled apparatus is given in Fig. 6. The completed transformers are shown in place at the left, together with some of the connecting wires and the manner in which the parts go together. This is a complete little unit, comprising a variable condenser tuner at *A*, an audion tube detector socket at *B* and sockets for amplifying bulbs at *C* and *D*. The front of the complete box, shown at the right, is one of the pieces fed to the engraving machine through the magazine described above. The engraving consists of lettering and arrows showing the direction in which to turn the various control knobs.

Estimating Modern Gear Production

Charts and a Slide Rule That Make Estimating Easy—Use of Disk Cutters and Hobs—Extra Travel of Cutters—Examples of Estimate Sheets

By GUSTAVE E. SPIES
Estimator, Gould & Eberhardt

THE increased productivity obtained from modern machines has created a demand for a means to easily and accurately calculate such production.

An estimating operation should be applicable to a given set of operating conditions, the method being such that the required result is obtained by means of purely mechanical operations on the part of the person doing the estimating, necessitating little or no mental effect.

Many factors affect the accurate calculation of gear production, each of which must be given careful consideration. The chief factor is the proper selection of the most suitable method, type of machine for the required output, style, finish and accuracy of the gear.

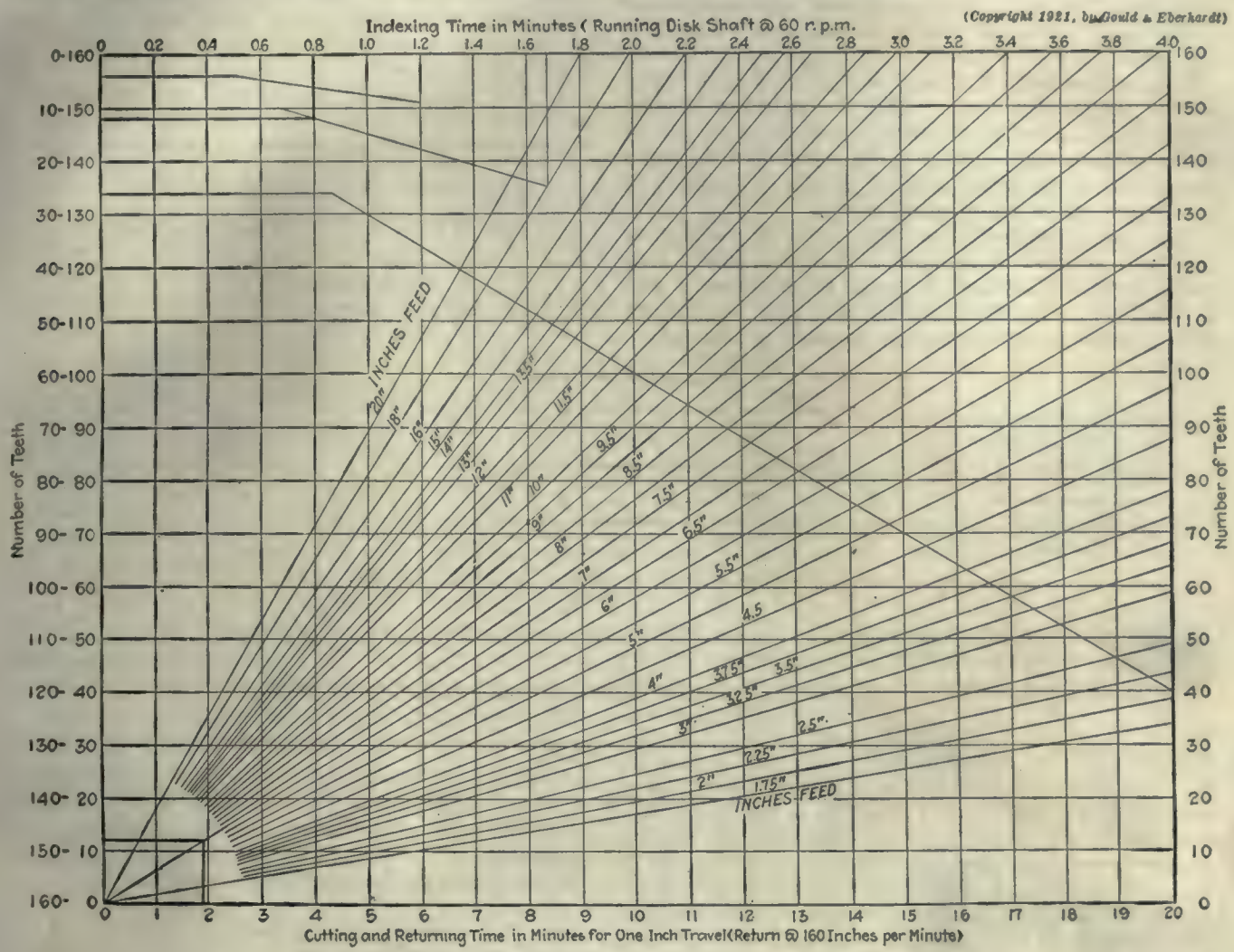


FIG. 1. CHART FOR DISK-CUTTER TYPE MACHINES

A series of charts has been developed in the factory of Gould & Eberhardt, Newark, N. J., for rapidly and accurately calculating the rate of production on gear cutting machines. The charts, which are presented herewith and fully described, are especially adapted for both the hobbing and disk-cutter type machines manufactured by Gould & Eberhardt. A slide rule for the same purpose is also shown and described which has various advantages over the charts mentioned, particularly in expediting the calculations.

Knowing this the following factors, relative to machining, are then to be considered.

Using Disk Cutters

First—When a disk-cutter type machine is selected:

A, Style of cutters.
B, Work support
C, Feed and return of cutter
D, Indexing of blank.

A. Cutters are of great importance in obtaining the best results. Great care should be taken in their selection and consideration should be given to the following items:

Whether the quality required is such that roughing

and finishing cutters are necessary.

Whether the quality required will permit finishing in one cut.

Whether two or more teeth can be finished simultaneously.

Whether one tooth can be finished with a roughing and finishing cutter in gang.

For roughing gears of 3-pitch and finer, cutters with right and left rake and hooked cutting faces can be used to advantage both singly and in gangs. When used in gangs, the cutters should be arranged in herring-bone style, that is, the inner edges of the cutting teeth on the two cutters should cut simultaneously and then the outer edges of the succeeding teeth and so on alternately, thereby counteracting any oscillating effect of the gear being cut, due to the alternate action of the cutters.

Gang cutters with right and left rake, but with radial cutting edges have been used for finishing several teeth in the gear blanks where quality was not of prime consideration. It is to be noted that in using these cutters the cutting edge should be radial and not hooked, as in the roughing cutter.

For coarser pitches a roughing cutter of the stepped type with hooked faces, and a finishing cutter with radial faces can be used in gangs for finishing a gear in one cut. The finer pitches can also be finished, with a finishing cutter radially ground, in one cut.

For the highest class of gears, it is advisable to rough out the gear with a single or gang roughing cutter, and then finish it in a separate operation with a radially ground finishing cutter.

B. The work support should be of very rigid design so as to eliminate the tendency for the machine to chatter. It has been found that the work support is a very important factor, in both output and finish of gear cutting machines. The elimination of chatter also increases the life of the cutter, by reducing the number of sharpenings of the cutting edge to a minimum.

C. The feed of the cutter in inches per minute must be selected with particular regard to the quality of finish desired and to maintain the proper form of tooth. The kind of material to be cut also controls the feed as well as the style of cutter used. The return of the cutter is an automatic operation which is constant and is figured in inches per minute.

D. The indexing of the blank is also an automatic operation and is constant for each tooth, the speed of which depends upon the number of teeth to be cut.

Work on a Hobbing Machine

Second—When a hobbing machine is selected:

A, Hob
B, Work support
C, Hob speed
D, Hob feed.

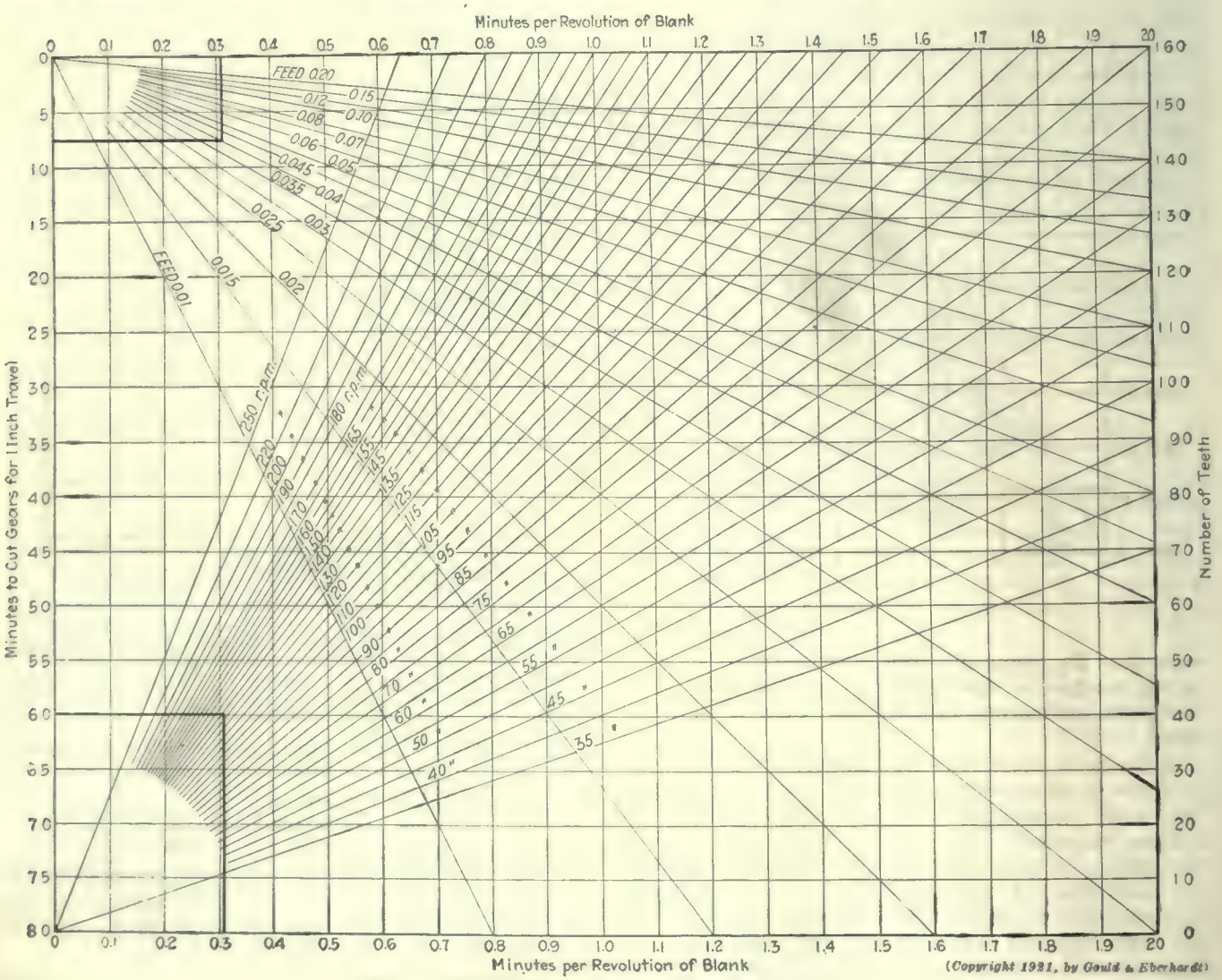


FIG. 2. CHART FOR GEAR HOBBING MACHINES

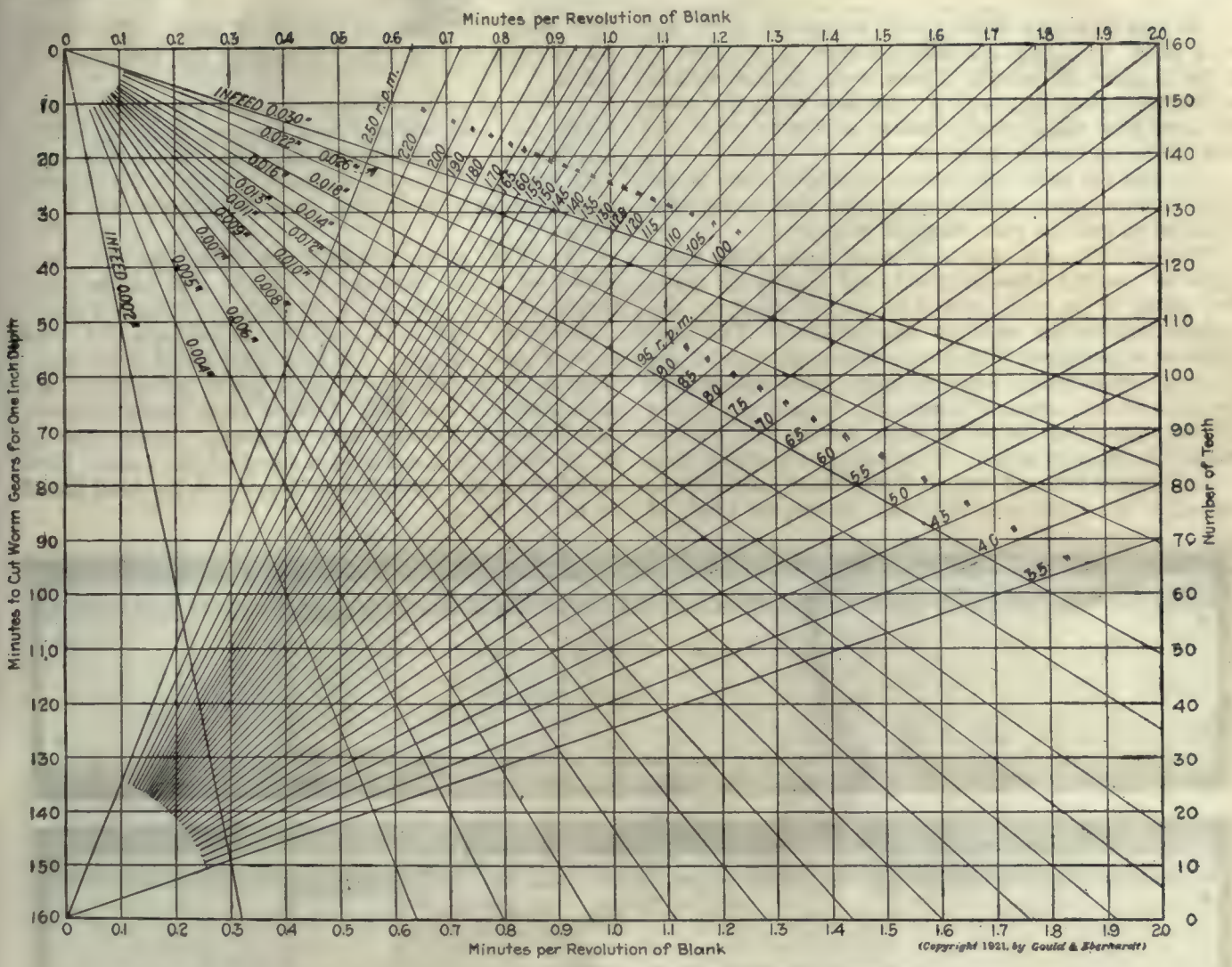


FIG. 3. CHART FOR WORM-WHEEL HOBBING MACHINES

A. The selection of the hob rests upon the following considerations:

Whether a roughing and finishing hob is to be used.
Whether or not the quality of finish is such that only one cut need be taken.

It has also been found advantageous, when roughing with hobs that they be made with hooked cutting faces, instead of radial cutting faces. Also that the roughing hob must be made thinner than the finishing hob. For accurately forming the teeth a radially ground hob should be used.

For commercial purposes spur gears and helical gears can be finished in one cut. For gears of higher quality it is generally advisable in cases of 3-pitch and coarser to take two cuts, one roughing and one finishing.

B. The work support must be of still more rigid design than that used on disk-cutter machines. The rim of the blank must be supported near the periphery. Very substantial clamping means should be applied because of a certain amount of tangential pressure that is put on the gear while being cut. When cutting helical gears of extreme angles it is often advisable to have keyways in the gear and in the work arbor.

C. The speed in feet per minute of the hob depends entirely upon the material to be cut and the number of sharpenings determined upon as being the most economical for a given period of time or output.

In hobbing gears, the speed of the hob, or rather its revolutions are an important factor in the output. In this respect hobbing is distinguishable from disk cutting, in which the revolutions of the cutter do not directly effect the output.

D. The feed of the hob in inches per revolution of the gear blank depends upon the finish required. It is not greatly affected by the material to be cut.

The practice as outlined, having been carefully considered, the next step is to determine the limitations of the machine, that is to say the number of blanks which can be stacked, having due regard for the fact that the blanks should be removed without disturbing centers. The estimator is then ready to proceed with the actual calculation of the output.

Jsing Chart for Disk Cutter Estimating

In Fig. 1 is illustrated a rectilinear chart especially designed for gear cutting machines of the disk cutter type. The factors having been determined as outlined, this chart is used as follows:

(1) Enter at the origin of chart and read up vertically on the tooth column to number of teeth in gear to be cut. From there go horizontally on the tooth line to where it intersects with the selected feed line, and read down vertically finding at bottom of chart the cutting and returning time of gear for 1 in. travel.

(2) Multiply this number by the total travel of cutter, and the product or result is total cutting and returning time, in minutes.

(3) For indexing time, enter at top of chart and read down vertically on tooth column to number of teeth in gear to be cut. From there go horizontally on the tooth line to where it intersects with the index line and read up vertically finding at top of chart the total indexing time in minutes.

(4) Add the total cutting and returning time to the total indexing time. The sum is total time in minutes required to cut the gear or stack of gears.

Example: To cut spur pinions in large daily quantities of medium class of finish and having 12 teeth, 3-4 pitch, 4 in. face and 0.50 carbon steel, a six-spindle turret-type machine was selected. This machine is so arranged that three cutters are cutting the teeth in three blanks mounted upon three spindles on one side of the turret. Three other blanks are loaded on the remaining three spindles during the cutting operation, thereby practically eliminating setting time.

The cutters selected were provided with radial faces and alternate right and left rake in sets of three of uniform diameter. The feed of cutter carriage per minute selected was 6.5 in. The total travel of cutter in this case is 5¾ in. using cutters of 4¾ in. diameter and having an extra travel of 1¾ in.

(The extra travel for cutters and hobs can be readily obtained from Fig. 5 which also indicates proper diameters for the various pitches.)

(1) Cutting and returning time in minutes for 1 in. travel (return at 160 in. per minute) = 1.95 min.

(2) 1.95 min. x 5¾ in. total travel = 11.03 min.

(3) Indexing time for 12 teeth = 0.8 min.

(4) Total cutting time 11.83 min.

The total time, 11.83 min., is for three pinions to which is added setting time of 0.5 min. for rotating turret and starting cut on three other blanks.

In Fig. 2 is shown a rectilinear chart adapted for spur and helical gear hobbing-machines. The factors having been determined as outlined above, the chart is used in the following manner:

(1) Enter at the origin of chart and read up vertically on tooth column to the number of teeth in gear to be cut. Then read over horizontally on tooth line to where it intersects with r.p.m. line (speed of hob) and read down vertically to bottom of chart. The result found there will be time in minutes per revolution of blank.

(2) Find at top of chart minutes per revolution of blanks just obtained and read down vertically to where this intersects with selected feed line. From here read over horizontally to left of chart and figure obtained in minute column is cutting time in minutes for 1 in. travel.

(3) The above quantity multiplied by the total travel of cutter carriage in inches will be the total time in minutes required to cut the gear or stack of gears.

Example: Let it be required to compute the total cutting time per gear, for mild steel gears of 40 teeth, 8 pitch, 1¼ in. face, stacking six gears per setting. An accurately cut and finely finished tooth being required, the following factors were assumed. Radial hob of 2⅞ in. diameter running at a speed of 130 r.p.m. Feed of 0.040 in. per revolution of blank and the total travel of hob 8½ in.

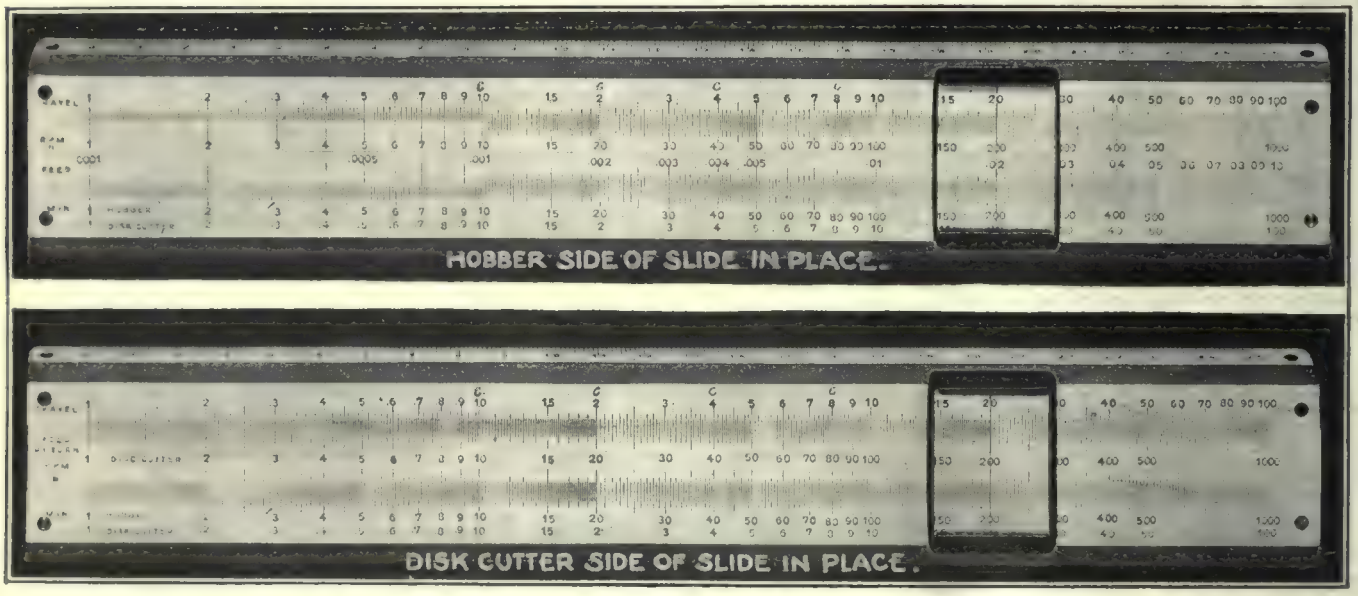


FIG. 4. SLIDE RULE FOR HOBBING AND DISK-CUTTER TYPE MACHINES

The following results were obtained by using the chart:

(1) Time per revolution of blank = 0.31 min.

(2) Time for 1 in. travel = 7.7 min.

(3) 7.7 min. per inch x 8½ in. total travel = 65.4 min. = cutting time for six gears.

In Fig. 3 is shown a chart used for computing the necessary time to hob worm wheels by the "infeeding" method. As this chart is analogous to the hobbing chart just described, its use need not be explained in detail.

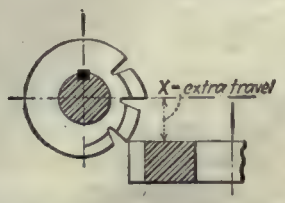
Charts similar to those shown in Figs. 2 and 3 can be prepared for calculating output on worm-wheel hobbing machines equipped with tangential feed. Different feed values in this case must be substituted for the feed values shown in Fig. 2. These values depend upon whether a tangential feeding hob or a fly tool is used. For the latter, smaller feed values are inserted. The method of using this chart is identical with that described in spur and helical gear hobbing.

In Fig. 4 is illustrated a slide rule developed by the writer for computing the problems solved by the charts just described. This slide rule being less cumbersome and combining in one instrument the essential elements of several charts, is far superior for quick work. In

common with other slide rules it consists substantially of a body with a slide and runner. All the scales on this rule, including the reverse side of slide, are graduated logarithmically with three cycles between the indexes. The slide as illustrated has two sides graduated, one for hobbing and the other for disk-cutting time computations. The four gage points marked *C* on travel scale represent constants which vary according to the number of teeth being cut on a disk cutter machine. They indicate the number of revolutions made by the disk shaft in indexing one tooth. Their use will be explained later. The scales have certain markings which are thus explained.

Travel = Total travel of hob or cutter.

The scale marked "MIN." has two values, an upper and a lower. The upper value indicates in minutes the



CUTTERS									HOBS							
HOLE	1¼		1½ •		1½		2 •		HOLE	1¼		1½		2		
KEYWAY	3/16 x 5/32		3/8 x 3/16		3/8 x 3/16		1/2 x 3/16		KEYWAY	3/16 x 5/32		3/8 x 3/16		1/2 x 1/4		
PITCH	DIAM.	X	DIAM.	X	DIAM.	X	DIAM.	X	PITCH	DIAM.	X	DIAM.	X	DIAM.	X	
1½					7¼	3⅜			1½					7½	3½	
1¾					6¾	2⅞			1¾					7¼	3⅜	
2					6¼	2¾			2			5¾	2½			
2¼					6¼	2½			2¼			5¼	2¼			
2½					6¼	2⅜	5¾	2½	2½			5	2⅛			
2¾					6¼	2¼	5¾	2⅜	2¼			4¾	2			
3	4¾	1⅞			5¼	2	5¾	2 1/16	3	4½	1⅞					
3-4	4¾	1¾	4¾	1¾	5¼	1 15/16	5¾	1 15/16	3½	4⅛	1¾					
3½	4	1½	4½	1 15/16	5¼	1⅞	5½	1½	4	3⅞	1½					
4	4	1⅝	4⅜	1 11/16	5¼	1½	5¼	1 15/16	3-4	3⅞	1½					
4-5	4	1 7/16	4⅜	1½	5¼	1⅜	5¼	1⅜	5	3½	1⅜					
5	3½	1⅜	4¼	1½	5¼	1⅜	5⅛	1⅜	4-5	3½	1⅜					
5-7	3½	1⅜	4¼	1 5/16	5¼	1⅜	5⅛	1⅜	6	3¼	1¼					
6	3½	1¼	4¼	1⅜	4¾	1⅜	5⅛	1⅜	7	3	1 1/16					
6-8	3½	1⅜	4¼	1¼	4¾	1⅜	5⅛	1⅜	5-7	3	1 1/16					
7	3½	1 5/16	4	1¼	4¾	1⅜	4⅞	1 5/16	8	2⅞	1					
7-9	3½	1 1/16	4	1⅛	4¾	1⅜	4⅞	1 1/16	6-8	2¾	1					
8	3½	1⅛	4	1 5/16	4¼	1 5/16	4⅞	1¼	9	2⅝	15/16					
8-10	3½	1	4	1⅛	4½	1 1/16	4⅞	1 5/16	7-9	2⅝	15/16					
9	3½	1 1/16	3⅞	1⅛	4¼	1⅛	4¾	1 5/16	10	2½	15/16					
10	3½	1	3⅞	1 1/16	4¼	1 1/16	4¾	1⅛	8-10	2½	15/16					
12	3½	⅞	3¾	15/16	4¼	1	4⅝	1 1/16	12	2½	7/8					
14									14	2½	¾					

• *Special cutters for multiple spindle machines*

FIG. 5. TABLE OF EXTRA TRAVEL FOR CUTTERS

total cutting time for hobbing, and the lower value has a triple significance, namely, cutting time in minutes, total returning time in minutes, and total indexing time in minutes for a disk cutting machine.

Scale Markings on Hobber Side

On the side of the slide marked Hobber the scale markings denote the following:

r.p.m. = Revolutions per minute of hob

N = Number of teeth in gear to be cut

Feed = Vertical feed for spur or helical gears and tangential or infeed for worm wheels per revolution of blank.

On the side of the slide marked Disk Cutter the scale markings indicate the following:

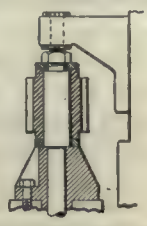
Feed = Feed of cutter in inches per minute

Return = Return of cutter in inches per minute

N = Number of teeth in gear to be cut

DRAWING NUMBER AM-10	PART NAME Pinion		DATE 10-10-21	NUMBER 2708
NUMBER TEETH 12	PITCH 3-4	FACE 4"	AGENT J. R Jones Mach. Co.	
STYLE Spur	MATERIAL 0.50 Carbon Steel		CUSTOMER Smith Tractor Co.	
FEED 6.5"	SPEED 100 Ft.		MACHINE No.36 S.T.	(3 Spindles Cutting) (3 Spindles Loading)

FIXTURES



CUTTER				TIME	
DIAM.	HOLE	KEYWAY	WIDTH	CUTTING	SETTING
4¾"	1½"	3/8" x 3/16"	0.96	11.8 min	0.5 min.
Use cutters with R. and L. rake and radial edge. In sets of three				TOTAL 12.3 min.	EACH 4.1 min.
REMARKS				OUTPUT PER HOUR AT 80 PER CENT EFFICIENCY	OUTPUT PER HOUR OF 8 HOURS
Use 3 spindles, 1 gear each. Total 3 gears. Finish 1 cut				11.7 gears	93.6 gears
				NUMBER MACHINES REQUIRED TO CUT GEARS PER DAY	

FIG. 6. ESTIMATE SHEET FOR GEARS CUT WITH DISK CUTTERS

r.p.m. = Revolutions per minute of disk shaft for indexing.

The table below denotes the constants *C* to be used for different numbers of teeth.

N	*C*
4 — 9	8
10 — 25	4
26 and up	2

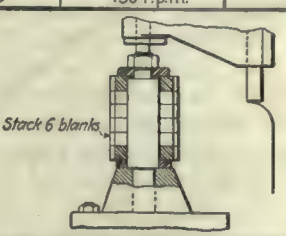
On some machines *C* has a constant value of 1 for all numbers of teeth. This value will not be used in this article.

Using the notation given above for disk-cutter machines, the basic formula for the computation of output follows:

$$\text{Minutes to cut gears} = \frac{TN}{F} + \frac{TN}{R} + \frac{NC}{r.p.m}$$

DRAWING NUMBER J-590	PART NAME Gear		DATE 10-10-21	NUMBER 2700
NUMBER TEETH 40	PITCH 8 P°	FACE 1¼"	AGENT F. B. Franklin Co.	
STYLE Spur	MATERIAL Steel		CUSTOMER J. P. Brown Mfg. Co.	
FEED 0.040"	SPEED 130 r.p.m.		MACHINE No. 18 H	

FIXTURES



CUTTER				TIME	
DIAM.	HOLE	KEYWAY	WIDTH	CUTTING	SETTING
2⅞"	1¼"	5/16" x 5/32"		65.4 min.	6 min.
Use radial hob				TOTAL 71.4 min.	EACH 11.9 min.
REMARKS				OUTPUT PER HOUR AT 80 PER CENT EFFICIENCY	OUTPUT PER DAY OF 8 HOURS
Cut 6 gears per setting. Finish 1 cut				4.+ gears	32+ gears
				NUMBER MACHINES REQUIRED TO CUT GEARS PER DAY	

FIG. 7. ESTIMATE SHEET FOR GEARS CUT BY HOBBING

The solution of the production problem used in connection with the chart for disk-cutter machines with the slide rule is given below.

(1) Set slide so 6½ in. on feed scale is under 5¾ in. on travel scale. Then move runner so hairline coincides with 12 on *N* scale, and on same hairline read on Min. scale for disk cutter, 10.6 min. cutting time.

(2) Set slide so 160 in. on return scale is under 5¾ in. on travel scale. Then move runner so hairline coincides with 12 on *N* scale, and on same hairline read on Min. scale for disk cutter 0.43 min. returning time.

(3) Set slide so 60 on r.p.m. scale is under constant 4 on travel scale. Then move runner so hairline coincides with 12 on *N* scale and on same hairline read on Min. scale for disk cutter 0.8 min. indexing time.

(4) Add the three results together and their sum is equal to 11.83 min., total cutting time for three gears.

An Estimate Sheet For Recording Computations

In Fig. 6 is illustrated an estimate sheet upon which production computations are recorded. The particular sheet shown has the result of the example just solved thereon.

Making use of the notations already given for hobbing machines, the fundamental formula for computing the probable output follows:

$$\text{Minutes to cut gears} = \frac{T}{r.p.m.} \times \frac{N}{F}$$

The problem used in connection with the hobbing machine chart will be solved by means of the rule, in the manner given below.

(1) Set slide so 130 on r.p.m. scale is under 8.5 in. on travel scale. Then move runner so hairline coincides with 40 on *N* scale.

(2) Reset slide so 0.04 on feed scale coincides with hairline on runner and under index on Min. scale for hobbers, read 65.4 minutes. total cutting time for six gears.

In Fig. 7 is shown an estimate sheet similar to that illustrated in Fig. 6 on which the result of the above example has been recorded.

With most gear cutting operations the setting time is largely dependent upon the type of machinery, the size and shape of the blank and the skill of the operator.

The Main Issue

By Entropy

It has often been said, and with much truth, that the principal object of manufacturers is to make money rather than to make any particular product. In the same way it may be said that every department of a manufacturing concern should be so conducted as to make the greatest net profits, always taking into account the permanency of the business and having due regard for the ethics of trade.

Every little while business is subject to fads that for the time obscure the main issue and which produce remarkable showings for certain departments, without always adding to the net profits. We have had attacks of cost systemitis, of planningitis, of Taylorism, and now we appear to be due for an attack of salesitis. Cost systemitis ran its course until it was discovered that it was important to cut down the cost of all parts of the product, and not merely those to which the cost system in vogue at the moment pointed a finger. Planningitis is still in full sway and will run until experience has shown just where it is profitable and where it is not. Taylorism ran until people became weary of hearing the word efficiency, and has since survived under other names and is at present applied in a less wholesale way.

The new thing, salesitis, briefly is a call to cut down cost of sales, ostensibly to enable this country to get its prices for manufactured goods down where they can be bought by those who need them, really to enable this country to pay a higher rate of wages than before the war and thus preserve a purchasing power that will enable us to live on our own market if we do not get the foreign business that we would like.

The Cost of Super-Service

We are told that it costs too much money to sell us things which we need. We reply that we do not want so much persuasion as we are getting, that we would rather buy as we wish than to have things sold to us. The ideal condition would be one where all advertising was educational and salesmen were merely demonstrators called in by the purchaser to confirm the statements made in the advertisement.

Those of us who make up our minds as to what we want and go after it rather than sit back and wait for salesmen to approach us, want to know why we do not get the cash and carry prices that we are becoming used to in the grocery trade. We feel that having a dozen agents spend ten dollars worth of time each and twenty dollars for traveling expenses to come and try to sell us a hundred dollars worth of goods means an expense that is unjustifiable; and we further are very certain that we are called on to pay for this super-service when we do buy, and that we are paying for similar service every time we buy. Yet we see no way to depart from the present custom. If we do go and buy without cost to the seller we get no rebate and hardly any thanks. So very naturally, seeing that we save nothing by doing otherwise we lie back, even though we know just what we are going to buy, and see agent after agent until the right one comes along and thus we experience that luxurious feeling that comes from being waited on. Being waited on is not only luxurious but it is enervating. Kept up long enough it renders us unable to wait on ourselves.

Without any desire to belittle the importance of getting at some plan to reduce all our selling to the self-service or automatic cafeteria plan, there does seem a danger that we may overlook the proper balance of total cost to total income. If we are to engage in any kind of manufacture the first thing to be accomplished is low cost of manufacture; and low cost of manufacture is first of all made possible by so designing the product that it can be made with the minimum of skilled labor, the least overhead charge, and yet fully meet the legitimate needs of the purchaser.

This last, the needs of the buyer, may, however, include much that is not utilitarian—it may include really artistic qualities as well as usefulness—but no matter what it includes, simplicity of manufacture should be kept in mind because it is just there, on the drawing board, that the greatest possible savings in total cost can be made. Let us not forget the main issue: Can we design so that low cost production can be assured and yet produce a useful product that appeals to the practical and so far as is necessary to the aesthetic side of the purchaser?

Properties of Aluminum Alloys

Why These Alloys Make Good Castings—Saving in Cost Shown in Relative Weights—Advantages of Melting Range, Thermal Conductivity, Rigidity and Shrinkage

FROM SALES DEPARTMENT CONDENSED DATA PREPARED BY THE TECHNICAL DEPARTMENT, ALUMINUM COMPANY OF AMERICA

FOR castings of low cost, or intended to meet special conditions, a comparison of physical properties indicates that aluminum alloys are often superior to other metals more commonly used. These alloys possess a decidedly low density, a shrinkage less than those of brass or steel and a thermal conductivity higher than that of iron. To attain the same rigidity as a cast-iron beam, a No. 12 alloy beam must be only half as heavy. Aluminum is therefore the better metal to use where low weight is the important consideration.

WEIGHT AND TENSILE strength of aluminum alloys are less than those of other cast metals.

Their shrinkage is greater than that of iron, but less than brass or steel shrinkage.

In thermal conductivity aluminum is higher than iron.

Its coefficient of expansion is twice that of iron and steel.

Melting range of its alloys provides for adjustment in mold while hardening.

The low density of aluminum is one of the principal reasons for its extensive use. Iron, steel, brass, bronze, copper, zinc, lead, tin and nickel are all heavier metals. With the exception of magnesium, all the common metals used for casting purposes are from two to three times as heavy as No. 12 alloy. To compare the true cost of any of these heavier metals with that of aluminum, the price of the heavier metal should be multiplied by a factor representing the number of times the weight of a certain volume of the heavier metal is heavier than the weight of the same volume of aluminum. For example, if the price of copper is to be compared with the price of No. 12 alloy it must first be multiplied by 3.11, the factor of copper which represents the number of times copper is heavier than No. 12 alloy, as shown in the last column of Table I.

The density of a metal is subject to variation from changes in both composition and structure. For this reason the values which are given in various books are frequently conflicting because the exact composition and structure are not stated. In general an attempt has been made in Table I to select values which are representative for the metals listed. In the case of aluminum and No. 12 alloy the values hold for dense castings. If the castings are somewhat porous they will have correspondingly lower densities, while if the impurities present are greater, the density may be increased somewhat.

Materials for motor car construction must possess the property of rigidity as well as that of high tensile strength. The rigidity of a metal depends upon its modulus of elasticity. The modulus of elasticity for No. 12 alloy, as shown by Table II, is 10,000,000 lb. per square inch as compared with 12,000,000 to 14,000,000 lb. per square inch for gray cast iron. If, therefore, beams be made of gray cast iron and No. 12 alloy of equal weight with the weight so distributed that the depth of the No. 12 alloy beam is 2½ times as great as that of the iron beam, the deflection of the cast-iron beam will be about seven times that of the aluminum beam under equal loads. The tensile strength of pure aluminum is low but increases when it is alloyed with copper, as shown in Table III. No. 31 alloy has a tensile strength equal to that of cast iron.

The thermal conductivity of aluminum is relatively high and is about 55 per cent of that of copper at 100 deg. C. The thermal conductivity of alumium increases with rise of temperature. This increase is about 10 per cent at 200 deg. C. and 15 per cent at 300 deg. C., while at 600 deg. C. the thermal conductivity is approximately twice as great as at 100 deg. C. According to these data, taken from the Smithsonian Physical Tables, the thermal conductivity of copper decreases with rise of temperature so that at relatively high temperatures aluminum actually has a higher thermal conductivity. Aluminum has a very much higher thermal conductivity than iron and this property makes the use of aluminum advantageous in the construction of motor parts which it is desirable to keep cool. Table IV lists some of the metals in order of their relative thermal conductivity.

TABLE I. DENSITIES OF METALS

(Data for aluminum from Research Bureau, A. C. O. A. Remainder of table compiled from Smithsonian physical tables and other sources. Values for 20 deg. C., 68 deg. F.)

	Grams Per Cubic Centimeter	Pounds Per Cubic Foot	Weights of equal Volumes With No. 12 Alloy = 1
Magnesium	1.75	109	0.612
Aluminum (Al, 99.7)	2.70	169	0.944
Aluminum (Al, 99.0)	2.71	169	.....
Aluminum (Al, 98.0)	2.73	170	.....
No. 12 Alloy (Al + Cu. 7.0 to 8.5)	2.84 to 2.87	177 to 179	1.00
No. 31 Alloy	3.0	187	1.05
Zinc	7.1	443	2.48
Iron, gray cast	7.1	443	2.48
Tin	7.3	456	2.55
Manganese	7.4	462	2.59
Soft Steel	7.8	487	2.73
Brass, cast (Cu 70; Zn 30)	8.4	524	2.94
Bronze, cast (Cu 80; Sn 20)	8.7	543	3.04
Nickel	8.8	549	3.08
Copper	8.9	556	3.11
Lead	11.3	705	3.95

TABLE II. MODULI OF ELASTICITY

Metals	Lb. Per Sq.In.
Lead	2,500,000
Aluminum	9,000,000
No. 12 Alloy	10,000,000
Cast Iron (gray)	12,000,000 to 14,000,000
Soft steel	30,000,000

TABLE III. TENSILE STRENGTHS

Metal	Tensile Strength Lb. per Sq.In.
Pure aluminum, cast	12,000 to 14,000
No. 12 Alloy	18,000
No. 31 Alloy	25,000
Cast brass (Cu 70 Zn 30)	40,000
Cast bronze (Cu 80 Sn 20)	32,000
Cast iron (gray)	25,000
Cast steel (soft)	60,000
Cast copper (electrolytic)	25,000
Cast zinc	4,000 to 12,000

It is important to know the thermal expansion of a metal when it is to be used for castings such as automobile pistons, which are subject to considerable variation in temperature. The linear thermal expansivity of aluminum is intermediate between that of zinc and brass

TABLE IV. RELATIVE THERMAL CONDUCTIVITIES AT 100 DEG. C. (212 DEG. F.)
(Compiled from Smithsonian Physical Tables)

Silver	100	Tin	14
Copper	91	Iron, wrought	14
Gold	71	Iron, cast	11
Aluminum	51	Steel, soft	11
No. 12 Alloy	40	Steel, hard	6
Magnesium	38	Lead	8
Zinc	26	Graphite	4

or copper, and about twice that of iron and steel. Table V shows the linear thermal expansivity per degree for unit of length of various metals. The volume expansion coefficient may be taken as three times the linear expansion coefficient.

The shrinkage of a metal is the linear contraction in cooling from the melting point to room temperature and determines the allowance the patternmaker must use in order to obtain a finished casting of the correct size. The shrinkage of aluminum alloys is somewhat greater than that of cast iron but less than that of steel. The decrease in shrinkage as a result of alloying pure aluminum with copper and zinc, is shown in Table VI. The high shrinkage of the pure metal is one factor which makes its use difficult except for simple castings.

The purest aluminum so far obtained melts at a temperature of 658.7 deg. C. or 1217.7 deg. F. as shown in Table VII. The commercial grades of metal melt at somewhat lower temperatures. Aluminum has the relatively high boiling point of about 1,800 deg. C. and is not appreciably volatile under ordinary conditions at temperatures below 1,000 deg. C. It is not good practice, however, in making castings of aluminum to heat the metal much above its melting point or to allow it to remain molten for a great length of time.

TABLE V. LINEAR THERMAL EXPANSIVITIES
Average Expansion Coefficient, 0 to 100 deg. C. (32 to 212 deg. F.)
(Compiled mainly from Smithsonian Physical Tables)

	Per Degree Fahrenheit	Per Degree Centigrade
Zinc	0.000017	0.000030
Lead	0.000016	0.000028
Magnesium	0.000015	0.000027
Aluminum	0.000013	0.000024
No. 12 Alloy	0.000013	0.000023
Tin	0.000013	0.000023
Cast brass (Cu 71; Zn 29)	0.000011	0.000019
Copper	0.0000095	0.000017
Nickel	0.0000078	0.000014
Cast steel	0.0000067	0.000012
Cast iron	0.0000056	0.000010
Invar steel	0.0000006	0.000001

Alloys differ from pure metals in that they do not melt at constant temperature but over a certain temperature interval. Alloys of eutectic composition are an exception to this rule and melt at constant temperature. The eutectic or lowest melting alloy of the copper-aluminum series contains 32 per cent copper and melts at 540 deg. C. (1,004 deg. F.). No. 12 alloy contains 8 per cent copper; it begins to melt at 540 deg. C. and is completely molten at 636 deg. C. (1,177 deg. F.). On cooling, the molten metal begins to solidify at 636 deg. and is completely solid at 540 deg. These facts are of great practical importance in the case of this alloy because the metal is more or less plastic over a considerable range of temperatures during the freezing process, and as a result, the metal is able to adjust its form to that of the mold without damage to the resulting casting.

The specific heat of aluminum is 0.21 at room temperature. This means that the quantity of heat that would raise the temperature of a given weight of aluminum through one degree, would raise the temperature of the same weight of water through 0.21 of one degree. The specific heat of aluminum increases with rise of temperature and is about 15 per cent greater at 500 deg. C. The mean specific heat in the temperature interval, 20 to 100 deg. C., for a number of metals, is given in Table VIII.

The electrical conductivity of pure aluminum is 61 per cent of that of copper. No. 12 alloy has an electrical conductivity only about 32 per cent of the conductivity of copper. Alloys have been developed which have conductivities less than 20 per cent of that of copper and which have temperature coefficients of resistivity less than half that of pure aluminum.

TABLE VI. SHRINKAGES OF METALS
(Inches per foot)

Pure aluminum	0.21	Brass	0.19
No. 12 Alloy	0.18	Gray iron	0.12
No. 31 Alloy	0.18	Steel	0.25

TABLE VII. MELTING POINTS
(These are the values accepted by the Bureau of Standards and given in their Circular No. 35. They hold for samples of the highest obtainable purity; less pure samples will in general have a lower melting point.)

Metal	Degrees Centigrade	Degrees Fahrenheit
Aluminum	658.7	1,217.7
Magnesium	651	1,204
Copper	1,083.0	1,981.4
Manganese	1,230	2,246
Nickel	1,452	2,646
Silicon	1,420	2,588
Iron	1,530	2,786
Zinc	419.4	786.9
Lead	327.4	621.3
Tin	231.9	449.4

TABLE VIII. SPECIFIC HEAT
Mean Specific Heat, 20 to 100 deg. C. (68 to 212 deg. F.)
(Compiled mainly from Smithsonian Physical Tables)

Water	1.000	Zinc	0.093
Magnesium	0.248	Copper	0.093
Aluminum	0.216	Brass	0.09
Cast iron	0.12	Tin	0.055
Manganese	0.121	Lead	0.031
Nickel	0.109		

Knowing the Other Fellow

BY ROBERT GRIMSHAW

The careful driver who knows his horses will be able to control them under adverse circumstances better than if he does not know their temperaments and capabilities. If this is true of the relations between the driver and his horses, how much more is it true of the leader and his human team, that have more species of temperament and more kinds of education, and can express their preference "without let or hindrance?"

Some men are amenable to reason; others "are open to conviction, but would like to see the man who could convince them." Some can be influenced only by "a soft word fitly spoken"; others again call for firmness, backed with authority. Some, indeed—fortunately few—must be handled like the children of the negro washerwoman, who on being complimented on their good behavior, and asked what method she employed to raise them, replied, "Ah raise 'em wid a bar'l stave, an' Ah raise 'em frequent!"

Some horses have been rendered balky by incompetent drivers, and once they have been so ruined, they must be handled skilfully until properly broken. So it is with men; if they have been oppressed and abused, it may take a period of firmness before they can be convinced that they will be handled gently if only they will respond.

Methods of Machine Tool Design

Conclusion of Third Article—Various Types of Machine Tool Gear Drives—A Number of Rules Applicable to Machine Tool Drives

By A. L. DeLEEUW

THE arrangements in use for obtaining variable speeds by means of gear shifts count up into the hundreds, and possibly thousands. It would be impossible to give rules or instructions as to which arrangement should be used unless all conditions were known. There are probably several thousand patents in existence dealing with various gear arrangements for variable speeds or feeds. The general tendency has been to make these arrangements more and more simple to operate, and to build them into a smaller and smaller amount of space. And the means to accomplish these aims have been the alloy steels, which permitted small gears to carry heavy loads; ball bearings, which did away to a large extent with friction; lubricating devices, which again reduced the friction on the shafts and made gears run more noiselessly, thus permitting higher speeds; and the automobile gear shift.

It used to be customary to make a change of speeds by removing a pair of change gears and putting on another pair, and this system is still in use for such machinery where shifts in speed are infrequent. It is not of much importance that a couple of minutes will have to be spent on a change of speed if the new speed is going to be used for days, or possibly weeks, at a time. Where frequent shifts have to be made, change gears are no longer used to any extent. When using change gears it is important to have them all with the same bore so that they can be used interchangeably. It is further important to avoid segments or any frail or

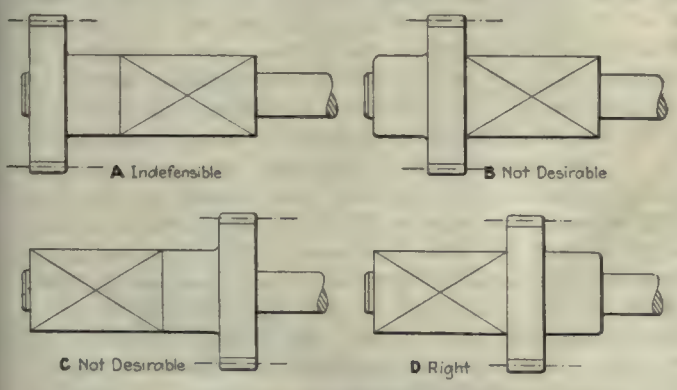


FIG. 22. METHODS OF MOUNTING HUB GEAR

loosely hitched up machine member, unless the amount of power to be transmitted is very small indeed. Where a large amount of power must be transmitted some provision should be made to support the outer end of the shaft. Where the change gears are confined in a box-like casting it should be possible to provide this casting with a lid or door containing the outward bearings for the change gear shafts.

There are two principal ways in which change gears are applied, namely, with or without the help of a movable quadrant or similar device. If they are applied without such a device, the sum of the numbers of teeth of two meshing change gears must be constant. In Fig. 23 *A* and *B* are the two change gear shafts, and *P* and *Q* are the change gears. It is possible to put a new gear on *A* with one tooth less, in which case *B* must receive a gear with one tooth more. We may continue this until we have gear *Q* on *A* and gear *P* on *B*. If the smallest gear on *B* should have *M* teeth and the

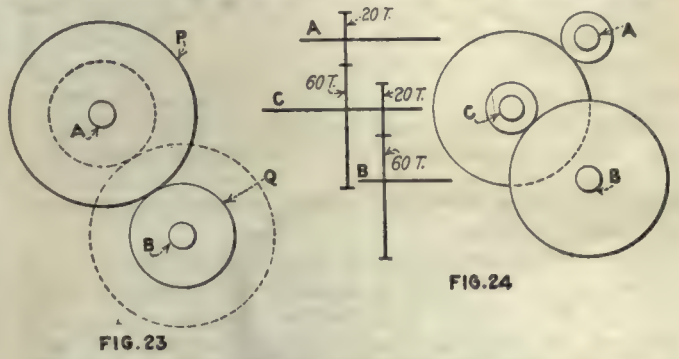


FIG. 23. CHANGE GEARS ON FIXED SHAFTS. FIG. 24. COMBINED SHIFT AND REDUCTION

largest gear on *A* should have *N*, then the sum of the number of teeth, *N* plus *M*, will be constant for any combination of gears we may put on the shaft; and the number of speeds we can obtain in this manner will be $N - M + 1$. However, if we should use all of these speeds we would sometimes slow down from *A* to *B*, and sometimes speed up; and, as particularly for heavy work, speeding up is not desirable, we will have to stop changing gears when both are of approximately even size. So, as a rule, only $\frac{N - M}{2} + 1$ change can be obtained.

Sometimes a gear *reduction* is combined with the gear *shift*. Such a device is shown in Fig. 24, where *A* and *B* are again the two shafts. A stud *C* carrying a compound gear is placed somewhere between *A* and *B*, though not necessarily in a straight line. It is not possible to say before hand how many speeds are obtainable in this manner, because there will be a time when one of the gears interferes with one of the shafts or bearings and when that time will be depends largely on the position of stud *C* in relation to shafts *A* and *B*. However, it will readily be seen that there are many more possibilities than before.

If, for instance, the pinion on shaft *A* cannot have less than 20 teeth, the gear on shaft *C* not more than 60 teeth, the pinion on stud *C* not less than 20 teeth and the gear on shaft *B* not more than 60; and if, again, we should not want to speed up—in other words, if we never wish to have a gear on shaft *A* larger than the meshing gear on stud *C*—it would be possible to have 21 speeds by merely changing these two gears. We would also get 21 speeds by changing pinion on stud *C* and gear on shaft *B*; but this does not mean that the total number of speeds obtainable will be $21 \times 21 = 441$, because if we have the combination 20-60—21-59 we will get the same speed as if we had 21-59—20-60; and furthermore, many of the speeds will be so very close together that they are of no practical value. However,

an arrangement, as the one shown here, is of great value when we want to obtain the following:

To get a variety of speeds over a wide range and so selected that we obtain as nearly as possible the proper

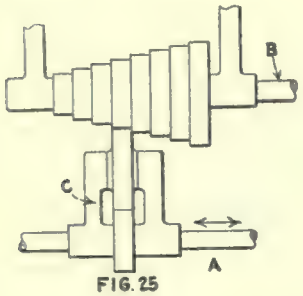


FIG. 25

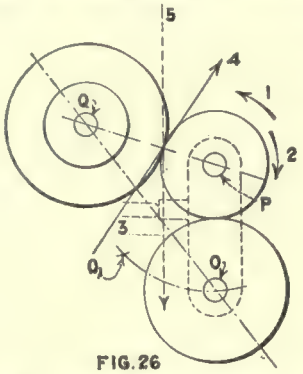


FIG. 26

FIG. 25. OLD-FASHIONED CONE, PINION AND IDLER. FIG. 26. DIAGRAM TO SHOW ACTION OF IDLER

speed for a few operations which we wish to carry out on a given machine.

The other arrangement of change gears is the well-known system in which a segment and idler are used, such as the change gear devices on the older style lathe, on the dividing head driving attachment on milling machines, and on various other machines such as the Brown and Sharpe screw machine. As a rule, the amount of power to be transmitted by such a device is so small that it is permissible to do some speeding up. However, it should not be forgotten that this speeding up will lead to a marked irregularity in the movement of the driven shaft, something which is quite noticeable when we attempt to mill a short lead spiral.

One of the favorite devices for obtaining the number of speeds by means of gears was the cone of gears with tumbler. Originally intended for a lathe feed it was gradually applied to drives transmitting considerable power and was found to lead to serious difficulties. Fig. 25 shows a cone of gears with pinion and idler in its most primitive form. In this form the device is only adapted to light feeds. *A* is the driving and *B* the driven shaft. The driving pinion is made to slide along the shaft by means of bracket *C* which also contains the stud or shaft for the idler. A lever attached to bracket *C* and not shown in the illustration serves to move this bracket endwise and also to turn it through the necessary angle to mesh the idler with one of the gears of the cone. All the tooth pressure is against the shaft which must necessarily have considerable length between the bearings, so that all the pressure between the gears of the cone and the idler causes the shaft to bend. Many variations of this construction have been made and there are many patents in existence dealing primarily with the means for engaging the idler with the selected gear of the cone. In many of these constructions the mechanism for the handling of bracket *C* is divided in two parts—one for the axial and one for the turning motion of the bracket. With these constructions two separate movements are required on the part of the operator for engaging the gears.

In Fig. 26 is shown a couple of gears of the cone, the idler and the driving pinion in diagrammatic form. Supposing the pinion to do the driving (which is not always the case as in some arrangements the cone is the driving member) we will notice that at the moment of engagement the idler may either pull itself in or may try to push itself away, depending on the direction of rotation. In the illustration with the center of the driving shaft located at *O* and the idler running in the direction of arrow No. 1, there will be a tendency to push the idler away at the moment of engagement, which will make the manipulation difficult and, in case of the transmission of considerable power, entirely impossible. Furthermore, the idler coming into engagement in the general direction of arrow No. 1, there is no possibility of placing a stop behind the bracket unless this is done by means of a third movement on the part of the operator, after the gears are in mesh; so that in a practical arrangement of this kind there would be a constant tendency to push the gears out of mesh. Any variation in load would cause the idler to move either further out of mesh or back again to its original position.

If the idler rotates in the direction of arrow No. 2, then it will have a tendency to pull itself in, but this

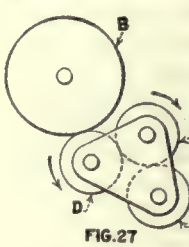


FIG. 27

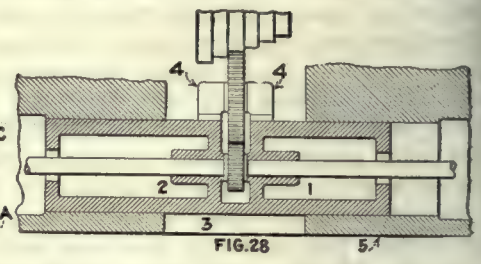


FIG. 28

FIG. 27. TUMBLER GEAR WITH TWO IDLERS. FIG. 28. SUCCESSFUL ARRANGEMENT FOR LIGHTER DRIVES

tendency can be overcome by placing a stop 3, against which the bracket can bear when the gears are fully in mesh. We see, then, that it is important to select the proper direction of rotation for the driving gear.

We are absolutely sure that if the idler runs in the direction of arrow No. 1 there will be a tendency to push it out of mesh, but we are not exactly sure that it will be pulled into mesh when it runs in the direction of arrow No. 2 because this depends not only on the direction of rotation but also on the relative location of the centers *O*, *P* and *Q*, and on the angle of action of the gear teeth. The solid line 4 indicates the direction of the line of action when rotating in direction of arrow No. 1; the dotted line 5 indicates the same for the opposite direction of rotation; and as long as this line falls between the centers *O* and *Q*, there will be a tendency to pull the idler into mesh, but if the center *O* were displaced and brought into a new location O_1 there would still be a tendency to push the idler out of mesh, notwithstanding that it has the proper direction of rotation. A careful investigation is therefore necessary as to the relation between the centers and the line of action. Tumbler gears have been used long before the cone of gears was applied to machine tools. Tumbler gear arrangements were found in the elevating mechanism for radial drills and in the reverse mechanism for the feeds on a lathe, and considerable trouble was experienced with such arrangements because the idler was necessarily running in the wrong direction part of the time.

In Fig. 27 is shown such an arrangement. *A* is the driving gear, *B* is the driven gear, and *C* and *D* are two idlers, each of which can be brought into mesh with *B*. These two idlers run in opposite directions and only one can have the proper direction.

Coming back to Fig. 26, it would seem at a first glance that it would be always easy to give the idler the proper

direction and this would be the case if there were only one gear in the cone with which the idler must mesh. However, there are several gears in the cone, and the diameters of these gears may vary so much that in some cases the line of action falls between the centers and in another case outside of the centers. If, for instance, in Fig. 26 the center *O* were near, but still to the right of line 5, and if at the same time the gear on center *Q* were made much larger, the line of action would fall outside the line *OQ*.

A construction is shown in Fig. 28, by which the driving shaft is entirely relieved of the pressure on the gears and which, at the same time, has the advantage of making a dust-free arrangement. The driving shaft finds its bearings 1 and 2 in a sleeve or cylinder 3. Pinion and idler mesh in a gap of the sleeve, the idler being held in a bracket 4, which is bolted to the sleeve. The handle for operating the sleeve is attached on the outside and is not shown in the illustration. The sleeve can slide and rotate in the bore of the frame 5. The pressure between the gears is therefore taken up on the sleeve. This arrangement has proved to be very successful and is quite well adapted to the lighter drives and to feeds. Where heavy drives must be taken care of it is advisable to use some other arrangements on

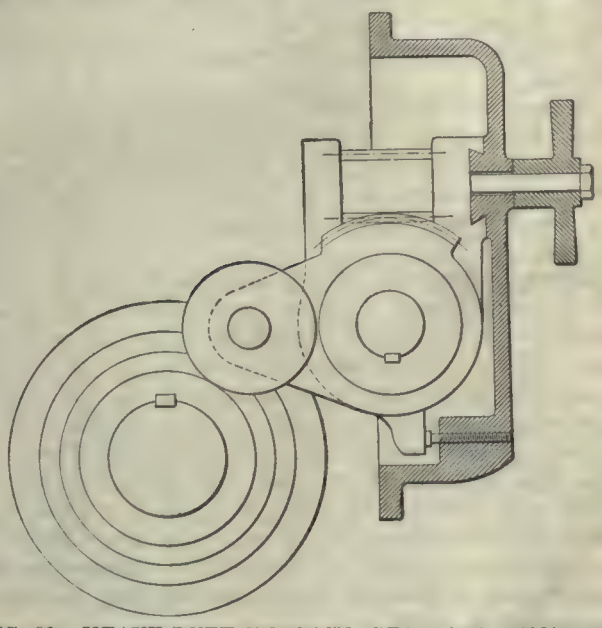


FIG. 29. HEAVY-DUTY TUMBLER GEAR ARRANGEMENT

account of the excessive size of the sleeve when the driving pinion becomes large.

In Fig. 29 is shown an arrangement used by the writer in the construction of the high-power Cincinnati milling machine, and which was called upon to transmit as much as 35 hp. In this construction a single member served to move the pinion and idler endwise as well as angularly. The endwise movement was obtained by moving a pilot wheel attached to the bracket containing pinion, idler and some other parts. When in the proper endwise position the pilot wheel was turned. This turning motion was transmitted to the bracket holding the idler by means of a worm and worm wheel, or rather a pair of spiral gears, the teeth of which had such an angle as to be self-locking. When the gears were in mesh, the turning movement of the pilot wheel was continued and this extra movement brought a hardened stop in the bracket up against a hardened pin in the frame of the machine, thus clamping the bracket in position. Here, also, the bracket supported the driving shaft instead of the driving shaft supporting the bracket, as was the case in the earlier constructions.

In order to function properly the arrangement should always run in the same direction, and this is particularly important with heavy drives. If there must be a reverse in the system, the reverse mechanism must be applied *after* the cone and tumbler and not between the first driving member and the tumbler arrangement. As there is necessarily some reduction in the tumbler arrangement the torque on the reversing mechanism will be greater after the cone of gears than before.

At one time arrangements such as shown in Fig. 30 were commonly used for changing feeds, and even in some cases for changing speeds of a machine tool. Such an arrangement is known as a pull-pin arrangement. It consists, generally speaking, of two cones of gears meshing with each other. One of the cones is keyed to its shaft, the other one runs loose on the shaft, and each one of the gears of this cone can be keyed to the shaft by means of a sliding key, operated by means of a rod going through the center of the shaft. There are many objections to this construction and it has gradually lost favor and is very seldom, if ever, used in modern construction.

In Fig. 30 *A* and *B* are the two shafts connected by the two cones of gears. Gears 1, 2 and 3 are keyed to shaft *A*, and gears 4, 5 and 6 are running loose on shaft *B*. The crosskey 7, connected to the pull-rod 8, moves in a slot of shaft *B* and can engage any one of the three gears 4, 5 or 6. In order to allow crosskey 7 to slide from one gear to the other, counterbores are provided in these gears and located so that when the crosskey is in the counterbore the gear is free to revolve. One of the counterbores is shown at 9, and the keyseated portion of the gear at 10. It is very obvious that this arrangement makes a weak construction of shaft and key and allows but little bearing of the three gears on the shaft unless the gear hubs are made excessively long, which would probably take up valuable space in the mechanism.

The question of lubrication, also, becomes a difficult one. It is not well possible to bush the gears, and it is very difficult to bring oil between the gears and shaft *B*. Undesirable as this arrangement is, it can be made worse by making *B* the driving shaft instead of the driven one. To make this clearer, we will assume certain figures for the number of teeth of the gears and speed of the driving shaft. Assuming *B* to run 300

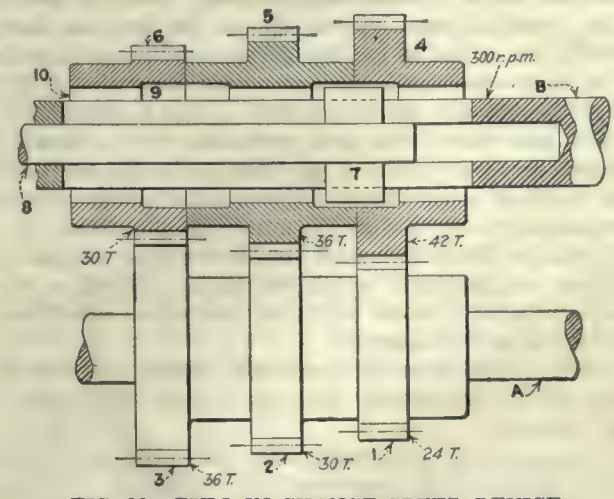


FIG. 30. PULL-IN CHANGE SPEED DEVICE

revolutions, and assuming the number of teeth to be as shown in the sketch, and further assuming that the key is engaging gear 4, shaft *A* must run 525 r.p.m.; and as gear 3 meshes with gear 6, this latter must run 630 r.p.m., which causes a relatively high speed between gear 6 and the shaft on which it runs. This condition will become still worse if there is a considerable slowing down between *B* and *A*. For this reason, if this kind of arrangement is used at all, shaft *A* should be the driving shaft.

Many variations have been made on this construction, but as none of them are desirable we will not go further into this matter.

The gear arrangement which is most commonly used at the present time and which has less objectionable features than any discussed heretofore is the so-called selective sliding gear. As an example of the application of such gearing will be given in a later chapter we will not discuss it here. We wish to point out, however, that the following rule may be put down as of quite general applicability:

For standard machinery, in which speeds or feeds must be arranged in geometrical progression, selective sliding gear arrangements are to be preferred; while for special machinery, in which certain definite speeds must be obtained, the change gear system is usually the simplest and best.

There are some other gear arrangements in existence which have their special applications and which will be taken up later on.

Try to obtain the desired amount of power by belt *speed* rather than by belt *width*. Belt speeds up to 3,500 ft. per minute are permissible in machine tools, but cannot always be obtained.

Try to obtain belt speed by a high number of revolutions of pulley rather than by a large diameter.

NOTE: The highest practical number of revolutions for a pulley depends on the nature of the lubricating system and other items. In any case, however, the shaft speed should be kept as high as conditions will permit.

Belts wider than 8 in. should never be used with cone pulleys. A 6-in. belt is difficult to shift. An 8-in. belt can still be shifted, but would not be practical if such a shift were of frequent occurrence. Belts wider than 8 in. cannot be shifted, except where some special device is used for the purpose.

The ratio between largest and smallest cone pulley steps should be kept as low as possible, so as to avoid too great a difference in the amount of power obtainable.

Where more than one countershaft speed is used the ratio between these speeds should be kept as low as possible so as not to get too great a variation in power.

As with other pulleys, cone pulley steps should be as large in diameter and of as small a face as practical.

Not less than ¼ in., and preferably ½ in., should be allowed for the width of the cone pulley in addition to the width of belt. Where the belt runs between a larger step and a flange, ½ in. is the minimum allowance.

Cones in the countershaft for the purpose of obtaining various countershaft speeds should be avoided as much as possible, and should never be used where speeds have to be changed frequently.

Belts which must be frequently shifted on cone pulleys should preferably not run faster than 2,000 ft. per minute.

Countershafts suspended from the ceiling on ordinary hangers should not run more than 400 r.p.m. If higher speeds are necessary the countershaft construction should be self-contained in a single casting which can be bolted to the ceiling.

Gears made by the ordinary processes, that is, without extreme care, should have speeds not exceeding 700 ft. for cast iron; 700 ft. for mild steel; 600 ft. for hardened gears; 900 ft. for bronze and steel; 2,500 ft. for rawhide, micarta or fibroid.

The gears alluded to are supposed to have been cut with a standard rotary cutter and they are supposed to run dry. Where special rotary cutters are used, or where the gears have been made by the Fellows or hobbing process, higher speeds can be used, provided that the gears are not hardened. Higher speeds can also be used when the gears run in oil or grease.

A gear which is keyed to the shaft or which runs on a shaft being bushed for that purpose, should have a sufficient number of teeth to allow for the proper thickness of metal between the root of the tooth and the top of the key or the outside diameter of the bushing. If the diameter of the shaft is considered as the pitch diameter of some imaginary gear, then the gear we design should have at least eight teeth more than this imaginary gear. Denoting the diameter of the shaft by *D*, and the pitch of the gear by *P*, we should make the gear with not less than $DP + 8$ teeth, though for light work we may occasionally use $DP + 7$.

Wherever possible, overhanging gears should be avoided.

A gear with a hub should have this hub turned away from the bearing wherever possible. A construction such as shown in Fig. 22-A is indefensible. Constructions such as shown in *B* or *C* cannot always be avoided, but are not desirable. The construction shown in *D* is proper.

Hunting cogs are of no importance for cut gears. They are, however, of some importance if the gear is hobbed with a multiple thread hob. In that case, however, the hunting cog does not refer to the two meshing gears, but to the gear in its relation to the hob. If, for instance, a gear is cut with a triple thread hob, its number of teeth should not be a multiple of three. The idea that gears with hunting cogs will gradually improve each other as to shape of tooth is a fallacy. If there is a defective tooth in one of the gears there will be a tendency to spoil all the teeth of the mating gear, rather than a tendency of the mating gear to improve the defective tooth.

Start a geared arrangement with the highest practical shaft speed in order to keep dimensions to a minimum. This is advantageous in regard to bulk and cost.

Make no unnecessary reduction, but keep shaft speeds as high as possible up to the last moment.

In making gear shift arrangements avoid as much as possible all speeding up.

Use as few groups or shifts as possible.

Make the shift by the simplest possible means, so as to avoid possible confusion on the part of the operator.

Avoid duplicating or overlapping of speeds.

NOTE: This rule should be applied with caution. There are cases, particularly in special machines, where the overlapping of speeds may be beneficial; for instance, where we have two ranges of speeds, one for roughing and one for finishing; so that a single shift will always produce the corresponding finishing and roughing speeds. In such a case it may well be that the highest roughing speed is higher than the lowest finishing speed.

And finally, the most important rule of all: None of the above rules should be applied without carefully going into the merits of the case.

Recommended Practice in Carburizing

Suggestions for the Selection of Carburizing Material—Methods of Testing It—The Best Materials for Different Kinds of Work—Design and Use of Carburizing Pots

By S. P. ROCKWELL
Metallurgical Engineer, Whitney Mfg. Co.

IT IS to be regretted that the average purveyor of carburizing materials argues fast penetration. Furthermore, many consumers consider fast penetration as a mark of merit. Eighty to ninety per cent of the practical men who handle carburized work consider only the depth of penetration and base their judgment on this alone. They overlook what is more important—the percentage of carbon in the case and the rate at which the carbon decreases toward the core. These last conditions are excusable as few plants are equipped with means for their determination. Often the examination of a carburized product will show carbon as high as 1.60 per cent for an appreciable amount of surface depth. This will rarely interest them, but these same people would never think of using carbon steel with any such amount of carbon.

Fast penetration is, of course, a desirable feature from a cost standpoint, but it is, almost without exception, accompanied by excessive high carbon surface and its product, free cementite. In order to put the free cementite into solution, the saving made in the time of the carburizing operation is usually lost by the first or high heat of double heat-treatment.

The fact does not appear in any publication that a steel of a specific analysis has a certain rate for a certain intensity of carbon absorption. The writer, however, from many observations, believes that this condition exists. In other words, a 1020 steel will absorb an eutectic case of a certain depth in a certain length of time, and nothing will increase this time, without causing the case to become hypereutectic.

It is rather difficult to say with any degree of surety what the correct amount of surface carbon should be in a casehardened gear. For ball bearing work a eutectic case (0.86 per cent carbon) is desired. The bearing after carburizing is considered to have 1.10 per cent carbon in the outer case. The grinding, however, is calculated to remove this. Due to warpage and the resulting uneven grinding it is a question whether the results desired are always attained.

For camshaft work considerable high carbon is permissible, providing the resulting cementite is in solution and not in the free state. When properly heat-treated a mosaic surface effect is produced. Finely divided particles of extremely hard cementite are imbedded in a softer matrix of eutectic steel. This condition is excellent for retaining the film of lubrication.

The gear, in a way, is subjected to both the requirements of the bell bearing and the camshaft. The pressure per unit of contact is less than the bearing and more than the camshaft. Furthermore, the gear must resist sliding and rolling contact. It is surmised that the surface carbon should be between 1.00 and 1.10 per cent. The inspection of work to enable one to hold to these conditions is a difficult procedure, unless a standardization of the carburizing material employed is made by the user for his own particular requirements.

The question of standardization of the materials and the specifications of the same are two different things. It is probable that if more users of carburizing materials would test them out for results the makers would be forced to supply according to specifications.

One concern buying carburizing material selects at random one bag from ten, and carburizes a 1-in. bar, 6 in. long, in a 5 x 10-in. pot at 1,650 deg. F. for 24 hours and pot cools. The bar is 1020 steel and all elements are within the specification range. The bar is centered and the surface removed before the carburizing operation. After carburizing and polishing with emery to remove adhering carburizer, 0.010 in. of the surface is removed in the lathe and a carbon combustion is run on the chips. The result, together with a micro-examination of the case, decides the question of rejection or acceptance of the shipment. In the operation of such a method of standardization, conditions should permit of exact duplication. In this respect uniformity of furnaces and calibration of pyrometers are of great importance.

Summarizing a comparison between types of carburizers to compare costs, case depth, surface case, toughness and hardness we have:

		Rating
(1)	Material with the greatest zone of eutectic	25
(2)	Material showing best joining of the different carbon zones	25
(3)	Material least destroying the core strength	15
(4)	Material giving greatest hardness with freedom from soft spots on single quench	15
(5)	Material giving the greatest case depth	10
(6)	Material giving the best surface	5
(7)	Material giving the greatest economy	5
	Total	100

There are, strictly speaking, but four different types of carburizers; they are classed by their physical form as follows: (1) Powder materials, in which the generator and the energizer are in a powder form, and are thus mixed together to form a mechanical mixture. Such materials are "hydro-carbonated bone black" No. 9 "Ajax," etc.; (2) pill materials, in which the generator and the energizer are in powder form, but are held together by a binder, which in itself may be a generator or an energizer. Such a material is "carbo;" (3) pellet materials, in which the generator is a granule of solid carbonaceous material coated with an energizer by the help of a binder. Such a mateiral is "Quick Light-A;" (4) pellet and powder materials, in which the generator is a granule of solid carbonaceous materials and the energizer is in the form of a powder. A certain per cent of the powder may also be a generator. Such materials in most common use are "Bohnite," "Carbonite," "Pearlite," etc.

Three other mediums are in use for carburizing, namely, bone, leather and gas. Bone is classed as a

Paper presented before Buffalo meeting of the American Gear Manufacturers' Association.

pellet material with this exception, that the energizer is contained within the bone. Leather is classed as a powder material; its energizer is a nitrogenous compound. Gas differs from the rest in that it is the result of the carburizing property of all carburizers. Charcoal, coal and coke cannot be classed as carburizers, due to their difficulty of control. Strictly speaking, they are generators, and are sometimes used as filters.

Choosing A Carburizer

To decide on any type of carburizer, one must first know the conditions of carburizing, and the results desired.

The writer offers the following as a guide for selection:

1. For low cost, and to secure uniform case with 0.10 to 0.20 less carbon in the case than is usually secured under pot packed condition; use tumbling barrel method developed by American Gas Furnace Co. with gas or with solid carburizer. With this system heavy work will be marred, and the method is not recommended for threaded work. With solid carburizer 3 lb of material will carburize 50 lb. of work to 0.045 in. depth at 1,650 deg. F. Use any type of carburizer.
2. For fast heating use coarse mesh carburizer such as types 2 and 3. The air spaces allow room for the heat-generated gases to thermo syphon and offer unrestricted passage for heat-transference to center of pot.
3. For non-shrinkage, use fine mesh carburizers, preferably a coke type generator or a carburizer with a lot of inert filler. These latter usually contain 40 to 60 per cent of petroleum coke.
4. For low carbon case, use charcoal generator with oil hydro-carbon energizers. Such materials are "hydro-carbonated bone black," bone and charcoal.
5. For high carbon case, use chemically energized materials. Such energizers contain cyanides, barium, ammonium, salts and carbonates. Carburizers containing forms of leather are also used.
6. For deep depths, use coke and charcoal generators with oil hydro-carbon energizers combined with fine mesh and considerable inert material.
7. For very clean surface work, use charcoal and bone carburizers where the energizer is naturally contained in the bone.
8. For work which must be carburized at low heats, use raw bone or carburizers containing a large percentage of raw bone.
9. For work which must be carburized at low heats to secure mottled effects, and clean surfaces, use charcoal, charred bone, charred leather or combinations of these. Avoid chemicals.
10. For copper-plated work, use charred bone, charcoal and oil hydro-carbon energized materials, together or alone. Avoid chemicals.
11. For extreme hardness of case use nitrogen carrying compounds, which would be cyanogen energized compounds, and leather mixtures.
12. For local carburizing where compound is forced by pressure and caked about zone desired to receive an increase of carbon, use fine mesh materials combined with a semi-liquid binder, such as molasses, tar and resin.

After a decision has been made on the type of carburizer for the particular class of work it is to be used with, the user will find that he is in no way restricted as to the dealers from whom he may purchase. Nearly all the standard carburizing materials dealers make all types, but they are apt to confine their advertisements to one or two more popular types. It will further be found that each type can be purchased in different variations of mesh and grain size.

How to Buy

Buy from a responsible house.

Study what type, mesh, generator and energizer is best fitted for your work.

Consider as first cost, the cost per cubic foot rather than the cost per pound.

Test the material under conditions as nearly like regular practice as possible. This means depth, representative work shape, temperature, and pot size.

Examine the pot-cooled sample for case structure by the microscope, and by carbon combustion. The microscope will be found invaluable for this purpose. Once one becomes familiar with estimating the carbon by the microscope, the combustion method can be dispensed with except as a means of check.

Maintain your standard for future shipment of material.

If soft spots develop on the hardened work do not blame the carburizer. Soft spots are due to rust on work prior to carburizing, phosphorous banding, delayed quenching, copper or sulphate spots, slag, faulty grinding, cold-rolled or planished surfaces, scale formation, excessive oxygen in hardening fires, faulty quenching medium, too low hardening heats. These faults cannot be laid to the carburizer. The carburizer rarely makes soft spots if it contains no excessive amounts of inert filler, or burned out material such as ash dust. These conditions should be guarded against. If hardened work has soft spots, and these areas are carefully marked and the piece carefully rehardened two results can be obtained:

(1) Original soft areas become hard. In this case trouble is not due to carburizing.

(2) Original soft areas stay soft. In this case the trouble may be due to rust, copper, decarburized in hardening, or to defective carburizer.

With the aid of the microscope, polishing wheels and cloth, and dilute nitric acid, any of these conditions may be accurately discovered.

Special alloy heat-resisting pots, are by far the best investment when compared to cast iron, malleable iron and cast steel. The round pot will be found to give a greater life than the square pot, due to the equalization of expansion and contraction stresses. The cored or chimney pot is only efficient, considering its added cost, where the chimney is 5 in. in diameter or over. Too large pots should be avoided for small work. The round pot will be found most satisfactory for pinion and ring gear work. It offers the advantage of even heating, and prevents the tendency to overcrowd the furnace hearth space.

Square or rectanglar pots are best for splined shafts, but the work must be packed with due regard to the transference of heat. The size of the pot should not be greater than the work demands. This is imperative from the standpoint of handling, slowness of heating and the subsequent unevenness of carbon penetration from center of pot to outside. It is also imperative that the pot should not be greater than is required by the work on account of the slowness of cooling where work is pot cooled with the subsequent separation of the carbon zones.

The best dimensions of the pot depend largely on the furnace. Too high pots are as bad as those too large in diameter. The average furnace varies greatly in temperature from top to bottom, and this variation increases with the arch height. A well proportioned pot never exceeds in height the greatest width or the diameter. The height is best made between $\frac{5}{8}$ and $\frac{7}{8}$ of the greatest width or diameter. All pots should be cast with legs to allow circulation of heating gases. For this same reason the floor of the furnace should be scraped clean after each heat. Great care should be used in sealing of the pots. The tighter the seal the more uniform the results. No pot should be used that is cracked, as this is the cause of blistered work. The pot becomes a veritable blast furnace, containing its own fuel.

Factory Storekeeping and Material Control

The Third Article—Balance Sheets as the Material Control Center—Four Types of Sheets—When and How To Use Them

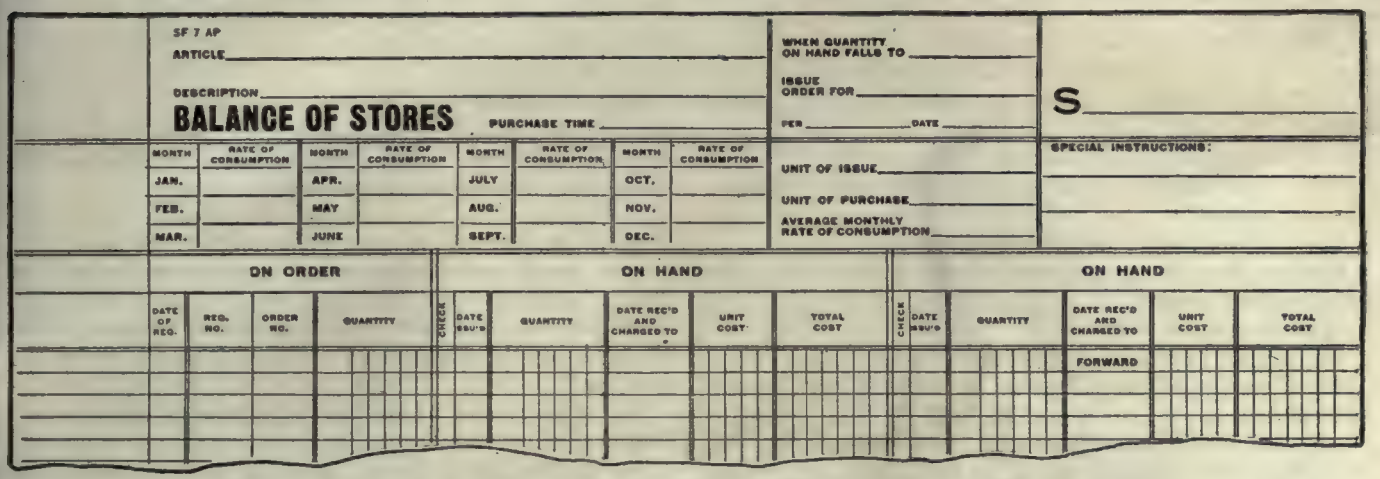
By Henry H. Farquhar

THE balance records, as has been indicated, should form the heart of the supply service of the factory, through which material control is secured. But they should do more than this. They should serve both production and accounting, if properly set up and regulated, in furnishing quick and accurate information as to the material status at any time—information of increasing value and reference as the business expands. In order that production may be adequately served, it follows that the balance sheets must be designed according to the need of that particular type of production.

Three general types of balance sheets are necessary to meet the three types of production calling for a control of replenishment under one of the plans *A*, *B*, or *C*. Each of these three general types are found in various forms, embodying different arrangements of columns designed to provide various sorts of information. No attempt will be made to present or discuss all of the possible or existing arrangements since the variety is infinite and the particular typography is a matter largely of choice and of comparatively little moment. Only the considerations necessary to the effective use of each will be taken up, illustrated by one example of each type of sheet.

Plan A. Here replenishment is governed by the amount on hand in the storeroom. This requires the simplest form of balance sheet in set-up and in operation. It needs only two main columns, one column for data relating to the material on order, providing subcolumns for the date and number of the requisition, the number of the purchase order, the amount received and the amount outstanding; and one column for the amount on hand in the storeroom, with subcolumns showing the amounts issued on what date and to what order, the total value and the value per unit. If the operation of the balance sheet presented under plan *B* is thoroughly understood, the operation of this simpler sheet illustrated by Fig. 2 will need no explanation, and no further description will therefore be given.

It must be emphasized again that such a method of regulating material has very limited applicability. It is entirely safe only when the average rate of use employed in ascertaining the minimum stock to be kept on hand is the actual rate of use throughout the year; in other words, where there is an entirely uniform rate or flow of materials. Such a balance sheet must not be expected to prove satisfactory under conditions for which it is not fitted.


SF 7 AP
ARTICLE
DESCRIPTION
BALANCE OF STORES
PURCHASE TIME
WHEN QUANTITY ON HAND FALLS TO
ISSUE ORDER FOR
PER DATE
S
SPECIAL INSTRUCTIONS:
UNIT OF ISSUE
UNIT OF PURCHASE
AVERAGE MONTHLY RATE OF CONSUMPTION

MONTH	RATE OF CONSUMPTION	MONTH	RATE OF CONSUMPTION	MONTH	RATE OF CONSUMPTION	MONTH	RATE OF CONSUMPTION
JAN.		APR.		JULY		OCT.	
FEB.		MAY		AUG.		NOV.	
MAR.		JUNE		SEPT.		DEC.	

ON ORDER				ON HAND						ON HAND					
DATE OF REQ.	REQ. NO.	ORDER NO.	QUANTITY	CHECK	DATE ISS'D	QUANTITY	DATE REC'D AND CHARGED TO	UNIT COST	TOTAL COST	CHECK	DATE ISS'D	QUANTITY	DATE REC'D AND CHARGED TO	UNIT COST	TOTAL COST
													FORWARD		

FIG. 2. PLAN *A*, BALANCE SHEET FOR REPLENISHMENT BY AMOUNT ON HAND

Plan B. The replenishment of material is regulated by the amount available. The balance sheet presented in Fig 3 is the one needed for major materials in the over-whelming majority of manufacturing plants, since most factories have a fluctuating rate of use. This plan has been in operation in many plants for a number of years, and has proved entirely satisfactory under conditions to which it was adapted. Its use is rapidly increasing. It is unnecessary to state that the sheet is not suitable for all manufacturing plants in the particular form here presented, although it has proved of very wide applicability. Comparatively slight modifications will adapt it to almost any type of industry.

The only situation where the use of plan *B* balance sheet is unnecessary is when we have conditions described in plan *A*, and sometimes in plan *C*, conditions vary rarely encountered. This balance sheet is, moreover, suitable for use under plan *A*, since all that is necessary in such a case is to use the first two columns. It can be used under plan *C* with certain additions.

Before considering the details of this particular sheet, it is well to review its general function in material regulation. A satisfactory regulation of materials under this plan of operation presupposes the ability to answer almost immediately the questions following. Such information may and should be embodied in one central place, the balance sheet.

(1) How much has been ordered?
(2) When was it ordered?
(3) The replenishment order number?
(4) The purchase order number?

For the author's forthcoming book. All rights reserved.

(5) How much has been received.

(6) How much is still outstanding on the purchase order?

(7) How much does the balance sheet show is now in the bin, and how does this compare with the amount actually in the bin?

(8) What has been issued, and for what purpose was it issued?

(9) What has been returned as credit, and what order or account was credited with the amount and value of the return?

(10) The total value of material on hand, including the transportation charges where practicable?

(11) The unit value of material on hand, including the transportation charges where practicable?

(12) What has been apportioned or set aside for manufacturing or other needs?

(13) When was it so apportioned?

(14) For what purpose was it apportioned?

(15) How much, if any, has already been issued against this reservation?

(16) The balance still on apportionment?

(17) How much is still available for apportionment to other orders?

(18) When did it become so available?

Besides furnishing answers to these questions, the balance sheet must:

(a) Be easy to operate.

(b) Be up to the minute in record of transactions.

(c) Provide an easy means of tracing each transaction.

(d) Enable the compilation of statistics covering the rate of use, the time necessary to renew the supply, the cost, and other information.

(e) Provide a means for checking the clerical accuracy of the entry and balances.

What the Balance Clerk Must Do

In order that answers to these questions may be instantly available, around the balance sheet must revolve the procedure following. The topics are numbered to correspond with and answer the preceding list of questions.

(1), (2), (3) The replenishment orders must be originated by the balance clerk or must pass through his hands for entry. Besides the amount ordered, on the sheet must also be noted the date the replenishment order was issued and the replenishment order number for identification.

(4) Upon the issuance of the purchase order, a copy must be sent to the balance clerk showing the amount actually ordered. This must be checked with the amount ordered as per the replenishment order, and any necessary adjustments made. The purchase order number must also be entered for identification.

(5) Upon the receipt of a shipment, a notification of the materials received must be sent to the balance clerk. This must be identified with the purchase order, and must show the amount actually received, and if convenient, also the amount passed and the amount rejected upon inspection, although this information may be sent forward later. It is important that the notification of the materials received go forward just as promptly as possible after the shipment is in, since requests for the issuance of material not on hand lodge with the balance clerk until they may be filled.

(6) Notification of the cancellation of purchase orders or of parts of purchase orders must be sent to the balance clerk so that in conjunction with the notation of orders and of receipts a running balance of the amounts still due may be kept.

(7) Stock count is the result of an actual physical count by the storekeeper or his representative for the item, and is made entirely independent of any knowledge of the balance as shown on the balance sheet for that item. This is one of the means by which accuracy of the perpetual inventory may be maintained. Such count may be made on a few items daily so that in the course of at least four or five months the whole storeroom may be covered, and then the process is repeated.

(8) The balance clerk must record the stores and worked material issues which have been filled, showing the amount actually taken from the storeroom and issued to the shop or other departments. These may show also, if desirable, the remaining balance in the bin after such issues have been subtracted, as an additional current check on inventory.

(9) The stores and worked material credits must be sent to the balance clerk showing the amount of goods actually returned to the storeroom as a credit to some previously debited charge account.

(10) and (11) The balance clerk should secure the original or duplicate invoice, showing the purchase price of the goods and the record of express or freight, or other transportation charges against the shipment. Dividing the total cost, including these transportation charges, by the number of articles on hand, gives the unit cost.

(12), (13), and (14) Bills of material, manufacturing orders, stores issues, worked material issues, or other forms of information, showing what materials and how much will be needed in the future for manufacturing or other needs must be recorded by the balance clerk. This information is for the purpose of apportioning such demands against the material. Such information must include, for entry on the sheet, the date of these requests, and the account number or symbol to which supplies are to be charged when finally issued.

(15) From No. 8 above, after passing through the storeroom for issue, is obtained and entered what has actually been issued for this use.

(16) By subtraction is obtained the total amount outstanding on apportionment after deducting this particular issue. This total should be entered.

(17) and (18) By subtraction the amount still available is found and should be entered with the date it became available.

To make such a record intelligible:

(a) The sheet must be so arranged as to be readily understood and followed.

(b) There must be a continuous flow of such records currently through the balance sheet.

(c) Each transaction must be complete in itself and so entered, complete identification of each entry being insisted upon.

(d) The balance sheet must form a permanent record.

(e) The balances of the amount ordered, plus the amount on hand, minus the amount apportioned, must equal the amount available at any time.

In order to conform to all of these requirements, the balance sheet must have a minimum of four columns, one for entries relating to orders, the second for entries relating to amounts on hand, the third for amounts apportioned, and the fourth for amounts available. Although extremely common, the four-column balance sheet is by no means universal for this purpose,

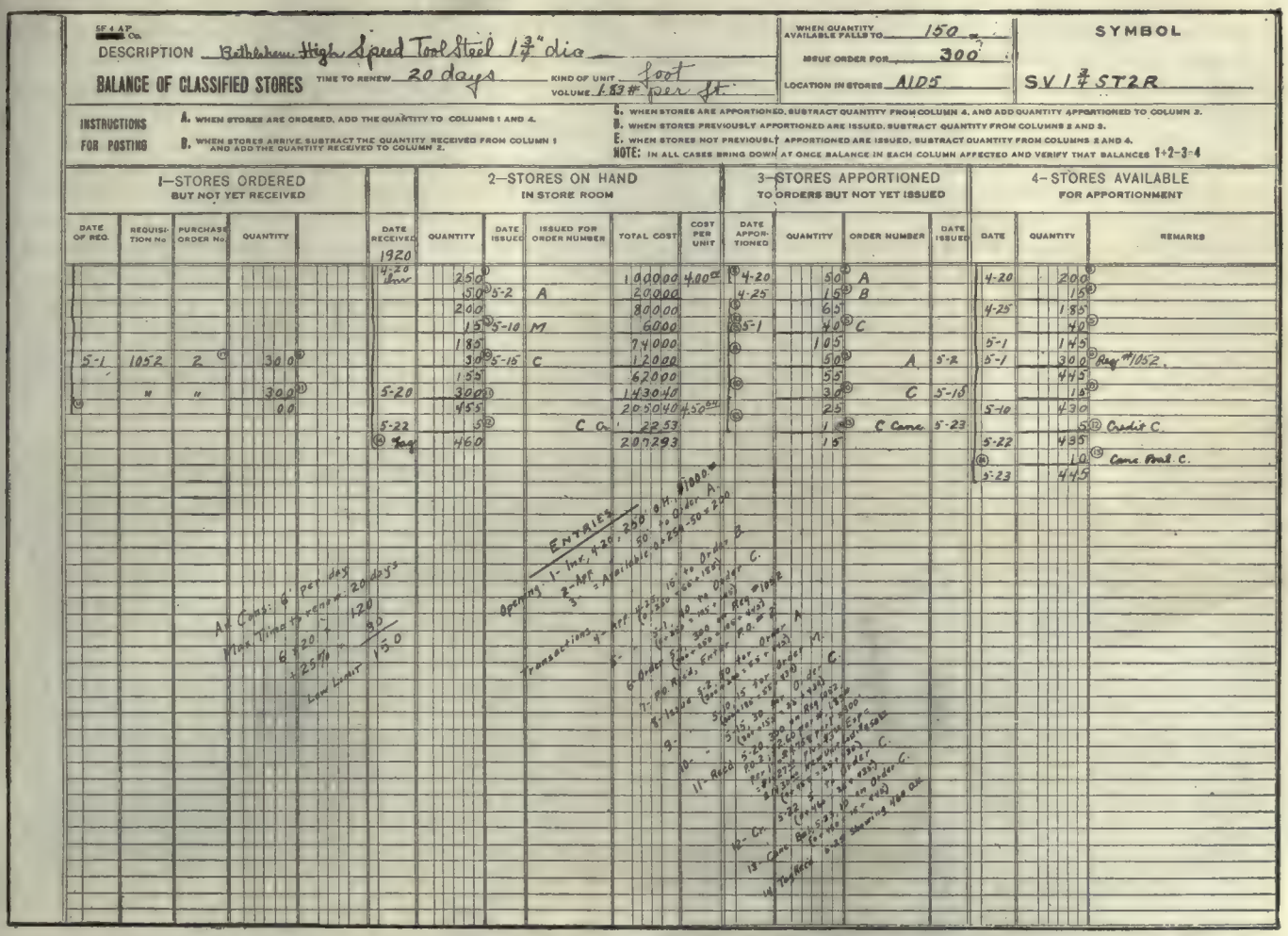


FIG. 3. PLAN *B*, BALANCE SHEET FOR REPLENISHMENT BY AMOUNT AVAILABLE

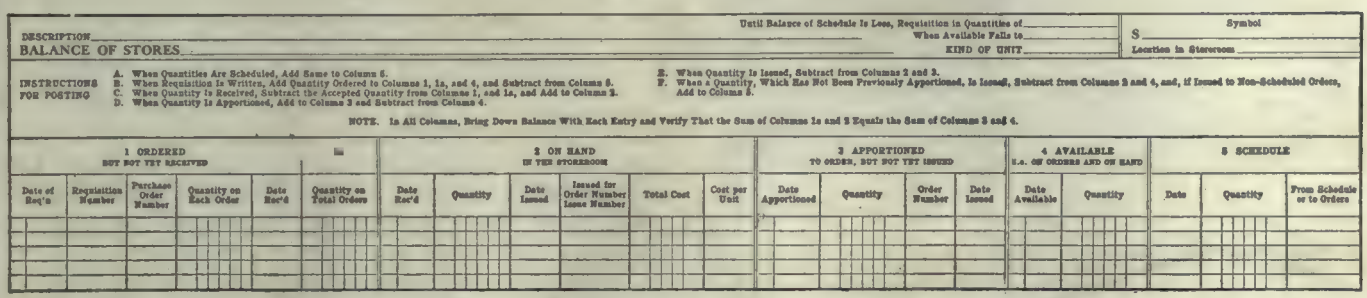


FIG. 4. PLAN *C*, BALANCE SHEET FOR REPLENISHMENT BY SCHEDULE

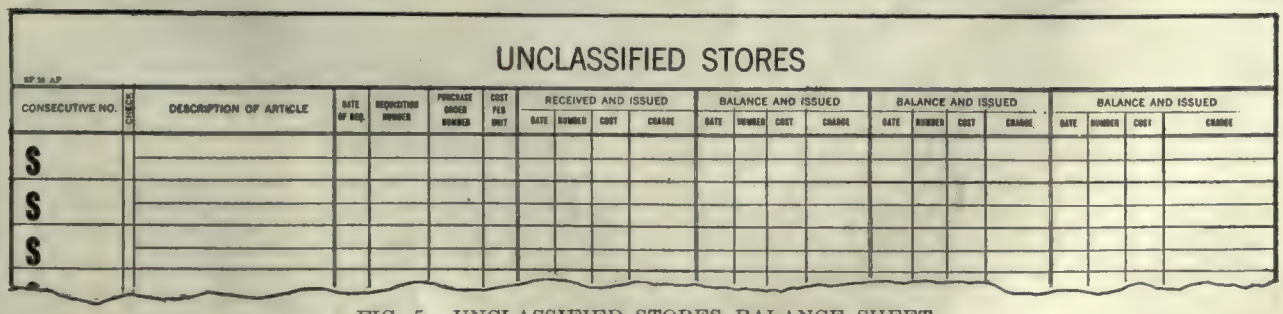


FIG. 5. UNCLASSIFIED STORES BALANCE SHEET

and various numbers of columns from four to possibly a dozen are encountered.

In the more elaborate and clumsy sheets, I have never found features embodied which could not be incorporated in the four-column sheet. For clearness, for a small amount of clerical work, and for the general ease of operation, it is usually to be preferred. The objection most generally made to it is that it does not provide separate columns for the entry of the amount received, the amount issued and the amount still on hand, for ease in tabulation. As can be seen on the sheet in Fig. 3, however, each of these entries may be readily picked out

by paying attention to the respective date entries which identify each transaction in the different columns.

A review of the preceding summary of transactions necessary to the operation of this balance sheet will immediately emphasize the point so often made that the balance clerk is the hub of the material procedure. Hardly a transaction of importance occurs from replenishment to issue which does not spring from or lead to the balance sheets, and if they are properly used they constitute an encyclopedia of information to anyone who desires to know anything about the state of materials. It should be unnecessary to add that such work should not be intrusted to an inexperienced clerk.

Plan C. The replenishment is made by schedule. Once the requirements in materials for a considerable period in the future are known, there are several ways in which the desired flow may be secured. Where plans may be followed without variation, the simplest method is to list or put on ticklers the dates when the various purchases are to be made. This method, however, provides for no follow-up in case production becomes more



FIG. 6. ARRANGEMENT FOR 5,000 BALANCE SHEETS

or less than planned. In such cases the balance sheet described for Plan *A* may be satisfactory to use where production is not too irregular. The balance sheet illustrated in Fig. 4 may be more serviceable where we can look ahead a long time but where the rate of production is not predictable. This sheet is similar to that of Plan *B*, with the addition of a schedule column.

A balance sheet for classified worked materials in design and operation may in some cases be very similar to that of the stores, while in other cases the need may be felt for two additional columns.

Unclassified Stores.—Little need be said in regard to the balance sheet for unclassified stores, since its operation will be entirely clear from the sample sheet shown in Fig. 5. This is used only for items which are not regularly stocked, but which are ordered for special purposes and ordinarily issued for those purposes just as soon as received. This sheet should be inspected from time to time to catch recurring items which may be transferred to the classified list and kept in stock.

Although loose cards of various sizes instead of sheets are frequently found in use in balance record files, it is felt that in general the use of the latter is much safer and more satisfactory. The danger of misplacing a card where there are possibly 30,000 items in the storeroom, each requiring at least one card, is very considerable and causes extreme annoyance when it occurs. Loose-leaf binders of this number of sheets, however, also have the disadvantage of taking up a great deal of room and of being either heavy or involving a great number of volumes. Some of the improved card-filing devices remedy both of these defects quite satisfactorily. Figure 6 shows a compact arrangement accommodating over 5,000 separate balance sheets. This file gives a maximum number of sheets or cards in a minimum space, makes it impossible to misplace a card, and makes it unnecessary to lift heavy volumes since entries are made in position.

Who Remembers This Bicycle?—Discussion

By Albert A. Bailley

In an article under the above title on page 381 of American Machinist, I. B. Rich is quite correct in stating that shafts with multiple splines were used before the days of the automobile; also in stating that this method was used in the construction of a bicycle.

The 1896 model Tribune bicycle, made by the Black Manufacturing Co., Erie, Pa., had its cranks attached to the shaft in this manner. I distinctly remember this, because I ground the cutters used in milling the broaches. Mr. Rich's friends evidently belong to the younger set, who think that everything they see for the first time is new and original because they never saw it before. But there are very few devices in use today that have not appeared in some form or other many years ago.

I was at one time employed by an old-time concern that started in business in the early part of the nineteenth century. About 1904 this firm happened to be hard pressed for cash, and as a last resort decided to cash in on a scrap pile that had been growing in the basement for about fifty years. At the bottom of this scrap heap was found a large black walnut toolchest. On being opened this chest disclosed the fact that it had belonged to a man named Mudge who flourished about 1841, some of the tools being marked with the name and date.

This man Mudge was evidently a genius and an excellent mechanic, as the chest contained many clever specimens of his handiwork. Among the contents were an adjustable spirit level, very similar to the best adjustable levels on the market today, a clamp lathe-dog which to my knowledge has been re-invented many times since, a number of hand-made skew gears, not very accurate as gears, but good specimens of hammer and chisel and file work.

There was also a partly finished piece having a stud with V-shaped serrations, exactly as referred to by Mr. Rich. In this case the stud was made of tool steel and hardened and made to act as its own broach. The end was made slightly tapering and the serrations were pressed instead of being cut in the hole, though the hole appeared as if broached.

A method resembling this has been used for a good many years, in holding the crossbars in chuck wrenches and T-tap wrenches, excepting that the serrations were produced with a knurling tool, and the parts are not hardened.

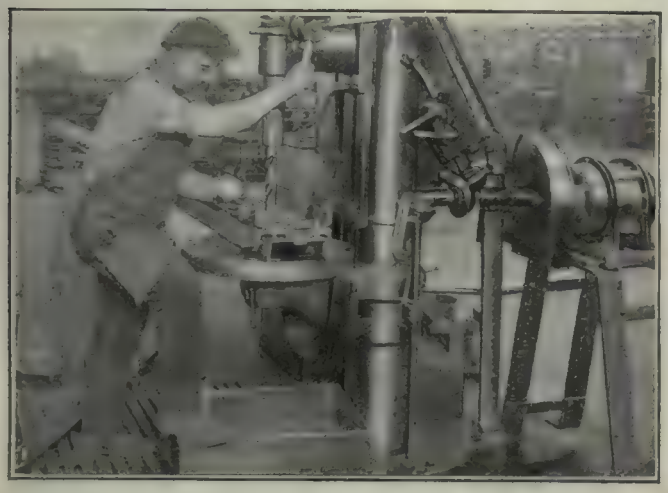
The Mack Truck Frame and Chassis

Drilling and Riveting the Frame—Rivets Heated by Electricity—Motor Storage Racks—Final Assembly of Complete Truck Chassis

BY FRED H. COLVIN
Editor, *American Machinist*

THE channels which comprise the side frames are drilled with reversible drilling fixtures as shown in Figs. 1 and 2. These fixtures are located from the ends of the channels and are held against side movement by setscrews when necessary. Both Figs. 1 and 2 show different applications of motor drives to heater and they are automatically, quickly, and uniformly heated. The pedal opens the contact for placing and removing the rivets.

Occasionally additional drilling needs to be done, as shown in Fig. 4. An air drill is used for this purpose and the "old man" or support shown has proved to be



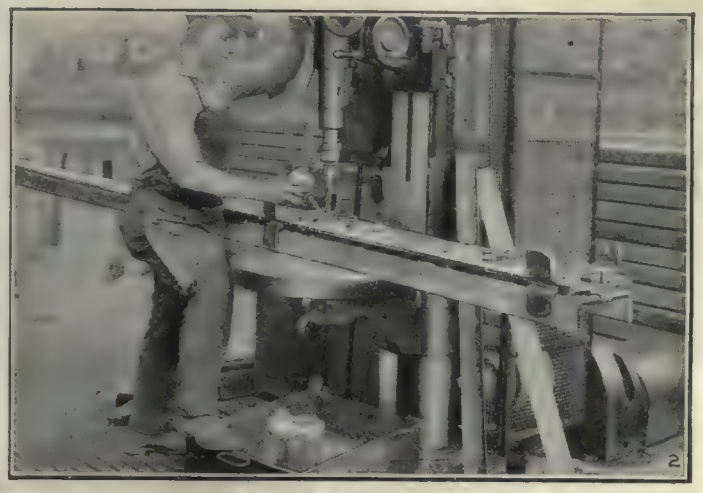


FIG. 1. DRILLING THE FRAME. FIG. 2. THE DRILLING FIXTURE

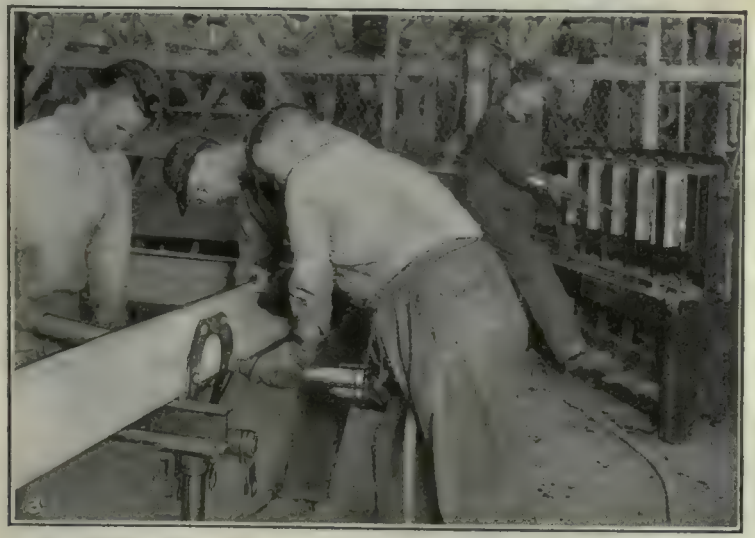




FIG. 3. RIVETING THE FRAME. FIG. 4. DRILLING ADDITIONAL HOLES

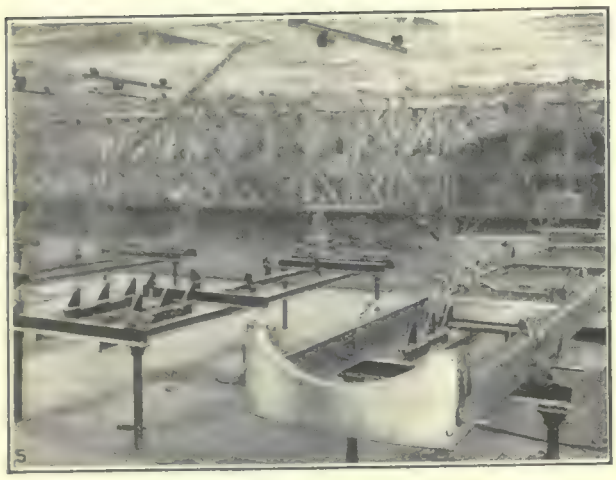
two drilling machines. In the case of Fig. 1 the motor is mounted on a neat stand. The reducing gears are enclosed in both cases.

The riveting of the frame shows in Fig. 3, now the four men work together in handling this work quickly. The man in the center puts in and removes the temporary bolts for holding the frame in position while the first few rivets are being driven. Two others handle the riveting hammer and "holder on" while the fourth man keeps them supplied with hot rivets heated in the electric furnace shown. It is only necessary to place the rivets between the contact points of the

very convenient. It consists of a U-shaped piece of bar iron with hooks on the end and the legs given a quarter turn as shown. This device is very convenient and saves considerable work on the part of the operator, as the side bars take the turning reaction from the drill cut. At the outer end is a substantial wooden block *A*, which carries the drills needed in suitable holes.

In Fig. 5 is shown the type of stands used in assembling the frame, and also a frame partially completed, including the heavy end cross-members which carry the side hooks for towing or being towed.

In the background is seen part of the motor storage,



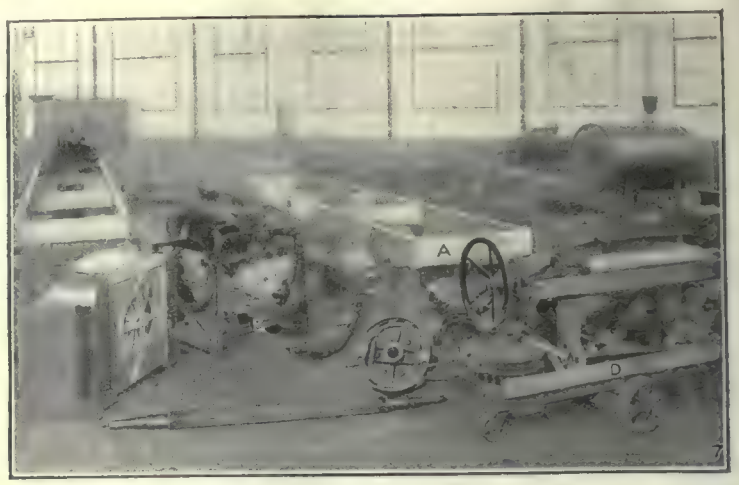


FIG. 5. THE ASSEMBLY STAND. FIG. 7. PARTS READY FOR ASSEMBLY

a closer view of which is shown in Fig. 6. This view gives some idea of the capacity of the assembling plant at the Allentown shop and shows the systematic manner in which the parts are stored. Suitable provision is made for handling the motors to and from the racks, and one of the trucks used is shown in the next cross aisle. This rack has a storage capacity for several hundred motors which are received from the plant in Plainfield, N. J.

The Assembly Floor

In Figs. 7, 8 and 9 are shown three views of the assembly floor. In Fig. 7 the frame has just been placed at *A*, the motor in its stand at *B*, a complete radiator unit at *C*, and a truckload of parts at *D*. These trucks are filled in the stock department with just the right number of parts to complete a truck assembly. This saves running back and forth to the storeroom and also the loss due to parts becoming mislaid, or tucked away under benches, as was too often the case under old methods in many shops. Springs, axles and other parts are shown convenient for the assembly and the work proceeds very rapidly when an assembly gang moves to a new frame.

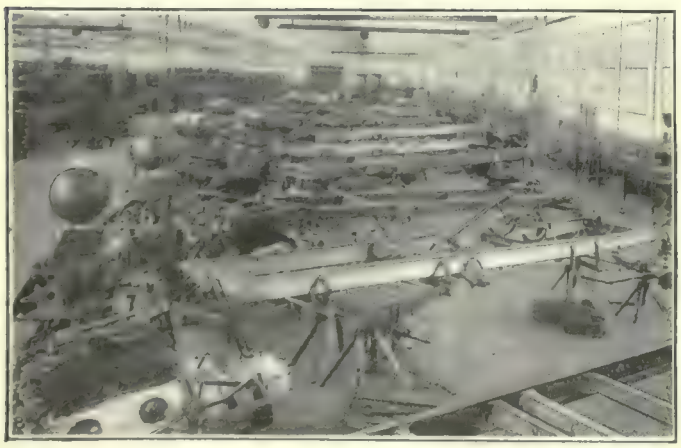
Another view of the assembly line, showing the motors, trucks and various parts in different stages, is seen in Fig. 8. It also gives an excellent idea of the layout of the shop, the system of monorail hoists and the splendid lighting, both from the side windows and the construction of the roof.

In Fig. 9 is shown a truck chassis of the chain drive type nearly assembled. Careful provisions are made both for the safety of the men and the expediting of the work and when a truck frame reaches the assembly floor it is a comparatively short time before it is completely assembled and ready to drive out for its road test and to receive the body which is to be supplied.



FIG. 6. MOTOR STORAGE RACK

Allentown, incidentally, affords an excellent opportunity for testing trucks as it has a variety of hills in all directions.



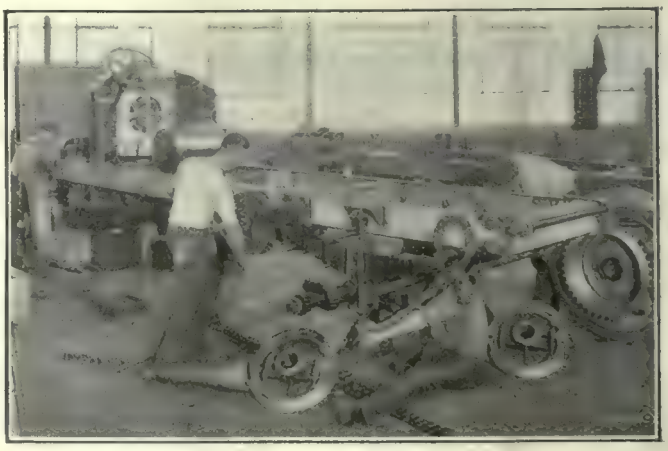


FIG. 8. THE ASSEMBLY LINE. FIG. 9. PUTTING THE TRUCK TOGETHER

The Maintenance of Textile Machinery

Purpose of Ball Bearings and Importance of Proper Lubrication—Common Abuses and Suggested Corrections

By EDWIN H. MARBLE
President, Curtis & Marble Machine Co., Worcester, Mass.

A MEMBER of a well-known firm of appraisal engineers recently stated that it was not practical to adjust values of textile machinery by any known annual depreciation percentages. Two machines placed in operation in different mills, receiving attention or lack of attention, will be represented on the valuation sheet by quite varying figures. It is the hope of the writer of this paper that some suggestion may be made that will bring the two valuations nearer together and assist in a better maintenance of the textile machinery that has been installed in so many of the mills.

We will take for specific illustrations that class of machines with which the writer is most familiar, namely, cloth-room machinery. The suggestions, however, will apply equally well to most of the machinery found in our textile mills. When machinery is being constructed by the builder, the frame is carefully leveled and the various bearings are adjusted and the machine, when placed in its proper position on the mill floor, should be carefully leveled and then securely fastened in its position. Several times we have had called to our attention a very careless carrying out of this suggestion. "The legs seem to be firm on the floor and the machine must be all right," was the report. This leveling is particularly important with machinery that has considerable length along the line of the main driving shaft, such as spinning frames, or with machines that have fine adjustments, such as shearing machines. Having attended to this particular feature at the installation of the machines it is well to repeatedly test out the stability of the leveling.

With the machine in position and various attachments and revolving parts in place, see that the bearings are not too snug and that each roll or shaft turns freely. We all expect a certain degree of stiffness in new machines and no matter how finely the builder may have made his fits, the transferring of the machine from one floor to another will have varied the adjustment to some extent.

The Importance of Lubrication

With the machine starting off smoothly, what suggestions can we make to assist in maintaining its operating condition? Lubrication is possibly one of the prime considerations. Often it is no oil, an unstable oil, or a surplus of oil. The same oil cannot well be used on the high-speed spindle and the slow-revolving main shaft. The type of bearing may not be suitable for some of the heavy non-fluid oils. A regular system of oiling up should be practiced. Every morning the operator should see that any exposed oil holes are carefully cleared out and enough suitable oil applied to lubricate each bearing.

On many textile machines you will find ball bearings of various makes and they require considerable attention. First, we would ask why these particular devices were installed. Reducing all the answers to their lowest terms we find three reasons; they reduce bearing friction and save horsepower; they render good service by the saving of oiling troubles; or they were installed because some salesman convinced some one that he had a panacea for most of the ills mechanical devices are troubled with. The first answer is a rather limited one, for while the actual saving of horsepower is in many cases quite an item, the application of ball bearings to a particular revolving body should be considered carefully and the condition of working load examined and charted before any new installations are made.

In almost all cases the machine builder has looked the designing of his machine over pretty carefully before he has sent it out and is a fairly good judge of when and what kind of a friction-reducing bearing can be used to advantage.

Lubrication of Ball Bearings

Now regarding the second reason, which concerns the lubrication side of the ball-bearing question, any ordinary bearing must be oiled frequently. The installation of a proper ball bearing will in many cases reduce to a considerable extent both the time required to oil and the amount of oil used. The frequent oiling of ordinary bearings oftentimes breeds carelessness, and the surplus oil, conveyed to stock or fabric, produces damaged goods. This can be prevented in a great measure by a careful consideration of the application of a suitable friction or lubricant-retaining bearing.

Do not for one moment think your troubles are ended when your ball bearing is installed. A ball bearing allowed to run dry can do as much damage as can any other type of dry-running bearing, and perhaps from a financial point of view much more damage. We can not attempt to tell how often a ball bearing should be repacked with suitable heavy oil or grease. The load under which it runs, the speed of the shaft and type of lubricant-retaining washers or felt that is used, all have an influence on this. Three or four times a year may be necessary for one bearing, while another bearing can be allowed to run for six months without injury. But plainly speaking, every bearing must receive attention or your maintenance costs mount upward rapidly.

In the textile industry more than in any other, the ball-bearing salesman seems to have found a large number of gullible customers. Draft rolls on a cotton-brushing machine, approximately 1¼ in. in diameter, revolving 60 to 100 turns per minute, have been equipped with expensive self-alignment, self-adjusting, felt-washered, oil-retaining bearings, guaranteed to reduce the horsepower required to run the machine from 30 to 50 per cent. The large percentage of the horsepower required is consumed in drawing the cloth through the machine. The friction load on the bearing is very small and rarely have we seen any noticeable saving in power by such an application. On the other hand we have noticed on some machines ball bearings subjected to a heavy working load that have failed to stand

Paper presented at the spring meeting, Atlanta, Ga., May 8 to 11, 1922, of the American Society of Mechanical Engineers.

up. This was due to misunderstanding the conditions or being afraid to ask a high price for the installation, so the salesman had equipped the machines with bearings much too light for the duty required. Hence when in doubt about ball-bearing equipment on an old type of textile machine, ask the maker.

Many machines receive power in some of their parts through friction clutches, and few mechanical movements have been subjected to so much abuse as have these devices. From a standing position you throw into action from ½ to 10 hp. and expect an immediate response at approximately full speed. Promptness of action is demanded, yet little attention is given to the mechanism that must respond to the demand. The cone, or actuating part, is probably scored by the lever being too tightly pressed against it; as the clutch is handled the starting load is in excess of the best efforts of the friction band. Most clutches are designed to produce a pressure rapidly increasing toward the end of movement, yet the movement is often so rapid that the start is not made until the extreme throw is completed. Through severe use the friction-creating surfaces are roughened so that instead of a gradually increasing friction application, the action is a grip or bite, demanding an immediate response on the part of the standing portion. Every application of the lever increases the roughness and necessitates more serious consideration of the remedy which eventually must be applied.

Give a little attention to the friction creating surfaces, cleaning them of gum or grease, smoothing any irregularities that may have been formed and particularly adjusting the toggle or connecting unit between the cone or actuating part. In fact, see that the clutch, as a whole, is in condition to respond to the call for its services. You are not dealing with a yielding movement like a leather belt, but rather a somewhat rigid device that depends on the frictional contact between two metallic surfaces for the transmission of energy—a splendid device when properly cared for, but usually one of the most abused attachments on any textile machine.

Belting in a Textile Plant

The moment any one says, "use belting in a textile plant," some one else has his dissenting viewpoint. Every belt has to adjust itself in passing over a pulley, according to its thickness and flexibility. A stiff, thick belt on a small pulley is giving the operator about 60 per cent of the value of the proper belt. An overcrowned pulley of small diameter is another loss of power. That any piece of leather or perhaps canvas is good enough to transmit power, seems to be the idea of some of those in charge of textile plants, and one will find stiff and non-flexible belting being used to transmit power to a series of rollers at high speed and equipped with comparatively small pulleys. The result is that the belt will not conform to the arc of the pulley and hardly has time to straighten itself after leaving one curved surface before it must reverse its curvature in going around a second pulley. A pliable single belt of good quality will transmit more power and maintain more uniform speed. Then belts are often put on with little attention to conditions. The leather is stiff, dry and without flexibility and the belts are united by heavy hooks or plates, driven into the leather, with the ends probably not cut off square, so that the joint is irregular.

Perhaps a final word will suffice about belt hooks, lacing, plates or other means of connecting the ends of belts. The nearer the joint is to the thickness of the belt and the more flexible its character the better. How many machines are deprived of much of their usefulness by a disregard of the small things which enter into their construction. A thumbscrew may hold some attachment in position; it is lost and a piece of string or frequently a strip of cloth is used in its place. This makeshift is so inadequate that more or less loose motion continually takes place, and due to the resulting constant wear the attachment is soon either discarded or becomes inoperative. A cover is flopping about because some one broke the hinge or tore it from the wood or ironwork. Even a belt shipper is rendered unsafe by the wearing of the retaining section. We find shipper levers retained in place by a stick or block or wood and the discovery of this condition by a safety inspector prevented serious accidents in two cases known to the writer. "A stitch in time save nine" can be applied to mechanical devices as well as to a pair of trousers.

The Treatment of Bearings

Have you ever noticed the treatment which bearings receive in different textile plants? A driving shaft of suitable size has been installed on a machine by the maker. It is subjected to some hard usage, runs at a somewhat high speed and is carried in well fitted bearings lined with some anti-friction or babbitt metal. It may have been 1⅛ in. in diameter originally, but neglected by the oiler both the shaft and babbitt eventually wear down and you have perhaps a 1⅛-in. shaft running in an oblong hole 2 x 2⅛ in. The result is a worn shaft wobbling around in a somewhat restricted space. At last the operator or foreman succeeds in calling a mechanic's attention to the condition and when the latter has time he takes out the shaft, removes it to the machine shop, finds it is out of round, turns it over to any odd size, takes off the bearings, knocks out the old babbitt and proceeds to rig up some blocking to rebabbitt. Without taking pains to center the shaft or to line up the bearings, he pours in his metal, chips off the surplus and repeats the operation on the cap to the bearing. He then endeavors to replace the bearing in its old position, but as it is not true in alignment, he either packs up his bearing or the cap with cardboard or paper and finding he can turn the shaft in its revamped housing, goes off contented. Now this is not a notion or fiction, but has been found by the writer in more than one case.

Let us suggest a plan of procedure. Turn your shaft to some special size, and carefully center the shaft in the bearings while they are in position. Then pack up under the shaft so as not to occupy quite one-half of the bearing, pour your bearing, and repeat the operation with the cap, packing up the ears to the cap so as not to have a full half of the shaft in the cap. But remember one thing, the shaft that you use to babbitt the boxes in has been subjected to considerable heat. Take it back to the machine shop, true it up and then scrape your babbitted bearings to this straightened shaft until you have a good running fit. See that you have cut new oil grooves in both box and cap and on leaving your completed job, quietly suggest to the operator that a little more attention to lubrication would assist you indirectly.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Machining a 30-inch Pipe

By William G. Hammerstrom
Chief Engineer, Lynchburg Foundry Co.

In the first operation for machining the bell and spigot ends of a 30-in. flexible pipe, the outside of the bell is turned to exactly 44½ in. in diameter and 4 in. in width. An allowance is made on the inside diameter of the steel band to make a tight grip over the bell in shrinkage. In this machining, the straight spigot end is placed against the faceplate of the lathe and is secured by means of four chuck jaws. A specially designed cast-iron spider is placed on the inside of the bell supported against the lead ring, and is held against the inside wall by means of screws. The spindle of the tailstock is placed in the center of the spider and the outside of the bell is turned in the usual manner of turning in an engine lathe.

The machining of the inside lead ring is the second operation. To accomplish this, special tools and rigging are necessary. The carriage is first run up on the ways of the lathe and out of the way, since it is not used in this operation. The pipe is held in the chuck of the faceplate, as in the first operation, and a large, heavy steadyrest made in two halves is placed over the runways of the lathe, as shown in Fig. 1. The supporting arms of the steadyrest are brought up against the finished outside diameter of the pipe and adjusted until the pipe runs absolutely true. The arms are fitted with removable brass shoes.

A specially designed cast-iron stand is placed over the ways of the lathe in front of the bell. On the top of the stand is a large, integrally-cast hub bored out to take the spindle of the tailstock. In this way, the tool is rigidly held. A centrally pivoted arm moving radially on the top of the stand carries a small tool and is fed by means of a screw secured to the handwheel.

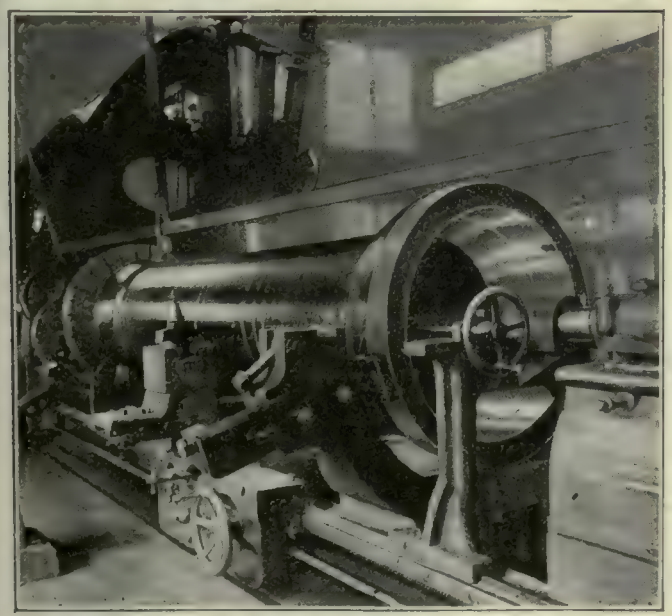


FIG. 1. MACHINING THE INSIDE LEAD RING OF THE BELL END OF A 30-INCH PIPE

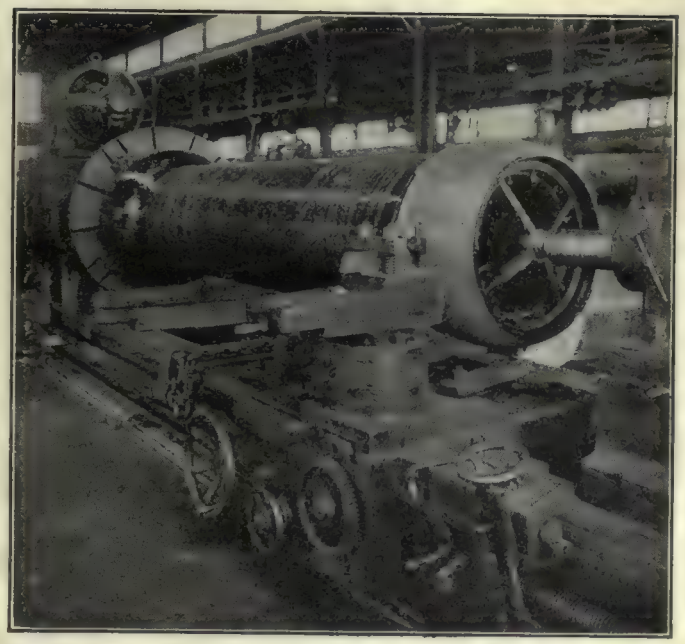


FIG. 2. MACHINING THE SPIGOT END OF A 30-INCH PIPE

The turning of the handwheel advances the arm and permits the tool to cut. The center of the arm is located accurately in relation to the face of the bell and is the same as the center of the ball of the spigot. The radius from the center of the arm to the point of the tool is also the same as the radius of the spigot.

These operations finish the machining of the bell end, after which the pipe is transferred to a 60-in., heavy, motor-driven, engine lathe for the machining of the spigot, as illustrated in Fig. 2. The spigot end is made straight to facilitate foundry practice and so it becomes necessary to remove no less than 400 lb. of surplus material in the form of heavy chips before the final finishing cuts are made. The pipe is placed in the lathe in the usual manner with the chucks on the faceplate gripping the inside of the bell while the spigot end is held by means of an inside spider.

To obtain an accurate spherical curvature of the spigot a cast-iron bridge is bolted to the outside way of the lathe, which clears the carriage and is long enough to permit the necessary horizontal travel of the carriage. A heavy forged steel link connects the bridge with the toolpost which is free to travel in a straight line towards the pipe. This link is fitted carefully to ground tapered screwed pins and is held by heavy nuts. The distance between the centers of the pins is equal to the radius of the ball on the spigot.

Placing the toolpost and tool carriage at the end of

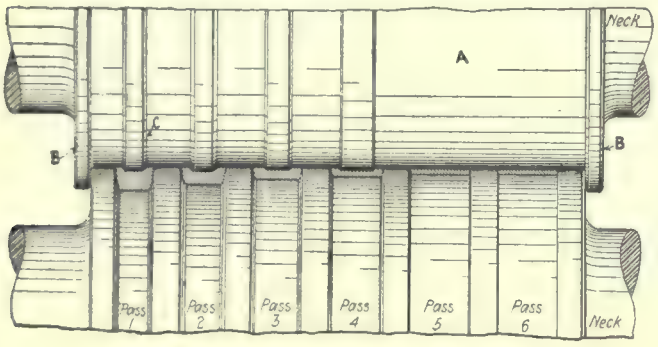
the spigot with the feed engaged, advances the carriage on the ways towards the headstock. Since the toolpost is free to move, the tool is held out by the link, making the outer radius until at the center the motion of the toolpost changes its direction and the tool is brought towards the pipe, thus forming the inner radius. The continuous motions make a perfect spherical surface. A light and final finishing cut is taken to make a smooth and even surface.

Rolls for Spreading Billets

By C. F. George

The rolls illustrated were designed especially for the spreading of square steel billets, an operation which is considered an impossibility by many steel manufacturers, it being a well-known fact that metal when rolled will elongate rather than spread.

With a set of these rolls it is possible for sheet manufacturers to buy square billets that were intended to make shells, heat them and roll them into flat plates for making sheet billets. With a proper arrangement of the mill these billets could be heated, rolled into plates, sheared and put through the sheet rolls all at one heating. The writer designed the rolls illustrated, had them made and was able to roll plates 6 in. wide by ½ in. thick in six passes from billets 3½ in. square.



ROLLS FOR SPREADING BILLETS

The top roll *A* has two end guides *B* and grooves or serations were cut across the projections *C* to provide the means of carrying the steel through the rolls. The square billet was heated and successively put through the passes, being turned over between each pass. The idea of this was so that the finished strip would have no raw edges, which would otherwise be the case, as the turning over process while rolling, kneads the raw edges into the bulk of the metal.

Making a Connecting-Rod Bearing

By Guy Cocklin

It may be of interest to know how I take care of orphan cars when they lose a bearing. I first get a couple of pieces of 2 x 4-in. hard wood, free from cracks or checks, or any pieces of wood that are suitable. I face one side of each so that they lie flat together as in Fig. 1. Next I chuck them in the lathe and bore a hole, slightly smaller than the crankpin; about 0.010 in. small will be found to be about right as the babbitt will pile up in the mold.

Then I take a sharp boring tool and bore out the form of the bearing in the wood (Fig. 2) to about 0.030 in. over the size of the connecting rod it is to fit. I take a piece of sheet iron of about No. 20 gage and make a trough and clamp it in the tool post so as to run the babbitt into the hole of the mold held in the

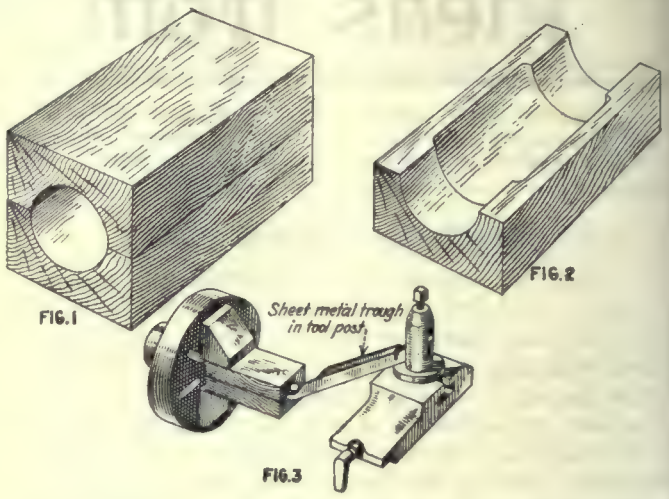


FIG. 1—THE BLOCKS BORED OUT. FIG. 2—THE RECESS FOR THE BEARING. FIG. 3—READY TO POUR THE BABBITT

chuck (Fig. 3) while the lathe is running about 1,000 r.p.m. When the hot babbitt is poured in, the centrifugal force throws the metal out into the form, leaving a hole slightly smaller than hole first bored in the block. When it hardens I bore inside of the bearing without removing the block from the chuck, then remove the blocks and take the bearing from the mold and place it on a mandrel. Finally I machine it to fit, cut the oil groove and saw in half.

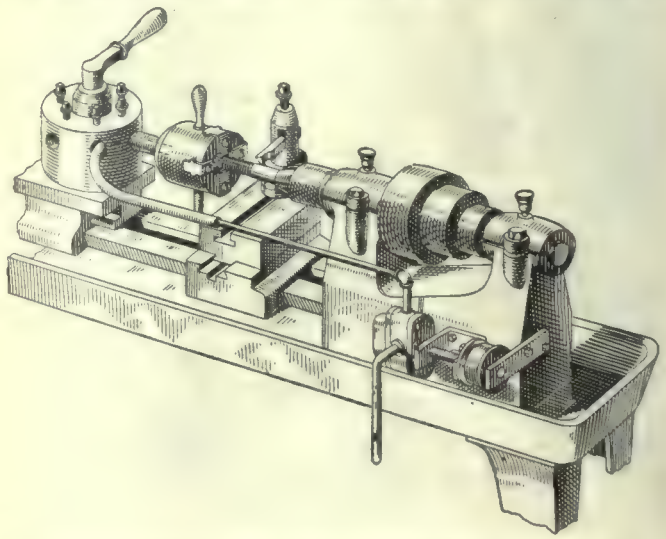
I have also found this method very satisfactory for replacing bearings on small electric motors that have babbitt bushings.

Novel Way of Getting Lubricant to a Die-Head

By Charles H. Willey

In cutting small studs upon the screw machine we had experienced considerable trouble from having the die load up and tear the threads, because of the difficulty of getting sufficient lubrication into the die.

The sketch shows how the foreman finally remedied the defect by attaching a rubber tube to the discharge



LUBRICATING A DIE HEAD THROUGH THE SHANK

side of the pump, leading it through one of the turret holes and into the rear end of the die-shank. The flood of lubrication flowing outward washed the chips clear of the die and we had no further trouble.

To Blueprint from Typewritten Sheets—Discussion

By A. A. Bertrand

A short article on page 420 of *American Machinist* entitled "To Blueprint from Typewritten Sheets," reminded the writer of an experience he had some years ago with a company which used as a shop form a blueprint made from a vandyke print.

This form was a material or parts list of the machine for the assembly department and its original was a typewritten sheet. It was our experience that no matter how we placed the carbon, we did not get the clear copies we desired, especially as we wanted a dark type on a light background. After considerable experimenting we found that by typing the sheets in a typewriter with a yellow ribbon we obtained a copy that made a very clear print.

The writer has suggested this method to a number of people and they have been very much pleased with the results. To prove this method, it is only necessary to mark a paper with different colored pencils and make a print which will indicate the most satisfactory color.

Taper Pin Turning Attachment

By L. Boiselle
Courbevois, France

Having a large number of taper pins of various sizes to make, I worked out and made a taper pin turning attachment to be used on a Brown & Sharpe semi-automatic, which has given very good results as far as cost of production and quality of work are concerned. The illustration shows the attachment fixed on the machine ready for operation.

It will be readily seen that the device consists of a tool-carrying block *A* sliding on a guide *B*, the guide having a shank to be fixed in one of the turret holes as shown. The toolblock is provided with a projecting arm, the length of which can be adjusted. At the end of the arm is mounted a roller which by means of a coil spring *C* is kept in contact with a former-plate having the same taper as the pins to be produced. The former-plate is fixed on the back toolblock on the cross-slide.

The stock is fed in the usual way and passes through a steadyrest *D*, the opening of which can be adjusted to suit the diameter of stock used. The steadyrest is fixed on guide *B* by means of two screws.

The tool *E* is held in the toolblock *A* by means of two setscrews. It will be noticed that the tool is placed immediately behind the steadyrest, thus realizing the best working conditions.

A lever *F* is provided to take the tool away from the work to avoid spoiling the tool and marking the taper pin when bringing the turret back. For cutting off, a tool *G* is fixed on the front toolblock on the cross-slide.

Any taper can be obtained by changing the former-plate fixed on the back toolblock.

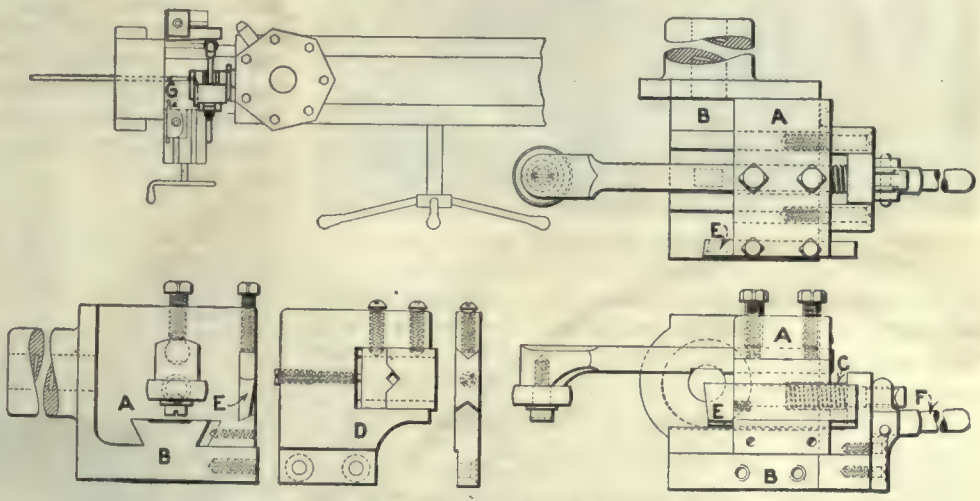
Safety Device for Paper Cutter

By C. D. Corwin
Works Engineer, Corona Typewriter Co.

Articles are frequently published illustrating or describing the means and methods used for making machines safer for the operator. Although it is a fact that many of the readers of these articles are not at the particular time of reading interested so far as the methods may apply to their own problems, it frequently happens that at some future date the suggestion or description does serve as a solution for a problem which has recently arisen. It is with such a thought in mind that the following material is written.

The paper cutter shown in the accompanying illustration is regularly provided with hand operating levers lettered *A*, one at each side of the table. These two levers are rigidly connected to a common shaft and the operation of either lever engages a clutch which drives the mechanism operating the knife.

The treadle *B* when depressed brings down a clamping piece just ahead of the knife in such a manner as to hold firmly the stock to be cut. It would seem, therefore, that this clamping device might serve as a warning device or safety guard in itself. In practice, however, in many instances the treadle and levers are operated in such close sequence (in many cases almost simultaneously), that the holding bar would serve to hold the operator's hand under the descending knife.



TAPER TURNING DEVICE FOR B & S SEMI-AUTOMATIC

To render this machine safer it was decided to make the operation a two-handed one, that is, to make the use of both hands necessary before the cutting operation could take place.

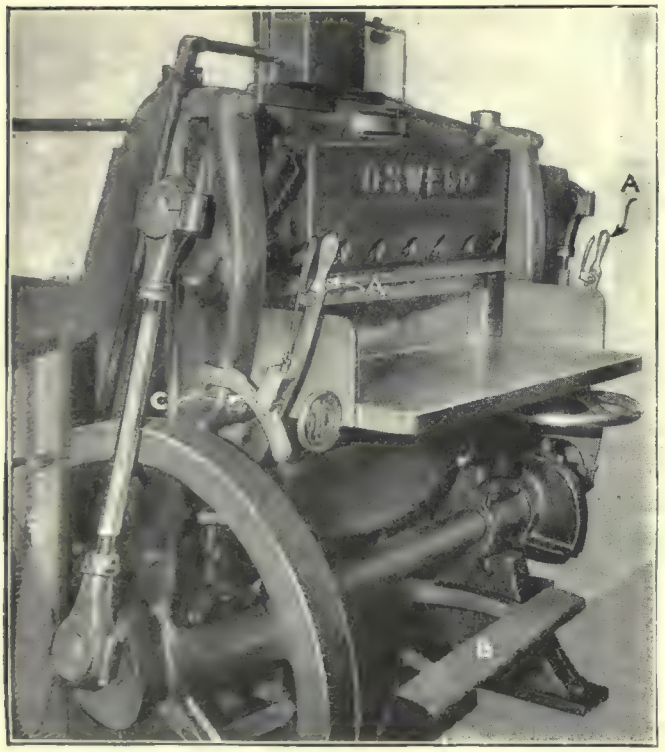
Two arcs lettered *C* in the accompanying illustration were formed of machine steel and bolted to the sides of the main frame in such a position as to hold the two latches, carried by the two regular operating levers. As these two levers were both rigidly connected to a common shaft it was necessary to open both latches before the machine would operate. It was at first

thought that this method of operating would hamper the operator in some cases. This fortunately has not been the case and a much greater sense of protection has resulted.

The Labor Inspectors of New York State of late have been giving considerable attention to print shop equipment. Such protection as just described, however, overcomes much of the objection to that class of machinery.

Although there naturally would be many designs which would render paper cutters safer, the device herein described is simple, is easily applied without changes in the mechanism of the machine and thoroughly accomplishes the purpose aimed at. This device has been in operation about a year and a half and no trouble or dissatisfaction has resulted.

With the utmost care accidents will happen and it



PAPER CUTTER WITH SAFETY DEVICE

is hoped that where paper cutters or machines of similar nature are used this article may be the means of saving a hand or finger.

Peculiar Flaw in Bar Stock

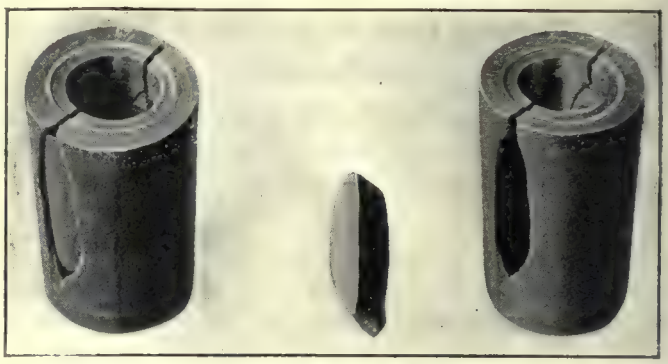
By Milton Wright

The accompanying cut shows a peculiar fault in the structure of a bar of point twenty-five carbon hot rolled steel. The bar in which it was found was one of a number of similar bars included in a shipment from the mill.

The fault is not a crack, but an oblong hole extending clear through the bar and was so completely filled by a plug, or "kernel," before the center hole was drilled as to escape casual inspection. When the bar was in the screw machine being transformed into machine parts, attention was called to the flaw by the continued breaking of drills.

The plug was, of course, cut in two by the drill. One part cannot now be removed from the bar, though it is sufficiently loose to be moved about with the fingers. The other part may be taken out toward the center hole but not from the outside of the bar.

There is considerable speculation as to how the flaw



PECULIAR FLAW IN A BAR OF MACHINE STEEL

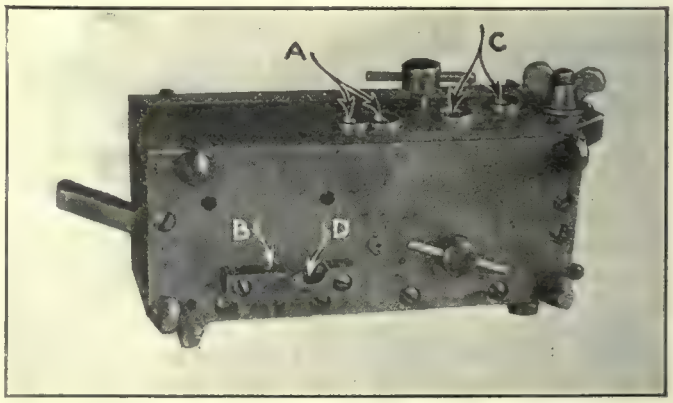
came about. One theory is that a larger bar had been drilled and plugged, and at a later time rolled to the present diameter, which is 2⅝ inches.

The photograph does not show two pieces, but two views of the same piece; one with the loose part removed and one with it in place.

Stop for Setting Drills

By H. E. Crawford

The job of drilling a blind hole is often an uncertain one and we had so many pieces spoiled, due to the fact that the operator either mis-read the scale on the spindle of the machine, or went to sleep and drilled the hole too deep, that we were forced to devise a fool-proof method of setting the drills. The result was that we attached a lug to the side of the jig, as shown in the photograph, at exactly the right height, so that when the operator inserts a drill in the chuck for drilling the two holes indicated by the bushings *A*, he pulls the spindle down as far as it will go and rests the point of the drill in the countersink *B* and then tightens the chuck. When setting drills for drilling the two holes *C*, he rests the point of the drill in the countersink *D* and tightens the chuck. When drilling the piece, he feeds the spindle down as far as it will go, at which point the hole is of the correct depth. A small



JIG SHOWING LUG FOR SETTING DRILLS

hole is drilled through the bottoms of the countersinks *B* and *D*, which prevents dirt collecting in the bottom of the depression. This saves both time and material.

Editorial

Idle Machines that Frequently Pay

TOO many managers seem to overlook the fact that the net cost of an article is what counts. They let side issues block their view of the real issues. One phase of this attitude is pointed out by John R. Godfrey in another column.

It is unfortunate, but true, that too many managers have certain notions, good in themselves but not the only factors to be considered. Keeping machines busy is one of these notions. An excellent idea in itself, it may easily lose money for the firm unless the net cost is carefully considered.

No one interested in economical management likes to see machines standing idle. But the man who criticizes the management of a shop that has idle machines is frequently guilty of that sort of snap judgment that proclaims him as being superficial instead of keenly observing. There are many cases where a machine that stands idle half the time is the best investment in the shop.

It is particularly important that this point be carefully thought out and understood at this time. There are new machines on the market with greater capacity than ever before, perhaps greater capacity than you can utilize at present. But before you decide against purchasing, figure out the net cost per piece, including idle time of course, very carefully. You are likely to find a net saving. If you do, there are many reasons for buying, and buying now.

The industry needs encouragement in every legitimate way. Any machine which will show a net saving on present production, should be bought now, if it can possibly be afforded. The man whose policy is to sit tight and buy only what is absolutely necessary is hindering the return of prosperity for himself as well as for everybody else.

Justice Works Both Ways

SPEAKING before the Plainfield Section of the American Society of Mechanical Engineers, A. L. DeLeeuw, whose name is familiar to readers of *American Machinist*, declared that the only basis on which satisfactory industrial relations can be based is justice. Mr. DeLeeuw went on to say that acts of injustice are quite as frequent on the part of the employees as on the part of the employers and in some trades far more frequent.

The shortcomings of the employers have been laid bare by the old muckrakers, the labor leaders and the modern sentimental investigators, and their duty has been pointed out with careful attention to detail. They have been admonished from the pulpit, villified by the demagogs and the radical press and investigated by governmental authority. If their way is not clear before them it is no fault of those whose welcome duty it is to tell the other fellow how to run his business.

The employee on the other hand has fared much better in his treatment by the uplifters. The principal effort in his case has been to enumerate and emphasize his rights with but the most casual attention to his duties. So one-sided have been the endeavors of his sympathetic friends and self-appointed representatives that he could be hardly be blamed if he completely lost sight of the fact that he has duties to perform as well as rights to claim.

The right to strike has been claimed so often and so vociferously by labor leaders that the right to work as defined by the Kansas Court of Industrial Relations and other judicial bodies has been somewhat neglected. The duty of rendering a fair day's work in return for a fair day's pay is one that should not be avoided, and cannot be in the long run if we are to continue our existence as a community.

Perhaps the insistence of the courts that this duty on the part of the employee is a very real one, is one of the reasons why Mr. Gompers recently expressed the devout hope, "God save labor from the courts!" If he and the other leaders of organized labor had been wise enough to spend a quarter of the effort in pointing out the duty of the workman to give a fair return for his wages, that they have spent in telling him about his rights, there would probably not be the need to fight for the threatened rights that undoubtedly exists in some quarters.

The average employee is just as anxious to play fair as the average employer. If each should subordinate everything else in an affort to deal justly, industrial peace would be in sight.

New Things That Are Old

THE replies to the query by I. B. Rich regarding the use of serrated axle ends for preventing the crank from turning, emphasize the salient facts. One, the difficulty of tying up events and dates in the average mind, and the other the time and money we spend in reinventing old devices.

Few men have memories which retain many details of events and we must apparently depend upon the printed page for authentic data as to the use of different devices. The difficulty is in knowing where to look for the information desired. The loss which this lack of knowledge entails can hardly be estimated, for thousands of hours and dollars are spent every year in working out some mechanical problem which has been used, perhaps many times, and lost sight of because the need for it temporarily disappeared.

Knowledge of what has been done before would also have a great effect on the granting of patents. Many devices and processes which have been used in the past have never been patented, so that the patent office has no record of their existence.

It has been suggested that the colleges could do a good work by collecting, filing and teaching, to some extent, the history of machine design and of machining processes. Such data would be of great value to all manufacturing establishments and they could well afford to pay for the information so obtained. It is not an easy task, but it is one well worth thinking over.

Shop Equipment News

Colburn Heavy-Duty Vertical Boring and Turning Mills

The Colburn Machine Tool Co., 1038 Ivanhoe Road, Cleveland, Ohio, is now placing on the market a line of heavy-duty vertical boring and turning mills that have been the subject of test and experiment for a number of years. The sizes include 42 in., 48 in., 54 in., 62 in., 72 in. and 84 in. The chief characteristics of these mills are rigidity and features that permit easy, rapid and safe operation. Among them are single lever control for feed and rapid traverse of head and ram; automatic gravity lubricating system; forced lubrication of angular and vertical spindle bearings; spring counter-weighting of rams and turret slide; close adjustment ratchets, carrying micrometer dials, mounted on the heads; friction disk clutches to raise and lower the cross-rail; single pulley drive; table guard; ball bearing equipment; narrow guide bearings on cross-rail. Front and rear views of the 42-in. machine are given in Figs. 1 and 2, which also serve to show the distribution of metal and the depth of cross-rail and housing-tie.

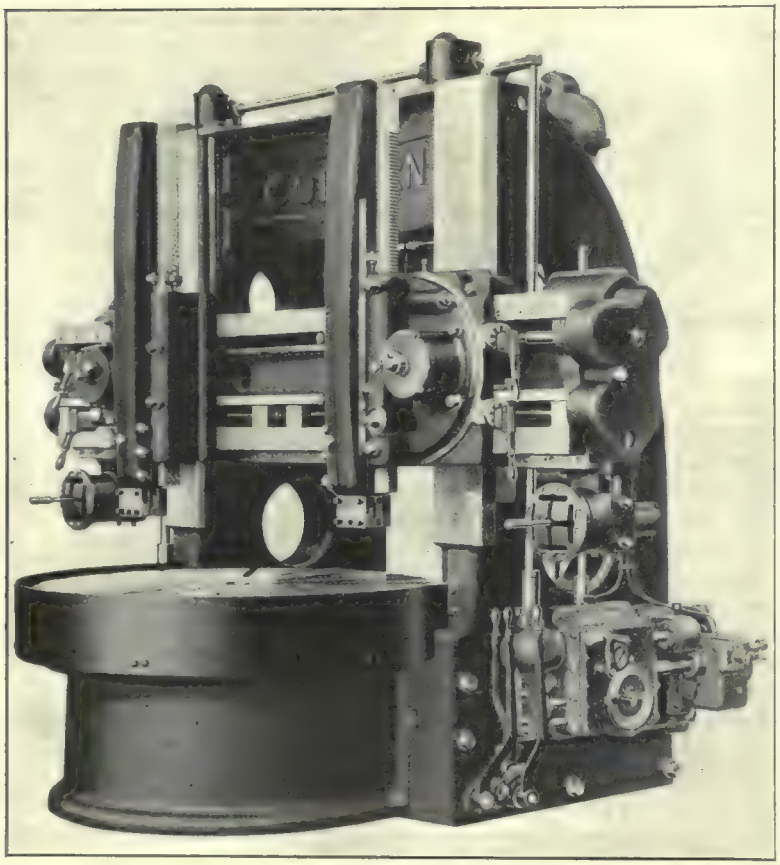


FIG. 1. COLBURN 42-IN. HEAVY-DUTY TWO SWIVEL HEAD BORING AND TURNING MILL

Specifications, 42-in. machine: Actual swing, 44 in.; diameter of table or chuck, 40 in.; height of table from floor, 33 in.; maximum distance under cross-rail, 36 in.; maximum distance under turret, 41 in.; swivel of heads either side of vertical, 45 deg.; table speeds, 12 changes, 2¼ to 70 r.p.m.; maximum ratio of gearing, 195:1; minimum ratio of gearing, 6½:1; horizontal and vertical feed, 16 changes, 0.006 to 1.000 r.p.m.; thread-cutting attachment, 2 to 24 threads per inch, including 11½; vertical travel of rams, 30 in.; vertical travel of turret slide, 26 in.; diameter toolholder shanks, ram 3 in.; turret, 2½ in.; maximum size tool accommodated, 1⅜ in. square; diameter turret, 13 in.; length of cross-rail, 97½ in.; width front face of cross-rail, 20 in.; vertical bearing of cross-rail on housing, 20½ in.; length horizontal bearings of saddles on cross-rail, 24 in.; width face of housing, 7 in.; driving pulley, 20 in. diameter for 5-in. double belt; speed of driving pulley, 440 r.p.m.; motor, 10 hp., 1,200 r.p.m.; net weight, 20,000 lb.; floor space and height, 108 in. wide, 97 in. front to back, 100 in. high; weight boxed for export, 23,000 lb.; boxed for export, 4 cases, 414 cubic feet.

The table is cast solid, that is, without being cored on the under side. Four sets of parallel T-slots are provided for holding faceplate jaws or fixtures. There are eight radial T-slots. The table spindle has a self-centering angular bearing and two vertical bearings. It is ground and is provided with spiral oil grooves cut on the vertical bearing surfaces. The table guard is of heavy sheet steel. There is clearance between table and guard so that chips may fall to the floor. Openings in the guard are provided for quick access to chuck screws on machines equipped with independent, built-in, four-jaw chucks. Twelve table speeds in geometrical progression are available. They are obtained by means of sliding gears and hardened positive clutches. Speeds are controlled by the operator from his regular working position, since both back gear lever and change gear lever are located on the front right-hand side of the machine. Gear shifts are accomplished by means of a cam arrangement, shown on the rear view of the assembled machine, Fig. 2. On each side of the machine, at the front, is a starting and stopping lever. Continuing the motion by which the clutch is disengaged, applies the brake.

Four of the twelve changes of speed are provided by the speed change gear box, or primary unit, and three by the secondary unit, located within the base of the machine. Power is transmitted through a single pulley with disk clutch. All gear shafts are mounted on ball bearings. Driving gears are held in position by keys and spacers.

Except where phosphor bronze gears are necessary, steel gears are used. Drive gears are stub tooth, heat-treated, except where size makes heat-treating impracticable.

The cross-rail is of the narrow guide bearing type. There are no projecting crank handles and clutches, which adds to the safety of the operator. Ball thrust bearings are provided at the ends of the crossfeed screws and vertical feed worm. Raising and lowering of the cross-rail is accomplished by engaging a multiple disk friction clutch running in oil, making unnecessary the use of tumbler gears, chains, sprockets, etc. The elevating device is shown in Fig. 3. The operation is by power, independent of the table drive.

The heads are independent in feed and traverse in

both directions. Each is provided with a feed box and a single lever control. Either head can be traversed to the center of the table for boring, where it is located by a positive hardened stop. Ratchets, mounted on the saddles, make possible close adjustments of the heads. Regular clamping bolts and additional long bolts are used to clamp the swivels to the saddles when the ram is in a vertical position. The added strength due to the long bolts is apparent.

Each ram has three taper gibs and an inset high-carbon steel rack running its entire length. The rams can be raised far enough that the bottom of the tool-holders will be above the lower edge of the cross-rail. They can be swiveled through 45 deg. either side of the vertical position. Swiveling is accomplished by means of a worm and segment, which makes setting easy and acts as a safety lock to prevent tipping when the clamping bolts are loosened.

Counterweighting of rams and turret slide is accomplished through spiral springs. This arrangement does away with weights, cables and sheaves. It prevents any interference with crane hook when brought directly over the center of the table. The spring can be adjusted to any desired tension, by means of a ratchet, as shown in Fig. 4.

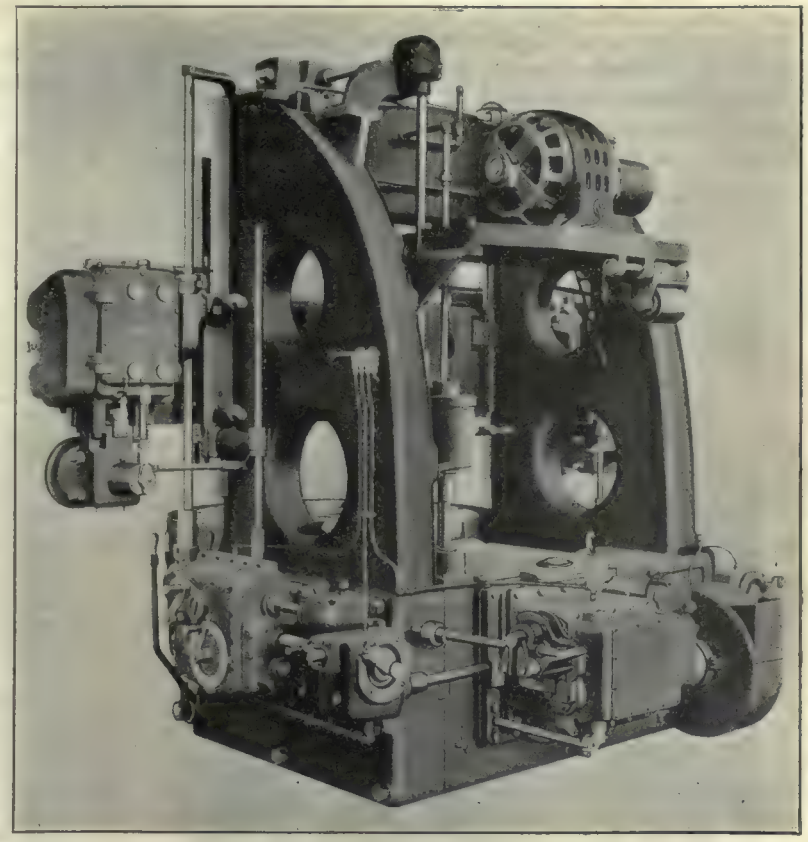


FIG. 2. REAR VIEW OF 42-IN. MACHINE

An especially noteworthy feature of the machine is the single lever control for head and ram of both feed and rapid traverse. The control for the right-hand ram is shown in Fig. 5. It is so designed that the lever is always thrown in the direction of the movement desired. When either feed or rapid traverse is engaged, the other is disengaged. Each of the four slots of the control plate is used for engagement of a feed and a rapid traverse. In each case the directions of feed and traverse are opposite. Running the slide to the limit of traverse without moving the lever to neutral position will cause the clutch to slip without damage to mechanism.

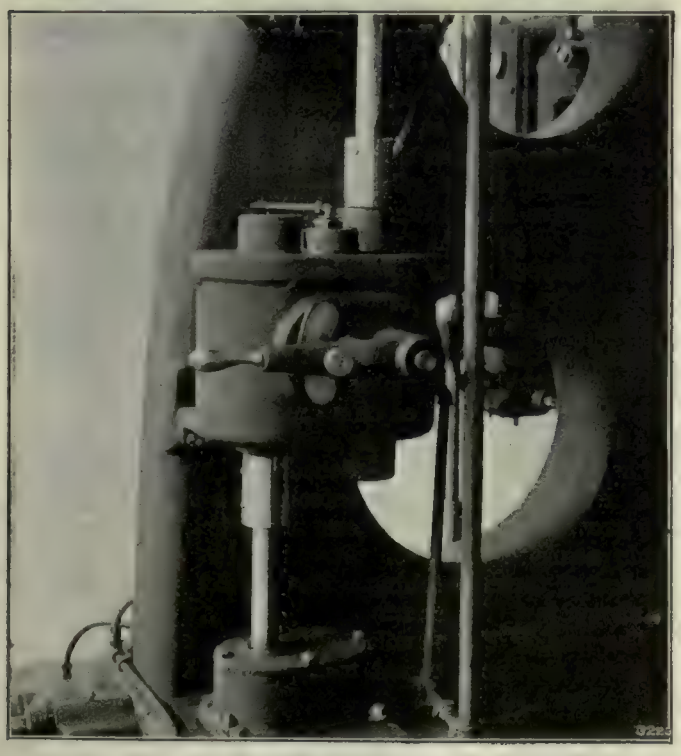


FIG. 3. CROSS-RAIL ELEVATING MECHANISM

Rapid traverse is obtained with the table in motion or at rest. The movement is at the rate of approximately 12 ft. per minute. Final adjusting ratchets for vertical and horizontal movements are mounted on the heads, a position making it unnecessary for the operator to leave his working position. They carry adjustable micrometer dials, reading in thousandths of an inch.

The secondary speed box forms an oil reservoir from which the oil is pumped to a cored chamber in the top brace. From there it flows to the feed cases, feed multiplying units, primary drive, spindle bearing and elevating device, passing through sight feed oilers on each side of the machine. The clutch boxes at the ends of the rail are filled with oil to a level indicated by an oil cup. Oil is pumped from the tank in the top brace to the outer edge of the angular spindle bearing and is fed by gravity down the vertical bearings back to the reservoir.

Power is applied through a single pulley mounted on ball bearings. A constant speed motor is mounted on a bracket between the housings at the rear of the machine and is belted to the driving pulley. An idler pulley maintains the proper belt tension. Radial and thrust ball bearings are used throughout the drive, in the clutch pulley and in the rapid traverse drive.

Threads of 4, 8 and 16 per inch can be cut without extra equipment. A thread-cutting attachment can be furnished to cut threads of from two to 24 per inch, including 11½. No changes in the feed mechanism are necessary.

A five-side turret head can be supplied. Each side

has three tapped holes for attaching box tools. The turret is tilted to an angle of 8 deg. to provide clearance for large tools when swung over the slide.

Sixteen changes of feed in geometrical progression from 0.006 to 1 in. per revolution of the table are available for both horizontal and vertical movements. Each

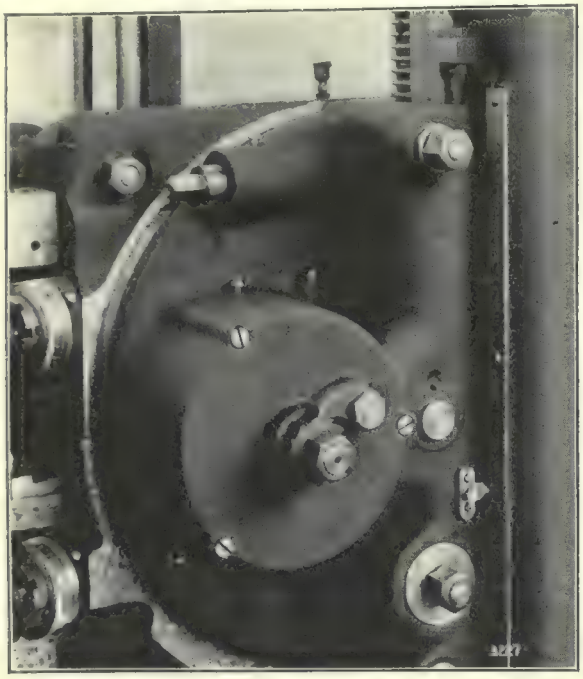


FIG. 4. SPRING COUNTERWEIGHT FOR COUNTERBALANCING RAM

head is independently controlled. All gears are steel.

The design includes among the safeguards for the operator: Encasement for all moving parts at the ends of the cross-rail; guards for driving pulley and clutch; table guard; friction feed clutches; an interlocking arrangement making it impossible to start the machine before the driving gears are fully in mesh, and preventing the making of speed changes until the clutch pulley has been disengaged.

The machine can be equipped with revolving center head for boring, reaming and facing operations on such

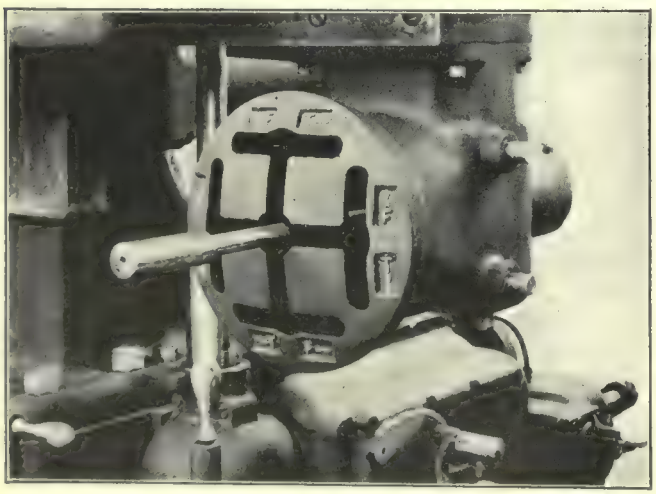


FIG. 5. SINGLE LEVER CONTROL FOR FEEDS AND TRAVERSE OF RAM

pieces as flywheels and pulleys; grinding spindles; milling spindles; cutting lubricant outfits; cross taper and forming attachment, and pulley crowning attachment.

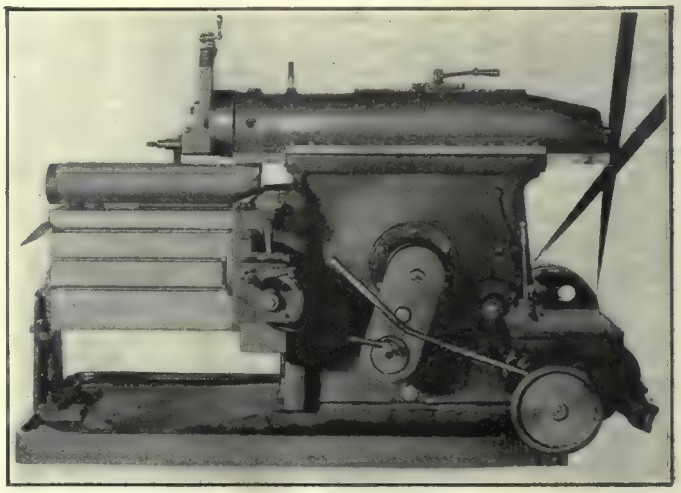
Kelly 32-inch Shaper

The 32-in. crank shaper shown in the accompanying illustration is a recent development of the R. A. Kelly Co. of Xenia, Ohio. The view shows the machine at work on the ram of a 14-in. shaper and gives an idea of the difference in size between the 14- and 32-in. machines. The 32-in. shaper is intended particularly for heavy duty, such as in railroad and forge shops.

The extreme stroke is 33 in., with a vertical movement of the table of 12½ in. and a cross traverse of 30 in. The table is of the revolving type, and work may be clamped on either side or the top. A special feature is the table support.

The feed mechanism on the machine is very simple and all parts are enclosed in a box. To change feeds, it is not necessary to touch any moving part. The feed cannot be caused to operate during the cutting stroke of the ram. The direction of the feed is controlled by a straight knurled lever on top of the box, and the amount of the feed by the lever on the side.

The gear box is patterned after an automobile gear box, and has four changes of speed, which are engaged by a ball lever on top of the box. The clutch and brake



KELLY 32-INCH SHAPER

are controlled by a long steel lever reaching to the operator's position at the front of the shaper. Pushing this lever in engages the clutch and starts the machine, while pulling it out releases the clutch and automatically engages the brake. By the use of this lever the ram may be brought to a stop at any point.

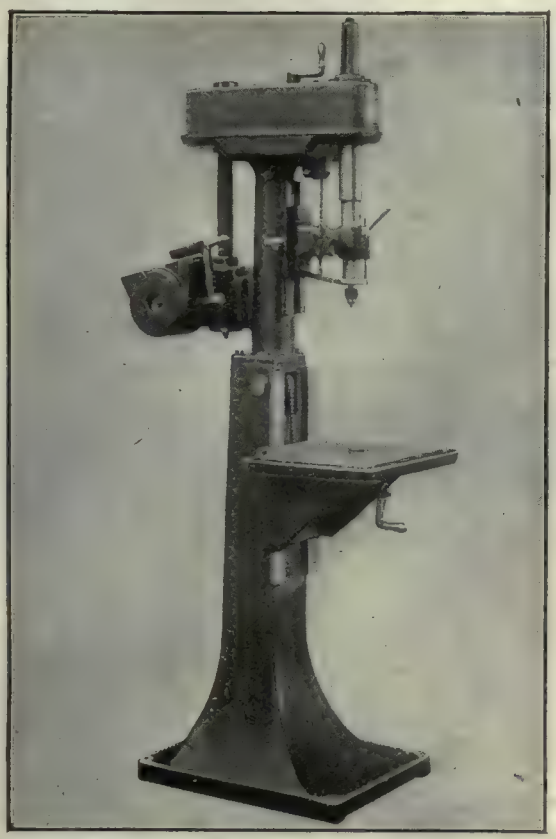
The only changes to be made when equipping for motor drive are bolting a bracket to pads on the back of the shaper and putting a gear on the drive-shaft instead of the pulley. All machines are built so as to be easily fitted with motor equipment, and a gear box may be quickly installed on a cone-driven machine.

All holes in the column and gear box are bronze-bushed and the shafts hardened. All gears are helical and made of steel or semi-steel. The sliding surfaces are provided with felt wipers, and lubrication has been made nearly automatic. Places difficult to reach are lubricated through tubing. The weight of the machine as shown is 6,500 pounds.

The machines are built for close, exacting work. It is stated that in a recent test, the machine very easily took a cut 1 in. deep with ⅛-in. feed in cast iron. After this test, the table was brought to its lowest and then to its highest position, and tests aken with a dial indicator showed that no corner was out 0.001 in.

Fosdick 13-inch "Superspeed" Drilling Machine

The sensitive drilling machine illustrated herewith has recently been added to the line of the Fosdick Machine Tool Co., Cincinnati, Ohio. It is built in a



FOSDICK "SUPERSPEED" DRILLING MACHINE

13-in. size, in two types, bench and pedestal, and in combinations of from one to eight spindles. The capacity is for drills up to ¾ in. in diameter in steel, iron or brass.

With the driving pulleys running at 1,750 r.p.m., three spindle speeds of 5,700, 8,000, and 12,000 r.p.m. are available, although other speeds to suit conditions may be substituted. All revolving members are equipped with annular ball bearings and dust-proof metal oil retainers, and the only revolving member exposed is the drill chuck. The helical-gear drive reduces vibration and noise. Because of the gears and the flat endless belt, the danger of drill breakage at maximum speeds is said to be greatly reduced.

The outstanding feature of the machine is the speed-changing arrangement, by which a single turn of a handle automatically releases the belt tension, shifts the belt first from the larger to the next smaller step on one cone pulley, and then by a similar movement from the smaller to the next larger step on the other cone. The belt tension then automatically adjusts to the new position. An aluminum guard, which completely encloses the belt and cone pulleys, may be lifted off without removing or loosening bolts or nuts, thus enabling the operator to install a new belt very easily.

In the pedestal-type machine illustrated herewith a very large floor area is provided. The elevating table is of the quick-acting counter-balanced type, with the clamping handle in front. The traverse is 10 in. Both the elevating and the bench tables are surrounded by liberal chip and lubricant channels.

The head has a vertical traverse of 6 in. and is counterbalanced to prevent dropping when unclamped. The spindle feeds to a depth of 3 in. and has an adjustable depth stop. It has an adjustable gravity counterbalance which employs no springs and which may be set to automatically return the spindle. The feed lever is adjustable to suit the operator. Opposite the feed lever is the quick-return handwheel, which enables the operator to position, feed, or return the drill with either hand.

The belt guard and shifter can be adjusted to receive the belt from any angle. Motor drives are either belted or direct connected, with a ½-hp. motor mounted on the machine. The regular equipment includes a No. 1A Jacobs drill chuck on each spindle. The bench-type single-spindle machine weighs 225 lb., and the pedestal type 464 pounds.

Brown Direct-Reading Resistance Thermometer

A direct-reading resistance thermometer, shown in Fig. 1, has recently been placed on the market by the Brown Instrument Co. of Philadelphia, Pa. The thermometer is intended for industrial use, and particularly for installations where it is necessary to know accurately a high temperature when only a small range is required. The large size of the divisions for each degree permits of more accurate reading than when the range on the scale is from zero.

The principle on which the operation of the thermometer is based is the change in electrical resistance occurring in metals with a change in temperature. This change can be accurately measured, and a scale calibrated to read directly in degrees of temperature. The coil of wire which changes in resistance is usually of nickel for temperatures up to 300 deg. F., and of platinum for temperatures up to 1,800 deg. This coil or "bulb" can be very small; a nickel wire bulb can be supplied with an active part 1 in. long and ⅛ in. in diameter, and the protecting tube need have an outside diameter of only ¼ inch.

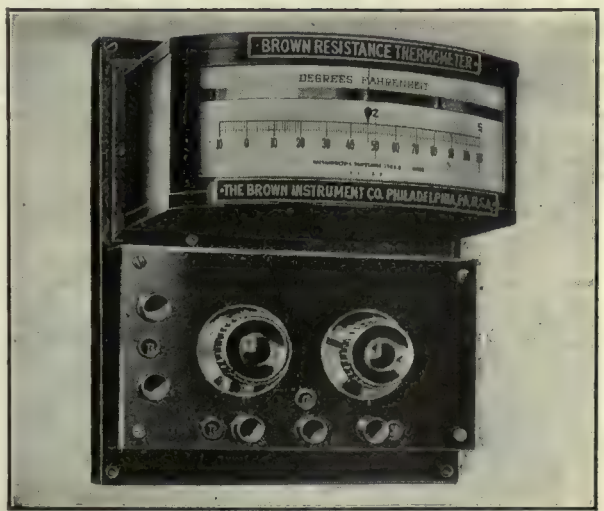


FIG. 1. BROWN DIRECT-READING RESISTANCE THERMOMETER

Bulbs can be furnished for all types of uses, whether for high or low temperatures or for use in chemical

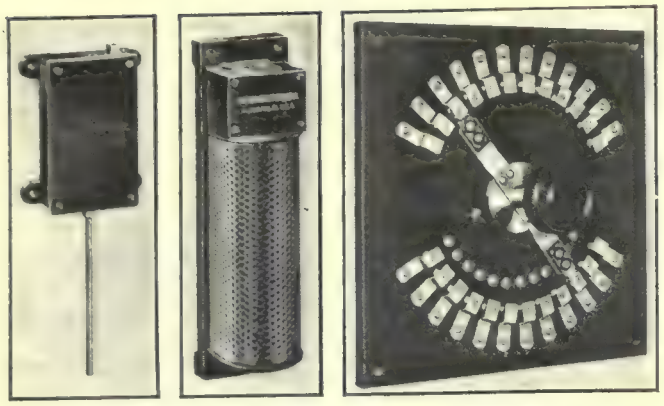


FIG. 2. BROWN BULBS AND SWITCH

processes. The view at the left of Fig. 2 shows a bulb for use in damp locations, while the view in the center shows the style ordinarily employed in rooms where no special conditions exist to disturb the operation. The latter type of bulb can be employed for public buildings, where accurate registration of the temperature is required.

The switch shown at the right of Fig. 2 enables connecting the instrument to any number of these resistance thermometer bulbs. For use in dry kilns, the instrument can be employed to measure both temperature and humidity, one bulb being subjected to the air temperature only, and the second bulb being covered by a wick connected to a tank of water.

Three wires lead from each bulb to the instrument, and changes in temperature along the wiring do not affect the reading. The length of the wire is immaterial, and the bulbs can be placed up to 1,000 ft. distant from the instrument when using 14-gage copper wire, or up to 2,500 ft. with 10-gage copper wire.

In checking the instrument for the zero reading in order to determine its accuracy, it is not necessary that the pointer be brought down to zero, since most scales are not provided with such a reading. However, the left-hand knob is turned to *Z* and then to *S*, to check the instrument with a standard resistance. When the knob is placed in the third position, the instrument is operated directly from the temperature bulb. The rheostat controlled by the right-hand knob on the instrument is used for adjusting the voltage. This check of the instrument is stated to be necessary only occasionally.

Modern "Quickgrip" Drilling Machine Table Vise

The Modern Machine Tool Co., 401 Water St., Jackson, Mich., has recently taken over the manufacture and sale of the "Quickgrip" table vise from the Sprague-Hayes Manufacturing Co. of Detroit, Mich. The vise, which was described on page 490, Vol. 51, of *American Machinist*, is intended for use on upright drilling machines.

The device is secured permanently to the machine and serves as both a table and a vise. When the vise is closed, the work-carrying table is 16 in. in diameter. A maximum jaw opening of 8 in. is provided, one jaw being moved by a 1¼-in. screw. The use of the device saves the time taken in mounting and removing a vise from a plain table. Either a plain, flat table or a vise or both together are quickly available.

Bath Ground Tap with "Sharpening Face" Flutes

A line of carbon and high-speed steel ground taps such as shown in Fig. 1 is being introduced by John Bath & Co., Worcester, Mass., incorporating a feature designated as the "sharpening face" flute.

As may be seen in the drawing, Fig. 2, which shows a section of the tap in contact with the grinding wheels, the shape of the flute is such as to leave a projecting face upon which is the cutting edge. The actual cutting face of each tooth is undercut by the round-face grinding wheel to give the effect of top rake and insure a clean and free-cutting tooth.

The taps are ground to size and final shape after hardening, thus removing all decarbonized material and eliminating errors due to distortion in hardening. The thread is not eccentrically relieved in the ordinary way,

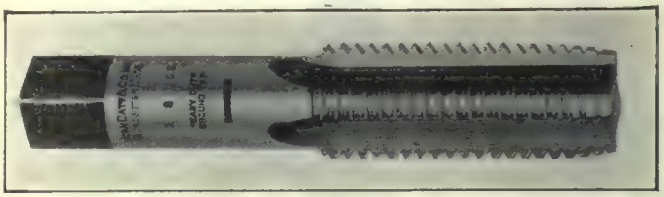


FIG. 1. BATH GROUND TAP WITH "SHARPENING FACE" FLUTES

but is given a form of relief that is peculiar to this tap alone and which is claimed to result in longer life.

The first four teeth, which remove by far the largest

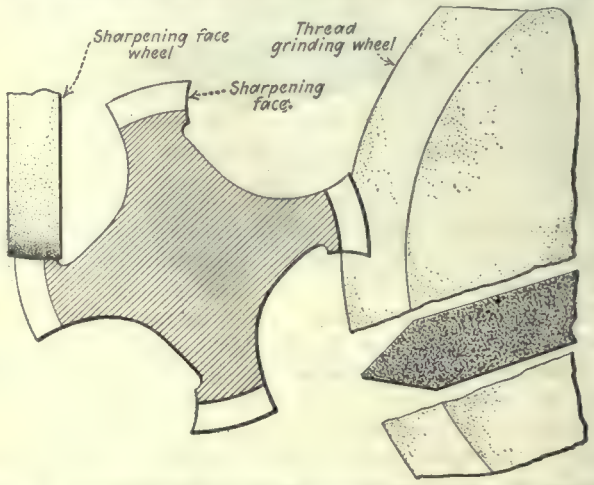


FIG. 2. SECTION OF TAP IN CONTACT WITH GRINDING WHEELS

portion of the metal from a threaded hole, are eccentrically ground, but the remainder of the cutting part is concentric and the outside diameter uniform. Beginning with the fifth tooth and continuing for four or five turns, the pitch diameter is constant and to exact nominal size. From this point, however, the pitch diameter falls away in a uniform taper toward the shank, where at the last turn of thread it is 0.00125 in. under size.

The advantages claimed for this tap are that the gradually lessening diameter reduces the tendency to bind and makes a free cutting tool; and that, because of the concentricity of the thread, regrinding the cutting face may be carried to any extent without diminishing the diameter of the tap or otherwise impairing its accuracy. The life of the tool is thus greatly prolonged.

Horton Differential Chuck

The E. Horton & Son Co., Windsor Locks, Conn., has developed a chuck for turret and engine lathes in which the power of the machine is utilized to close the jaws and grip the work, doing away with the necessity for wrenches and lessening the time and labor of setting up as compared with that required with a manually operated chuck. The chuck is of the scroll type and may be fitted with any of the standard Horton chuck jaws for internal or external holding.

The scroll-plate is considerably thicker than in the regular scroll chuck, and instead of the usual teeth of a bevel gear upon its periphery, as in wrench-operated chucks, the back face is counterbored and in the recess thus formed an internal gear is cut from the solid metal. The absence of teeth upon its periphery allows the scroll-plate to take its bearing within the body of the chuck upon its outer circumference, instead of upon the narrower and smaller diameter of its bore.

Directly back of the scroll-plate in the assembled chuck is an annular steel ring, attached to the body of the chuck as described later. Upon the inner circumference of the ring are cut the teeth of an internal gear similar to the one in the scroll-plate but slightly larger in pitch diameter. This ring is called the "backing gear."

Turning freely upon a large ball bearing mounted on the hub of the chuck is a ring, known as the "handwheel," of the same outer diameter as the chuck body. This wheel may be seen in Fig. 1, where it appears as the knurled portion of the body, and separately in Fig. 2 with the backing gear and differential pinions in their respective places.

Five pairs of pinions are mounted on studs shouldered into the inner face of the web of the handwheel. Of each pair, one pinion is slightly smaller in pitch diameter than its mate and meshes with the internal gear of the scroll-plate, while the larger one meshes with the backing gear. The two pinions of each pair are pinned together as one piece, the entire mechanism thus forming in effect an epicyclic train.

Considering for the moment that in the assembled chuck the backing gear is rigidly attached to the chuck body, it is obvious that if the handwheel (carrying with it the pinions) is rotated in a forward direction upon the stationary chuck, the pinions will run freely around in mesh with their respective internal gears. However, because of the differential ratio, the internal gear that is part of the scroll-plate will turn slowly backward with relation to the stationary chuck body.

Similarly, when the chuck is running forward with the lathe, if the hand is pressed upon the knurled part of the handwheel and its rotative movement stopped, the differential action of the epicyclic train will cause the scroll-plate to creep slowly ahead of the revolving chuck and thus close the jaws.

This differential action may be made in any desired ratio. In practice, it has been found desirable to make it about 9 to 1, causing the chuck jaws to move radially $\frac{1}{32}$ in. for each full revolution of the handwheel upon the chuck body. When mounted upon a machine, as a lathe, turret, or screw machine, a lever and brake are supplied to be attached to the headstock, thus providing means by which the pressure may be applied to hold the handwheel stationary while the rotation of the chuck automatically closes the jaws upon the work.

Theoretically the backing gear should be firmly attached to the chuck body. Actually it is held to the latter by studs entering short curved slots upon its periphery in such manner as to permit a certain amount of lost motion or "backlash" in the mechanism. Thus a quick forward movement of the handwheel will deliver a hammer blow upon the train, and will effectively release the most obstinate grip. This rocking movement of the handwheel may be repeated, if necessary, until the chuck releases, when the wheel will spin rapidly forward without material resistance.

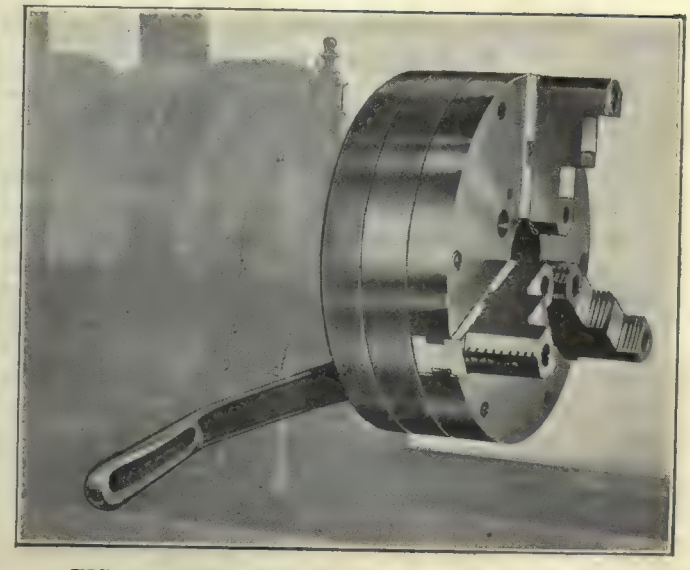


FIG. 1. THE HORTON DIFFERENTIAL CHUCK

Except for the manner of operating it, the chuck is the same as the standard steel-bodied Horton chucks, the jaws being interchangeable. Though it has the appearance of greater width, the new chuck has no more overhang than the standard chuck; all of the additional mechanism is back of the faceplate.

As the power to move the scroll-plate is delivered at five equally spaced points around the circle of the plate, the pressure is balanced, and all energy applied to the handwheel is utilized to move the jaws. As all moving parts except the scroll-plate are mounted upon ball bearings, the handwheel turns easily and may be spun rapidly backward or forward to open or close the jaws any considerable distance.

The chuck holds any piece within the range of standard chucks of similar sizes without adjustment or change of parts. All parts remain stationary with relation to the chuck body except when operating the jaws; therefore, there are no frictional losses or wearing of parts when the chuck is running. The chuck is available in the 13-in. size, and will be made in 9-in. and 16½-in. sizes.

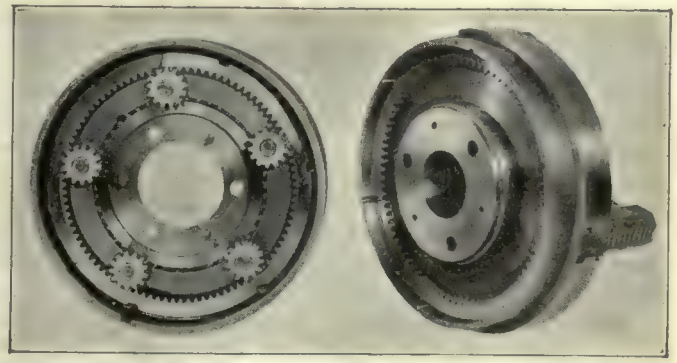
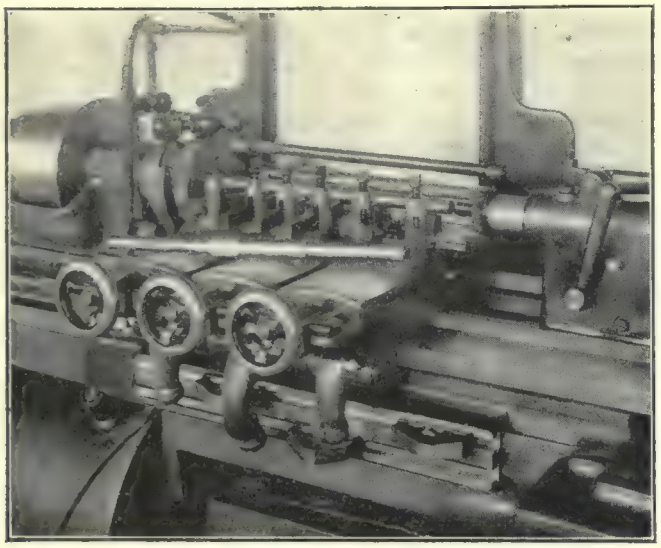


FIG. 2. OPERATING MECHANISM OF THE CHUCK

Necking Attachment for P. & W. Full Automatic Lathe

The Pratt & Whitney Co., Hartford, Conn., has recently brought out a necking attachment for use on its full automatic lathe such as described on p. 897, Vol. 55, of *American Machinist*. The attachment is used for squaring shoulders or necking below the turned surfaces of work that is being prepared for grinding, although it is adaptable to other operations where the crossfeed can be utilized. It can be readily removed and the regular carriage with its actuating parts applied to the lathe.

The attachment consists of multiple carriages that replace the regular carriage of the lathe. One, two or three of these carriages may be adjustably clamped to the front way of the bed. They carry regular toolslides, and provision is made for employing multiple toolposts. Adjustment for depth of cut is made by the handwheels shown in the accompanying illustration



NECKING ATTACHMENT ON P. & W. LATHE

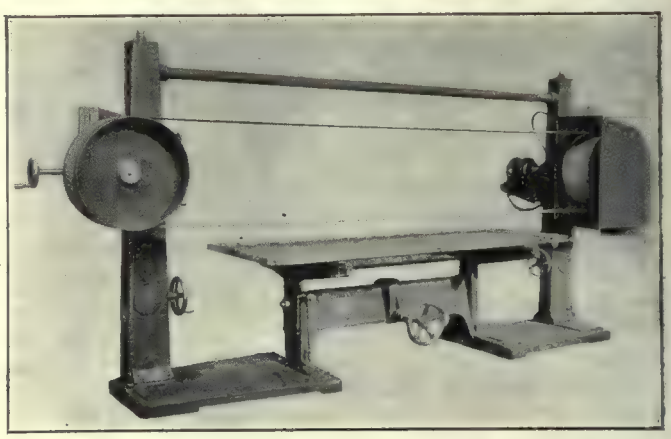
mounted on screws with graduated dials reading in thousandths of an inch.

The cross-slides are actuated, through the medium of roll-carrying arms, by the adjustable cams mounted on a cam carrier that is reciprocated longitudinally by the main feed cam of the machine. These cams can be adjusted to provide any sequence of the cross movements, or all slides may be moved in unison, depending on the nature of the work. Suitable oil distribution is provided, and all of the automatic functions of the lathe are retained.

Oliver No. 183 Self-Contained Belt Sanding Machine

The belt sanding machine shown in the accompanying illustration has recently been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. The machine is self-contained and designated as No. 183. It is adapted particularly to rapidly sanding and polishing straight, flat and irregular wooden surfaces, such as on large patterns, as well as to polishing metal surfaces.

The machine consists of three principal parts, the power stand, the idler stand and the table. The table is fastened to the base plates of the stands, which are connected overhead by a rigid bar. The sand belt pulleys run on ball bearings that are provided with individual adjustment vertically. The bearing housings



OLIVER NO. 183 BELT SANDING MACHINE

are mounted on gibbed, graduated ways and are moved by means of handwheels operating through bevel gears and screws.

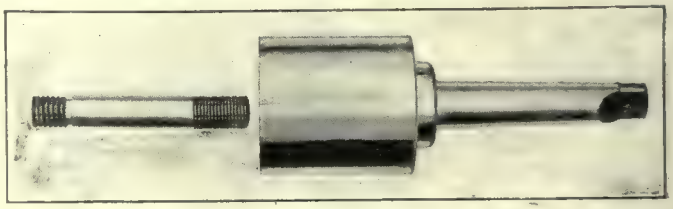
The arrangement of the parts of the machine is convenient for the operator, so as to enable quick work. The spokes in one pulley are guarded and the other pulley is entirely enclosed in the exhaust hood. The table rolls on ball bearings, and not on ball-bearing rollers. No gravity idlers are employed. The table is 96 in. long and 32 in. wide. It travels 36 in. horizontally and adjusts 14 in. vertically. The belt is about 31 ft. long and any width up to 10 in. may be used.

With the slow-speed motor drive, the motor is directly connected to the driving pulley. A high-speed motor may be geared to the pulley, as shown in the illustration. The pulleys are 24 in. in diameter and have 10-in. faces. They are rubber faced and run at 600 r.p.m. The large diameter of the pulleys requires that the belt be bent but little when passing around them, so that the life of the belt is increased. By means of a reversible switch, the belt may be caused to run in either direction.

The machine will take work of any length, and sand to the center of a 72-in. circle. It will hold work 42 in. high on the table, and by unbolting the table, work 66 in. high from the floor can be accommodated.

Jarvis Self-Opening Stud Setter

The Geometric Tool Co., New Haven, Conn., has recently placed on the market the Jarvis self-opening stud setter shown in the accompanying illustration. The tool is simple in design and provides a quick grip and



JARVIS SELF-OPENING STUD SETTER

release for the work. The parts are hardened and the tool is made to withstand long service.

The setter is made in three sizes. The No. 1½ size

has a capacity up to ½-in. studs, and is provided with a No. 2 or 3 Morse taper shank. The No. 2 size has a capacity up to ⅞ in., and Nos. 3 or 4 taper shanks. The capacity of the No. 3 size is up to 1¼ in., and Nos. 4 or 5 shanks are used. Special sizes of taper shanks can be furnished to suit particular needs, and special sizes of jaws can be supplied.

Van Keuren Thread-Measuring Wires

The Van Keuren Co., 362 Cambridge St., Boston, Mass., has recently added to its line various sizes and sets of wires for use in the measurement of screw threads, angles and profile gages. The measuring wires are made by methods similar to those used in the manufacture of gage blocks, so that wires which are practically perfect as to roundness, uniformity of diameter and size are said to be produced. The wires are standardized by light waves against standards certified by the National Bureau of Standards at Washington, D. C., so that their accuracy is assured.

The wires are 1⅞ in. in length and are lapped the full length, thus giving a long wearing surface. They are usually furnished without handles or suspension ends,



VAN KEUREN THREAD-MEASURING WIRES

which can be supplied when desired. The wires provided for screw-thread measurement are known as "best size" wires; that is, wires of the theoretical diameter to touch on the pitch line or at the pitch diameter of a perfect thread. By using the "best size" wire for each pitch, the measurement of pitch diameter secured is unaffected by any error of angle which may be present in the thread measured. The angle of thread may be easily checked by taking a measurement with the next larger size of wire.

The glass bottles in which the wires are packed give protection against rust and loss or breakage of wires. The label on each bottle shows the calibrated diameter of the wire to hundred-thousandths of an inch. On the label is also given the formula for the measurement of pitch diameter of the screw thread. When using the "best size" wire to find the pitch diameter, all that is necessary is to subtract a constant given for the three wires from the micrometer measurement taken over the wires as they lay in the screw thread.

The set shown in the accompanying illustration includes the common sizes of wires from 6 to 36 pitch, and contains all of the wires needed for the measurement of U. S. Standard, S. A. E., National Coarse and National Fine threads between these pitches. Additional sizes are made ranging from a ½-in. diameter measuring plug to wires for measuring 90-pitch threads, which are 0.00641 in. in diameter.

When It Pays to Have Machines Idle

By John R. Godfrey

Man is a funny bird. And an X-ray of the stuff which passes for brains would in many cases be a good imitation of a vacuum. The particular kind of a bird I have in mind is the alleged manager who won't buy a machine unless he can keep it busy all the time.

Such a bird was giving a new grinding machine the once over not so long ago. It was a whale of a machine and the way it chewed off metal was a marvel to all beholders. That was why the aforesaid manager didn't order one. It did the work too quickly. He couldn't keep it busy all the time and an idle machine is his pet aversion. "Eats its head off" was his favorite bromide when giving his reason for not buying.

The Point of View

It's the old story of not looking at the whole subject—of seeing just one particular angle and forgetting the real factor, net cost. It's the same type of managerial mind which refuses to pay a good man a dollar an hour and pays two dubs sixty cents each to do the same work.

The ideal condition is to have every machine working at its maximum. But the man who tries to limit his equipment to his exact requirements, soon strikes a snag. Machines will break down and wear out occasionally. Tools will break and men still get sick or bury their mothers-in-law occasionally. And so every good manager allows a surplus machine equipment to take care of this. Otherwise he finds production schedules completely busted and delivery dates a thing of the past.

We all like to see every machine busy. But if we can save money by running a machine only one week a year, that's the thing to do. It's all a question of balancing one expense against another—and that is really the essence of successful business.

This doesn't mean that you should buy every machine that comes out, even if it can do some of your work faster than those you have now. What you want to do is to figure the first cost, interest on investment, overhead charges by the year and see how much your product costs per piece with these charges against it. Of course you count labor, but only while it is operating the machine, for labor is at work elsewhere even when the machine is covered with grease and glory.

Surplus Machine Capacity

It frequently happens that a machine that can clean up all the work necessary in one week out of four, is a paying investment. Even if careful calculations show that the new machine will not more than break even, and it has surplus capacity, it is usually a good buy. For this surplus capacity is an incentive to find other work for the machine, and it frequently happens that work which was not at first considered, finds its way to the machine and is done more economically than before. Surplus machine capacity is usually much better than surplus floor space. You always have the possibility of increased production without further expenditure and at a reduced overhead.

So, before you join the ranks of the one-idea managers, who think a machine that is not working all the time is a poor investment, just figure it out from all sides. The chances are you'll be money ahead at the end of the year if you buy it.

News Section

March Exports of Steel Total 210,095 Tons

Exports of iron and steel from the United States in March totaled 210,095 long tons, an increase over January and February of this year of 40 and 55 per cent respectively. These figures are taken from statistics compiled by the iron and steel division of the Department of Commerce. Noticeable increase was made in the exportation of flat steel sheets, steel rails and plates, boiler tubes and welded pipes, structural steel, iron and steel bars, plain wire, ingots and wire rods. Shipment of wire nails, tin plate, fabricated structural steel, iron and steel castings, horseshoes and ferro-manganese fell off somewhat during this month. The total volume of American exports of iron and steel for the first quarter of the year (508,070 tons) is at the rate of slightly more than 2,000,000 tons for the year. In 1921 the total, which comprised only those commodities listed according to quantity in the export transportation obtaining at that time, was 2,171,282 tons. For the year 1920 the volume of export was 4,702,632. There is evidence that the total volume for 1922 will exceed 1920.

Course in Employee Training at Wisconsin

A course in "Employee and Foremanship Training" has been established in the department of industrial education and applied arts of the University of Wisconsin, Madison, Wis. The purpose of the course is to give to students of engineering a conception of the problems of education and training found in industry, and the opportunities for trained men and women in various industrial positions. A careful study is made of the programs of large factories and corporations, and of the various foremanship courses given by other schools and agencies.

Federal Approval of Philadelphia Exposition

Full approval of Federal participation in the Philadelphia sesquicentennial celebration has been voted by the committee on industrial arts and expositions, which has reported, with certain amendments, the Darrow bill and recommends that it receive the prompt approval of the House.

The bill as amended specifies that Fairmount Park shall be the site of the exposition and that the form of Federal participation is to be determined by the President.

The committee believes that the sesquicentennial will be even more potent in its influence on industry than was the exposition in 1876 and in its official report to the House predicted that the exposition in 1926 will be the greatest international affair of the kind ever held.

Motor Car and Truck Production Increases

Reports received by the Department of Commerce show a further increase in the production of automobiles during April. New records were made for the output of both passenger cars and trucks, compared with the preceding ten months for which figures are available.

With the reports lacking for only a few small companies, the total April production of passenger cars amounted to 196,512, or an increase of nearly 30 per cent over the March production of the identical firms. The April truck production totaled 21,944 machines, compared with 19,449 from the same firms in March.

The following figures give the production for identical firms for the past four months.

1922	Passenger Cars	Trucks
January	81,638	9,204
February	109,039	12,968
March	152,647	19,449
April	196,512	21,944

Standards Committee to Conduct Survey

At the request of Secretary of Commerce Hoover, the American Engineering Standards Committee will undertake a canvass to determine what simplification in manufactured products is most needed and most desirable. This canvass will be conducted through the engineering and technical bodies having representatives on the committee, or co-operating in its work, and the survey will extend into almost every line of activity in America.

This assignment to the American Engineering Standards Committee is one of Secretary Hoover's steps to save for American industry a few of the many millions of dollars wasted annually, as has been revealed in the report on waste in industry which was made not long ago by a committee of the Federated American Engineering Societies. This request of Secretary Hoover and its acceptance by the committee is significant of the close co-operation between the Department of Commerce and American engineering and industrial bodies. There seems to be a general recognition of the fact that simplification of products and the improvement of processes are to a large degree only other words for standardization. This joint movement for standardization and simplification now under way may therefore be said to have begun its work in its own household, by standardizing, simplifying and unifying its own machinery and processes.

Representatives of this committee recently held a conference on this subject with Mr. Hoover, in Washington, and arrangements were made for an exchange of representatives between the two organizations so that there may be the closest possible co-operation between them.

Freight Loadings and Repairs

Loading of revenue freight totaled 755,749 cars during the week ending May 6, compared with 758,286 cars the previous week, or a reduction of 2,537 cars, according to reports just filed by the carriers of the United States with the car service division of the American Railway Association. This was, however, an increase of 34,027 cars over the corresponding week last year.

Compared by districts, increases in the total loading of all commodities over the preceding week were reported in only the Eastern and Central western districts, while all reported increases over the corresponding week last year except the Alleghany and Southwestern districts.

Freight cars idle on American railroads, because of business conditions, totaled 521,746 on May 8, compared with 529,658 on April 30, or a decrease of 7,912.

Of the total, 353,239 were surplus freight cars, while the remaining 168,507 were freight cars in need of repairs in excess of the normal number unfit for service.

Of the 2,274,240 freight cars on line, reports showed 327,704 or 14.4 per cent to be in need of repairs on May 1, compared with 317,783 or 13.9 per cent on April 15. Allowing 7 per cent of the cars on line as representing the normal number in need of repairs would leave 168,507 cars as the number idle because of business conditions and need of repair.

Revenue Bureau Gives Ratios for Amortization

The Internal Revenue Bureau has announced ratios of estimated post-war cost of replacement, for use by taxpayers in computing claims for tentative allowance for amortization. The ratios are expressed in percentages based on prices as of June 30, 1916, and include the following:

Electrical machinery and equipment, 130 per cent; engines, turbines, compressors and similar facilities, 175 per cent; pumps, 135 per cent; boilers, 160 per cent;

Transmission equipment including shafting, pulleys, hangars, etc., 135 per cent; belting, 100 per cent.

Machine tools and small tools (machine tools considered as that class of metal working machinery which can be used on both cast iron and steel), 130 per cent.

Wood working machinery, 155 per cent.

Textile machinery, 155 per cent.

All other machinery, including cranes, the cost of which did not exceed 10 cents per pound as of June 30, 1916, 120 per cent; machinery the cost of which did exceed 10 cents per pound as of June 30, 1916, 130 per cent.

Further information on amortization requirements appear on page 836d.

Steel Treaters Meeting in Pittsburgh

A sectional meeting of the American Society for Steel Treating, taking in the chapters of the society from Cleveland, Buffalo, Rochester, Syracuse and Pittsburgh, was held in the auditorium of the Bureau of Mines in Pittsburgh May 25, 26 and 27. The out-of-town chapters were the guests of the Pittsburgh section and were welcomed at the opening session by N. D. Hoffman, chairman of the Pittsburgh Chapter.

At the first session the following papers were presented: "Fiber in Steel and Iron," by Prof. F. F. McIntosh of the Carnegie Institute of Technology; "Mass Influence on Heat Treating," by W. B. Crowe, metallurgist, Carnegie Steel Co.; and "Impact Tests," by J. N. Lessels, Westinghouse Electric and Manufacturing Co. At the close of this session the members adjourned to the University Club where they were the guests at an informal dinner.

The morning of the second day was spent in visiting steel mills and manufacturing plants in and around Pittsburgh, ending with a luncheon at the Westinghouse plant. In the afternoon under the chairmanship of H. M. Boylston, of the Case School, papers were presented on: "Abrasive Qualities of Carbon and Alloy Steel," by A. M. Cox of the Pittsburgh Commercial Heat Treating Company; "The Importance of Properly Heating and Cooling Steel," by J. A. Succop of the Heppenstall Forge and Knife Co.; "Manufacture of Springs," by D. A. Smith, Union Spring and Manufacturing Co.; "Change in Dimensions of High Speed Steels in Heat-Treatment," by M. A. Grossman. Electric Alloy Steel Company.

In the evening the members attended a smoker at which a motion picture showing the operation of an open hearth furnace was exhibited through the courtesy of the American Rolling Mills Co. This completed the technical phase of the convention, the last day being devoted to a meeting of directors and executives. The convention was closed with an entertainment on Saturday evening at Carnegie Institute.

Gary Counsels Optimism and Confidence in Future

Prefacing his remarks at the opening of the twenty-first annual meeting of the American Iron and Steel Institute, held in New York City on May 26, with a frank statement of confidence and optimism in the future of American business, Elbert H. Gary, chairman of the board of the United States Steel Corporation, delivered an interesting analysis of conditions in the United States, taking up legislative and industrial problems which directly affect the present. The meeting was well attended by prominent steel producers and manufacturers.

In a clear definite manner Judge Gary presented a message of common sense philosophy. It was a message filled with encouragement, and the earnestness with which he spoke greatly impressed his audience. What he said on the great subjects now foremost in the minds of the public, deserves the sober thought of every fair-minded citizen. The tariff revision he likened to an "intermittent disease," appearing at least with every change in administration if not with every session of Congress. He deplored the fact that the work done and the data collected by the National Tariff Commission at great expenditure of public money, had been entirely ignored. Today the tariff has become largely a local issue, favoring certain classes and not adjusted to suit the welfare of the body politic. That there is urgent need for a permanent tariff commission consisting of well paid and non-partisan men to adjust rates on a scientific basis seemed to him to be quite evident.

On the much discussed subject of the soldier bonus he counseled that final judgment be deferred. Because of the already heavy burden of taxation the country is not reaping the full limit of its opportunities; far better at this time it seemed to him to employ the funds required by a bonus bill in making the necessary extensions to industry so urgently required; that in thus furnishing employment the need for a bonus would be shown to be in a great measure unnecessary. If and when a bonus is paid the fairest method least likely to burden the people at large seemed to him to be by taxation, equally distributed. He said that he believed the sales tax represented the fairest method of all.

On the subject of Government in business he said that governmental regulation and investigation of industry was to be welcomed, provided it was conducted along non-partisan lines. He thought there was a disposition lately to exempt labor and farmer organizations from any such supervision. This exemption gave to such organizations power to do things beneficial to themselves but injurious to others—in short to create class distinction. He declared that governmental regulation could never be successful unless applied fairly and equally to all.

As to future business conditions Judge Gary held out great hopes. Though obscured at times since the signing of the Armistice, profitable business and general prosperity for all industries and for the people of this country are today nearer realization than at any time before.

At the banquet in the evening, held in the Hotel Commodore, Judge Gary presided. Earl French was the guest of honor.

Machinery Company Denied Another Hearing

On the ground that the case was heard twice before the Supreme Court and all phases of the controversy considered, Solicitor General Beck, for the Government, has opposed the motion of the United Shoe Machinery Co., for rehearing and modification of the court's decree in the case which banned leases of shoe machinery under the anti-trust law. He opposes authority being given the District Court to permit use of clauses in the leases which under other circumstances might not be violative of the law, on the basis that it would open up the case to endless litigation and defeat the effectiveness of the decree.

Veterans' Bureau Can Supply Trained Workmen

The United States Veterans' Bureau has 130,738 ex-service men in training status who are receiving instruction in every trade of industry and in agriculture. They are completing their courses at the rate of 500 a month. Manufacturers who want personnel trained in a particular vocation, are asked to write to the Rehabilitation Division, Employment Section, U. S. Veterans' Bureau, Washington, D. C.

The Government is conducting the largest trade and industrial school in the world in which more than 130,738 students are enrolled. The instruction in these vocations is furnished in leading colleges, technical and commercial schools, as well as in business establishments, shops and on farms. The men are in training in every state in the union and in every large city in the country. In all the large industrial centers the men who have received this intensive training from the Government are available for positions. Every vocation is represented and any employer who needs additional personnel will be furnished such personnel from his vicinity in short time by notifying the bureau.

These men are not permitted to terminate their training until the bureau is assured that they are skilled workmen and capable of carrying on in the vocation for which they are trained, and meet the requirements of the commercial, industrial and agricultural world.

The public has the impression that the majority of men who are receiving vocational training suffer from amputations. This impression is erroneous as statistics compiled by the bureau show that less than two per cent of the men in training suffer from amputations.

Employers who wish to employ these ex-service men who have been trained and whose ability to successfully carry on in a vocation has been assured by the training given, should correspond with the above address, state the type of personnel required, when the position is available and the place of employment.

General Conditions in Italy Show Better Business

Unemployment in Italy which reached the high point of 606,819 on Feb. 1, has registered 576,284 on March 1, and 498,606 on April 1, says a cable to the Department of Commerce from Mr. MacLean, commercial attaché at Rome. Business failures still reflect unsettled conditions in Italy, and during April totaled 277, as compared with 306 during the previous month, and 110 during April of last year.

The Bachi index of wholesale prices, based on the average price in 1920 of seventy-six commodities, registered 84.37 for April as compared with 85.43 for March, and 90.1 for February.

December exports were approximately 865,000,000 lires, an increase of 147,000,000 lires over those of the previous month.

Government expenditure during the five month's period of last year, July to November, amounted to 6,291,000,000. This represents a decrease of approximately 2,238,000,000 from those of the same period in 1920.

Germany's Labor Problem

Wage Regulations Retard Production—High Rents and Living Costs a Burden—Management Hampered by Union Rules—Exchange the Barometer of Business

BY OUR BERLIN CORRESPONDENT

(Continued from last week's issue.)

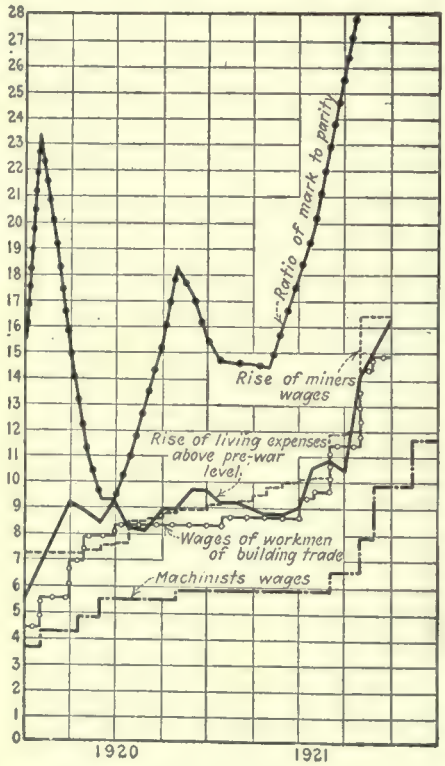
It is part of the labor regulations that wages are settled by agreement between employers' associations and employees' unions. Such agreements, called "wage tariffs," are concluded in large towns locally, in small towns and in the country for districts. They are contracted for a specific time, sometimes a year, but can be terminated by notice of a month or so, according to special arrangements. They include also stipulations for additional payments like subsidies to wife and children, provisions for holidays, and stipulations for piecework payment, especially the minimum earnings granted to pieceworkers.

The network of regulations, cleverly woven round the wage problem, naturally acts as a retarding force. Spread over the whole field of production and exercised with special care and exactness where necessities of life are concerned (in which respect it is further helped by the criminal law dealing with excess profits), it has enabled the administration to keep prices down, even after the control of prices on food stuffs and other commodities has been removed. It is, however, very doubtful whether this expedient will work permanently. Recent developments, resulting in an upward rush of all prices, are rather alarming in this respect. They are, of course, caused by the unprecedented depreciation of the currency, but the disquieting side of it consists in the fact that prices by their great inertia will not stop simultaneously with the exchange fluctuations.

The Rent Factor

Deliberate actions of the government to keep prices down have in the course of time diminished to the care taken of grain prices exercised by contributions from public funds. This last remnant of the control of food stuffs has recently been abandoned, and the insignificant reaction on the living cost is proof of the fact that this measure has in its import been greatly overrated. There is, however, another factor which is of far greater importance, and deserves special attention, not only because it is frequently overlooked by observers from outside, but also because it will supply the administration with an effective control of living costs long after all other means will have ceased to work. This is the rent factor which absorbed in pre-war times from one-third to one-fourth of the average workman's income. This part of his expenditure has, however, only doubled. If the prices of all commodities would reach the equivalent of the pre-war standards, and the workman had to be paid accordingly, he could not claim increase of the part of his income going towards housing expenses, except for the insignificant doubling of his rent which, apart from all other factors, would allow his income to be kept down below pre-war level by from 25 to 30 per cent. This is important in view of the much feared approach of prices to the gold standard. It appears, therefore, that the property owners are carrying to a large degree the burden of the administration's labor policy.

The following diagram shows five interesting curves, which held together are a very lucid illustration, not only of the labor problem but of Germany's whole industrial situation.



The first curve shows the movement of the exchange, the second that of the living cost. Of the three stepped curves, the first indicates the movement of the wages of the miners, the second that of the building laborers, and the third those of the machinists. The diagram extends over the years 1920 and 1921. The abscissa in the diagram demonstrate the ratio of the respective figures to the pre-war level. The curve of depreciation (ratio to parity) only reaches as far as September, 1921.

Regarding living cost, it should be mentioned that the exactness of the statistic index figures upon which the diagram is based is strongly questioned, not only by the workingman but also by a number of economists. It is contended that if the index figures were composed in a way conforming with pre-war living standards, and not with apparently much lower ones, they would show a much stronger deflection. Comparing living costs with money depreciation, it is seen that the first are in some measure following the latter, leaving a wide margin between. It is interesting to note that the recovery of the currency in 1921, extending from January almost to July, is hardly reflected in the living expenses, although the reversion was sharp. Though the curve of living costs show a number of fluctuations, its upward tendency as a whole is unmistakable.

In none of the three groups of workmen seen in the diagram, nor in any other, have wages ever been reduced, not even when the currency recovered from nearly 100 to 39m. to the dollar. On the contrary, the unbroken upward movement of wages in the time corresponding with that recovery was rather marked. This fact will explain the prevalent fear that in the case of a future reverse of the exchange movement, with conflicting conditions so much more pronounced than in 1920, the curves representing money and cost of labor might one day intersect, which point would no doubt mark a most severe crisis.

Divergence of Rates

It is peculiar to note how far the wages of the three groups represented in the diagram differ. The wages of miners and for building labor keep close together; the wages of the machinists' unions, which comprise all workers in the metal industry, are remaining however far below. The wages of the miners follow closely the movement of living costs, and have in places even gone beyond them. This is due to the fact that the miners occupy a rather privileged position among the workmen. With regard to building laborers, the explanation is not so easy. The reason is that building laborers have during the war and the years immediately following, in a large number joined other vocations, and cannot be persuaded to return to their old trade, unless special inducement is offered. In spite of the small amount of building work going on, workmen are scarce, a condition which gave the unions a clue to put forward claims for higher wages than are paid to other groups of workmen.

Much has been written and said about the unhealthiness and hot house nature of German prosperity, and although the arguments derived therefrom have been frequently used for the country's cause in the reparations problem and are probably flavored, they are by no means without foundation. The manufacturers are pointing out incessantly that, granted equal conditions with foreign rivals, German industry could not compete with them. Any one going through German factories—even at the present time, when intensity of production is at its highest, calling forth all reserves of energy—can bear witness that this complaint is correct in a large measure. It must be remembered that the way traversed since the revolution is marked by a forced retreat on the part of the employers, strewn with concessions to the workmen, cutting deep into the scope of management of the works.

The eight-hour day is declared by the

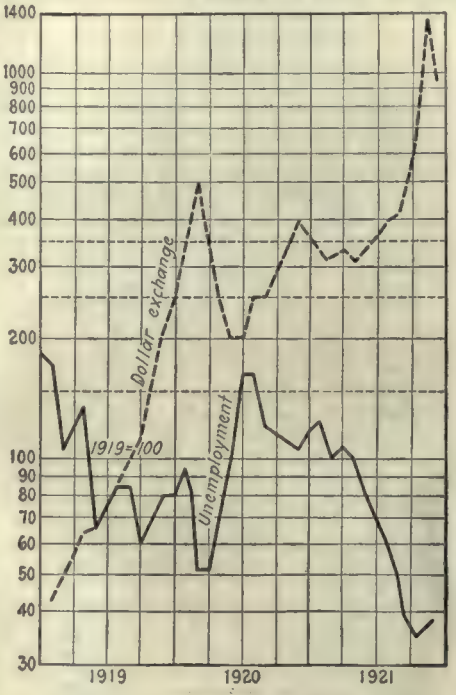
employers to be the greatest evil inflicted upon them. The shop council law, with the strong protection it gives the workman against dismissal, the prohibition of overtime, and the large financial burden the employer has to bear for providing towards workmen's welfare institutions, are further adding to the discontent. The workmen on their side are dissatisfied by the extent of concessions they have derived since their ascendancy to power. If disorganization and dissolution have not set in, and gradual recovery even taken place, it is not the fault of the new state of affairs, but solely due to the innate discipline and industriousness of the race. Quite apart from other conditions, the impossibility to dismiss workmen for incompetence suffices to frustrate all efforts to develop efficiency and exercise economy. Nothing has been done yet to make the best of the new order of things. Hardly anywhere have attempts been made to speed up the working process in compensation of the reduced working time. Manufacturers declare that such speeding up is impossible in view of the frame of mind of the workmen.

In this contention they are believed. They are solely dependent on the good will of the workmen. If the latter feel like spending an hour over work which could be done in half the time, the manufacturer cannot interfere. If there is not sufficient work, time is "stretched," otherwise it is also stretched because there is no spur for filling it adequately with work. Existing regulations prevent anything which would reward diligence and punish laziness. The spirit of equalizing, the basic socialistic doctrine, is ruling the whole situation. Differentiation is most effectively eliminated. The working speed and the economy which manufacturers can effect are those that the workmen accord them voluntarily from their sense of duty and honor. That the results are not exactly poor speaks highly for both. But even as it is, economy and efficiency in production have sunk considerably below the prewar standard. The individual efficiency of the workman may in the average have reached 60 per cent of the old standard, but in the case of economy this percentage is much less.

Spirit Lacking

This is not entirely due to remissness on the side of the laborers, but in a large measure to an entirely disproportionate increase of overhead, depreciation of machinery, inferior quality of tools, and last but not least to the whole system lacking spirit and "pep." Moreover, it can be noticed that workmen, as well as manufacturers, have frequently lost all sense of economy, doubtless due to the continuous depreciation of money and because the elasticity of its value has so far saved manufacturers from feeling the pinch. They seem to have forgotten the old methods of making both ends meet, and are relying upon the vicious circle, which is in the habit of closing up automatically between increased cost by a rise of sale prices contingent with a further depreciation of the currency.

Probably the most dangerous item of the unhealthy conditions prevailing consists of the fact that business is not ruled as it used to be by the laws of supply and demand, but by the money exchange. A little diagram recently prepared by the State Bureau of Statistics shows two curves. One depicts the extent of unemployment; the other the exchange of the dollar in Berlin. The chart demonstrates this clearly.



In explaining the way this diagram is drawn up, it should be mentioned that the graduation of the abscissa is not equi-distant but in the logarithmic order, which it is alleged more clearly demonstrates the run of a curve. If, for instance, the mark would drop from 30 to 15 cents, this would in an ordinary diagram be expressed by a large drop. If, however, it sunk from 1 to ½ cent, the deflection in the diagram would hardly be visible, although it would mean a drop from 100 to 200m. to the Dollar. In the diagram the curves representing unemployment and the movement of the dollar exchange in Berlin are running exactly counterwise. The dependency of business on the fluctuations of the exchange is even increasing as the movement of prices is more and more drawn into the vortex. Up to now, it has been possible to preserve a certain continuity of prices, but during the last months a growing tendency has become noticeable of prices quickly following the inflections of the currency. This is no doubt due to the fact that the prices of a number of commodities of everyday use have already reached pre-war parity, and for this reason are bound to follow the lead of the money market, thereby influencing the rise and fall of the whole market to a certain degree. The money exchange has become the business man's barometer. Like the seaman's first glance in the morning is up to the sky, the German business man's first look is at the dollar exchange. This state of things would probably not be so dangerous if the money market were controlled with a view to maintaining a certain steadiness, or if at least it were left to itself. But this is not the case. The relation of the mark to the dollar is by no means ruled solely by the state of the finances, but rather strongly by hopes and disappointments, based upon happenings of the most divergent nature, political and economic. This picture of Germany's economic life is unique and full of unhealthy perversity. Jokers say that when Lloyd George smiles in Genoa, eggs get cheaper in Berlin. This is not a mere jest but contains more than a grain of truth. It is certainly true that a number of mark speculators, bulling or bearing it at will, are able to shake the whole structure of business life to the very foundations. All the institutions devised to protect the business man against the effects of currency fluctuations and contracts concluded in foreign standard currency, are of no avail in such emergencies. The trend of business bears no more semblance to a uniform current but rather to a whirlpool full of eddies and undercurrents, making navigation extremely difficult and dangerous. In view of this picture, the prosperity seen everywhere looks puffed up and unhealthy.

A Great Wage Problem

Although the advantages of a stabilized currency are obvious and realized everywhere, the feeling among business men in this direction is divided. There is no doubt that in the case of a stabilized exchange, no matter in what relation to parity stabilization is effected, prices and wages would adjust themselves to the standard of currency, and gradually run up close to it, thus diminishing the economic advantages producers now enjoy. Stabilization of the currency would squash all hope of a future improvement of the exchange. This hope plays an important part in the present scheme of things. If wages and prices are soaring up, a timely arranged bulling of the mark has never failed to check this movement. A good many of the arguments used to keep wages down rest upon the unsettledness of the exchange. The most effective argument, for instance, against the strongly advocated scheme of putting wages on a sliding scale is supplied by the possibility of a recovery of the exchange, in which event the wages would be forced down. If this is accompanied by a "propaganda of hope" through the public mouthpieces, and with fluctuations of the exchange clearly demonstrating that the mark might go up as well as down, a state of uncertainty is produced which so effectively dims the vision of everyone that the treatment of the labor problem can follow the crooked course into which economic conditions force it, without it becoming clearly visible to the observer.

Moline Plow Reorganized

The Moline Plow Co., Moline, Ill., has been reorganized and has taken in the Stephens Motor Car Co. as a subsidiary. The new company is being launched with $16,000,000 of current assets and with all current indebtedness cleared from its books, except a few accrued current expenses. The officers of the reorganized company are: President, George N. Peek; vice-presidents, H. S. Johnson, R. W. Lee, F. W. Edling, C. B. Rose and H. B. Dinneen; secretary, L. C. Shonts; treasurers, F. N. Honenigman and John Hammerich. Frank O. Wetmore, president of the First National Bank of Chicago, is chairman of the board.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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A 10 per cent reduction in our railway freight rates and a meeting of the world's greatest bankers in Paris to consider lending between one and four billion dollars to Germany were the outstanding events of last week in the business world.

Their significance is not yet appreciated or rightly understood. In the stock market the reduction in freight rates was unfavorably construed and this construction was reflected by a slight decline in railway shares. It will be short lived, for the lower rates will greatly augment the traffic and bring an increase in gross earnings that will benefit both the country and the carriers.

When about two years before his death I was talking of railway rates to the late E. H. Harriman he said: "Price, give me the gross and I will take care of the net. The earnings of a railway depend upon the density of its traffic. If I can get all the freight I can haul that is all I want."

In these epigrams Mr. Harriman briefed the policy that made his roads successful. The larger the traffic the cheaper he was able to carry it, and I venture the prediction that the increase in gross revenue which will follow the rate reduction ordered last week will be so surprising that the railways will themselves take the initiative in applying for a further reduction. Cheaper transportation and greater profits I believe would be the effect if Secretary Mellon's proposal for removal of government restrictions on rate making for five years were adopted, though there is little likelihood that it will win public support. But as the reduced rates do not take effect until July 1, reduced earnings are to be expected during June because those who can will delay shipments until the new rates apply.

A Revival in July

I have previously named the first of July as the date upon which a country-wide revival of business would be due and the fact that it is upon that day that the lower freight rates take effect increases my confidence in the coincident arrival of a business boom.

Transportation is the very life blood of economic civilization and anything that tends to cheapen the cost of carrying goods from the producer to the consumer must make for prosperity. It is to be hoped that the Interstate Commerce Commission will soon order a reduction in passenger rates. As Commissioner Cox pointed out the passenger traffic is now 7,000,000,000 revenue passenger-miles below normal and from this statement some idea can be had of the increase in travel which would follow a return to prewar rates.

As to the German loan that is under consideration at the bankers' conference in Paris, it can probably be taken for granted that a bond issue will be arranged on some terms. The amount, the rate and the security are of course undetermined as yet, but a loan that will be sufficiently large to take care of her reparation payments until Germany gets on her feet is so obviously necessary and desirable that it is safe to assume that it will be made.

There are some who doubt whether any substantial proportion of such a loan would be subscribed in the United States, but leading bankers here think differently and believe that at least $500,000,000 gold bonds could be sold in this country if the rate were sufficiently attractive. This belief is based upon the theory that such a loan would greatly aid in liquifying the debts due our merchants and banks by Europe and South America and that our financiers will leave nothing undone to insure its success.

The soundness of this theory is unquestionable and as the arrangements for the loan approach consummation further buoyancy in the stock and commodity markets is to be expected.

Markets Are Sound

The confident tone that has recently prevailed in these markets showed no abatement last week. Copper is now up to 14 cents. Sugar is firmer and as the surplus supply disappears higher prices seem indubitably indicated. Rubber is steady and the activity in the tire business is commencing to make an impression upon the American stocks of rubber. Cotton has been steady. Everyone is bullish on cotton and the position is statistically strong, but it should not be forgotten that the crop generally improves during June.

The iron and steel industry is almost booming, but the much-talked-of mergers are held up pending the approval of the Attorney-General. As a speculative influence their effect is probably spent. Wool and silk are again higher and the dry goods market shows more activity from day to day.

The New England textile strike is gradually wearing itself out. It has so wearied the New England manufacturers that many of them are talking about moving South, but it is unlikely that any of them will actually move, though it is to be doubted whether many more cotton mills will be built in the North.

Money is still easy, though the increased borrowing of New York stock brokers is gradually absorbing the surplus funds of the New York banks.

Thomas A. Edison's proposal that the Government should build warehouses for the storage of farm products against which Federal Reserve Notes should be issued for half the average value during the previous 25 years, has attracted not a little attention and is said to have been favorably received by some of the farm "bloc" in Congress. It appeals to the agrarian imagination, but no attempt to give it effect seems likely.

The sale of 40,994 shares of the stock of the National Bank of Commerce in New York at $267 per share for account of the Mutual Life Insurance Co. and the Equitable Life Insurance Co. of this city is something of novelty. The stock was sold within two hours and the success of the offering may indicate that the investment demand is shifting from bonds to stocks. Fewer new securities are being floated and more stock issues are appearing among them. The demand for funds for current business uses is increasing and as industrial improvement continues the money market will surely tighten. Country banks are said to have been active buyers in the bond markets, employing funds which business probably will want within a few months, and steady expansion of Federal Reserve rediscounts is to be looked for. Perhaps it is already under way, for the report of the system for the week ended May 24 shows that bills on hand totaled $592,604,000, an increase of nearly $30,000,000 over the previous week. It was offset, however, by the acquisition of $2,500,000 additional gold, and the reserve ratio shows only a one point decline to 77.5 per cent.

The apathy with which the coal strike is regarded is not favorable for its early settlement. The union leaders seem to have picked the time for the strike with more shrewdness than was generally considered, for it is reported that in some fields reviving industry is making it easy for the strikers to find sufficient work to keep them alive and they are holding out better than seemed possible. On the other hand industry professes to be well supplied for at least two months yet, and the strike is not likely to create a critical condition until July. Of almost as great importance is the setback which the building boom is experiencing in New York and Chicago through labor troubles, including bombings, strikes, and the intolerable jurisdictional disputes of the unions.

These are the black spots of the picture. They are almost invisible in the sunshine which floods the view. Though we realize that there are clouds which, arising in Washington or Europe, may appear over the horizon, for the present it seems perfectly safe to venture out without an umbrella.

Machinists in U. S. Best Paid in World

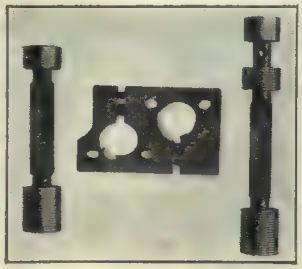
In a Senate tariff debate last week, Senator Gooding of Idaho gave the average daily wage of machinists in various countries. In the United States he stated they were $6.40; in England $2.90; in France $1.38; in Japan $1.50; in Italy 82 cents and in Germany 72 cents. The Senator gave these figures as an argument for protecting the American workmen against the products of cheaper labor.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Gages, Spark Plug, Limit, "Trilock"
Pratt & Whitney Co., Hartford, Conn.
"American Machinist," February 2, 1922

The gage set is made to S.A.E standard limits and consists of a double-end limit plug gage, a "go" and "no-go" templet in one unit, and a setting plug for the templet with a cylindrical plug for checking the root diameter. The pitch diameters of the plugs are 0.841 and 0.843 in. and the tolerance for tapped holes is 0.002 in. The templet pitch diameters are 0.836 and 0.839 in., giving 0.003 in. tolerance for the threads on the body of the spark-plug. There is a neutral zone of 0.002 in. between the maximum spark-plug and minimum hole sizes.



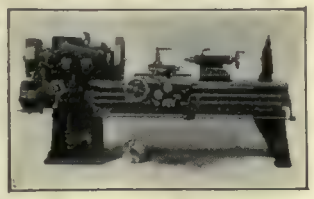
Grinding Machine, Motor Drive for
Grand Rapids Grinding Machine Co., Grand Rapids, Mich.
"American Machinist," February 2, 1922

This arrangement for motor drive is applied to the No. 1 universal grinding machine. The stand consists of a cast-iron base, into which is screwed an upright section of heavy iron pipe, carrying at its top a table casting to which are bolted the motor and countershaft. The grinding machine is bolted to the base casting. The starting switch is located on the column, directly back of the machine. Any make of motor may be used and a reasonable variation in motor speeds is allowable.



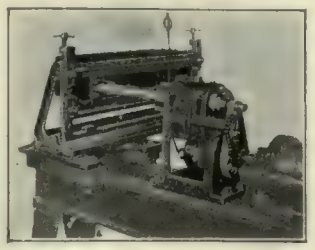
Lathe, Engine, Coneless, Geared-Head, 18-in.
Boye & Emmes Machine Tool Co., Cincinnati, Ohio.
"American Machinist," February 9, 1922

The headstock, reversing gear and arrangement for mounting the driving motor are different from the standard lathe design. Twelve spindle speeds are obtained by shifting the jaw clutches. The spindle is controlled by a vertical lever on the apron and an auxiliary lever below the headstock. The range of spindle speeds is from 9 to 350 r.p.m. Longitudinal and cross feeds cannot be engaged while screw-cutting. Forty threads, from 2 to 56 per in. can be cut without changing gears. Feeds, $\frac{1}{8}$ to 224 per in. Floor space, 10 x 3 ft. Weight, 4,270 lb.



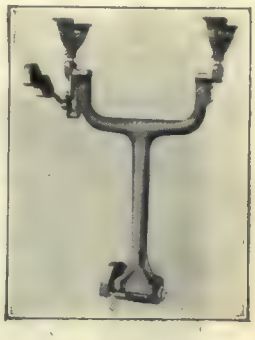
Grinding Attachment, Cylinder, Lathe, "Elteco"
Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J.
"American Machinist," February 9, 1922

The machine is attachable to an engine lathe having a swing of 14 in. or more. The work holder is mounted on the lathe carriage, the spindle head on the ways; and the headstock of the machine drives the rotary feed of the wheel spindle. Spindle drive is by means of a $\frac{1}{3}$-hp. electric motor. An eccentricity up to 1 in. in diameter can be obtained, the amount being varied by a screw graduated to 0.0005 in. Cylinder bores from $2\frac{1}{2}$ to 7 in. in diameter can be ground. Longitudinal work feed is obtained by using the lathe carriage feeds. Spindle speed, 5,600 r.p.m. Weight, 500 lb.



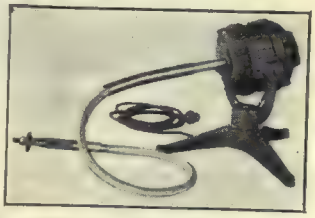
Saw, Cut-Off, Swing, Motor-on-Arbor, No. 36
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," February 2, 1922

The machine is made with three frame lengths, 5 ft. 5 in., 7 ft. 5 in., and 9 ft. 5 in. The motor operates on three-phase, 60-cycle, 220 or 440 volt alternating current, has 3 hp., and runs at a speed of 3,600 r.p.m. The saw carried is ordinarily 16 in. in diameter and is protected by a guard. The motor is controlled by a push button above. The device can be furnished with the motor mounted on top of the swinging bracket and belted to the saw arbor, or larger size saws can be driven from a countershaft.



Grinder and Buffer, Flexible-Shaft
Valley Electric Co., St. Louis, Mo.
"American Machinist," February 2, 1922

The ball-bearing motor used to drive the wheel is mounted in trunnions in a fork that is carried on ball bearings for swiveling the motor in any direction. The flexible shaft permits the wheel to be moved to any position. Different types of abrasive wheels may be employed. The device is made in both $\frac{1}{2}$ and $\frac{3}{4}$ hp. sizes to operate on either 110- or 220-volt alternating current of 60 cycles and one- or three-phase, or on direct-current of the same voltage. Bench space, 14 in. square. Weight, 80 to 100 pounds.



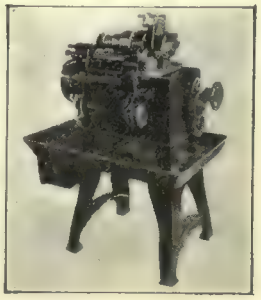
Screwdriver, Ratchet, Hand
H. D. Chapman, 2929 Clifton Ave., Baltimore, Md.
"American Machinist," February 9, 1922

The device is made in three sizes. With it a strong torque can be obtained on the screw at the same time that the axial pressure is applied. The top of the handle is rigidly fastened to the shank or blade. The lower part of the handle at the center of the tool is free to rotate about the shank. By means of a ratchet device, this lower handle may be engaged with the blade so that it is free to turn in one direction only. This direction may be reversed.



Forming Machine, Cutting-Off, Duplex
L. P. Brown Machine and Tool Co., Attleboro, Mass.
"American Machinist," February 9, 1922

The machine forms and cuts off parts not requiring turret tools, but ordinarily machined on an automatic screw machine. It has two spindles. A two-speed countershaft provides 6 feed changes from 240 to 1,820 r.p.m. The feed, independent of the forming movements, may be set to any length up to 3 in. Forming tools independently adjustable and carried on a single cross slide, operate simultaneously. Cut-off tools are carried on slides at an angle of 30 deg. to the vertical to allow clearance between the forming and cut-off tools. Floor space, 44 x 26 in.



William Gleason, of Rochester, Dead

William Gleason, pioneer manufacturer of machine tools, and president of the Gleason Works, of Rochester, N. Y., died at his home in that city on May 24. He was 86 years old.

Mr. Gleason came to this country from Ireland in 1851 and learned the machinist trade in the shop of Asa



WILLIAM GLEASON

Smith in Rochester. During the Civil War he worked in Colt's Armory in Hartford, Conn.

In 1865 he returned to Rochester and organized the nucleus of the present machine works. In 1873 he perfected what is said to be the first practical bevel gear planer. Since then he has turned out several important improvements in the design of gear planers.

Of late years he has been inactive in the management of the Gleason shops, leaving that to his son James E. Gleason. A daughter, Kate Gleason, is a vice-president of the company, and is one of the few mechanical engineers of her sex in the country. She is well known for her designs of gear machines.

American Foundrymen in Rochester Next Week

Plans have practically been completed for the annual convention and exhibit of the American Foundrymen's Association to be held in Rochester, N. Y., June 5 to 9. A comprehensive program of technical papers covering every phase of the foundry and allied industries has been prepared by the committee on arrangements. The speakers include some of the most important men in the industry. Nine sessions will be devoted to reading of technical papers and committee reports. There will be an international session at which papers by American, British, French and Belgian foundrymen will be read and discussed. Other sessions will include steel, brass, aluminum, gray iron, industrial relations, molding sand research, malleable cast iron and a general business session. As has been the custom in the past, a joint non-ferrous session will be held with the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

The exhibit is expected to be one of the largest ever held.

Amortization Requirements

Regulations 62, relating to Income Tax and War Profits and Excess Profits Tax, under Revenue Act of 1921, provide, in respect to amortization of war facilities, Article 184 (2), that in the case of property subject to amortization, the value in use shall be "not greater than the estimated cost of replacement under normal post-war conditions, less depreciation."

Prior to the promulgation of Regulations 62, it was not possible to amortize war facilities, which were in full use in a going business. The new regulations, however, provide, as indicated above, for amortization of what is commonly referred to as excess cost. Roughly speaking, the amortization which might be allowed on such a facility would be the difference between the original cost and the estimated normal replacement value. The accumulation of data necessary to establish such normal replacement cost is necessarily a considerable task. Engineers of the amortization section have already called upon a majority of the machine tool manufacturers and have secured such data as was requested. There are, however, a number of manufacturers who have not yet been asked for this information. The writer has been informed that it is the intention of the Bureau of Internal Revenue to write to such manufacturers requesting this information. This data is to be used, as indicated above, to determine the difference between the cost of machine tools during the war and the cost of the same articles under post-war conditions. This information is necessary in order to enable the department to determine proper allowances for amortization and all prices are held strictly confidential.

Where such information is not on file in the Department, there is either a delay while it is being secured, or if the manufacturer is unwilling or dilatory in supplying it, the claim is necessarily settled without it—possibly to the detriment of the taxpayer.

It is evident, therefore, that the work of the amortization section will be greatly expedited if all requested data, as indicated above, is furnished by the manufacturer. The settlement of income tax claims tends to stabilize conditions in the machine tool industry, and also among the machine tool builder's customers. This is an indirect result that follows.

As the latest current price on any article is also a factor in determining normal post-war replacement costs, it is essential that the latest prices be on file in the department at all times. It is recommended that machine tool builders furnish this information to the chief of amortization section as soon as any new lists are issued. This information will, of course, be held strictly confidential.

Henry H. Morse, Chief of Commerce Division

Secretary of Commerce Hoover has announced the appointment of Henry H. Morse, of Boston, to be chief of the specialties division of the Bureau of Foreign and Domestic Commerce. The appointment becomes effective July 1. Mr. Morse brings to the bureau the wide experience in the export trade, an intimate acquaintance with foreign markets and a wide practical knowledge in the field of specialties. He is well known in New England business circles, having served as chairman of the Boston Export Round Table since 1919, and as chairman of the committee on Trade Expansion of the National Boot and Shoe Manufacturing Association. He was honorary vice-chairman of the National Foreign Trade Convention in Cleveland, in 1921, and is at present the director of the New England Chamber of Commerce, and chairman of the Advisory Committee on Foreign Mails.

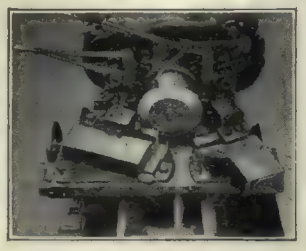
DOMESTIC EXPORTS OF METAL WORKING MACHINERY FROM THE UNITED STATES, FOR THE MONTH OF MARCH, 1922

Countries	Lathes		Boring and Drilling Machines		Planers, Shapers and Slotters		Milling Machines		Sharpening and Grinding Machines	
	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars	Number	Dollars
Belgium	1	1,099	...	.....	1	41	..	.....	3	350
Denmark	1	1,435	...	.....	...	.....	...	.....	...	.....
France	3	2,266	...	.....	4	4,014	5	5,441	8	3,087
Greece	...	.....	...	.....	..	.....	1	100	30	113
Latvia	4	1,809	1	60	..	.....	..	.....	...	.....
Netherlands	...	.....	4	85	..	.....	..	.....	32	139
Norway	...	.....	2	145	..	.....	..	.....	1	936
Spain	2	2,611	3	575	..	.....	..	.....	41	2,087
Sweden	...	.....	2	985	1	1,165	..	.....	...	.....
England	3	438	1	1,348	..	.....	2	392	36	16,188
Scotland	...	.....	...	.....	..	.....	1	140	...	.....
Canada-Maritime Province	...	.....	1	174	..	.....	..	.....	45	188
Quebec and Ontario	21	10,193	30	1,653	3	199	7	2,459	171	17,797
Prairie Province	3	800	1	9	..	.....	..	.....	38	658
British Col. and Yukon	2	3,028	...	.....	...	.....	...	.....	14	296
Mexico	18	15,846	20	7,657	1	1,148	9	1,117	9	520
Cuba	3	1,269	...	.....	..	.....	..	.....	2	169
Argentina	6	119	...	.....	..	.....	..	.....	...	.....
Brazil	3	31,881	1	12,182	..	.....	..	.....	57	827
Chile	1	718	...	.....	..	.....	..	.....	1	669
Colombia	5	8,881	...	.....	..	.....	..	.....	...	.....
Peru	...	.....	...	.....	1	2,328	..	.....	...	.....
Venezuela	2	1,019	...	.....	..	.....	..	.....	15	71
British India	...	.....	93	1,292	..	.....	3	2,560	2	1,435
China	6	5,295	3	416	1	350	..	.....	2	135
Other Dutch East Indies	...	.....	1	52	...	.....	...	.....	...	.....
Japan	11	14,866	4	24,284	7	10,640	4	4,479	31	4,709
Palestine and Syria	2	1,012	...	.....	..	.....	..	.....	...	.....
Philippine Islands	1	300	...	.....	..	.....	..	.....	7	765
Australia	1	347	1	180	..	.....	9	9,129	27	196
British South Africa	13	660	...	.....	..	.....	..	.....	7	41
British East Africa	1	659	...	.....	..	.....	..	.....	...	.....
Total	113	106,551	168	51,097	19	19,885	41	25,817	579	51,378

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Attachment, Lathe, Bevel-Gear Turning
Warner & Swasey Co., Cleveland, Ohio.
"American Machinist," February 9, 1922



The attachment is used on No. 3-A universal, hollow-hexagon turret lathe when machining bevel-gear blanks. It is interchangeable with the top slide of the lathe carriage, and cuts all standard angles on blanks up to 14 in. in diameter. Two tool slides are operated by the hexagon turret and saddle. A shaft mounted on the turret engages a double pinion in the saddle, and transmits motion to the tool slides. The front slide operates on one side of the gear and the rear slide on the other, both moving at the same time.

Drilling Machine, Sensitive, Electric, Motor-Driven, 12-in.
Louisville Electric Mfg. Co., Louisville, Ky.
"American Machinist," February 9, 1922



The speed of the spindle can be easily adjusted. The table is counter-balanced by a weight in the column. A ½-hp. motor running at 1,725 r.p.m. is used. The motor and controlling switch are built in the machine, the motor being furnished to suit the available circuit. The machine is made in both bench and floor types, and is furnished with a V-block, cup and point centers. Capacity, up to ½-in. hole in the center of a 12-in. circle. Spindle speed, 450 to 1,200 r.p.m. Height, 76 inches.

Toolmakers' Knee and Box Parallel, Precision
Simplex Tool Co., Woonsocket, R. I.
"American Machinist," February 9, 1922



The toolmakers' knee, adapted for gage and small work, may be used for both inspecting and laying out work either with or without a magnetic chuck and clamped directly to any surface. It is made in one size, 2½ x 3 x 4 in. The precision box parallel, for larger work than the ordinary parallel, is used in either the machine shop or toolroom for inspecting and laying out large work. It is made in four sizes from 4 x 4 x 6 to 6 x 14 x 16 inches.

Press, Arbor, Garage, Hand-Operated
Evansville Arbor Press Co., Evansville, Ind.
"American Machinist," February 9, 1922



Presses Nos. 8 and 9, shown on the left, have stationary tables with 10-in. openings. The table on the Nos. 8-B and 9-B presses, shown at the right, consists of a pair of adjustable side bars. The uprights are channels 40-in. apart. A handwheel provides for quick return of the ram. Work diameter, No. 8, 30 in.; No. 9, 40 in. Largest arbor opening, 8 in. Capacity over table: No. 8, 27½ in.; No. 8-B, 36 in.; No. 9, 30 in.; No. 9-B, 44¾ in. Weight: No. 8, 585 lb.; No. 8-B, 450 lb.; No. 9, 715 lb.; No. 9-B, 585 lb.

Wrench, Pipe, Chain
Armstrong Bros. Tool Co., Chicago, Ill.
"American Machinist," February 9, 1922



The wrench jaws are provided with long bearings on the bar, and with flanges to guide the chain and to protect it from abrasion. Two types of chain can be furnished, the flat-link style as shown, and the cable-link chain. The wrench is made in seven sizes, for use on pipe and fittings from ⅛ to 16 in. Wrench length, 20 to 78 in. Chain length, 13½ to 72 in. Weight 5¾ to 98 lb.

Sand Blast, Portable, Hose-Type, Small Size
Pangborn Corporation, Hagerstown, Md.
"American Machinist," February 9, 1922



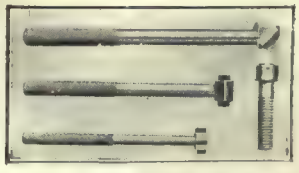
The hose machine consists of a suction-type gun controlled by a trigger in the handle. The motion of the compressed air carries the sand from the hopper to the gun body. The body forms a mixing chamber for the air and abrasive, giving it a swirling action. Nozzles are interchangeable. The blast operates on any air pressure from 5 to 100 lb. A small cabinet that can be set over the hopper of the hose sand-blast, as illustrated, can be supplied for cleaning small parts.

Sawing Machine, Hack, Motor-Driven
Louisville Electric Mfg. Co., Louisville, Ky.
"American Machinist," February 9, 1922



The vise swivels and is graduated. The stroke length is adjustable from 5 to 7 in. Two speeds, 45 and 90 strokes per minute, are provided. Stock up to 5 in. thick can be cut. The feed is by gravity, and the saw arm can be raised and held in any position. An automatic stop shuts off the motor when the piece has been cut off. The motor has a capacity of ½ hp. and is fitted with ball bearings. The machine can be mounted on wheels. Floor space, 18 x 36 in. Height, 36 in. Weight, 450 lb.

Screwdriver, Offset, "Utility"
Porter Products Corporation, Brewerton, N. Y.
"American Machinist," February 9, 1922



The device is used in close quarters, being developed for automobile use. It operates with the handle at right angles to the screw. On each of the four sides of the head is a blade set at an angle of 45 deg. to the one on each side of it. The tool is rotated between each stroke to bring a different blade into use. Because of the leverage, large wood screws or machine screws can be easily set up, or screw bolts that have rusted in place can be loosened. The tool is made in three sizes, ¼, ⅜ and ½ in., the thickness of the blades being 0.040, 0.050 and 0.078 inch.

Clip, paste on 3 x 5-in. cards and file as desired

Business Items

Beginning June first, the Arrow Tool and Manufacturing Co., of Bridgeport, Conn., will be known as the Forsberg Manufacturing Co. The change is being made because another company in the same field has a prior right to the name "Arrow."

The Modern Machine Tool Co., Jackson, Mich., has taken over the stock and machinery of the Sprague-Hayes Manufacturing Co.

The Reliance Steel and Tool Co., of New York, has moved its offices from 24 Murray St., to 30 Church Street.

The Spafford Machine Screw Works, Inc., of Hartford, Conn., has filed a voluntary petition in bankruptcy in the U. S. District Court at New Haven; showing liabilities of $40,638 and assets of $25,314.

Jenkins Bros., manufacturers of valves, etc., Bridgeport, Conn., following conferences with the workmen, decided to go on a five-day per week schedule. The company has been working six days, but in changing to the five-day schedule, the working hours will not be affected, as the new schedule will be arranged so as to get in the forty-eight hours per week.

The Remington Arms Co., Bridgeport, Conn., has recently incorporated under the laws of the State of Connecticut, as a separate corporation, the Remington Cutlery Works, to manufacture pocket cutlery, etc. The capital of the cutlery branch will be $25,000, and the incorporators are: Chauncey B. Garver, William B. Stitt and Charles R. Barrett, all of New York city. There will be no change in the management or policy of the company, and the new firm will be operated as a subsidiary of the larger concern. The knives will be manufactured in the Bridgeport plant.

The Hampden Grinding Wheel Co., of Springfield, Mass., has been incorporated under the laws of Massachusetts, to manufacture grinding wheels, etc. The firm will take over the present plant and business of the Hampden Corundum Wheel Co. in that city. The capital stock is $100,000 and the incorporators are Willard P. Leshure, John M. Collins and Frank S. Hatch. Mr. Leshure, who was president of the old company, will be the president of the new concern.

The Murmac Manufacturing Co., Inc., of Gloucester, Mass., has been incorporated under the laws of Massachusetts to conduct a general machine shop, etc. The capital stock of the new company is $25,000; the incorporators are John A. Moran, David F. Murphy and Morgan J. McSweeney, of 247 Essex St., all of Salem, Mass.

The Merwin Screw Co., Inc., Bridgeport, Conn., recently incorporated to manufacture and deal in screws, etc., has opened a shop at 143 Bennett St., that city. The company organized recently by the election of the following officers, who are also the directors: Fred H. Merwin, president and treasurer; N. A. Walsh, vice-president; Edna W. Merwin, secretary.

The Lomar Manufacturing Co., Middletown, Ohio, manufacturers of shock absorbers, has been incorporated with a capital stock of $100,000. Officers are: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president; L. L. Lomar, general superintendent.

The Murphy Valve Co., Columbus, Ohio, which was recently incorporated for $50,000, has elected Paul R. Good as president; Harry B. Redding, vice-president; Walter S. Jones, secretary; was William G. Jones, treasurer.

At the annual meeting of the stockholders of the Superior Sheet Steel Co., Canton, Ohio, the following officers were elected: W. W. Irwin, president; H. A. Roemer, vice-president and general manager; H. S. Renkert, treasurer; D. A. Williams, assistant general manager; M. C. Summers, general manager of sales; P. I. Howenstine, assistant treasurer; U. K. Becker, secretary.

Announcement has been made that the Blake Pump and Condenser Co., of Fitchburg, Mass., will locate in Alliance, Ohio, and perparations are now under way to move the machinery to that city. In the new location the concern will be known as the Alliance Pumping and Machinery Co.

The Ketchum Tool Equipment Co., L. Leroy Ketchum, president, 856 Broad St., Bridgeport, Conn., tool manufacturers, has recently filed a petition in bankruptcy in the United States District Court.

The Acme Machine Co., of Hartford, Conn., has filed a petition in bankruptcy in the United States District Court, giving liabilities of $67,151, and assets of $20,467.50.

The Wagner Electric Manufacturing Co., of St. Louis, Mo., announces the removal of its Salt Lake City office to 313 Dooly Building.

Personals

EARL CONSTANTINE, executive secretary of the National Industrial Council, has been appointed assistant to John E. Edgerton, president of the National Association of Manufacturers. He will be located at the headquarters of the association at 50 Church St., New York City.

FRANK HIGGINS, works manager of the Willys-Morrow plant in Elmira, N. Y., has left that position to engage in business for himself.

TOBIAS DANTZIG has resigned as research engineer of SKF Industries, Inc. He will engage in scientific and technical consulting work specializing in bearing problems.

O. H. DALLMAN, formerly of the Vanadium Alloy Steel Co., has joined the sales force of the Independent Pneumatic Tool Co., of Chicago. Mr. Dallman will travel out of the general offices in Chicago.

GEORGE W. WAY has joined the Detroit sales force of the Union Drawn Steel Co., of Beaver Falls, Pa. For several years he has been a specialty salesman for the Carnegie Steel Co. in the Michigan territory, leaving there to become general sales manager of the Cromwell Steel Co., of Cleveland. For the past year he has been in charge of sales in the Middle West for the Electric Alloy Steel Co. of Youngstown.

JOHN A. PEEBLES, general foreman of the Willys-Morrow plant in Elmira, N. Y., has resigned.

HENRY ROSS JONES, formerly president of the United Alloy Steel Corporation, of Canton, Ohio, has been elected chairman of board of directors of the fifteen million dollar Dominion Alloy Steel Co.

F. W. MURPHY has resigned as head of the highway products department of the Truscon Steel Co., Youngstown, Ohio. He has joined the sales force of the J. Ira Davey Co., of Detroit.

EDWARD T. MCNULTY has resigned as superintendent of the Yorkville, Ohio, plant of the Wheeling Steel Corporation to become general manager of the Charcoal Iron Products Co., at Washington, Pa.

GORHAM C. PARKER has organized the Parker Arbor Co., Ann Arbor, Mich., for the manufacture of the Parker drill chuck arbors.

EDWIN P. HOPFER, purchasing agent of the Hartford Specialty Machine Co., Hartford, Mass., has been appointed a member of the City Planning Commission of Hartford.

W. J. SMITH has been appointed special sales representative for Ohio and Michigan for the Hill & Griffith Co. of Cincinnati, Ohio.

A. H. BENNELL has resigned from the sales staff of the Youngstown Sheet and Tube Co., of Youngstown, Ohio.

F. N. SATTER has resigned as chief inspector with the Newton Steel Co., Newton Falls and Youngstown, Ohio, to become district sales manager of the Electric Alloy Steel Co., of Youngstown.

Obituary

A. W. GIBBS, chief mechanical engineer of the Pennsylvania Railroad system, died suddenly on May 19. He was 66 years old. He served as an apprentice in the Altoona, Pa., shops of the company in 1879.

WILLIAM YEATES, founder of the London Machine Tool Co., died last week at his home in London, Ont., Canada, following an illness extending over many months. He was 75 years old.

ISAAC JOSEPH, president of the Isaac Joseph Co., iron dealers, and of the Edna Brass Manufacturing Co., of Cincinnati, Ohio, died suddenly at his home in that city on May 23.

F. J. TOWN, superintendent of the foundry of the Pittsburgh Valve and Fitting Co., Pittsburgh, Pa., died at his home in Barberton, Ohio, on May 24. He was 69 years old.

Forthcoming Meetings

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

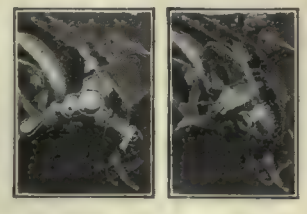
Grinding Machine, Cutter, Portable, Bench, "Elteco"
Liberty Tool Co., 1080 Springfield Ave., Irvington, N. J.
"American Machinist," February 9, 1922

The motor of ¼-hp. capacity can be driven by either direct or alternating current, and is mounted on a slide to adjust the tension of the wheel-spindle belt. The wheel head has a transverse movement of 4 in., obtained by a crank-operated screw. Straight grinding work is mounted on centers with a swing of 7 in. The maximum distance between the centers is 9 in. For grinding cutters with angles or tapers, an attachment is provided with a longitudinal movement of 1⅝ in. for feeding the work, the feed screw being operated by a crank.



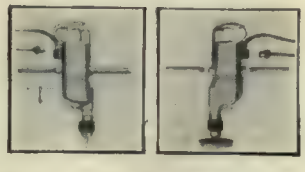
Stop, Cross-Slide, Lathe
Worcester Lathe Co., Worcester, Mass.
"American Machinist," February 9, 1922

A pinion keyed to the cross-feed screw is at all times in mesh with a gear which turns freely on a stud set into the back of the case. In adjacent faces of the gear and worm wheel are stop pins. The pins stop the rotation of the gear and worm wheel at a pre-determined point. The 0.001-in. graduations on the dial are spaced ⅛ in. apart, for close adjustment. The stop is imposed against the rotation of the screw, instead of against the forward movement of the slide. The slide may be run forward or back, and returned by turning the lever to re-engage the stop pins.



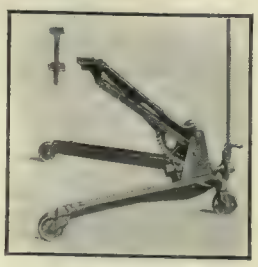
Drill and Grinder, Electric, Portable, Combination
Wodack Electric Tool Corporation, 23 South Jefferson St., Chicago, Ill.
"American Machinist," February 16, 1922

The tool has a drilling capacity of ⅛ to ⅝ in. in steel, and when used as a grinder carries a 6 x ¾ in. abrasive wheel. Two speeds are provided, the slow one for drilling, the fast one for grinding. The tool can be quickly changed from high to low speed and from grinding to drilling. The motor develops ½ hp. and is universal, for direct and alternating current with the same voltage. The switch, of the automatic-stop type, is located in the handle top. Weight, 19 lb.



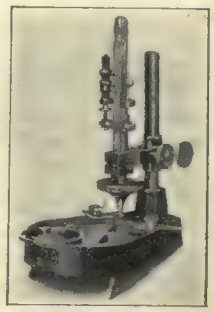
Jack, Automobile, "Hi-Lift"
Weaver Manufacturing Co., Springfield, Ill.
"American Machinist," February 16, 1922

The jack is used in garages for lifting trucks and passenger cars, and enables the operator to raise one end of the chassis for working on the under parts of automobiles. The jack is mounted on four casters, the two near the operating lever having ball and roller bearings. The arm can be raised or lowered, by means of a ratchet and worm operated by a long lever. For raising and carrying truck wheels, an attachment can be fastened to the end of the arm. Saddle height, 7 to 38 in.; with screw attachment, 45 in. Lifting capacity, 3,000 lb. Width, 40 in. Weight, 225 pounds.



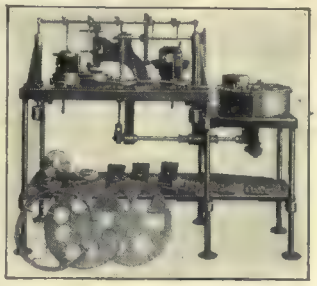
Prestometer, Fluid Gage, Piston-Ring
Coats Machine Tool Co., Inc., New York, N. Y.
"American Machinist," February 9, 1922

This device for gaging piston ring thickness consists of the prestometer fluid micrometer gage fitted to a special base. It has collapsible legs, and wing back stops to set the work. The base has two slots, extending radially at 60 deg. to each other from the point of contact of the measuring ball, to hold the adjustable contact points in position. It accommodates rings of any diameter up to 5 in. The piston ring rests on the two movable contact points and on the stationary one directly under the ball of the prestometer, giving a three-point support.



Finishing Machine, Air-Brake Valve, Semi-Automatic
Walter H. Foster Co., 50 Church St., New York, N. Y.
"American Machinist," February 16, 1922

The machine finishes mechanically both railroad air-brake slide valves and their seats, doing the lapping itself and maintaining flat surfaces to the edges of the ports and openings. The lapping plate and the work holder rotate in opposite directions, and are eccentric to each other. Thus, the work constantly changes its position on the lapping plate, so as to obtain flat surfaces and to keep the lapping plate true. The reciprocating laps on the left finish the seats in the bodies of the valves. A ½-hp. motor drives the machine, although tight and loose pulleys can be employed. Floor space, 64 x 28 in. Weight, 1,200 pounds.



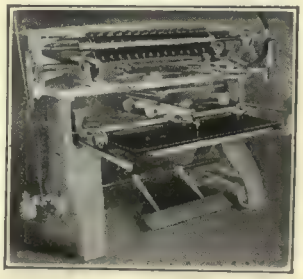
Sawing Machine, Band, Metal-Cutting
Clark Tool Works, Inc., Belmont, N. Y.
"American Machinist," February 16, 1922

The features of the machine are the movable carriage, gravity feed, work-holding vise and motor drive. The two speeds are controlled by a handle on the outside of the box. The table is pivoted in the center. The saw guides are mounted on the table and swing with it. The movable carriage operating on the table is provided with a gravity feed controlled by changing the position of the weight on the lever. Stops are provided to adjust the travel. The removable work-holding vise holds the work at any angle to the saw. Capacity, 6 x 12 in. Table, 20 x 24 in.



Marking Machine, Pantograph
George W. Dover, Inc., Providence, R. I.
"American Machinist," February 23, 1922

The machine is used for marking in multiple with diamond-pointed tools. The design or pattern is placed on the table at the front, and traced with the point connected to the pantograph motion operating the arm holding diamond-pointed tools. Thirty-four of these tools may be employed, and they cut both on the top and on the bottom of the work or roll. Lenses with trade marks invisible to the naked eye can also be marked. The top set of diamonds is rotated for this work by individual motors mounted on each spindle.



The Weekly Price Guide

Rise and Fall of Market

Advances.—Further upward movements in metals feature market, electrolytic copper quoted ½c. higher at New York; lead is now at 6.25c. higher than last week's price of 6c. Antimony is at 6.50c. Active demand has increased the price of copper sheets ½c. at New York, copper wire has advanced to 15c., and copper rods to 18.75c. Brass sheets and tubing rose from ¼ to ½c. Tin is firm. Zinc sheets are now quoted at 8.50c., advancing ½c. over last week's price. All scrap prices have advanced from ¼ to ⅜c., heavy brass now quoted at 7c.

Declines.—Linseed oil fell to 91c. from 95c. because of lack of demand. Solder has dropped 2c., from 23 to 21c.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.10
Nos. 22 and 24.	3.05	4.20	3.60	4.15
Nos. 25 and 26.	3.10	4.25	3.65	4.20
No. 28	3.15	4.35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.30
Nos. 12 and 14.	3.25	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No. 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	71	58½	⅜ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2 00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.50
Tin, 5-ton lots, New York	32.25
Lead (up to carlots), St. Louis, 5.40; New York	6.25
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½@6.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.50	7.50	6.25
Copper sheets, base	20.25	20.00	23.00
Copper wire (carlots)	15.00	16.50	16.25
Copper rods (ton lots)	18.75	21.50	19.50
Copper tubing (100-lb. lots)	22.25	23.00	23.00
Brass sheets (100-lb. lots)	16.50	17.50	18.75
Brass tubing (100-lb. lots)	19.50	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	15.50	15.75
Brass wire (carlots)	17.00	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	21.00	22.00	19.00
Babbitt metal (fair grade)	35.00	40.75	36.00
Babbitt metal (commercial)	15.50	15.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.00	9.25
Copper, light, and bottoms	10.00	9.00	8.25
Lead, heavy	4.75	4.50	3.65
Lead, tea	4.25	3.25	3.00
Brass, heavy	7.00	5.00	8.00
Brass, light	6.00	4.50	4.75
No. 1 yellow brass turnings	6.50	5.50	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.91	.95	1.04
White lead, dry or in oil	100 lb. kegs.	New York,	12.25
Red lead, dry	100 lb. kegs.	New York,	12.25
Red lead, in oil	100 lb. kegs.	New York,	13.75
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-10%	60-10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60-5%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, hex. heads	+10-15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75-5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ill., Chicago—Levitan Mfg. Co., 1335 Washington Blvd.—one hand screw machine with 1¼ in. hole in spindle.

Kan., Hutchinson—The Modern Welding & Machine Shop, North Adams St., M. W. Hartman, Mgr.—heel cylinder grinding machine.

La., New Orleans—R. R. Hepinstall & Co., Maison Blanche Annex—12 ft. plate bending roll for ½ in. plate.

Mich., Battle Creek—Nichols & Shepard Co.—10 ft. power brake for 10 gage iron.

Mo., Carterville—Carterville Garage, 324 West Main St., R. Rice, Purch. Agt.—power drill press, lathe and emery wheel.

Mo., Carterville—W. Wilson, 120 East Main St., (garage)—power lathe, drill press and electric motor, 60 cycle.

Mo., Carthage—C. W. Biggs, (woodworking and machine shop)—lathe for power equipment.

Mo., Carthage—Carthage Press, H. K. Steward, Purch. Agt.—one power metal cutting machine and a power drill press.

Mo., Carthage—W. C. Hoots, 317 East 4th St., (woodworking shop)—wood lathe, band saw and polishing machinery for power equipment.

Mo., Joplin—Zark Dehydration Co., 1801 Main St., manufacturer of fruit dryers—power riveting machine for sheet metal.

Mo., Kansas City—H. C. Darnell Mchy. Co., 15th and Elmwood Sts.—power lathe, shaper and drill press.

N. Y., Beaver Falls—J. P. Lewis Co., (paper manufacturer), H. S. Lewis, Purch. Agt.—roll-grinding equipment.

N. Y., Brooklyn—U. S. Indestructible Gasket Co., 829 East 15th St.—one multiple four spindle movable drill head, to drill four holes 1/16 to 1/8 in. diameter, equally spaced on circles from about 3 to 6 in. diameter.

N. Y., Buffalo—A. Plotkin, 72-74 East Eagle St.—machinery and equipment for garage and repair shop.

N. Y., Niagara Falls—The McGarigle Machine Co., 518 2nd St.—cylinder grinding machine.

N. Y., Rochester—Morley Machine Corp., 800 St. Paul St.—lathes, punch presses and boiler tubes.

N. Y., Rochester—L. A. Royal, 4 Church St.—one 10 x 15 or 12 x 18 Platen press, (new or used).

N. Y., Rochester—C. Weber, Andrews St.—cylinder grinder and small machinery and tools for proposed garage on North Water St.

O., Cincinnati—The Eastern Mchy. Co., 408 East Pearl St., R. Smith, Purch. Agt.—power punch presses, all sizes, No. 18, 19, 20 and 21 Bliss; boring mills 30-72 in.; radial drills; 24 in. shaper; lathes 10, 12 and 14 in. swing; lathes 24-60 in. swing; hand screw machine.

O., Cincinnati—A. A. McLaughlin & Co., 24 West 2nd St., (dealers in woodworking machinery)—one Hawker No. 2 dowel machine; one Am. Columbia 42 in. and 48 in. triple drum sander; Smith or Greenlee hollow chisel mortiser; automatic lathe, 10 ft. between centers, 6 in. swing; Bates or Wysong & Miles, belt sander, (used).

O., Cincinnati—Norton-Broadway Mchy. Co., 236 Bway., (dealers in used machinery)—one 6 ft. radial drill press and one 36 in. shaper.

O., Cincinnati—The Randle Mchy. Co., Cincinnati, Hamilton & Dayton R.R. and Powers St.—60 in. vertical boring mill and power shear for 6 in. x 6 in. x ½ in. angles, (used).

O., Columbus — The Murphy Valve Co., Majestic Theatre Bldg., W. S. Jones, Secy.—one boring machine, one grinder, one drill press and other equipment.

O., Columbus—R. J. Rickenbocker, 183 East Cherry St., garage and repair shop—one grinder, one drill press and other equipment.

Pa., Sheffield—C. A. Dahl—machinery and equipment for garage and blacksmith shops now under construction.

Pa., Sheffield—M. A. Olson—cylinder grinding machine and other machinery for garage now under construction.

Va., Big Stone Gap—The Lonesome Pine Motor Co., (automobile repairs), A. P. Hammond, Secy.—various small tools in connection with machine shop.

Wis., Milwaukee—The Automotive Grinding Co., 118 Clinton St.—one Heald grinder No. 65.

H. T., Honolulu—The Honolulu Rapid Transit Co., Ltd., H. S. Johnson, Mgr.—$13,000 worth of machine and car shop equipment.

Ont., Ottawa—The City of Ottawa, City Hall, F. H. Plant, Mayor—cement gun, Universal tool and cutter grinder, power press, single head bolt machine, variety saw, quarry jack hammer, buzz planer and matcher, oil and gas furnace, and sclerescope.

Ont., Welland—The Lackawanna Tubes, Ltd., F. L. McCallum, Purch. Agt.—
One 18 x 10 lathe.
One 20 in. shaper.
One 36 in. planer.
One 20 in. drill press.
One 14 in. emery wheel and stand complete.
Blacksmith outfit.
One hydraulic pump 1,500 lb. pressure, 2,000 lb. max.
One air compressor 100 lb. pressure, and receiver for same.
One Gillitine billet shear for 4 in. max. round-inlet table 20 ft. long with gauges.

Machinery Wanted

Del., Wilmington—J. E. Marsden Glass Wks., Inc.—machinery and equipment for glass manufacturing plant.

Ga., Atlanta—The Atlanta Casket Co., Box 693, N. P. Cannon, Pres.—machinery and equipment for steel casket plant now under construction.

Ga., Cuthbert—Randolph County Advertising Club, J. G. Woodruff, County agt.—15-ton ice plant, complete.

Ky., Jackson—Jackson Lumber & Supply Co., W. C. Cole, Mgr.—machinery and equipment for lumber mill.

Ky., Lexington—American Metallic Packing Co.—225 cu.yd. daily capacity, jawed portable rock crusher on skids or wheels, (used).

Miss., Laurel—Chamber of Commerce, W. H. Smith, Secy.-Mgr.—complete machinery and equipment for canning plant.

Mo., Carterville — Carterville Weekly News, O. L. Whitestine, Purch. Agt.—job press and newspaper press for new plant.

Mo., Carthage—F. E. Ford, 313 East 4th St., (woodworking shop)—wood lathe, polishing machinery, and sanding machinery, for power equipment.

Mo., Carthage—G. W. Gibboth, 315 East 5th St., (blacksmith shop)—power drill press.

Mo., Kansas—Cavanal Coal Co. Ridge Bldg.—10-ton ice plant.

Mo., Kansas City—V. L. Phillips Co., 700 Delaware St., (contractor)—rock crusher, mounted outfit, but can use small jaw crusher on skids.

Mo., Webb City—Hilbum & Plain, F. Plain, Purch. Agt. — newspaper power printing press and job press.

N. Y., Batavia—E. N. Rowell Co., Inc.—additional machinery for the manufacture of paper boxes.

N. Y., Batavia—Ralph Gypsum Co. — crushing and screening machinery and equipment for mine.

N. Y., Buffalo—Amer. Macaroni Co., Inc., 825 Ferry St.—machinery and equipment for proposed macaroni factory.

N. Y., Buffalo—The Buffalo Coffee Co., Inc., c/o W. J. Daetsch, Ellicott Sq.—coffee roasting and packing machinery.

N. Y., Buffalo—Woodworking Mchy. Co. of Buffalo, 54 Mechanic St.—miscellaneous woodworking machinery.

N. Y., Jamestown—The New Ice & Coal Co., Gokey Bldg., J. H. Rogerson, Purch. Agt.—machinery for handling coal, wood, etc., and for the manufacture of ice.

N. Y., North Tonawanda—R. Wurlitzer Co., Inc., Niagara Falls Blvd.—machinery and equipment for the manufacture of toys.

N. Y., Rochester—M. Brennan, Frank St.—air compressor, pump and other equipment for proposed service station on Jones and Brown Sts.

N. C., Marion—The Clinchfield Pottery Wks., A. W. Hilton, owner—machinery for the manufacture of pots, vases and various earthenware articles.

O., Cleveland—Cleveland Metal Products Co.—machinery for the manufacture of oil stoves and utensils, for proposed plant at Oakland, Cal.

O., Cleveland—Nat. Bronze & Aluminum Fdry. Co., East 88th St. and Laisy Ave.—molding machines and miscellaneous foundry equipment.

Pa., Greenville—The Du Roth Steel Truck Co.—machinery for proposed truck factory.

Pa., Greenville—Greenville Steel Car Co.—one 10-ton crane.

Pa., Marianville—The Marianville Express, E. Pickens, Purch. Agt.—printing press, printshop equipment and small machinery to replace presses, etc., destroyed by fire.

Pa., Phila.—The Pennsylvania R.R., 18th and Filbert Sts., c/o Purchasing Dept.—6-15 ton electric cranes, 97 ft. span, for proposed addition to car shops at Altoona.

Pa., Pittsburgh—Bd. Educ., Fulton Bldg.—woodworking machinery for manual training departemnts of Westinghouse High School and Perrysville and Greenfield Elementary Schools, now under construction.

Pa., Republic—Redstone Twp. Bd. Educ., c/o A. Thompson, Republic—equipment for manual training dept. of high school in Redstone Twp., near Uniontown.

Pa., Titusville—E. Moore, 321 South Franklin St.—complete tinsmithers outfit and tools.

Pa., Titusville—Titusville Iron Wks. Co.—machinery and tools for proposed foundry on South Perry St.

S. D., Chamberlain—J. H. Olson & Co.—motor and mortise and tenon machine.

Tex., Austin—The Woodward Mfg. Co., Post Rd., S. Sparkes, Vice-Pres.—machinery for proposed auto body factory.

Va., Berkley (Norfolk P. O.) — The Huddleston Mahogany Co. Inc., c/o Greenleaf Johnson Lumber Co., S. Moore, Secy.—woodworking machinery.

Va., Gloucester—The Roaring Springs Marl Lime Co., R. M. Janney, Mgr.—several hoisting engines for plant, (new or used).

Va., Ocean View—The Normandie Corp., Willoughby Beach Blvd., bottling plant, C. A. Anderson, Secy.—bottling machinery for soft drink plant at Norfolk.

W. Va., Bluefield—Amicon Fruit Co., H. Charlton, Vice-Pres. and Genl. Mgr.—machinery for cold storage plant addition.

Wis., Fox Lake—F. N. Pettigrew—machinery for proposed truck factory at Waupun.

Wis., Milwaukee—H. Becker, 3407 Center St.—refrigeration machinery, motor power.

Wis., Milwaukee—C. Bielefeld, 1161 Grant St., carpenter and millwork—one sander.

Wis., Milwaukee—Maple Leaf Dairy Co., c/o W. G. Wheeler, 204 Grand Ave.—dairy plant equipment, line shaft drive.

Wis., Milwaukee—North American Textile Corp., c/o G. W. Kalinert, 1392 Prospect Ave.—looms, looping machines and electric motors.

Wis., Milwaukee—J. Weiss, 301 Reed St.—woodworking machinery to manufacture show cases, (exact requirements not determined).

Wis., Racine—The Wisconsin Gas & Electric Co., 305 6th St., S. B. Sherman, Purch. Agt.—one mono rail crane.

Wis., Riplinger—The Cheesemakers Mfg. Co., B. F. Riplinger, Purch. Agt.—modern cheese-making machinery, power.

Wis., Wisconsin Rapids—The Eighth Corner Cheese Factory, c/o A. Whitrock, Route 5—cheese making machinery, vats and boiler.

Mexico, Mexico City—The San Raefel Paper Co., Ltd.—machinery and equipment for proposed paper mill at Merida, Yucatan, Mex.

Ont., Burnt River—J. Hadley—equipment for shingle mill recently destroyed by fire.

Ont., Galt—Newlands & Co., Ainslie St.—weaving machines, etc., for robe and woolen mill addition.

Ont., Kitchener—Kitchener Mfg. Co., S. F. Howard, Mgr.—materials, tools and machinery for the manufacture of radio outfits.

Ont., Lynden—R. A. Thompson—$25,000 worth of equipment for flour mill.

Ont., Niagara Falls—The Canadian Shredded Wheat Co.—machinery for the manufacture of shredded wheat.

Ont., Toronto—B. Amod, 1216 St. Clair Ave.—gasoline pump and tank for garage.

Ont., Welland—British Empire Cutlery Corp., Ltd., C. Grantham, Purch. Agt.—machinery for the manufacture of scissors.

Ont., Welland—The St. Thomas Packing Co., W. Moody, Mgr.—complete equipment for cold storage plant.

Metal Working Shops

Cal., Colma—M. Massaglia has awarded the contract for the construction of a 1 story machine shop, on San Bruno Ave. Estimated cost $10,550.

Cal., San Francisco—E. T. Meakin, c/o Powers & Ahnden, Archts., 460 Montgomery St., is having plans prepared for the construction of a machine shop on Folsom and 14th Sts. Estimated cost $20,000.

Cal., Vallejo—Western Die Casting Co., 2927 Newbury St., Berkeley, is receiving bids for the construction of a 1 story 125 x 162 ft. factory on Napa St., here. C. E. Perry, Jr., 514 Marin St., Archt.

Conn., Springdale—The Segal Metal Products Co. has awarded the contract for the construction of a 1 story 40 x 45 ft. foundry extension, and a 3 story 30 x 120 ft. machine shop.

Ill., Chicago—R. F. France, Archt., 155 North Clark St., is receiving bids for the construction of a 1 story, 110 x 200 ft. garage at 247-78 North Clark St., for K. R. Beak Co., 193 North Clark St. Estimated cost $40,000.

Ill., Chicago—The Fries-Malwitz Motor Co., 4001 Irving Park Blvd., is having plans prepared for the construction of a 2 story, 122 x 217 ft. auto sales and service building on Irving Park Blvd. near Keeler Ave. Estimated cost $300,000. J. Jensen, 4915 North Lawndale Ave., Archt.

Ill., Chicago—The Holton-Seeley Co., 140 South Dearborn St., is receiving bids for the construction of a 2 story, 125 x 161 ft. garage at 616-24 Dewey Pl. Estimated cost $50,000. L. E. Russell, 25 North Dearborn St., Archt.

Mass., Cambridge—The Simplex Wire & Cable Co. has awarded the contract for the construction of an addition to its factory. Estimated cost $100,000.

Neb., Lincoln—F. W. Tyler, 827 "N" St., plans to build a 1 story, 50 x 50 ft. shop for plumbing and heating machine work. Estimated cost $8,000.

N. Y., Binghamton—Titchener Iron Wks., Inc., plans to construct additions to its plant at 7 Frederick St. Estimated cost between $35,000 and $40,000. L. E. Barnes, Secy.

N. Y., Buffalo—The Buffalo General Electric Co., 960 Front St., plans to construct 120 x 120 ft. service building 45 ft. high, on Front St. Estimated cost $135,000. Architect not announced.

N. Y., Buffalo—Fedders Mfg. Co., Inc., 57 Tonawanda St., manufacturer of auto radiators, plans to build a specialty factory addition to its plant. Estimated cost $5,500.

N. Y., Buffalo—J. Emig & Son, 871 East Ferry St., manufacturer of special machine tools, dies, etc., has awarded the contract for the construction of a 1 story, 50 x 80 ft. machine shop. Estimated cost $5,000.

N. Y., Buffalo—L. Reimann, 69 North Division St., plans to build a machine shop addition. Estimated cost $5,000. Architect not announced.

N. Y., Buffalo—E. M. Statler Co. plans to build a 6 story garage on Delaware Ave. and Mohawk St. Estimated cost $300,000 to $350,000.

N. Y., Geneva—De Zeng Standard Co., East State and 20th St., Camden, N. J., plans to bulid a factory for the manufacture of optical instruments, on East Main St., here. Estimated cost between $40,000 and $50,000.

N. Y., Hammondsport—The Keuka Industries Inc., plans to rebuild part of machine shop recently destroyed by fire. Estimated cost between $20,000 and $25,000. J. H. McNamara, Genl. Mgr.

N. Y., North Tonawanda—The Frontier Mfg. Co. plans to rebuild portion of kettle factory on Erie Ave., which was destroyed by fire. Estimated cost $20,000. Architect not announced.

O., Warren—The Youngstown Steel Co., Stambaugh Bldg., Youngstown, plans to build a large steel plant at Gibbons Farm, off North Mahoning Ave., here. Estimated cost $100,000 to $150,000. Architect not announced.

Pa., Bellefonte—Western Penitentiary of Pennsylvania, is having plans prepared for the construction of a 1 story, 30 x 132 ft. machine shop at Rockview. J. Frances, Warden. Private plans.

Pa., Greenville—The Du Roth Steel Truck Co. is receiving bids for the construction of a steel truck factory on Osgood St. Estimated cost $50,000. Architect not announced.

Pa., Newton Falls—The Newton Steel Co. is having plans prepared for the construction of 6 new sheet mills. $750,000. Architect not announced.

Tex., Austin—The Woodward Mfg. Co., Post Rd., manufacturer of auto bodies, plans to rebuild its plant which was destroyed by tornado. Estimated cost $200,000. S. Sparks, Vice-Pres.

Wis., Mellon—Universal Toy & Novelty Mfg. Co. plans to build a 1 story 100 x 152 ft. factory. Estimated cost $40,000. J. R. and E. J. Law, Strand Theatre Bldg., Madison, Archts.

Wis., Waupun—F. N. Pettigrew, Fox Lake, plans to build a 2 story, 70 x 120 factory here, for the manufacture of trucks. Estimated cost $50,000. Architect not selected.

Ont., Toronto—B. Amode, 1216 St. Clair Ave., has awarded the contract for the construction of a 1 story 50 x 60 ft. garage on Yonge St. Estimated cost $15,000.

General Manufacturing

Cal., San Francisco—California Woodcarving Co., 144 8th St., has awarded the contract for the construction of a 2 story, 27 x 100 ft. wood carving shop on Southeast Howard and Langton Sts. Estimated cost $15,000. Private plans.

Cal., San Francisco—The Italian-Amer. Cigar Co., 419 Jackson St., is having plans prepared for the construction of a 4 story factory on Vallejo and Battery Sts. Estimated cost $160,000. I. Zanolini, 604 Montgomery St., Archt.

Conn., Hanover—The Airlie Mills has awarded the contract for the construction of a 2 story, 60 x 230 ft. addition, for the manufacture of woolen goods. Estimated cost $85,000.

Conn., Hartford—The Capitol City Glass Co., Chapel St., has awarded the contract for the construction of a 2 story, 40 x 150 ft. addition to its glass factory. Estimated cost $40,000.

Ky., Jackson—Jackson Lumber & Supply Co., plans to build a lumber mill to replace the one destroyed by fire. Estimated cost $130,000. W. C. Cole, Mgr.

Ky., Lexington—The Co-operative Dairy Co. plans to construct a dairy on Jefferson St. $11,000. Architect not announced.

Me., Lewiston—Bates Mfg. Co. plans to build an addition to its mill for the manufacture of gingham goods. Architect not announced.

Mass., Springfield—The Springfield Catholic Diocese, Eliott St., has awarded the contract for the construction of a 1 story 40 x 180 ft. laundry on Wilbraham Rd. Estimated cost $40,000.

Mich., Kalamazoo—The Kalamazoo Vegetable Parchment Co., River Bd., is having plans prepared for the construction of a 4 story addition to its paper mill. Estimated cost $500,000. Billingham & Cobb, Press Blk., Archts.

Mich., Sault Ste. Marie—The Cadillac Lumber & Chemical Co., is having plans prepared for the construction of a 1 story, 93 x 275 and 110 x 110 ft., saw mill. Estimated cost $250,000. E. C. Hall, 221 Grand Ave., Milwaukee, Wis., Archt.

Minn., South St. Paul—R. N. Katz Packing Co., 352 East 6th St., St. Paul, is having plans prepared for the construction of a 3 story, 50 x 130 ft. packing plant, and a 1 story, 34 x 36 ft. office building. Estimated cost $100,000. Henschien & McLaren, 37 West Van Buren St., Chicago, Archts.

Minn., Winona—The Pepin Packing Co. is having plans prepared for the construcion of a 1 story, 72 x 180 ft. canning factory and storage warehouse. Estimated cost $50,000. A. H. Husemann, 614 9th Ave., W., Archt.

Mo., Kansas City—F. C. Sharon, Sterling Bldg., will soon award the contract for the construction of a 1 story, 50 x 150 ft. factory for the manufacture of cartridges, on the northeast corner of Belmont and Independence Sts. Private plans.

N. J., Nutley—G. La Monte & Sons Co. Kingsland Rd., has awarded the contract for the construction of a 1 story, 60 x 100 ft. paper factory and a 2 story, 60 x 80 ft. office building. Estimated cost, $60,000.

N. Y., Batavia—K. B. Mathes, c/o Uni-Lak Co., manufacturer of paint specialties, plans to build a 1 story factory on South Lyon St. Estimated cost $25,000. Architect not announced.

N. Y., Buffalo—Amer. Macaroni Co., Inc., 825 Ferry St., plans to build a factory for the manufacture of macaroni. Estimated cost $5,200.

N. Y., Buffalo—Queen City Candy Co., Inc., 396 Bway., plans to build a 22 x 76 ft. candy factory addition, 26 ft. high. Estimated cost, $5,000. Architect not announced.

N. Y., Newark—Phillips-Werth Optical Co., Rochester, is receiving bids for the construction of a 55 x 175 ft. optical factory on Willow Ave. and West Main St., here. Private plans.

N. Y., New York—The New York Times, Times Sq., will soon receive bids for the construction of an 11 story, 100 x 143 ft. printing plant and office building at 217 West 43rd St. Ludlow & Peabody, 101 Park Ave., Archts. Noted Jan. 19.

N. Y., New York—The Transit Commission, 49 Lafayette St., will receive bids until June 5, for the construction of additional shops at Lenox Ave. and 148th St. Private plans.

N. Y., Port Henry—The Witherbee-Sherman Co. have had plans prepared for the construction of extensive additions to present plant facilities, including new blast furnace, daily capacity 500 ton, and new sintering plant capacity 400 tons, etc.

N. Y., Rochester—The Duntile Products Co., Holland, Mich., plans to construct tile manufacturing plant on Lexington Ave., here. Estimated cost between $40,000 and $50,000.

N. Y., Rochester—The Rochester Gas & Electric Corp., Clinton Ave, N., plans to

construct and install a new liquid gas pumping station. Estimated cost $70,000. J. P. Haftenknapp, Engr.

N. Y., Utica—The McLoughlin Textile Corp., plans to build a factory and warehouse at 614 Broad St. Estimated cost $40,000 to $50,000.

N. Y., Watertown—The International Burr Corp., 500 Newell St., plans to construct a factory for the manufacture of pulp stone dressing burrs. Estimated cost between $20,000 and 25,000. Adress W. P. Aiken, c/o owner.

N. Y., Waverly—The Philadelphia Battery Co. is having plans prepared for the construction of a 3 story, battery manufacturing, charging, repairing and storage plant on Fulton. Estimated cost between $40,000 and $45,000. C. W. Smith, Waverly, Archt.

N. C., Goldsboro—The Utility Mfg. Co. plans to rebuild its veneering plant which was recently destroyed by fire. Estimated loss $200,000. Architect not selected.

N. C., Mt. Pleasant—A. M. Haithcock is having plans prepared to construct a flour mill. Estimated cost, $10,000 to $12,000.

N. C., Shelby—A. P. Weathers, et. al., plan to construct a cold storage plant. Estimated cost, including machinery and equipment, $40,000. Architect not selected.

O., Canton—The Hygienic Products Co., 715 Walnut Ave., S. E., has had plans prepared for the construction of a 2 story, 50 x 70 ft. factory for the manufacture of cleasing powder. Lockwood, Greene & Co., Hanna Bldg., Cleveland, Archts.

O., Cleveland—A. and B. Box Co., 8628 Woodland Ave., has awarded the contract for the construction of a 1 story, 90 x 193 ft. factory, at 1190 East 152nd St. Estimated cost $60,000. H. C. Roberts, Secy.

O., Cleveland—Billings-Chapin Co., 1163 East 40th St., is receiving bids for the construction of a 4 story, 80 x 140 ft. factory, for the manufacture of paints, on East 40th St. along the tracks of the New York Central R.R. Estimated cost $200,000. Lockwood Green & Co., Hanna Bldg., Archts.

O., Cleveland—Kaase Co., 2836 Lorain Ave., plans to build a 2 story 150 x 200 ft. addition to its bakery. Estimated cost $100,000. C. Kaase, Pres. W. D. Guion, 640 Engineers Bldg., Archt.

O., Cleveland—The Standard Envelope Co., 1011 Oregon Ave., is having plans prepared for the construction of a 1 story factory. Estimated cost $60,000. Christian, Schwartzenberg & Gaede, 1900 Euclid Ave., Archts.

O., Cleveland—H. M. White Music Co., 5229 Superior Ave., has awarded the contract for the construction of a 3 story 30 x 115 ft. factory on East 53rd St. and Superior Ave. Estimated cost $50,000. H. M. White, Pres.

O., Wellsville—The McNicol-Corns Pottery Co. plans to rebuild part of its pottery plant recently destroyed by fire. Estimated cost $8,500.

Pa., Altoona—The Confederated Home Abbatoir Corp., 216 Commerce Bldg., will receive bids until May 29, for the construction of 4 story, 81 x 163 ft. meat packing plant, 2 story, 47 x 57 ft. stock pens and 40 x 60 ft. power plant, on Sugar Run Rd. Estimated cost $125,000. Gorman-Brown Eng. Co., Boston, Mass., Archts. C. Stadler, 40 Rector St., New York, Engr. Noted Feb. 9.

Pa., Lewistown—The Viscose Co., Marcus Hook, manufacturer of artificial silk, has awarded the contract for the construction of 1 story manufacturing buildings, here. Estimated cost $1,500,000.

Pa., Marianville—The Marianville Glass Mfg. Co. plans to rebuild its plant which was recently destroyed by fire. Estimated cost $55,000. Architect not announced.

Pa., Phila.—W. E. S. Dyer, Engr., Land Title Bldg., is receiving bids for the construction of a 5 story, 61 x 64 ft. plush factory on Venice St. and Green Lane, for the Kaufman Plush Co. Estimated cost $80,000.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. machine shop addition at 5116 Wakefield St.

In May

we published

537

Machine-Tool and Machinery Wanted Items

which is at the rate of over 6000 items a year, against 2277 items published in the whole of 1921.

In addition

we printed 253 tips as to new and enlarged metal-working shops and general manufacturing plants.

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Pa., Phila.—The Quaker City Laundry, 48th and Ludlow Sts., has awarded the contract for the construction of a 2 story, 16 x 32 ft. laundry on 48th and Ludlow Sts. Estimated cost $85,000.

Pa., Wissinoming (Phila. P. O.)—C. Wunder, Archt., 1415 Locust St., Phila., is receiving bids for the construction of 2 story, 35 x 50 ft. and 1 story, 48 x 234 ft. factory for the Natl. Ammonia Co., Van Kirk Ave., Phila. Estimated cost $50,000.

R. I., Olneyville — The Rochambeau Worsted Co. has awarded the contract for the construction of a 3 story, 100 x 300 ft. factory for the manufacture of worsted goods. Estimated cost $250,000.

Vt., Brattleboro—The Preshey-Leeland Co., Barre, plans to construct granite cutting plant. Estimated cost $100,000. Architect not announced.

Va., Richmond—Virginia Carolina Rubber Co., 10 North 19th St., plans to build a 1 story, 100 x 271 ft. factory on Mill Rd. along the tracks of the Southern R.R. Estimated cost $25,000. Davis Bros., 2510 West Main St., Archts.

Va., West Point—Chesapeake Corp. of West Point, plans to build a mill for the manufacture of pulp board and paper specialties. Estimated cost $200,000 to $250,000. W. C. Gouldman, Secy. Architect not selected.

W. Va., Bluefield—Amer. Fruit Co. plans to build a 6 story cold storage plant addition. Estimated cost including machinery, etc., $250,000. H. Charlton, Vice Pres. and Genl. Mgr. Architect not announced.

Wis., Madison—Kennedy Dairy Co., 618 University Ave., will soon award the contract for the construction of a 2 story, 85 x 132 ft. dairy. Estimated cost $80,000. E. Tough, 24 East Mifflin St., Archt.

Wis., Madison—The Natl. Vacuum Street Sweeper Co., c/o D. Mowry, Secy. Assn. of Commerce, Cantwell Bldg., plans to construct a 4 story, 60 x 120 ft. factory. Estimated cost $60,000. Architect not selected.

Wis., Madison—M. P. Schneider, Archt., 401 West Doty St., is receiving bids for the construction of a 1 story, 50 x 110 ft., filling station on Gilman St., here, for North Wisconsin Oil Co., Menasha. Estimated cost $45,000.

Wis., Monroe—The Badger Cheese Co. has awarded the contract for the construction of a 2 story, 26 x 100 ft., cold storage plant. Estimated cost $25,000.

Wis., Prairie du Chien—The Prairie du Chien Woolen Mill Co., has awarded the contract for the construction of a 3 story 47 x 186 ft. factory addition. Estimated cost $65,000.

Wis., Pulaski—The Badger Cabinet Co., Plymouth, plans to construct a 2 story, 50 x 100 ft., furniture factory. Estimated cost $55,000. Architect not selected.

Wis., Racine—S. C. Johnson & Son Co., 1012 16th St., manufacturer of floors, etc., has awarded the contract for the construction of a 3 story, 60 x 162 ft. factory on 15th St. Estimated cost $70,000.

Wis., Spencer—The Spencer Condensory Co. has awarded the contract for the construction of a 2 story, 48 x 96 ft. condensory. Estimated cost $30,000. Noted March 2.

Ont., Burnt River—J. Hadley plans to rebuild shingle mill recently destroyed by fire. Estimated cost $35,000.

Ont., Galt—Newlands & Co., Ainslie St., will soon award the contract for the construction of a 3 story, 86 x 86 ft. factory addition for the manufacture of robes and woolens. Estimated cost $50,000. Address G. Dobbie.

Ont., Niagara Falls — The Canadian Shredded Wheat Co. has awarded the contract for the construction of a storage building, containing a cleaning department, etc., on Lewis Ave. Estimated cost $150,000.

Ont., Welland—The Empire Cotton Co., Ltd., A. D. Payne, Secy.—machinery and equipment for new $250,000 addition to cotton mill here.

Ont., Windsor—The Shell Oil Co., 3608 Notre Dame St., E., Montreal, is having plans prepared for the construction of an oil distributing plant on Caron Ave., here. Estimated cost $100,000. Private plans.

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Scientific Management in the British Factory

Considered by Some a Revolutionary Movement—Why It Cannot Be Adopted as a Whole—Methods Not Popular with Organized Labor

By WILLIAM J. HISCOX

THE call of scientific management has been responded to in a manner typically British, the result being that even now it is enjoying but a doubtful sort of popularity. While in some cases its need is being frankly recognized and efforts are being made to secure its enthronement, in others it is being looked upon as a revolutionary movement and as such to be avoided as the plague. Yet it is in the latter connection that progress is being made, for unwittingly, perhaps, its opponents are succumbing to its charms and improvements are being effected which, although not openly under the banner of scientific management, are at least indebted to it for the inspiration. The enthusiasts swallowed the doctrine wholesale, and failing to achieve results, condemned it. This because they did not understand. The others regarded it with suspicion but, recognizing its effect upon the production of America, commenced a progressive campaign which embodied its essentials.

PLANT LAYOUT, types of shop buildings and the attitude of employees are all governing factors in the success of new systems.

British manufacturers do not discredit scientific management, but do believe that the adoption of any system in toto as a panacea for all ills is fraught with great danger unless the remedy be administered in homeopathic doses.

So for the moment the popularity of scientific management is of a doubtful character, for its erstwhile champions now openly deride it and its opponents make use of its ideals without acknowledgment. But, when all is said, it is a principle rather than a system, and a principle may be subject to adoption without being destroyed. The seed has been planted and the tree will grow but the difference in the soil will naturally affect the appearance. In America it is a strong and mighty tree, of huge girth and of comprehensive embrace; but in England it is small and compact but none the less virile. It cannot be otherwise, for the conditions in the two countries are utterly dissimilar, and there is no room here for the giant growths of the States. That is why scientific management, as practiced in America, cannot be imported, and because those who have attempted to do so have failed, it does not mean that adoptions are impossible.

There are many here who have a wholesome respect for the business methods of America, and if these methods are accepted as proof of what can be done in given circumstances, appreciation will have a stimulating effect. But it is a mistake to assume that there are no brains in the Old Country, and that the future of industry depends upon the importation of methods from abroad. One industry has been built up by ideas inspired by the conditions we were called upon to meet, and at that time there were no precedents to act as a guide. Our American cousins had the precedent of our labors, and were thus able to avoid many pitfalls. They used our ideas as a means of effecting improvements, and they were thus enabled to commence upon a higher level than we had attained. Their own peculiar circumstances had to be catered to, and in their efforts to solve the problems new ideas and methods were evolved. While this development was taking place over the water, we at home were not standing still, but our development was of a somewhat different order. We were moving forward, but not so rapidly, because the circumstances were not so vital. The industrial position just prior to the World War made it necessary for us to increase our efforts, and naturally enough it was to America that we turned our eyes. We saw the methods by which she had surmounted difficulties and was forging ahead, and we were inclined to examine these methods with a view to adoption to our own needs.

The mistake was that many failed to do what the Americans had done previously, viz., to profit by the experiences of others and avoid pitfalls. The Americans started off with an American adoption of British ideas, specially designed to cater for her own peculiar requirements, and what is now wanted in this country is a British adoption of American ideas, specially designed to cater to its present-day requirements.

We should be able to lead off on a higher plane—that is to say, the methods we evolve should be more efficient when applied to British manufacture than are the present American methods in relation to their own manufacture. If a man invents something, all the other inventors seek to improve upon it, not to copy it. They use it as a spring board, and we must do the same with methods. No one man can draft out a system and say that it covers the beginning and the end of scientific management. It is at present only in a crude shape, full of possibilities, but as yet undeveloped. The seed may be cultivated in all countries and applied to all industries, but the methods employed will be dissimilar.

The measure of success attained depends upon the

efficiency of the method employed to deal with the specific problem. The monopoly is held by no one country or firm. It is purely a question of efficient application, and so long as the *principle* is thoroughly understood, the *application* is a mere matter of detail as it automatically presents itself.

Some British firms boast of their Americanized systems, but they are wrong. The actual systems (in entirety) operating in America cannot be applied with success in any British factory. British foremen and department heads are sent to America to see the methods employed, and while this is all good, these British foremen could not apply those methods if they would. This is no reflection upon their personal ability, for no man, no matter how fortunate he may be in the matter of brains, could do it. But an examination of those methods would undoubtedly suggest an adoption, and it is for this reason that the foremen are sent.

Part Acceptance of Scientific Management

We have accepted scientific management, so far as it applies to sectional control. We have discarded the "all rounder" and are cultivating the "specialist," and in theory, we believe in payment by results. Unfortunately for us, many of our factories were built before the scientific era dawned and we have not advanced far enough to say "Scrap the lot, and let us rebuild." We do the best we can with the means at our disposal, and one of the reasons why our methods must rise superior is that greater skill is necessary to exploit the possibilities of our somewhat antediluvian style of factory.

Our attempts at "mass production" upon the American plan have failed, but our "repetition production" is going strong, because it fits in with the need. We have, of late years, given more attention to the organization of our toolroom, and we are coming round to the belief that this is a productive department in the truest sense of the term. The "aids to machining" are many and various, and "work by hand" is practically confined to assembling. The "fitter" of a decade ago, who could "turn his hand to anything" has disappeared, and in his place is the "specialized assembler" who handles his one little section so rapidly that the erstwhile "fitting department" is enlarged almost beyond recognition to allow for the units it is necessary to lay down at one time to permit of continuous employment.

We have realized that "mechanical aids" are necessary in the interests of rapid and economical production, and our machining departments are well equipped. The operations on each and every detail are calculated to a nicety, and the old "all embracing" process order is replaced by two or more orders of a more definite character.

We have a planning department, and output from every manufacturing section is pre-determined. We no longer expect the department foreman to calculate his times or rates—the expert rate fixer is available for the purpose. The works manager is not now expected to run the factory single-handed. He has the assistance of experts who between them control the factory organization. There is the works engineer, the production manager, the progress manager, the inspection manager, the commercial manager, and the like. Each is a specialist, with ability and opportunity of concentrating upon the one thing which immediately concerns him.

Cannot the principle of scientific management be discerned here? And yet this name is not mentioned in the factory. The methods adopted are dictated by common sense and a keen appreciation of the need of product. It is recognized that it must be produced to sell, which means that the cost incurred in manufacture must be low enough to permit of a margin of profit between that and the selling price, which must be low enough to attract the notice of the buyer.

We therefore endeavor to reduce costs by quickening output, for this is the only way to insure economical production. We have a factory and upon this we have to pay the standard rent, rates and taxes, no matter now much (or how little) is being produced. The power and lighting charges are not entirely standard, but increased production in the building already equipped with power and light does not materially increase these charges, and the same may be said in respect to the management and administration charges. It is the direct labor charge which alone shows any marked increase, and this again is quite disproportionate to the increase in production. It is not that the wages of the individual are reduced—rather they are increased—but the cost per piece is reduced. The man who produced one piece in one hour, at a labor cost of 2s. 1d. now turns out four pieces per hour, at a labor cost of 9d. each.

Our organized workers are not taking kindly to the idea of "payment by results" but individually they are rather keen upon it. At the present time the methods of times fixing are not so scientific as they might be, and until something is done in this direction there is sure to be some opposition. In spite of the progress already made, factory organization does not yet commend itself to the workers, and our methods of management must be further developed before the confidence of the workers is gained.

It is a question of thoroughly understanding the needs of industry and applying the correct remedies. Everything under the sun is good, so long as it is in its right place and kept there. We know that the methods of twenty years ago are inadequate today and we have to move with the times. Our population is increasing and employment must be found. We have to think of industry as something necessary to preserve the whole human race and not regard it as purely personal.

A Modified System

In England this is being appreciated but it is a slow process. We have, however, accepted the principle of scientific management and we are putting it into practice in our own inimitable way. We are not content to copy the American system, for that will not assist us, but we *are* out to improve upon it inasmuch as we must make it fit in with our own requirements.

Scientific management has not "had its day," as many people aver. In fact, so far as this country is concerned, its day is only just dawning. Before long the possibilities will become more apparent and exploitation will follow. It is thought by many that our manufacturers are too conservative to grasp at the opportunities offered and no doubt this is correct. Fortunately for the country, however, there is a band of business men who appreciate what business really is and who frankly enjoy their calling. They have no use for hoary traditions, neither do they possess conservative tendencies and sooner or later they will assume control and in the reconstruction which follows, scientific management will undoubtedly come into its own.

Standard Cams for Brown & Sharpe Automatic Screw Machines

Making Special Cams Unnecessary in Many Cases—Cams for Forming and Cutting Off Often Interchangeable—Marking and Indexing Cams

By D. A. NEVIN
Chief Engineer, Watters Corporation

IN ALL factories where the product includes screw machine work there frequently arises the question of making special cams for parts required in considerable quantity but which are not to be manufactured permanently.

In presenting the standard cams, Figs. 1 to 5, it is not claimed by the writer that they will cover all varieties of plain and threaded parts, a few of which are suggested in Figs. 6 and 7; but it is the purpose to show how they may be made the foundation of a system in which each cam is detailed on a card and numbered so that after a required set of cams has been computed the nearest standards may be selected from the list and the expense of making special sets of cams thereby greatly reduced. As the number of cams increases, the system naturally becomes more complete and therefore of greater value. An order of operations (Figs. 9 and 10) is furnished the operator the same as when special cams are made. It specifies by symbol number the cams to be used, also the spindle speeds and gearing, and is an improvement over the old method of requiring the foreman or set-up man to piece together a set of cams, making a guess at the proper feeds and speeds.

This article refers to fast jobs on the No. 00 machine, though fast jobs on the No. 0 machine can also be handled economically by this method. For all work on the No. 2 machine it is advisable to make individual sets of cams. However each cam of these sets should be numbered and card indexed as there is always a possibility of using the cross-slide cams and sometimes the lead cam for other work.

The cams illustrated in Figs. 1 to 5 will make all of the parts shown in Figs. 6 and 7, with only a slight difference in production than if special cams were used.

When necessary to design special cams, all similar parts to be made should be grouped. For instance parts *H* and *K* (Fig. 7) can be made with the same cams, provided the cut-off cam is made to suit *H*; therefore it is well to make first those cams required to have the most throw. A slight difference in the length or lead of the thread does not necessitate a special thread lobe,

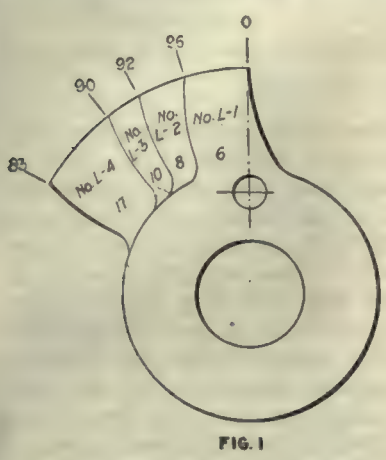


FIG. 1

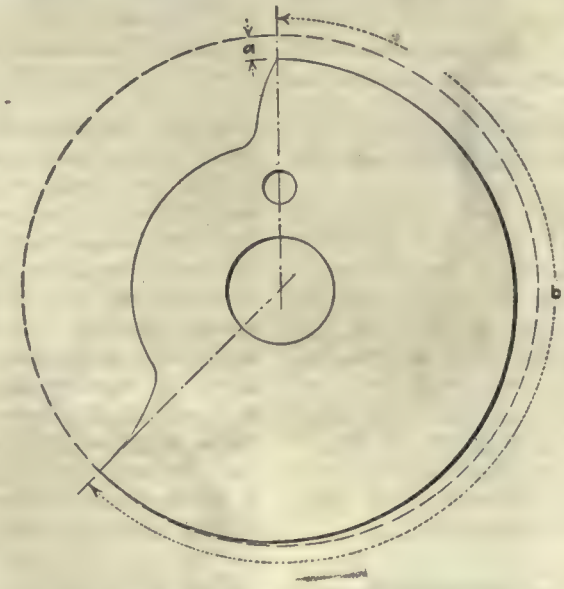


FIG. 2

Number	Throw	Hdts.
S-1	0.040	60
S-6	0.040	80
S-9	0.070	60
S-10	0.100	60
S-3	0.100	70
S-2	0.110	70
S-13	0.110	80

Number	Throw	Hdts.
S-11	0.120	60
S-12	0.140	60
S-4	0.160	85
S-7	0.175	60
S-5	0.175	70
S-8	0.175	90

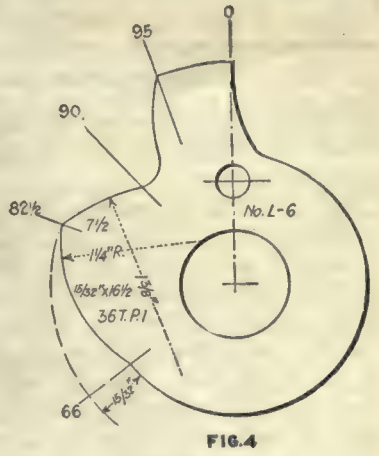


FIG. 4

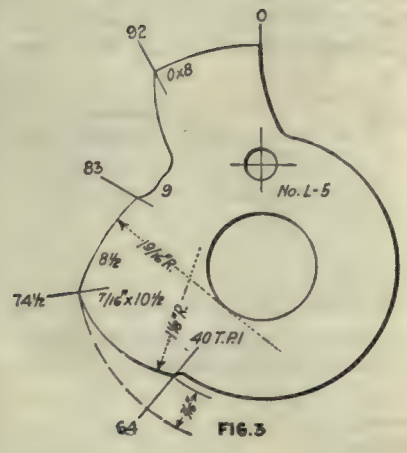


FIG. 3

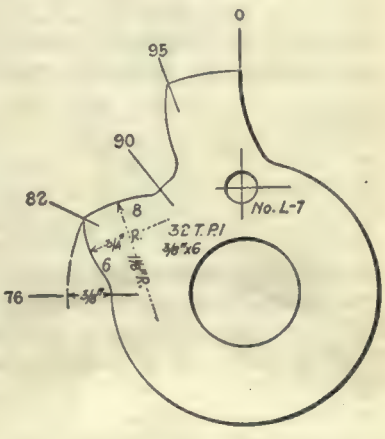


FIG. 5

FIGS. 1 TO 5. STANDARD CAMS

as the purpose of the thread lobe is to start the threading die and it is made with sufficient clearance to allow the die to thread itself on the work and to be threaded off again by the reversal of the spindle. The compression of the coil spring in the die holder makes allowance for considerable variation in the length of the threaded part.

As is generally known, cams used for forming and cutting off operations are interchangeable providing the throw and length of cam surface are suitable for the work to be done.

For forming operations the cross-slide cams can be used for a great variety of jobs, because this operation is usually performed on the end of the bar while the finished part is being cut-off, therefore a wide variance in the length of the cam surface has no effect on production and causes only a small variation in the feed of the form tool. The throw of form cams does not vary greatly because they have no relation to the diameter of the work, as for instance the screws *H* and *M* (Fig. 7), also parts *A*, *B*, *C* and *D* (Fig. 6), have practically the same difference in diameters and therefore require the same throw of form cam.

are given a standard symbol number. The throw and length of cam surface is stamped on each cam as shown in Figs. 1 to 5.

In Fig. 8 is shown an order of operations for parts *E*, *F* and *G*, Fig. 6, made from screw rod, the throw of the form cam being relative to the maximum and minimum diameters of the different parts and the throw of the cut-off cam relative to the largest diameter of all of the parts, adding 0.014 in. for the bevel and 0.005 in. for facing the end of the bar.

The cams required are lead cam with stop seven hundredths of cam surface, cut-off cam 0.175-in. throw by ninety-three hundredths, form cam 0.101-in. throw by ninety-three hundredths. Selecting from the standard cams we find a lead cam with stop lobe of eight hundredths, No. L-2, Fig. 1; cut-off cam 0.175-in. throw by ninety hundredths, No. S-8 and form cam 0.110-in. throw by seventy hundredths, No. S-2, Fig. 2. The lead cam is cut down sufficiently to allow for all but extra long parts. The rise and drop is made according to the templet for 6 to 35 sec. jobs. The pinhole is not required to be used on the No. 00 machine for driving purposes and by removing the pin, the cams may be located in any suitable radial position. However it is well to make it a rule when laying out to start all cross-slide cams at zero so that they may be the more interchangeable if locating pins are used.

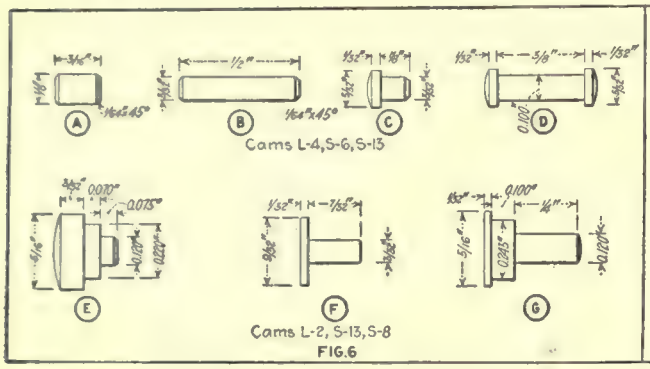


FIG. 6

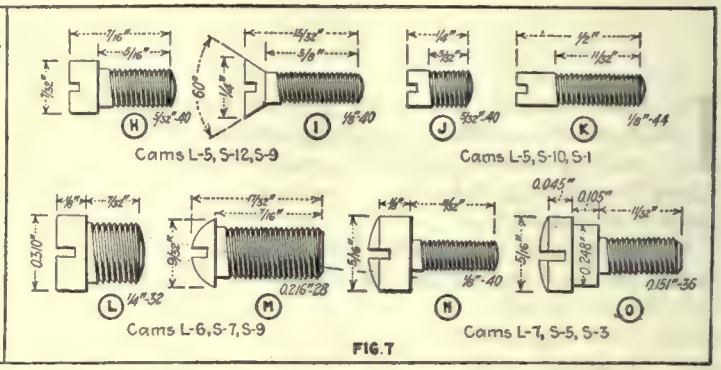


FIG. 7

FIGS. 6 AND 7. PARTS THAT CAN BE MADE BY THE CAMS SHOWN IN FIGS. 1 TO 5

ORDER OF OPERATIONS	SPINDLE SPEED 1087 R.P.M.	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop	11 Revs.	7	
Cut off 0.175 inch travel at 0.00115 feed	152 "	93	
Form while cutting off 0.101 inch travel at 0.00066 inch feed	(152 ")	(93)	
Total revolutions to make one	163 "	100	
Time for one piece, 9 seconds. Gears: 60 driver, 54 driven			
Net in 10 hours, 3600. Maximum surface speed of stock, 89 ft. per minute			

FIG. 8. PRELIMINARY LAYOUT FOR PARTS *E*, *F* AND *G* (FIG. 6) IF MADE FROM SCREW ROD

ORDER OF OPERATIONS	SPINDLE SPEED 1492 R.P.M.	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop	14 Revs.	8	L-2
Cut off 0.175 inch travel at 0.00111 inch feed	157 "	90	S-8
Form while cutting off 0.110 inch travel at 0.00079 inch feed	(139 ")	(80)	S-13
Lost time	3 "	2	
Total revolutions to make one	174 "	100	
Time for one piece, 7 seconds. Gears: 60 driver, 42 driven			
Net in 10 hours, 4,600. Maximum surface speed of stock, 122 ft. per minute			

FIG. 9. PRELIMINARY LAYOUT FOR PARTS *E*, *F* AND *G* (FIG. 6) IF MADE FROM BRASS

ORDER OF OPERATIONS	SPINDLE SPEED 927 FORD	SPINDLE SPEED 1273 BACK	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop		15 Revs.	8	
Cut off 0.140 inch travel at 0.0012 inch feed		114 "	60	S-12
Form while cutting off 0.070 inch travel at 0.0006 inch feed		(114 ")	(60)	S-9
Index turret 5 times, reverse spindle clearance		8	4	
Thread on 16 threads at slow speed	16	21	10½	S-5
Reverse spindle, thread off		16	8½	
Index turret		17	9	
Total revolutions to make one		191	100	
Time for one piece, 9 seconds. Gears: 60 driver, 54 driven				
Net in 10 hours, 3,600. Maximum surface speed of stock, 85 ft. per minute				
Maximum surface speed to thread, 30 ft. per minute				

FIG. 10. PRELIMINARY LAYOUT FOR PARTS *H* AND *I* (FIG. 7)

SKELETON ORDER OF OPERATIONS	SPINDLE SPEED 792 FORD & BACKWARD	HUNDREDTHS OF CAM SURFACE	CAM NUMBER
Feed stock to stop		5	
Cut off 0.175 inch throw			
Form 0.100 inch throw			
Clear		6	
Thread on 18 threads and reverse spindle	18	7	
Thread off 18 threads	18	7	
Index turret		5	
Total revolutions to make one	257	100	
Time for one piece, 20 seconds. Gears: 20 driver, 40 driven			
Net in 10 hours, 1600			

FIG. 11. PRELIMINARY LAYOUT FOR PARTS *H* AND *O* (FIG. 7) IF MADE FROM HARD STEEL

An order of operations similar to Fig. 8 should be worked out for each representative group and figured according to the proper feeds and speeds. Drawings and cams similar in throw and length of cam surface

A numerical list of all cams should be kept for the purpose of taking out new symbol numbers and each cam should be entered on an individual card so that it may be filed in order according to throw.

Parts can be made from brass or hard steel with the same cams, using suitable feeds and speeds, as for example the order of operations shown in Fig. 9 for the parts *E*, *F* and *G*, Fig. 6, if made from soft brass.

In designing lead cams to become standards for threaded parts, a variety of thread lobes (designed according to various speeds and pitches of threads) are laid out on transparent paper for comparison.

Usually the selection of a few varieties will answer most requirements. These are stamped with throw of cam, hundredths of cam surface, and pitch of thread for which the cam was designed, the latter for comparison when using the cam for making other screws. The cam shown in Fig. 3 was designed for use with a fast spindle speed backward and intermediate spindle speed forward, while the one shown in Fig. 4 was designed for a fast speed backward and slow speed forward and the one shown in Fig. 5 for the same speed forward and backward.

In order to select a suitable thread-lobe cam for making a screw it is necessary to find the proper gearing to rotate the cam at a speed corresponding to the required spindle speed. As an example, a ⅜-in. 36 pitch screw, 1½ in. long with a ⅝-in. diameter head made from hard steel would require surface speeds of approximately 25 ft. per min. for threading and 65 ft. per min. for forming and cutting off or a suitable spindle speed of 792 r.p.m. forward and backward.

In the skeleton order of operations (Fig. 11) it is shown that if the thread cam shown in Fig. 5 is used, the number of hundredths of cam surface for threading (or 7) divided into the eighteen revolutions required for threading, equals 257 revolutions of the spindle to make one piece. Referring to the table in the B. & S. instruction book for the No. 00 machine, under 792 r.p.m. we find the nearest number to 257 is 264, requiring gears 20 driver and 40 driven. If the required spindle speed was 927 r.p.m. gears 20 driver and 34 driven would be used with the same cam. The amount of cam surface not used (Fig. 5) approximately establishes the minimum feed for the cutting off and forming operations, but as a rule this does not interfere with the selection of the lead cam. In the example above the feed for cutting off and forming (also using standard cams) is 0.00086 in. and 0.0005 in. respectively. The omissions in Fig. 11 are to make clearer the method of computing to obtain proper gears.

If a thread lobe is laid out for the screw given in the above example the outline will be found to match closely with that in Fig. 5, designed for a different pitch screw made from soft steel with a correspondingly faster spindle speed.

Threaded and plain bushings, collars and parts requiring a variety of turret operations can also be made with a large percentage of standard cams, although those lead cams having more than two lobes in addition to the stop are usually limited to machining the work for which they were designed. Cross-slide cams having a small amount of cam surface occur frequently in this class of work and may be used for a great many different parts.

A few of the cams are used so frequently that it is advantageous to duplicate them. Parts to be made in large quantities should have special cams designed for the purpose of saving every fraction of a second, an economy which will become noticeable in a few weeks. The nature of the work, number of machines and cams on hand, etc., are all factors which determine to what extent the standard cams may be used.

Enlargement of Cast Iron by Heat-Treatment

By Guy L. Bunch

With reference to an editorial query appended to an article by Ivan C. Beach on the subject of "Enlarging Gas-Engine Pistons," appearing upon page 638 of *American Machinist*, my experience may be of interest.

While serving as assistant inspector in the Bureau of Ordnance, Navy Department, I made a series of experiments and found that a 12-in. cast-iron projectile was enlarged 0.017 in. at the bourrelet, while at the base of the same projectile the swelling amounted to 0.020 in. The test was made upon the body of a 12-in., 870-lb. standard Navy target projectile that had been cut off just forward of the bourrelet, and was for the purpose of determining whether or not it was possible to reclaim projectiles that had been machined below the limit of size for acceptance.

Three test bars were taken out of the projectile by means of a hollow drill and laid aside to be used to check by. Three others were taken out and heat-treated at the same time and in the same furnace with the mass, and still three more were taken out of the mass after it had been heat-treated. All test bars were turned to a uniform diameter of 1.129 inch.

The results were rather astonishing, particularly as there was a general feeling that cast-iron heated to a cherry red would be deteriorated by the treatment. The raw bars pulled within 300 lb. of the original test upon the same material, the bars that were treated with the mass pulled about 15 per cent higher than the raw bars, and the bars that were taken out after treatment of the mass showed an increase of 12 per cent in strength over the raw bars. The bars cut from the mass before treatment and treated with it showed an enlargement of from 0.005 to 0.0075 in. in diameter and a slight increase in length. Every care was exercised to locate the measuring points upon the bars in exactly the same place, and each bar was seated privately so that there was no possibility of mixing them.

The result of these experiments would seem to indicate that cast iron was not only increased in size by heat-treatment but that its material characteristics were also improved thereby. Whether or not the composition had anything to do with the result the experiments did not go far enough to determine, and this would seem to be an excellent field for further experimentation.

The Foreman and the Community

By A. W. Brown

As a rule, neither the management nor the mass of workers thinks much of "the community"—who constitute it, where they live, move and have their being and what their rights may be. Probably the foreman is much better fitted than either the management or the working class under him to give a thought to that "class," which is not a class, because it comprises all classes, and which has at least an indirect interest in all industrial comings and goings, thinkings and doings.

Problems of the Die Head Manufacturer

Factors Affecting Design and Manufacture—Construction and Details of Manufacture—Why Parts for Special Threads Are Costly

By C. W. BETTCHER
Sales Manager, Eastern Machine Screw Corporation

IT MAY safely be assumed that few users of self-opening die heads realize the complexity of the problem with which the manufacturer of this class of tool is confronted.

To gain some idea of the magnitude of this problem, it is necessary to consider the following factors: (1) The variety of thread forms used upon articles of modern manufacture; (2) the multiplicity of sizes and pitches in which each thread form must be produced; (3) the various kinds of material upon which threads are cut, and (4) the kind and condition of the machine and the degree of intelligence and interest displayed by the workman who operates it.

Of thread forms we have in common use the U. S., V, Acme, Whitworth, British Association, Cycle Engineering, French, Standard-International, pipe threads and many special shapes. Each may be required in either right- or left-hand, in any pitch from 3 to 110 per inch, and of any size from ¼ to 3 in. in diameter. Added to the above list is the possibility of having to furnish any one or all of them in double, triple or even quadruple pitch.

The complexities are still further swelled by the fact that many kinds and sizes of thread may be cut with several sizes or styles of die-head, making it necessary for the manufacturer to increase his stock of chasers by that number in order to meet all requirements. In fact, a recent inventory at this factory disclosed approximately 1,300 varieties of the combinations given above.

While this outline is designed to suggest the great possibilities of the self opening die head, it may serve in even greater measure to emphasize the importance to the customer of adopting for his work some form and pitch of thread that is already to be found in standard tables. The special thread not only is usually an arbitrary requirement on new work, but actually increases production costs for the reason that the special tools and gages must be made at a cost many times in excess of the cost of standard equipment, to say nothing of longer time it will take to get them. It is the practice of the Eastern Machine Screw Corporation, and I believe of most die head manufacturers, to simply make an extra charge for the cost of the hobs when special chasers are ordered and to absorb the other losses.

The manufacture of chasers is work that cannot be hurried. In ordering new or special thread forms, pitches, etc., the customer should remember that any deviation from standards already set involves the making of tools for the production of the new chasers and that with the making hardening, grinding, and testing of these tools, thirty operations are introduced, all of which tend to lengthen the time required for deliveries. Allowances in delivery should be made upon all orders for chasers that differ in any detail from those that have hitherto been made. A recent inventory disclosed the fact that there are well over 1,750 different kinds of chasers in stock ready for immediate shipment. When it is considered that in some of these chaser sizes hundreds of chasers must be available on any one order it will be seen what this investment must mean in order to give the proper service to the customers in the matter of chaser deliveries.

> THIS OUTLINE, in addition to suggesting what is possible in self-opening die heads, emphasizes the importance of selecting threads wherever possible from tables already considered as standards.
>
> Following such a procedure will mean not only more prompt service in the matter of chaser deliveries but also better deliveries from the manufacturer of taps and gages, and lower costs.

Difference of material upon which threads are to be cut involves a difference in minor details of the tools that are to cut them, even though the thread characteristics may remain the same. Though cold-rolled screw stock is by far the most commonly used material upon which threads are cut, nickel, chrome-nickel, chrome vanadium and other steels (some heat-treated) cast-iron, cast brass, bar brass, tubing, aluminum, fiber, hard rubber and even celluloid are often used. Fig. 1 shows a few examples of the threads and materials. Each material requires a careful study of its characteristics in order to be sure that tools will render satisfactory service upon it.

Self-opening die heads are used upon automatic single and multiple spindle screw machines of different designs and principles, bolt threading machines, hand screw machines, lathes, drill presses and many special machines. In some of them the die head revolves while the work remains stationary, in others it is the material that revolves. Some rotate both work and head at differential speeds. All of these things have a bearing upon the kind of die head to be used and must be taken into consideration by the manufacturer who supplies the tools.

Not the least important of the variable factors is the workman who has the handling of the tools. Though the equipment may be beyond criticism and perfectly adapted to the work it is expected to do, all the study and forethought of the tool manufacturer may speedily be brought to naught by a careless, indifferent or ignorant workman who may run the tools at speeds for which they were never designed or may allow the supply of lubricant to fail at a critical moment.

The self-opening die head has, however, reached such a point of perfection in detail, rigidity and reliability

of action that with proper supervision in the matter of grinding chasers and suitable instruction to the workman in the use of it, the tool can be depended upon to produce work upon a quantity production basis that will equal in accuracy the best product of the toolmaker's skill.

The following points are essential to a successful die head. It must be simple in construction so that it will function instantaneously; it must be strong and rigid that it may stand up to its work continuously without its operation being affected by working conditions; it must hold the chasers firmly and in the most advantageous manner so that there will be no yielding under pressure of the cut; all parts must be carefully hardened to insure against undue wear; and all parts must be ground after hardening to extremely close tolerances so that old and new sets of chasers may be interchanged as necessary and the changing from one style of die head to another style of the same size effected without difficulty. These requirements involve not only the most exacting methods of manufacture but a system of inspection that will enable the manufacturer to keep the limits of tolerance under his strict observance and insure perfect workmanship and interchangeability.

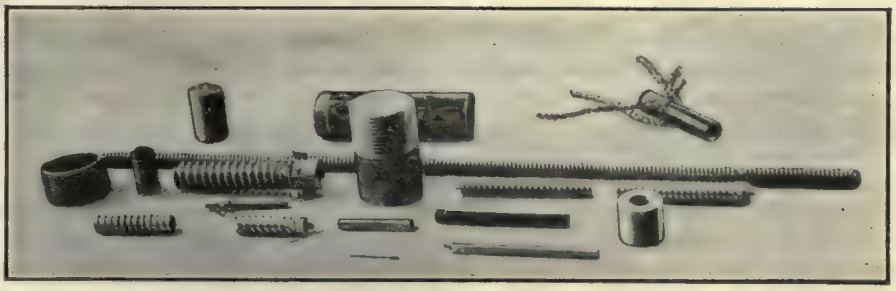


FIG. 1. EXAMPLES OF THREADS AND MATERIALS



FIG. 2. TESTING THE HEADS FOR SYMMETRY

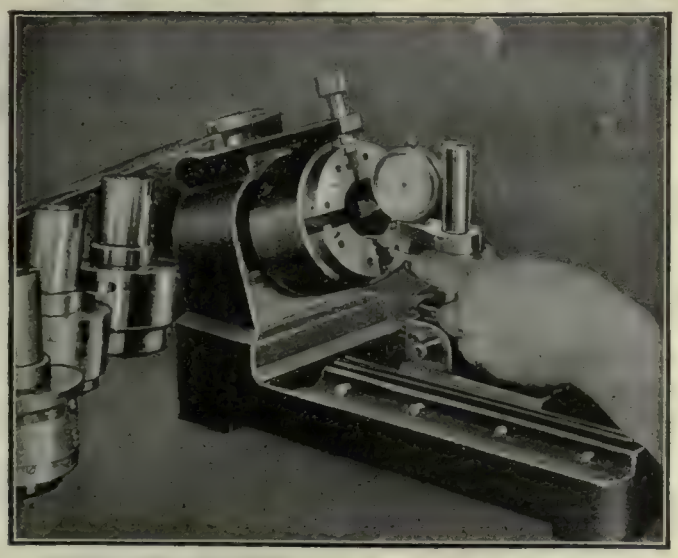


FIG. 3. TESTING THE CAMS FOR RADIAL POSITION

An important feature of the construtcion of a self-opening die head is the slot in which the chasers move. These slots must be ground to accurate dimensions so that chasers, old or new, will be a close sliding fit without perceptible shake, else chattering and consequent imperfect work will result. Besides accurate dimensioning it is of extreme importance that the slots be symmetrically disposed with relation to each other and to the axis of the die head.

In Fig. 2 is shown how the heads are tested in this respect. Go and no-go gages are used to keep the width and depth of the slots within limits while the bar gage and indicator enable the inspector to detect errors of a very small fraction of a thousandth in location. Tolerances, even on large scale production, are held as closely as in the most exacting tool work.

In Fig. 3 may be seen the method of testing the cams to make sure that each bearing surface is exactly the same distance from the axis of the head. Here, again, the tolerance must be very close, for any variation in this respect would mean that the work of threading would fall unevenly upon the chasers, resulting in bad work and the rapid deterioration of the chaser that was bearing the brunt of the burden.

Turning now to the chasers we find that it is a matter of vital importance in tooling up for their manufacture for exactly the right amount of clearance. However slight this may be, it is very essential to a free cutting tool. We have to control the clearances from the cutting edge back around the screw and also from the throat to the rear. Though these clearances are difficult to measure, they must be maintained within definite and very close limits.

The length of each chaser is another important feature; "length" in this case meaning not the over all length but the distance between the pitch diameter of the thread and the point where the chaser takes its



FIG. 4. TESTING THE CHASERS FOR LENGTH

bearing upon the cam. In Fig. 4 may be seen the device for checking this measurement, indicating the care which is exercised to keep each chaser in a set to the same dimension.

Experience throughout the war in the matter of thread specifications, the importance of having accurate and smooth threads in high-speed engines, such as those for automobiles, airplanes, etc., has made us critical in this respect. For many years the manufacturer of die heads has seemed to have the advantage over the manufacturer of taps, but within the last year or two the latter has made very rapid strides and taps are now available that will cut threads beyond criticism.

Threads on chasers are cut by the hobbing process and as these threads can be no better than the hobs that cut them, the designing and making of the latter constitute no small part of the problem with which the manufacturer must deal. This phase alone calls for a vast amount of gaging and testing apparatus in the inspection department.

Though the self-opening die head cannot be said to be a new thing as mechanical inventions go, it has undergone a wonderful development within the past few years. Considered but a short time ago as a tool capable of producing a "good enough" thread, it has been improved by strengthening its parts, closing up its limits of tolerance, and extending its range of usefulness until now it may be depended upon to produce in hundreds of thousands many kinds of threads and worms once thought impossible for it, and this to a degree of accuracy hitherto regarded as unattainable except by the most laborious and painstaking methods.

Notwithstanding the rigor of present-day thread specifications in the matter of form, lead and smoothness of finish, the die head is meeting them with ease and regularity, and this has been made possible largely through the efforts of a comparatively small group of manufacturers who, having faith in the possibilities of the tool and the determination to demonstrate it have devoted their time and skill to overcoming the difficulties one by one as they have arisen.

Time and Motion Study vs. Red Tape Wage Systems

Premium Earnings Should Not Be Used to Control Wage Fluctuations—Time and Motion Study Is Too Frequently Confused with Rate Setting

BY GAYLORD G. THOMPSON
Production Engineer, Pawling & Harnischfeger Co.

"IT APPEARS to me that we are beating around the bush in our methods of wage payments." These were the words of a general manager, uttered at an executive meeting. "I had occasion to visit ——— & Co. the other day," he continued, "and I was very much impressed by the small clerical force they employ to keep records of their labor and manufacturing costs. They have no premium or piece work in their plant, consequently prodigality of forms and records does not exist. The workers are paid on a flat hourly basis. Upon completion of a job, it was not necessary to pass the labor record through a multitude of hands to complete the calculations of labor costs. I will venture to say that if I take any foreman in our shop and walk with him through any department with which he is not familiar, he will be unable to tell me which of the workers, judging by their application to their work, are on premium and which on straight work. When I walk through the shop and witness an apparent equality in production and physical exertion of employees on premium jobs and those working on a flat wage rate, I am forced into the opinion that our premium system is availing us nothing. It appears to me that our premium system has degenerated from an incentive toward increased production, to a red tape method of the application of a wage payment system."

At this meeting the subject of retrenchment predominated. To the exponents of the premium system of wage payments supplemented by the application of time and motion studies, the words of the general manager contain a challenge to the arguments for efficiency based upon time and motion study. They perhaps typify the opinions of many executives who are inclined to discount the value of time and motion studies as a basis of establishing efficient manufacturing methods and rates. Evil germinates from a cause, consequently every evil attributed to the functions of time study must have its cause. The harvest resulting from the seeds of time study is in proportion to the knowledge and care taken in their planting and cultivation. To condemn time study, when the fault lies in the misapplication of its fundamental principles, is just as logical as mixing yellow and blue together and condemning the mixture because it is not white instead of green.

There was a time when the majority of manufacturing concerns having premium systems in their plants, would hire their employees at a certain rate per hour that was satisfactory to the employee regardless of whether he worked premium or piece work. Premium earnings of 10 to 15 per cent in excess of the flat wage rate of the worker were considered sufficient incentive for increased effort and met with satisfaction because the wage rate was high enough to counteract any tendency toward dissatisfaction should the worker be called upon to perform duties on which no premium rate had been established.

Before the World War, the evolutionary development of time study had progressed so far that time study was becoming an essential factor in progressive and efficient manufacturing methods. Unprecedented prosperity, resulting in riotous clamor for production regardless of cost, had the effect of partially breaking down the structure constituting the fundamentals of time and motion study. In the efforts to comply with

the demands of labor for increased remuneration, premium rates were established from past performance records of employees. This was found to be the most convenient source of realizing quick results. Right here is where we discover the cause of the "apparent equality in production and physical exertion of employees on premium jobs and those working on a flat wage rate."

When premium rates are based upon the past records of employees without due consideration of the effect of inefficient operation methods, the whole affair resolves itself into a red tape method of wage payment and nothing more. Premium rates as based upon the conclusions of time study are supposed to incorporate an element of incentive toward increased production. Rates which are based upon the performance of the individual rather than upon time study, will eventually defeat their purpose because the facts relating to the details of the operation affected are not available. Thus we have as a result of all this, nothing more than an estimate.

In carrying out their plans of retrenchment, many manufacturing concerns will find that their employment managers have been hiring help on the basis of so much per hour and a promise of additional premium earnings. Although dissatisfied with the low base wage rate, the worker upon being employed will always bear in mind the prospects of premium earnings counteracting the low flat wage. After he has been assigned to his job and finds that his premium earnings do not come up to his expectations he will either demand an increase in premium allowance or quit. Almost invariably in the past these demands were granted promiscously in order to keep the worker on the job. If they were not met, the subsequent increase in labor turnover was traceable to the employment man because of the impression he created in the mind of the worker at the time he was employed.

The Employment Man's Troubles

We cannot, however, place the blame on the employment man for this state of affairs. His troubles were plenty when labor was scarce. In many cases his inability to meet competitive bids for labor on the flat hourly basis compelled him to inform the prospective employee of every possibility of increased earnings over the flat wage rate.

The works manager of a certain concern was constantly beset with requests for increased wages. Every morning his desk was stacked with application forms for wage increases submitted to him by various foremen for his approval. To stem the tide, he called all of the foremen and superintendents into consultation and advised them that in the future no increases of the basic wage rates would be made where an employee had opportunities to work premium or piece work. Any increase in earnings of that class of labor would have to be realized by an increase in premium or piece work rates. In fact, where premium rates were established on a basis of the worker's making 25 per cent above his wage rate, instructions were given to assign the rates so that the worker would realize approximately 50 per cent additional earnings.

This had the effect of turning the demands for increased earnings into the channels of the time-study division. Old established premium rates soon became the object of attacks by disgruntled workers. There was no alternative for the time-study men except to increase these premium rates in order to maintain harmony and satisfaction of the workers and at the same time keep within the scope of premium rate adjustments as promulgated by the works manager.

Premium Earnings Must Not Be Used to Control Wage Fluctuations

It is obvious that attempting to use premium earnings as a control of wage fluctuations will directly affect the method by which the employment man engages help. The very moment that such an attempt is made the embryo of a red tape method of wage payment comes into existence.

Fundamentally, it is wrong to establish low wage rates and depend upon the premium system to keep the workers satisfied. When a concern has reached the point where a guaranty of premium earnings must be given in addition to the basic wage rate, it would be far better to discontinue premium work and bring the wage rate up to the approximate unit level of the average combined wage rate and premium earnings of the individual employee.

Overhead would be reduced considerably by the elimination of extra clerks required to calculate the pay roll under the wage-rate-plus-premium method of wage payments. Efficient supervision in the shop should also contribute to further the economy effected by this reduction in overhead, especially in a manufacturing concern which maintains a department masquerading under the title of "Time Study" when as a matter of fact its functions are merely the allocating of rates.

The name of "time study" has been erroneously applied to departments having functions that do not in the least interpret such a title. Such faulty application of the title is a contributary factor in bringing time study into disrepute. For example to call a "rate-setting" department a "time-study" department is fundamentally incorrect because all of the evils arising from rate setting, which may lack the research and analysis of time study, would be placing the blame on time study.



Miscellaneous Operations on the Mack Truck

Special Milling Fixtures and Operations—Centerless Grinding—Using the Thread Comparator—Making Radiators, Cabs and Hoods

By FRED H. COLVIN
Editor, *American Machinist*

SOME of the miscellaneous machining operations in both the Allentown, Pa., and Plainfield, N. J., plants of the International Motor Company are particularly interesting, showing the adaptation of standard machines for special work by the use of ingenious fixtures. A case of this kind is shown on an Ohio tilted milling machine in Fig. 1, where it is necessary to flatten the ends of a large number of steel pins. It was desirable that the bottoms of the cuts be concave instead of convex, as would have been the case had they been arranged on the outside of the circular table and fed past the milling cutter. In order to make them concave, the pins are arranged for milling in groups of four, two being held by each single bolt strap, as this makes the easiest and simplest kind of a fixture to load. The back ends of the pins rest against the adjustable stops shown.

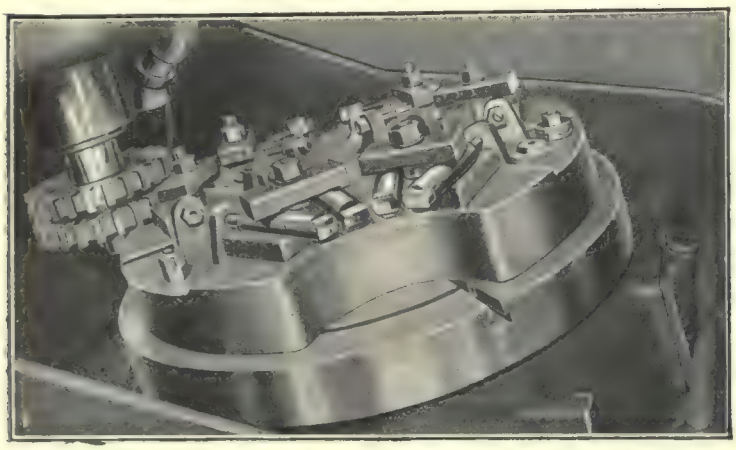
The table holds twelve pins in three groups of four each, and is readily indexed from point to point, and then fed in to the milling cutter. Four pins are milled at each stage of the operation and this method has proved very satisfactory in handling the work.

In Fig. 2 is shown a centerless grinding machine handling piston pins, a particularly interesting feature being the simple form of guides used. The guides are simply hardened steel strips set into the blocks shown, the result being satisfactory both as to output and quality.

The method of testing the water pump casting is shown in Fig. 3. The clamps shown hold the pump casting firmly in place while the pressure is being applied. The pressure regulator shown at *A* insures the proper pressure for each test made. One of the uses made of the Niagara metal-washing machine is shown in Fig. 4. Manifolds and other parts washed in such machines come out thoroughly clean and are ready to go directly to the assembly.

The Hartness thread comparator, Fig. 5, is used in every day shop work and assists materially in securing good screw thread fits. Its surroundings indicate that it is a shop tool instead of a laboratory instrument.

The radiator on the large Mack trucks is of rather peculiar design, being behind the motor and having the fan in the center, so that it throws the air out through the cooling coils instead of in a horizontal direction, as is usual in most cases. The frame work of the



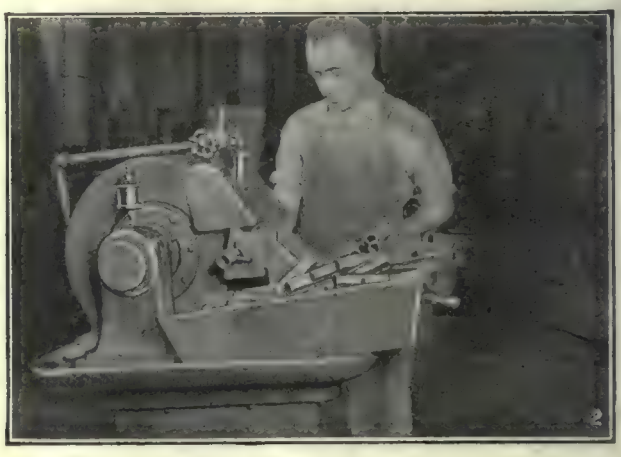
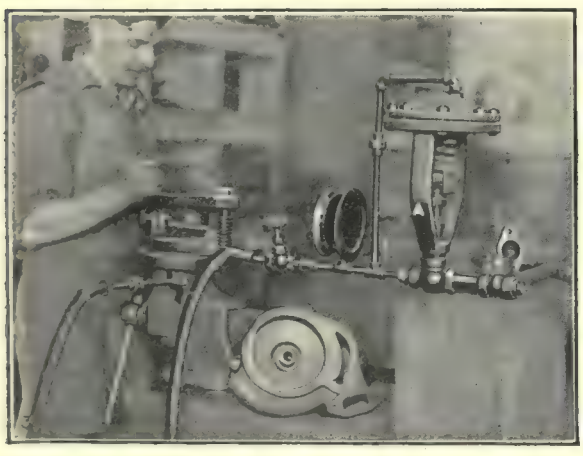


FIG. 1. SPECIAL FIXTURE FOR MILLING STUDS. FIG. 2. GRINDING PISTON PINS



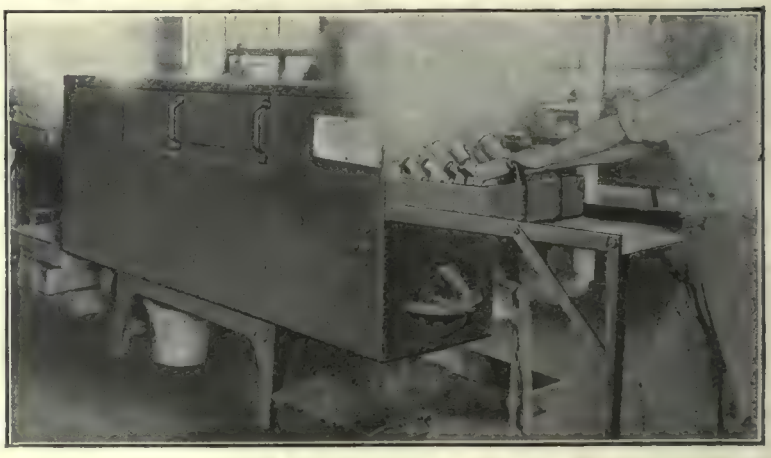
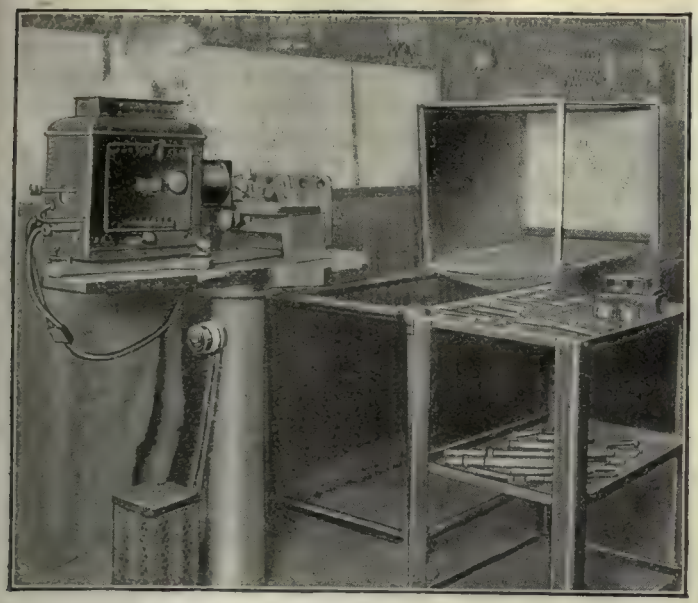


FIG. 3. TESTING WATER PUMP CASES. FIG. 4. WASHING PARTS BEFORE ASSEMBLY



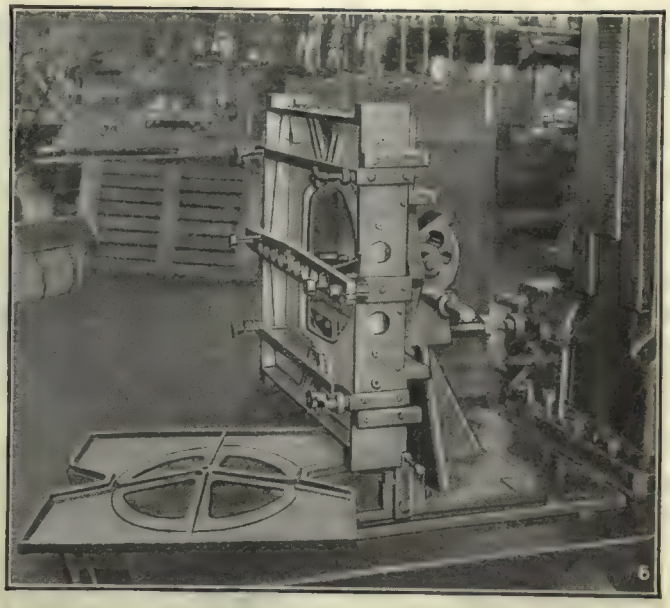
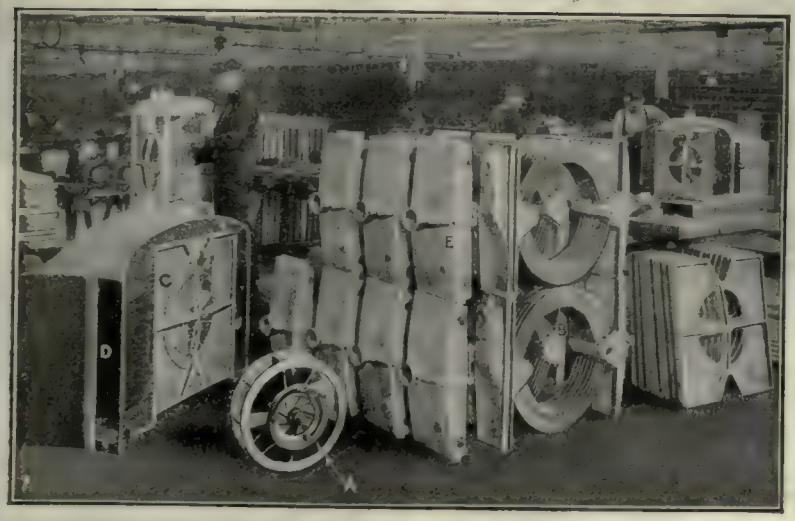


FIG. 5. USING THREAD COMPARATOR IN THE SHOP. FIG. 6. DRILLING RADIATOR FRAME



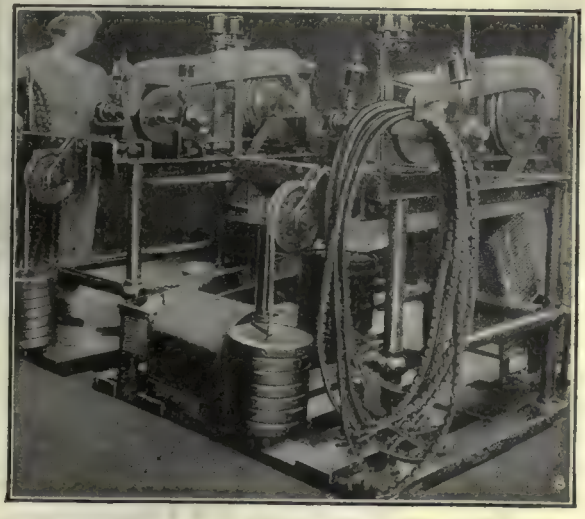


FIG. 7. RADIATOR READY TO ASSEMBLE. FIG. 8. TESTING THE FAN BELTS



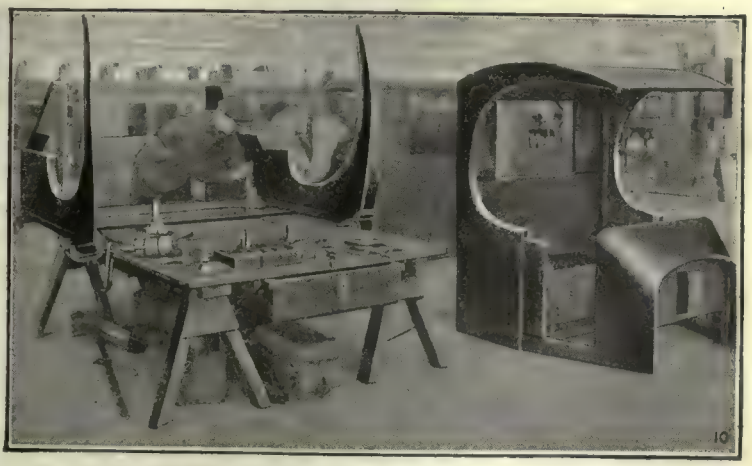


FIG. 9. BUILDING THE CABS. FIG. 10. A COMPLETED CAB

radiator is shown in Fig. 6, together with the drilling fixture, and some of the completed radiators can be seen in Fig. 7. The latter also shows one of the fans at *A*. The fan is mounted inside the circular coils *B*, as may be seen in the assembled radiator at *C*. The side openings in the cowl *D* permit air to escape at each side. The tank for the water supply is an aluminum casting shown at *E*.

Special V-shaped belts are used in driving the fan, and in order to insure satisfaction and prevent slippage while the belt is new, every belt is tested and stretched on the machine shown in Fig. 8. It is run for a given

time under a specified load as supplied by the weight shown. After stretching, it is cut to the proper length so that the user should have very little difficulty even while the belt is new. After testing, the fan belts are carefully wrapped in oiled paper to protect them from moisture.

The driver's cabs are both substantial and comfortable, as can be seen in Figs. 9 and 10. There is considerable work on the cabs as will be noted from the drilling, riveting and bolting up operations shown in the two illustrations. One of the completed open cabs is shown at the right of Fig. 10, and, as may be seen, the door slides back into the side of the cab body. Many cabs are completely enclosed in cold weather so as to afford ample protection for the drivers.

The making of the distinctive Renault hood consists of a number of cutting and forming operations. The final-assembly form is shown in Fig. 11, together with



FIG. 11. A HOOD AND ITS FORM

one of the completed hoods. The form is mounted on a shop truck so as to be at a convenient working height and also to be easily moved anywhere in this department of the shop.

Putting Limits on All Dimensions—Discussion

BY ALFRED T. GREGORY

None of us can give an inflexible rule for dimensioning machine drawings that will serve satisfactorily for all classes of work. Putting limits on dimensions is very practical when carried on with moderation. Beyond the usual practice, however, of making limits for dimensions requiring considerable accuracy, I am not in accord with John Thomas, who wrote the article "Putting Limits on All Dimensions," on page 639 of *American Machinist.*

Let us suppose that a new machine is to be constructed. In some shops a separate set of drawings would be made for the pattern shop, the machine shop and the assembly department. In each of these sets of drawings the draftsman will dimension the drawings to suit the needs of the particular department for which they are intended. In other shops one set of drawings serves all three departments, and the patternmaker must make allowance on his patterns for machining operations.

When the patternmaker receives the drawings and checks them over, is it necessary for him to have limits for his work? He knows how much to allow for certain machining operations. He can tell from the general appearance of the drawings whether $\frac{1}{16}$ in. off here or on there will make any material difference in the casting.

After awhile, when the castings come to the machine shop to be machined, the foreman will plan out just what has to be done to each part, and which machines they should go to for their various operations. If he is in a large shop he will probably call his assistants and job setters and talk it over with them.

It is quite certain that the foreman will know just how each part should be made; as a study of the drawings will give him practically all the information he will need. An experienced mechanic should know about how much to allow for practically all the dimensions that are not limited on the drawings. For instance, if the drawing gives one dimension for a particular part with a note, as driving fit or sliding fit, he knows what to do without any limits. Many times no note is needed to convey information. If he does not quite understand any particular part of the drawings, a talk with the designer will clear up all doubts.

When the work comes to the assembly department, some of it may have to be chiseled and filed, other parts may have to be drilled, etc. The foreman of the assembly department should have a thorough understanding of the mechanism of the machine, so that beyond possibly a few necessary limited dimensions, it would be a waste of time for the draftsman to attempt to put limits on all the dimensions.

In all shops there is a standard of workmanship which is what might be called an unwritten code, and it should not take a new man long to become acquainted with that standard. In large airplane and automobile shops where a high degree of workmanship is maintained, there is always a large force of inspectors whose duty it is to see that these standards are maintained.

It will be apparent from the foregoing that putting limits on all dimensions is unnecessary and impractical from the shop man's point of view. Now a word for the draftsman. Many times a drawing will be so crowded that to add limits to all the dimensions would make it practically impossible for anyone to understand it. Then too, it would add a great deal of unnecessary work to the draftsman's duties. It would take considerable time for a draftsman to limit every dimension, as very often he would have to look up the various tools and fixtures and spend a great deal of time collecting other data. Should the machine be wanted in a hurry, it would only add more delay to its final delivery. In the face of the great competition now existing among manufacturers, and also the way that everyone is trying to cut down expenses, it seems to me that the idea of putting limits on all dimensions is very impractical.

Clear Explanation

BY ROBERT GRIMSHAW

It is one thing—and a good thing, of course—to know a thing thoroughly and accurately. But explaining it to another is an entirely different, and often equally important matter. Showing is sometimes impossible; doing so would necessitate doing the job, instead of having it done, which, where there is no repeat work, would be inadvisable and uneconomical.

The foreman must be able to analyze the job into its main divisions and explain each in sequence to the worker, in terms that the latter can understand and remember.

The Gleason System of Bevel Gears

Quietness in Operation, Strength and Durability Considered — Limiting the Undercut — Preference for Low Pressure Angle—Pressure Causes Wear

By F. E. McMULLEN and T. M. DURKAN

FOR a long time need has been felt for a definite system of designing bevel gear teeth, which would give the most desirable tooth form for use under average conditions. It has been common practice in the past to use spur gear formulas, such as those of Brown & Sharpe, in figuring bevels. These formulas were worked out for an interchangeable spur gear system, which necessarily required some compromise. When they were applied to bevel gears, where interchangeability was not a factor, the possibilities of the involute curve were not fully utilized.

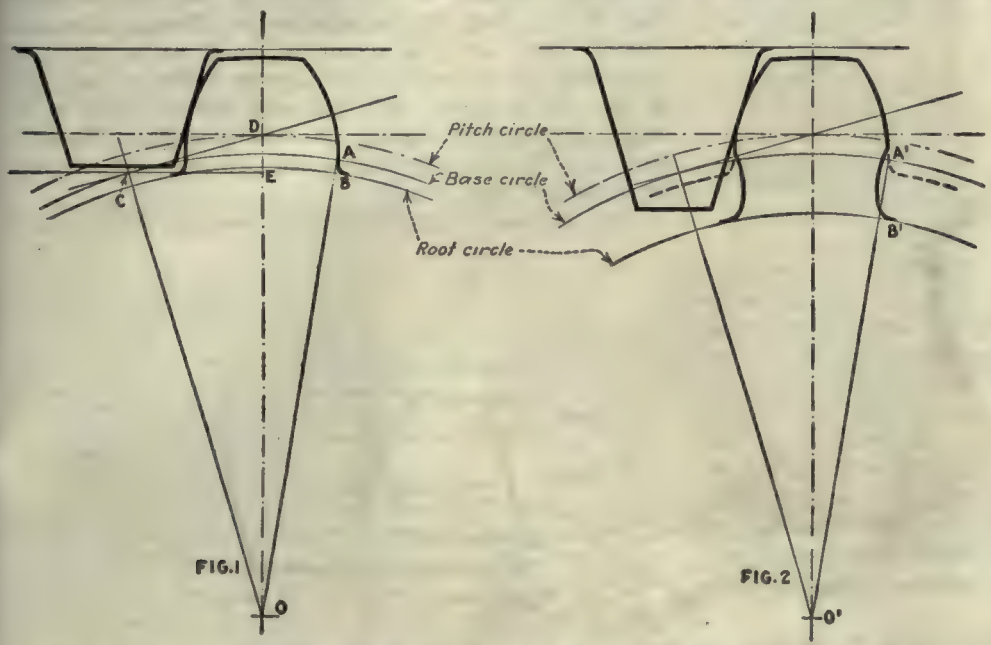


FIG. 1—INVOLUTE TOOTH IN MESH WITH RACK, SHOWING FILLET. FIG. 2—INVOLUTE TOOTH SHOWING UNDERCUT

The Gleason 0.3 and 0.7 long and short addendum tooth was brought out to improve this condition, and various other alterations of the standard spur gear design have been used. For the most part these can be applied to certain combinations only and, therefore, are not universal. Recent applications of bevel gearing covering a wide range of ratios have made it imperative that a progressive system embracing all ratios and any number of teeth in common use, be worked out.

An investigation has been conducted by the Gleason Works to develop a practical system for designing the form of tooth that is consistent with strength and wear considerations, the quietest in operation. The results of this research have been incorporated in the accompanying tables. This system applies to any pair of generated spiral or straight tooth bevel gears operating at right angles where the pinion is the driver and has ten or more teeth. The bevel gears cut on the former-type planers are subjected to a special study as certain practical limitations prevent the application of the system to this class of gearing without modification.

Presented at the spring meeting of the American Gear Manufacturers' Association, April 22 at Buffalo, N. Y.

The principal qualities considered in arriving at this system, arranged in the order of their importance, are quietness in operation, strength and durability. In regard to quietness, experience has shown that bevel gears cut with a lower pressure angle will operate more quietly than those with a higher one, other conditions being equal. There are several reasons which will account for this: With the lower pressure angle a greater arc of action is obtained; any eccentricity has less effect; and the radical component of the tooth load is minimized. Thrust forces also make it desirable to avoid the higher angle, not only because of the introduction of an axial or cone thrust not present in spurs, but also because the majority of bevel gears are overhung from their supports so that the total load should be kept as low as possible. For these reasons the basis of the system is the use of the lowest pressure angle which will not sacrifice strength by introducing an excessive undercut.

It might be well to describe here what is meant by undercut. In Fig. 1 is shown an involute tooth in mesh with a rack. The tooth profile consists of two parts, the involute curve which has its origin at A and continues to the top of the tooth, and the fillet AB lying between the base and root circles. If the rack, which represents the generating tool, does not project below the point C, beyond which involute action cannot take place, the fillet AB will always lie outside of a radial line OA drawn from the origin of the involute.

When the rack tooth is made longer so that it extends below point C, the condition shown in the exaggerated form in Fig. 2 is realized. In this diagram the fillet $A'B'$ lies inside of a radial line $O'A'$ and also slightly cuts away part of the involute curve. An examination of Fig. 1 shows that the value for the dimension DE, which is the distance from C to the pitch line, is equal to the back cone radius $DO \times \sin^2$ pressure angle. From this we might make a definition of undercut by stating that a generated bevel gear tooth is said to be undercut when the dedendum is greater than the back cone radius $\times \sin^2$ pressure angle.

However, it can be shown mathematically that it is possible to exceed this value considerably before there is any appreciable undercut. In fact for the ordinary automobile rear axle pinion having anywhere from ten to thirteen teeth, the dedendum is nearly always more than this critical value, and is sometimes as much as 100 per cent greater. The point at which to limit the

undercut in the present system has been determined by a study of successful automobile practice, because that application represents a condition where both silence in operation and strength are paramount.

The 10-tooth—47-tooth, 14½ deg. spiral bevel ratio

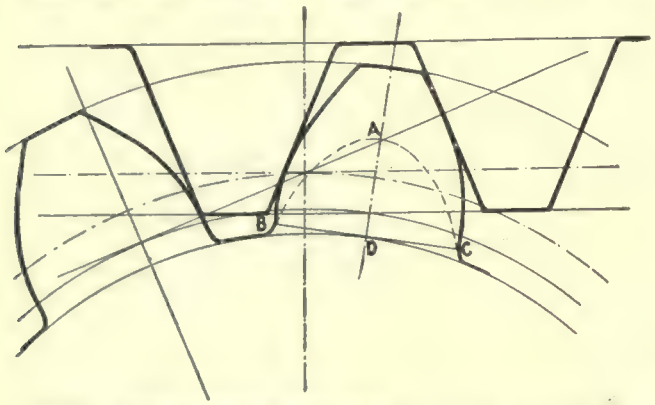


FIG. 3—THE GLEASON SYSTEM 10-TOOTH—47-TOOTH SPIRAL BEVEL RATIO WITH 14½-DEG. PRESSURE ANGLE

shown in Fig. 3 has a pinion dedendum 60 per cent greater than the back cone radius × $\sin^2$ pressure angle, and although the undercut is about as great as for any tooth form in the spiral bevel system, it cannot be called excessive. Likewise the 14-tooth—16-tooth, 14½ deg. straight bevels in Fig. 4 represent as extreme a case of undercut as will be encountered in the straight tooth system, and yet they have a tooth profile which is not weakened to any great extent. The same ratio with a 17½ deg. pressure angle is shown in Fig. 5 but the strength of the gears is increased less than 5 per cent, although the increase appears to be larger.

The selection of a low pressure angle in preference to a higher one does not result in a considerably weaker tooth, as is ordinarily supposed, for the stronger section of the higher pressure angle tooth is offset by the greater arc of action with the lower angle. Reference to Figs. 3 and 6 will make this clear.

In Fig. 3 a 10-tooth—47-tooth ratio drawn with a

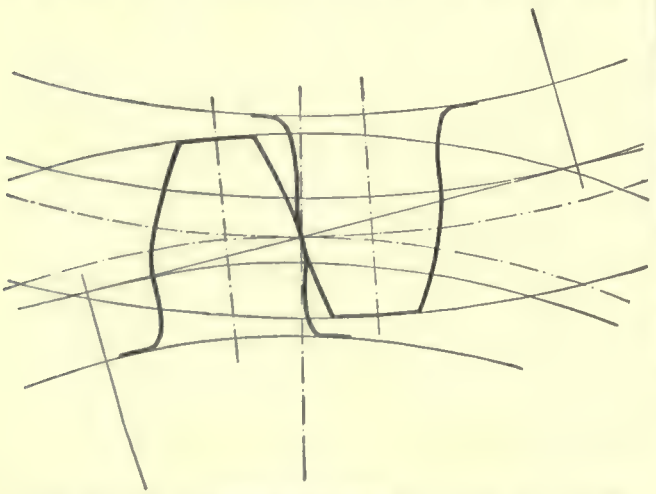


FIG. 4—THE GLEASON SYSTEM 14-TOOTH—16-TOOTH STRAIGHT BEVEL RATIO WITH 14½-DEG. PRESSURE ANGLE

14½ deg. pressure angle is shown and in Fig. 6 the same ratio is laid out with a 20 degree pressure angle. In each case the pinion tooth at the left is just on the point of engaging so that the tooth at the right is carrying the full load. This will be the worst condition of loading on each tooth as any further movement to the right brings another tooth into contact with consequent distribution of the load over two teeth, while movement to the left lowers the line of application of the force toward the base of the tooth. In this position the comparative strength of the teeth can be found by passing a parabola through the intersection, point *A* (see Figs. 3 and 6) of the line of action and center line of tooth, and tangent to the tooth profile. The value of $(BC)^3 \div AD$, which is a measure of the strength can then be obtained.

For the 10-tooth—47-tooth ratios shown in Figs. 3 and 6 the 20 deg. gear is about 14 per cent stronger than the 14½ deg. but the pinions are of equal strength. The 20 deg. ratio, however, is much worse for case hardening on account of the narrow width of top land. A pair of 15 tooth, 14½ deg. and another pair of 15 tooth, 20 deg. miter gears are shown in Figs. 7 and 8. Here the 20 deg. gear is less than 10 per cent stronger than the 14½ deg. gear.

This method of calculating the strength is similar to

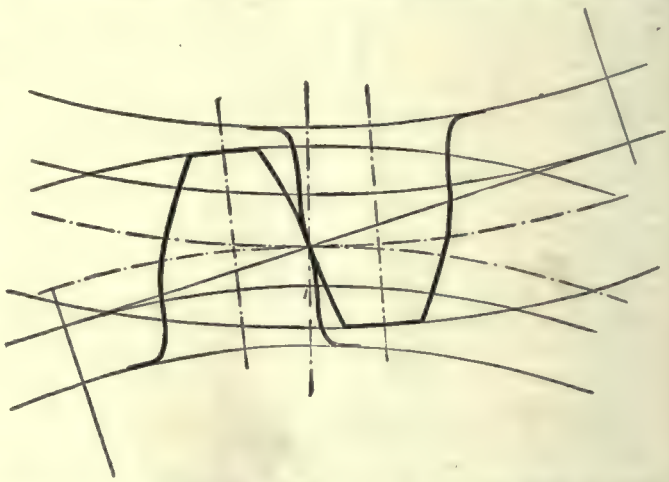


FIG. 5—A 14-TOOTH—16-TOOTH STRAIGHT BEVEL RATIO WITH 17½-DEG. PRESSURE ANGLE

the one used in deriving the Lewis formula, except in regard to the point of application of the load. The Lewis formula is based on the assumption that the load is applied at the end of the tooth, but in modern generating gearing this is a condition which practically never occurs. Prof. Marx in his experiments at Leland Stamford University, found that the force was not at the end of the tooth when failure took place, and also proved that the strength was increased as the arc of action became greater. From a consideration of these conditions, it is evident that the choice of a 14½ deg. instead of a 20 deg. pressure angle is not made at any extreme sacrifice of strength, but that for a large number of designs there is very little difference between the two.

The question of durability viewed from a theoretical standpoint would seem to resolve itself into a problem of obtaining a minimum of sliding and a maximum of rolling motion, as it is natural to assume that the wear would vary directly with the sliding action. But it is well known that the greatest wear often takes place near the pitch point where there is no sliding action. This is because the big factor causing wear is unit pressure and not sliding action. When the point of contact is near the pitch point all the load is borne by one tooth, while it is distributed over two teeth near the

beginning or end of action with a consequent reduction of unit pressure.

In Figs. 7 and 8 that part of the pinion profile which will wear most rapidly is *FG*, because it is forced to carry the whole load. On account of the lower unit

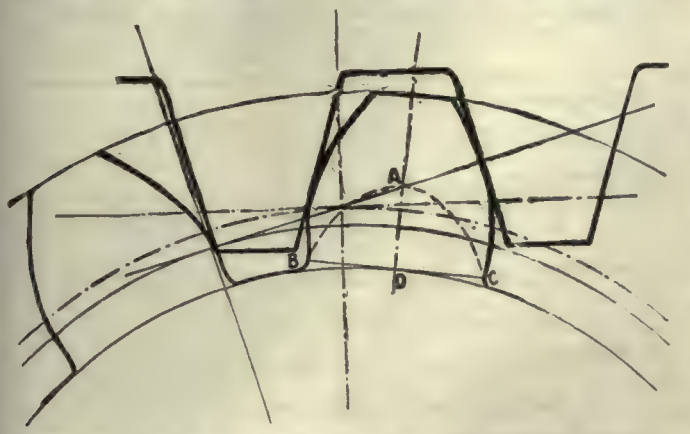


FIG. 6—A 10-TOOTH—47-TOOTH SPIRAL BEVEL RATIO WITH 20-DEG. PRESSURE ANGLE

pressure *EF* and *GH* will not wear as quickly even though the sliding action is higher. For this reason no attempt has been made in this system to maintain any predetermined percentage of rolling action but rather to balance up between approach and recess the amount of rolling already fixed by the requirements of quietness and strength.

Wherever possible, the action during approach has been favored in order to compensate for the change in direction of the friction component which tends to increase the obliquity of the line of action during approach and decrease it during recess. Account has also been taken of the high velocity of sliding action which occurs at the top of long addendum pinion teeth and which, in extreme cases, has led to abrasion. Safe values for this sliding action were obtained from jobs in service and the design was regulated so that these were not exceeded.

In establishing the various factors which go to make up the system, the aim was to arrange them in as simple and practicable a form as possible without sacrificing any of the three principal qualities of quiet-

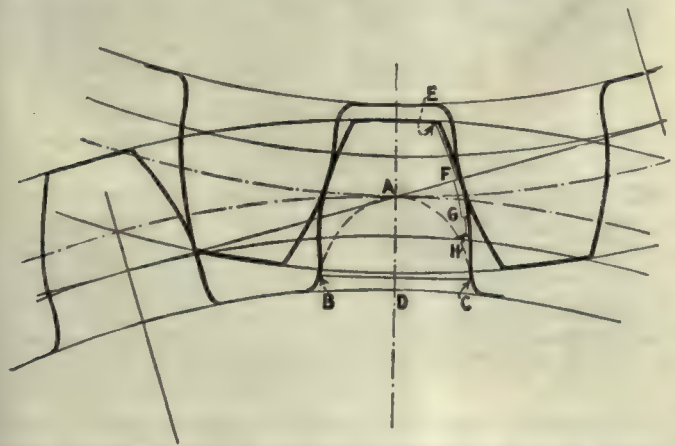


FIG. 7—THE GLEASON SYSTEM 15-TOOTH SPIRAL BEVEL MITER WITH 14½-DEG. PRESSURE ANGLE

ness, strength and durability. In a non-interchangeable system like the one here presented, any of the factors can be made to vary for each ratio and number of teeth. However, simplicity and the interests of standardization are opposed to expressing these factors as variable quantities where the probable accuracy of the assumptions made in determining them does not warrant it. An example of this is the pressure angle.

In a purely theoretical system the pressure angle might have any value. However, the same practical results are obtained in this system, which includes all ratios having ten or more teeth in the pinion, with the use of three angles of 14½, 17½ and 20 deg. for straight tooth bevels and of one angle of 14½ deg. for spiral bevels in all except a few unusual cases.

The pressure angle to be used for any given pair of gears is specified in Tables I and III, and has been selected as the lowest angle which avoids excessive undercut. The introduction of the pressure angle of 17½ deg., which is not universally used, is considered necessary in order to live up to the stated purpose of developing a practical system which will give the quietest form of tooth consistent with strength and wear.

It has been found by experience that there is a decided increase in noise when the pressure angle is changed from 14½ deg. to 20 deg., so that in order not to compromise the system when the undercut becomes

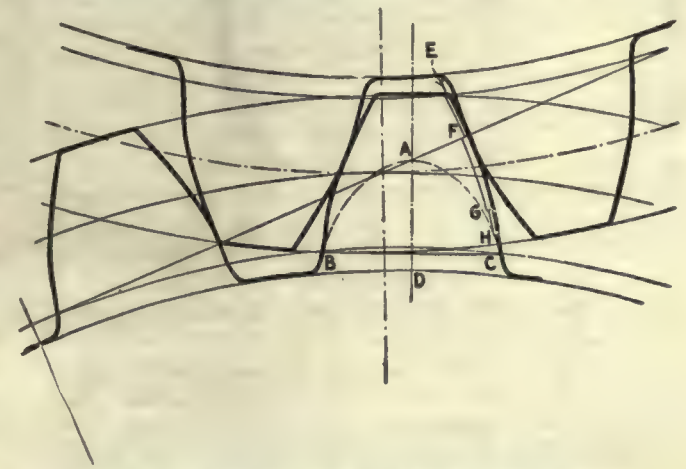


FIG. 8—A 15-TOOTH SPIRAL BEVEL MITER WITH 20-DEG. PRESSURE ANGLE

too great with 14½ deg., an intermediate pressure angle must be called for. The angle of 17½ deg. has been selected because it has already been used to quite an extent by different gear manufacturers. Although at least one pressure angle between 14½ deg. and 20 deg., which are 5½ deg. apart, is required, more are unnecessary. Any new angle would not differ by more than 1½ deg. from the three selected angles of 14½, 17½ and 20 deg. This change is too small to have any practical effect.

The working depth of tooth, which has been fixed as 2.000 in. ÷ D.P. for straight tooth bevels and 1.700 in. ÷ D. P. for spirals, has been successfully used for a number of years. For the average spiral angle of about 30 deg., the normal pitch is approximately 85 per cent of the linear so the normal section of a spiral tooth will have about the same proportion as a straight tooth.

Originally the working depth for both straight and spiral bevels was made to equal 2.000 in. ÷ D.P., but some years ago the depth for spiral bevels was decreased to 85 per cent of this amount because the top of the tooth on the normal was too thin and gave rise to hardening troubles. Stubbing the tooth more than 85 per cent decreased the arc of action and gave a noisier gear.

It would be desirable from a standpoint of standardization to use the same working depth for straight tooth bevels as for spirals, but after considerable experimenting along this line, it was found that straight bevels having an 85 per cent stub tooth were noticeably noisier in running than similar gears with the full depth tooth.

Consequently, the standard of $\frac{2.000}{D.P.}$ in. has been retained for straight tooth bevels.

The bottom clearance specified in the system is $\frac{0.188}{D.P.}$ in. (which is 0.06 × circular pitch). This is the minimum amount which experience shows is necessary for the average job to insure against any bottoming of the teeth. In the past, 0.05 × circular pitch was used and was found to be insufficient, while 0.07 × circular pitch which was also tried out was more than required.

The method followed in proportioning the addendum and dedendum was to adjust them until the amount of sliding during approach was about the same or slightly less than the sliding action during recess. This also had the effect of making the arc of recess greater than the arc of approach, which is very desirable, since the recess action is quieter than that of the approach. To obtain these conditions it was necessary to decrease the gear addendum and increase the pinion addendum

TABLE I—FORMULAS FOR GENERATED STRAIGHT TOOTH BEVEL GEARS, OPERATING AT RIGHT-ANGLES WHERE THE PINION IS THE DRIVER AND HAS TEN OR MORE TEETH

Working Depth $\frac{2.000"}{D.P.}$

Full Depth $\frac{2.188"}{D.P.}$

Pressure Angle

Ratios having 14 or more teeth in pinion ..... 14½ deg.
Ratios 13-13 to 13-24-17½ deg. Ratios 13-25 and higher 14½ "
Ratios 12-12 and higher ..... 17½ "
Ratios 11-11 to 11-14-20 deg. Ratios 11-15 and higher 17½ "
Ratios 10-10 and higher ..... 20 "

Addendum

Addendum of gear = $\frac{\text{addendum for 1 D.P. (from table)}}{D.P.}$

Addendum of pinion = $\frac{2.000"}{D.P.}$ − addendum of gear

Dedendum

Dedendum of gear = $\frac{2.188"}{D.P.}$ − addendum of gear

Dedendum of pinion = $\frac{2.188"}{D.P.}$ − addendum of pinion

Circular Thickness

Circular thickness of gear for all ratios using 14½ deg.
$= \frac{1.071"}{D.P.} + (0.5 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using 17½ deg.
$= \frac{0.971"}{D.P.} + (0.6 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using 20 deg.
$\frac{0.871"}{D.P.} + (0.7 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of pinion for 14½ deg., 17½ deg., or 20 deg.
$= \frac{3.142"}{D.P.}$ − circular thickness of gear

TABLE II—VALUES FOR STRAIGHT TOOTH BEVEL GEARS

ADDENDA FOR 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:—

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add.
1.00	1.00	.1000
1.00	1.02	.990
1.02	1.03	.980
1.03	1.04	.970
1.04	1.05	.960
1.05	1.06	.950
1.06	1.08	.940
1.08	1.09	.930
1.09	1.11	.920
1.11	1.12	.910
1.12	1.14	.900
1.14	1.15	.890
1.15	1.17	.880
1.17	1.19	.870
1.19	1.21	.860
1.21	1.23	.850
1.23	1.25	.840
1.25	1.27	.830
1.27	1.29	.820
1.29	1.31	.810
1.31	1.33	.800
1.33	1.36	.790
1.36	1.39	.780
1.39	1.42	.770
1.42	1.45	.760
1.45	1.48	.750
1.48	1.52	.740
1.52	1.56	.730
1.56	1.60	.720
1.60	1.65	.710
1.65	1.70	.700
1.70	1.76	.690
1.76	1.82	.680
1.82	1.89	.670
1.89	1.97	.660
1.97	2.06	.650
2.06	2.16	.640
2.16	2.27	.630
2.27	2.41	.620
2.41	2.58	.610
2.58	2.78	.600
2.78	3.05	.590
3.05	3.41	.580
3.41	3.94	.570
3.94	4.62	.560
4.62	6.81	.550
6.81	∞	.540

VALUES OF "K" FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion and ratio given by above formula.

Number of teeth in pinion	Ratios —	Values of "K" for different ratios. 1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10		.025	.070	.100	.120	.140	.160	.175	.190	.205	.215	.225	.230	.240	.250	.255
11		.010	.015	.050	.080	.105	.125	.145	.160	.170	.180	.190	.195	.200	.210	.220
12		.000	.040	.070	.100	.120	.140	.155	.170	.180	.185	.190	.195	.205	.210	.215
13		.000	.015	.040	.045	.050	.060	.070	.080	.090	.100	.110	.120	.135	.150	.165
14		.000	.015	.030	.050	.065	.080	.090	.100	.110	.120	.125	.130	.140	.150	.160
15 to 17		.000	.000	.010	.020	.030	.045	.060	.070	.080	.090	.095	.100	.110	.115	.120
18 to 21		.000	.000	.000	.000	.010	.020	.045	.060	.070	.080	.085	.090	.095	.100	.100
22 to 29		.000	.000	.000	.000	.010	.030	.040	.050	.060	.065	.070	.070	.080	.085	.085
30 and up		.000	.000	.000	.000	.010	.025	.035	.040	.045	.050	.055	.060	.065	.070	.070

TABLE III—FORMULAS FOR GENERATED SPIRAL BEVEL GEARS OPERATING AT RIGHT-ANGLES WHERE THE PINION IS THE DRIVER AND HAS TEN OR MORE TEETH

Working Depth $\frac{1.700"}{D.P.}$

Full Depth $\frac{1.888"}{D.P.}$

Pressure Angle

Ratios having 12 or more teeth in pinion 14½ deg.
Ratios 11-11 to 11-19-17½ deg. Ratios 11-20 and higher 14½ deg.
Ratios 10-10 to 10-24-17½ deg. Ratios 10-25 and higher 14½ deg.

Addendum

Addendum of gear = $\frac{\text{addendum for 1 D.P. (from table)}}{D.P.}$

Addendum of pinion = $\frac{1.700"}{D.P.}$ − addendum of gear

Dedendum

Dedendum of gear = $\frac{1.888"}{D.P.}$ − addendum of gear

Dedendum of pinion = $\frac{1.888"}{D.P.}$ − addendum of pinion

Circular Thickness

Circular thickness of gear for all ratios using 14½ deg.
$= \frac{1.061"}{D.P.} + (0.6 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of gear for all ratios using 17½ deg.
$= \frac{0.976"}{D.P.} + (0.7 \times \text{addendum of gear}) - \frac{K}{D.P.}$ (from table)

Circular thickness of pinion for 14½ deg. or 17½ deg.
$= \frac{3.142}{D.P.}$ − circular thickness of gear

TABLE IV—VALUES FOR SPIRAL BEVEL GEARS

ADDENDA FOR 1 D.P.

To obtain addendum select from table value corresponding to ratio given by this formula:

$$\text{Ratio} = \frac{\text{Number of teeth in gear}}{\text{Number of teeth in pinion}}$$

Ratios From	Ratios To	Add.
1.00	1.00	.850
1.00	1.02	.840
1.02	1.03	.830
1.03	1.05	.820
1.05	1.06	.810
1.06	1.08	.800
1.08	1.09	.790
1.09	1.11	.780
1.11	1.13	.770
1.13	1.15	.760
1.15	1.17	.750
1.17	1.19	.740
1.19	1.21	.730
1.21	1.23	.720
1.23	1.26	.710
1.26	1.28	.700
1.28	1.31	.690
1.31	1.34	.680
1.34	1.37	.670
1.37	1.41	.660
1.41	1.44	.650
1.44	1.48	.640
1.48	1.52	.630
1.52	1.57	.620
1.57	1.63	.610
1.63	1.68	.600
1.68	1.75	.590
1.75	1.82	.580
1.82	1.90	.570
1.90	1.99	.560
1.99	2.10	.550
2.10	2.23	.540
2.23	2.36	.530
2.36	2.58	.520
2.58	2.82	.510
2.82	3.17	.500
3.17	3.67	.490
3.67	4.56	.480
4.56	7.00	.470
7.00	∞	.460

VALUES OF "K" FOR CIRCULAR THICKNESS FORMULA

Select value corresponding to number of teeth in pinion and ratio given by above formula.

Number of teeth in pinion	Ratios —	Values of "K" for different ratios. 1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25	2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75	3.75 to 4.00	4.00 to 4.50	4.50 to 5.00	5.00 and higher
10		.020	.055	.085	.105	.125	.125	.110	.120	.130	.140	.150	.155	.160	.170	.180
11		.030	.075	.105	.070	.085	.095	.105	.115	.125	.135	.140	.145	.150	.155	.160
12 to 15		.005	.015	.025	.035	.045	.055	.065	.075	.085	.095	.105	.115	.125	.135	.135
14 to 16		.000	.005	.015	.025	.035	.050	.060	.075	.085	.095	.100	.105	.105	.105	.105
17 to 19		.000	.000	.005	.015	.025	.035	.050	.065	.075	.085	.090	.090	.090	.090	.090
20 and up		.000	.000	.000	.005	.015	.025	.040	.050	.055	.060	.060	.060	.060	.060	.060

as the ratios of the numbers of teeth in the gear and pinion became greater. These values of addendums for gear and pinion were originally worked out for each ratio and number of teeth, and from an examination of them it was found possible to make an arrangement in a simple tabular form according to the ratios as shown in Tables II and IV, without any sacrifice of practical qualities.

Circular thicknesses were found entirely by making enlarged layouts in which the teeth were balanced up partly on a width of top land and partly on a strength basis. The formulas given in Tables I and III were worked out so that they would give the same results as were obtained from the layouts.

In conclusion it can be said that this system is not something new or untried but, in the case of spiral bevels at least, it is represented in practice by a large number of very satisfactory jobs. It also checks up closely with successful straight tooth bevel gear practice although the long and short addendum tooth has not been used as universally for straight tooth bevels as for spirals. The system, as presented, represents in a simple and usable form an intensive study of the question of bevel gear tooth design, treated from both a practical and theoretical standpoint.

It might not be out of place here to express the opinion that a standard non-interchangeable system is needed for spur gears, possibly along similar lines to the one just presented. In fact such a system should be of as great importance as a standard interchangeable system since a large proportion of spur gears, like bevels, are intended to operate in pairs only. The concessions made to allow interchangeability are so great that the case of the non-interchangeable gear should be granted as much consideration for a standard system as is given to the interchangeable gear.

Romances of Metal Working—
The Sagas of Volund and His Sword

By H. H. Manchester

One of the most famous series of Norse Sagas has to do with Volund, the smith, and his magic sword, Gram.

Volund and his two brothers were famous smiths in the days of the early gods. As they kept the smithy ringing with their blows, they accompanied them with this song:

"Tick, tack, tock, tick, tack, tay,
Hey, merry comrades, hammer away:
When the iron's hot and the sparks do fly,
Something comes of it by and by."

Nothing was too wonderful for them to forge. One of Volund's masterpieces was a marvelous sword, Gram, of which he had learned the secret among the black dwarfs, who forged the sword of Freyer. He forged and broke it over and over many times until it had such a temper that it could not be broken by mortal strength. The edge itself he tempered with elf powder and dragon's blood until it would cut through anything.

Not long after the sword was made the brothers saw three beautiful Valkyries bathing, with their white wings laid aside on the beach. Seizing the wings they persuaded the maidens to remain and be their wives. This endured for seven years, during which period Volund forged numberless precious ornaments for his wife, Alvit, or All White. At the end of this time the Valkyries took their wings and flew away, but in the meantime Volund had learned to forge wings with which he could fly.

The other brothers went in search of their wives, but Volund remained, because All White had left him a magic ring which he had made, to which she must sooner or later return.

While asleep, Volund was overpowered by King Nidud, of Sweden, and carried away into slavery together with all his treasures. The sinews of his legs were cut, and he was set to work forging marvelous ornaments and weapons for the king. In the meantime, however, he stealthily forged himself wings like those of the Valkyries.

Not long afterward the king brought in his magic sword, Gram, to be refurbished. Volund secretly fashioned a duplicate of it and gave it to the king instead. Then in revenge he killed the two younger children of the king, made love successfully to the king's daughter, and putting on his wings, and taking his sword and the ring for All White, mounted the top of the castle, and after taunting the king with what he had done, flew away to find his wife.

The subsequent fortunes of this sword run all the way through the story of the Nibilungens and Wagner's operas, and were even said to have been traced down to our own country.

Odin, the king of the Norse gods, gave this sword to Sigmund, who used it to revenge the murder of his family by Siggeir and the Goths.

When Sigmund's time had come, Odin himself had to appear on the battle field and break the sword before Sigmund could be defeated. His young wife, however, gathered up the pieces of the sword and carried them with her to another kingdom.

When Sigmund's son, Sigurd, was a young man, Regin, another smith, urged him to go against Fafnir, a dragon who guarded a great treasure. For this purpose Regin forged one sword after another, but Sigurd broke them with ease. He then thought of the pieces of his father's sword which had been saved by his mother. He brought them out, and they were welded together by Regin. To try this weapon Sigurd struck it upon the anvil, and was amazed to see that it cleft the iron anvil from top to bottom. With it he slew Fafnir the dragon and obtained the treasure.

After this Sigurd, who appears in Wagner's opera as Siegfried, journeyed to awake Brunhild the beautiful Valkyrie, who had been condemned to sleep until a man without fear should rescue her. Her castle was entirely surrounded by flames, but the sword cut through them as easily as it did through iron. Later Sigurd was enchanted by Grimhild, queen of the Nibilungens, and married her daughter Gudrun, aiding her son Gunar to gain Brunhild as his wife. This brought about a situation which could only end in tragedy.

The sword descended to Attila and accounted for his victories. The legend runs that it later came into the possession of Charles IX of Sweden, then of Peter the Great of Russia, then Gustavus Adolphus of Sweden, and finally Frederick the Great. In each case it was supposed to have made its possessor, though he did not know it, unconquerable while he held it. It was even reported that it was sent by Frederick the Great to Washington with the message: "From the world's oldest to its greatest general," and in later years Congress actually purchased one of the swords left by Washington on the assumption, which was perhaps mistaken, that it had been sent to him by Frederick the Great.

Automotive Service Methods and Equipment

XI. Simplicity and Efficiency in Service Tools—Facing Valves—A Connecting-rod Fixture—Lapping Cylinder Bores

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

IT IS frequently found that the efficiency of a tool increases in proportion to the simplicity of its construction and the ease with which it is operated. The equipment of the service plant of the Chicago distributors for the Studebaker Corporation includes a number of tools that would come under this classification, some of which are described herewith.

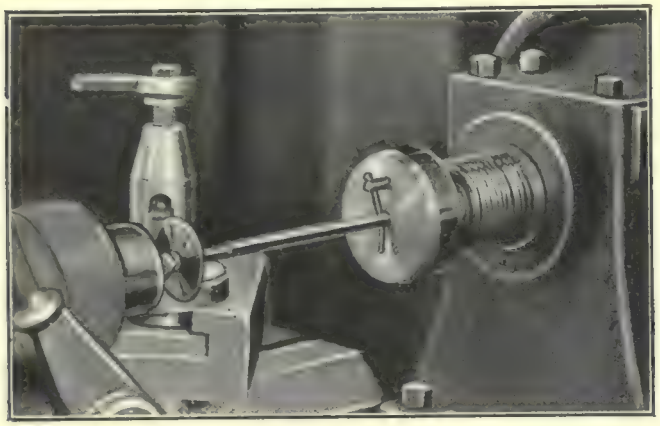
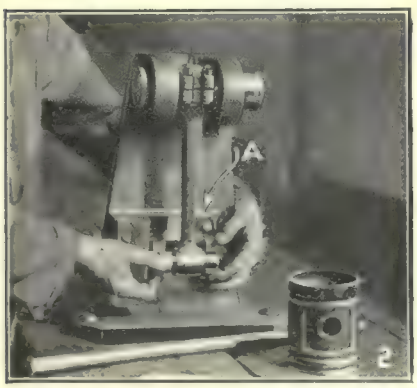
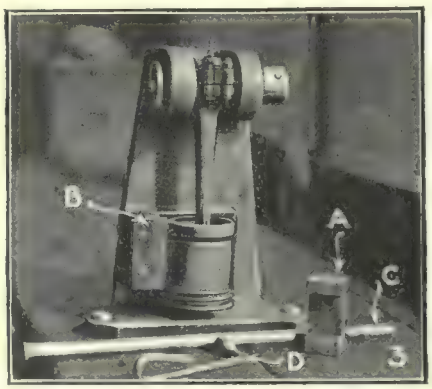


FIG. 1. FIXTURE FOR VALVE FACING

In Fig. 1 is shown a fixture for holding and driving a valve while the seat is being faced. The necessity for such a fixture arises from the fact that the end of the valve stem is centerless. The fixture is made of cast iron and has a taper shank turned on the back side, which makes it possible to hold it in the spindle of the lathe. A central hole is drilled in the face, to receive the end of the valve stem, as shown. A steel pin $\frac{5}{16}$ in. in diameter is driven or screwed into the face of the fixture, about $1\frac{1}{2}$ in. from the center, which serves to drive a pin inserted in the hole in the valve stem, thus turning the valve with the spindle.

The method of testing a connecting rod for straightness is shown in Fig. 2. The shaft by which the large end of the rod is held in the fixture is of the same diameter as the crankshaft. A finished surface can be seen at *A*, against which the operator is holding the steel block shown at *A* in Fig. 3. A pin that has been ground to a push fit in the wristpin hole is inserted in the hole and aligned with the ends of the block. The center of the block has been milled out so that the rod will not interfere. If there is any twist in the rod, it can be instantly detected.





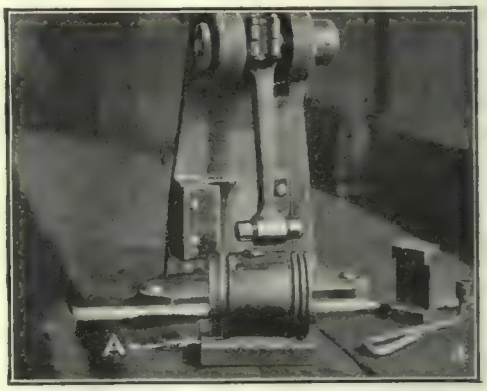


FIG. 2. TESTING A CONNECTING ROD FOR TWIST. FIG. 3. TESTING A CONNECTING ROD FOR STRAIGHTNESS
FIG. 4. TESTING WRISTPIN HOLE FOR SQUARENESS

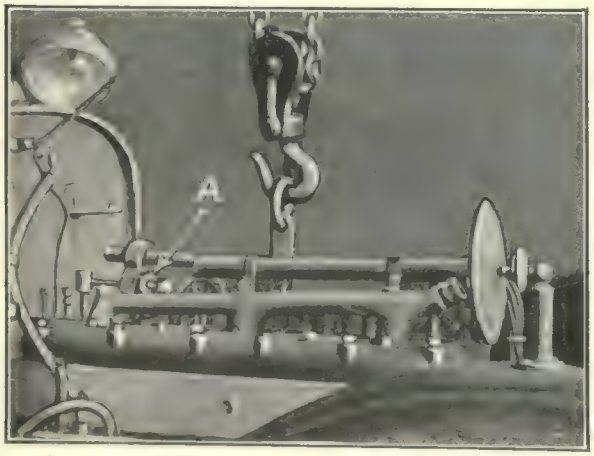


FIG. 5. METHOD OF HANDLING MOTORS

A piston is now assembled to the rod and aligned with the steel block shown at *B* in Fig. 3. If the rod is bent or twisted, the small end of the bar *C* is inserted in the wristpin hole and the rod is straightened. The wrench shown at *D* is used to tighten the bearing cap bolts.

In case there is any doubt as to whether the wristpin hole is square with the axis of the piston, it is tested on the gage shown at *A* in Fig. 4. This gage consists of a steel block with a plane surface, in the center of which is a pin of the proper diameter for a running fit in the wristpin hole. The piston is placed on this pin and if the hole is not square with the axis, it can be instantly detected by the light that will shine through under one end of the piston.

A very common method of handling motors is to screw an eye-bolt into one of the spark plug holes and then hook into the eye-bolt with a chain block. This throws the weight of the motor entirely on to the

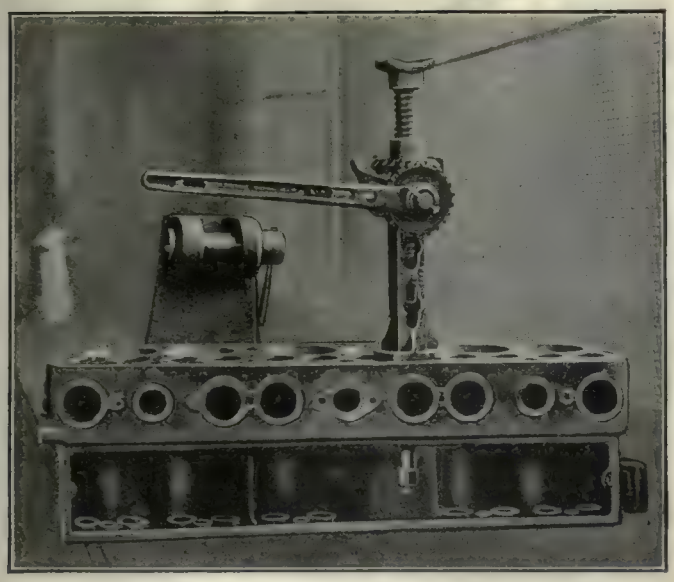


FIG. 6. VALVE GUIDE ASSEMBLING TOOL

threads of one hole. In this plant, however, a method has been devised whereby the weight of the motor is distributed over four holes, greatly reducing the possibility of damage to any one of them. Eyebolts are screwed into each of the four holes, two at each end of the motor, and each pair of holes is connected by a small shaft, as shown at *A* in Fig. 5. These small shafts are then attached to a larger shaft as shown, the larger shaft being in turn pinned through the center to a block into which a ring has been forged.

A tool for assembling valve guides to a cylinder block is illustrated in Fig. 6. This is nothing more nor less than an ordinary jack which has been converted to this use by the simple process of attaching a rod to the bottom end of the screw. The rod is small enough to slide through the valve stem hole in the valve guide, and long enough so that when the tool is set on the top of a cylinder, the rod will extend down through the cylinder far enough to allow a valve guide to be placed on the rod with room for a nut to be screwed on the end to hold the guide. The simple operation of "raising" the jack, by operating the handle up and down, then draws the valve guide into the hole. This tool has an advantage over some of the tools that have been placed on the market for this purpose, in that it pulls the guide straight in without the necessity of the rod's turning in the guide. The rod is attached to the screw by threading one end and screwing it into a tapped hole in the bottom end of the screw.

The operator shown in Fig. 7 is polishing a cylinder

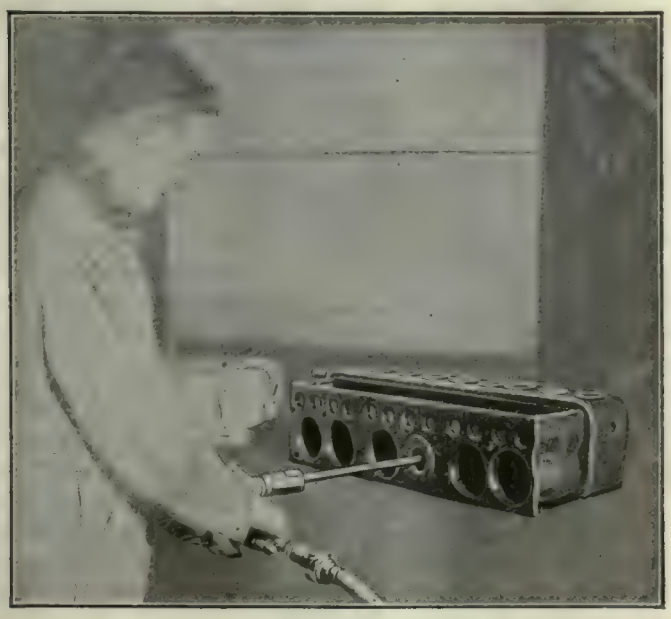


FIG. 7. POLISHING A CYLINDER BORE

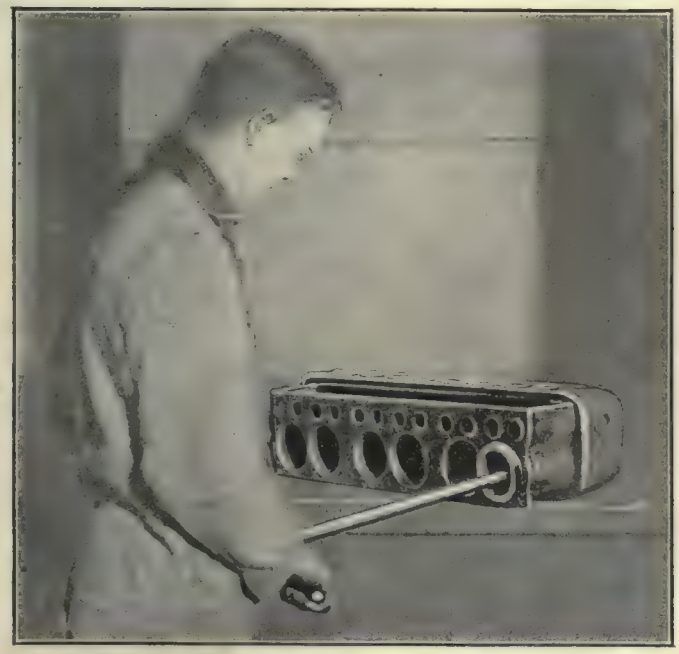


FIG. 8. LAPPING-IN A PISTON



FIG. 9. TESTING AN AXLE FOR STRAIGHTNESS

bore with a wooden piston which has been covered with abrasive cloth. The piston is held by a pin through an eye in the end of the shaft and the tool is being operated by means of an electric drill. The grade of abrasive cloth used is varied according to the amount of polishing necessary, a coarse grade being used at first if much polishing is to be done, and crocus cloth being used to finish the operation. This method is frequently employed to make a bore the same diameter throughout its entire length, in cases where the piston has worn the cylinder larger at one end than at the other.

After the high spots have been polished out of the

cylinder bore, it may be necessary to lap the piston "in" so that it will be an easy sliding fit. A T-handle is used for this operation, an eye in the end of the shaft allowing the piston to be attached by means of a wrist-pin. Abrasive and oil are used to lap the bore until the piston will slide easily. This tool is shown in Fig. 8.

One form of gage used to test an axle for straightness is illustrated in Fig. 9. That part of the gage indicated at *A* is a straight bar that extends clear across and rests on the rim of the opposite wheel. When the shoulder *B* is resting against the side of the rim, the point *C* should just touch the side of the rim at its highest point. If there is a gap between the side of the rim and either the shoulder or the point, the wheel is not vertical. The point *C* is adjustable, but is never moved after being set even with the shoulder.

Power Transmission in the Machine Shop

By F. P. Terry
Belfast, Ireland

A few days ago I was asked why it is that in about nine out of ten machine shops one finds wobbling pulleys and shafting, slipping belts and occasionally belts made up of odd pieces of various kinds of belting such as balata, cotton, rubber and leather, while in nine out of ten textile works the opposite is to be found, shafting bright and true, pulleys painted and running true, bearings clean and with neat drip pans to collect any oil that may escape the bearings.

I had to admit that there was a good deal of truth in what my friend said, but to explain the cause is difficult unless we put it down to sheer neglect. We cannot say ignorance because in many cases the worst offenders are the very firms who have started up with the beautiful arrangements referred to and found in the textile mills.

One important factor is that very often line shafting and the care of it is in the charge of a millwright department that is quite content so long as things keep moving, and the machine shop foreman finds his complaints neglected or ignored altogether, with perhaps a gentle reminder to "mind his own business."

The purchasing of belting is frequently entirely in the hands of a buyer or purchasing agent, who buys entirely on price because it is the only thing he knows about. Usually the machine shop foreman can, as a special concession, specify the type of belting to buy, but whether it is leather, balata or any other kind he has to put up with the cheapest obtainable.

The above conditions are a moderate representation of what existed in a shop that I took charge of a few years ago, and, after tackling some of the most pressing problems directly affecting the output, I began to look at the things above. This brought me up against the foreman millwright whose principal argument was that things had been all right for the last twenty years and he was for leaving well enough alone; but after a good deal of noise about the noise above, I got a millwright under my own charge who also took charge of machine tool repairs. My next trouble was with the purchase of belting, which proved a difficult matter, because the buyer was on the office staff and not so easy to get at; also because of the fact that there is no definite standard in belting as in other furnishings. Even the best manufacturers make two or three grades and the purchasing agent who buys on price can always be accommodated, and in my opinion is very much to blame for the many types of poor belting manufactured today. In my case the belting used was the poorest quality imaginable and was no sooner on the pulleys than it developed the proverbial "dog's hind leg" shape. I remember well the starting up of a Landis universal grinding machine, the last place in the world on which to put a belt of this variety. It was a case of a different belt or sending the machine back to the makers. I also gave a personally conducted tour round a few more belts that were busy slap banging the belt forks as their main object in life. This resulted in the selection and purchase of all belting for my own use passing into my hands. Everything now appeared to be smooth sailing, but I very soon discovered I had a great deal to learn and I was greatly surprised at the amount of power lost and the excessive wear of bearings that can accrue from shafting that is out of line or not properly supported by bearings.

Regarding belting, I got many surprises. I read all I could find about it in back numbers of the American Machinist and other journals and found that if one wanted to get a certain speed from a driven pulley, belt thickness had to be calculated with the pulley diameters and the substitution of different thicknesses of belt changed the speeds; that badly twisted leather belting could be coiled tightly on a wood mandrel, placed in a chuck and faced up, after which, although reduced in width, it would do considerable service. I also found that running leather belts in the right direction with the lap joints made a very great difference to the life of the joints and that leather belting made of pieces over 4 ft. 6 in. long could be consigned to the class known as second-rate. In my own case I returned any over this length to the makers.

Up to this time I had no faith in any belting other than leather, but studying the subject I found that for motor drives where the motors are placed on side rails and free from belt forks, endless balata belts are hard to beat and are also easy to make; an intelligent beltman after one lesson can do the job satisfactorily. I also found that wide thin belts were preferable in most cases to narrow thick ones, and that belts subject to sudden reversal on machines such as turret lathes had a very short life when reversal took place from the countershaft, but that turret lathes reversed from the headstock did not have the same affect.

These and many other little matters kept me very busy for some months, but I was content in my own mind that the job was worth doing. At the end of the first year I was brought on the carpet by the buyer to explain why I had expended nearly two hundred pounds more in belting than ever had been spent in one year before, but very little explanation was necessary, in fact, before the end of another year I was asked to take over control of the shafting and belting for the whole works, which I did to the satisfaction of everyone concerned, more particularly myself, as I felt that in this one item, so often neglected in many shops, I was earning my salary.

Methods of Machine Tool Design

Beginning Fourth Section on Belting and Belting Applications—Belting Specifications, Elementary Principles, Kinds—Round Belts, Crossed and Quarter-turn Belts

By A. L. DeLEEUW

IT IS not the intention in these chapters to repeat statements or to give information which may be found in many standard works existing at the present day. Nevertheless, it will be necessary to point out some of the most important features of some of the elements used in machine-tool construction and to discuss their advantages and disadvantages.

Considering belts and belt drives we should look at them, in the first place, as means for power transmission and then note the limitations of such arrangements when applied to machine tools. There are single,

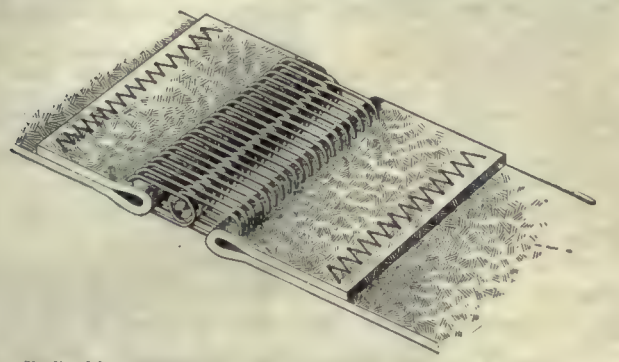


FIG. 31. METHOD OF JOINING CANVAS BELT

double and triple belts. The belts we are most familiar with are made of oak-tanned leather. The very fact that we are so familiar with this class of belts is a disadvantage because we naturally take for granted that this kind must be used in all cases where a belt is applied to a machine tool.

However, there are other kinds which have marked advantages in certain cases. For instance, though in the majority of machine-tool drives the oak-tanned leather is perhaps the best, in cases like planer drives where the belt must repeatedly pick up a load and start it in a very short period of time from a condition of rest to a condition of full speed oak-tanned leather is not the best for the purpose. The unavoidable slippage in this case has a tendency to burn the surface in contact with the pulley. In such cases chrome leather should be used, notwithstanding that it is not quite as strong as oak-tanned leather.

There are many cases in the heavier machine tools where it is not advisable to use a very wide belt and yet where we must provide sufficient strength of belt to transmit a large amount of power. This could be done by using a triple or even a quadruple belt, but in doing so we would need very large pulleys on account of the great thickness. In such cases a belt made up of leather and hard rawhide should be used. The rawhide is cemented between two layers of oak-tanned leather and is much thinner than either layer. As the unyielding layer of rawhide is in the center, it does not materially affect the flexibility of the belt, but it adds very much to its strength. The strength of this rawhide is 20,000 lb. per square inch section as compared to 5,000 lb. for oak-tanned belt. Where belts have to transmit a large amount of power, and at the same time may have to withstand a great amount of slippage, chrome leather with rawhide in the center meets the condition. There are cases where a chrome leather belt, though properly meeting the condition of slippage, is not quite strong enough for the purpose. In such cases a double belt is made up of one layer (the one next to the pulley) of chrome leather and an outside layer of oak-tanned leather.

There are cases where rubber belts, and others where camel's hair or fabric belts, give the best service. However, as such cases are exceedingly rare in machine-tool drives we will confine ourselves to the statement that rubber belts give good satisfaction where a great deal of cast-iron dust is present in the atmosphere, which is very apt to neutralize the grease in a leather belt. Camel's hair belting is particularly adapted to moist and hot places, and it is but seldom that machine tools are found in such locations.

Canvas belting, especially of the endless variety, is used for light and high-speed drives, such as for spindles of internal grinding machines. In such cases the belt should be impregnated with some gum or other substance which will produce an adhesive surface. Canvas belting has also been used for the drive of very light machinery and gives good satisfaction. It stretches little or not at all and consequently does not

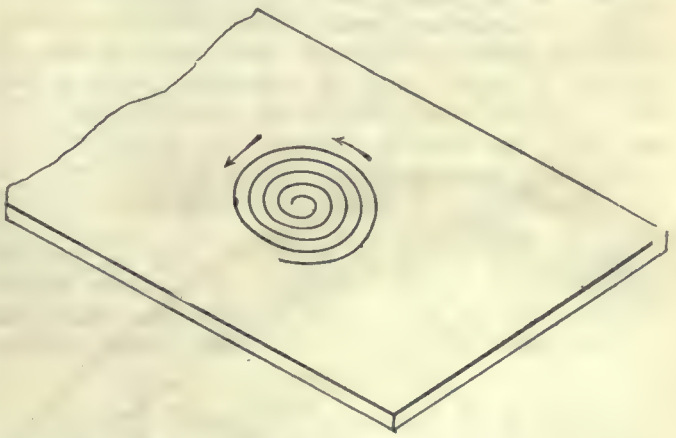


FIG. 32. METHOD OF CUTTING SPIRAL STRIP FOR ROUND BELTING

require to be taken up. Its chief drawback is that there is no good belt fastener in existence which meets the requirements of canvas belts, and that either the two ends of the belt must be stitched together in position or else the two loose ends must be turned over before a metallic fastener is introduced. This has the tendency to cause a thick portion in the belt where the joint is made. (See Fig. 31.) The loose flaps *A* and *A* are apt to cause trouble, and for that reason should be stitched to the main portion of the

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belt, as shown in the illustration. There is no reason why canvas belts should be recommended except on account of their cheapness, and whether such belts are

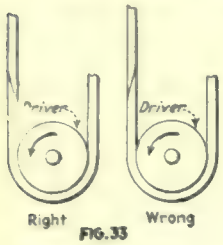




FIG. 33. RIGHT AND WRONG WAY OF APPLYING BELT.
FIG. 34. CROSSED BELT

actually cheaper in the long run remains yet to be established.

Practically all belts are flat, but now and then a round belt is used. Such belts are only useful where the work is very light. Due to the way they are made, round belts lack uniformity. The strips of leather which are cemented together to make a flat belt are always cut lengthwise of the hide, or rather, center (that portion of the hide which should be used for belting). These strips do not all have the same qualities. Strength, stretch, flexibility, and adhesive quality vary with the distance of the strip from the center of the hide (line of backbone), and there is even a certain lack of uniformity in different parts of one strip, depending on whether that part is near the shoulder or near the tail. However, these differences are not excessive and, in any case, cannot be avoided.

On the other hand, a round belt is usually cut by going around the leather (center) in a spiral. (See Fig. 32.) Thus some parts of the belt are lengthwise and other parts crosswise of the hide. This causes a great lack of uniformity, making the crosswise parts very weak. As a result, a round belt stretches unduly and cannot be heavily loaded.

When three or more round belts are twisted together they are more reliable, but cause some trouble in making a proper joint or fastening. Such a belt may be useful when there is not sufficient room for a flat belt; the *grip* of a round belt in a V-rimmed pulley being much greater than that of a flat belt. As a whole, round belts should be avoided except for the very lightest kind of work.

Putting the belt in the machine is not the work of the designer, but as the machine is often blamed when the belt is at fault, it is right that we should mention those things which may cause trouble with an

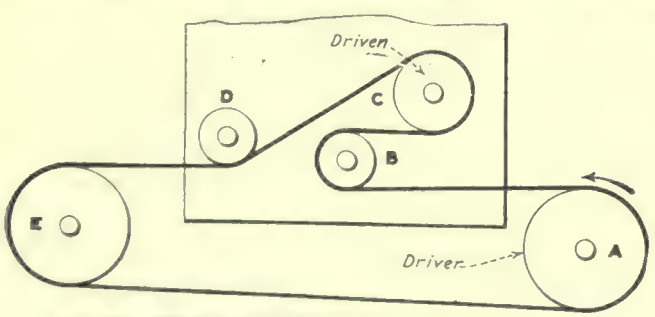


FIG. 35. BELT DRIVE WITH IDLE END PULLEY

otherwise well-designed machine. Among them are some qualities of the belt and also the manner of its installation.

After exhaustive research and many tests, the U. S. Steel Corporation has recently issued a set of specifications for oak-tanned leather belting, of which we give an extract. Many other points, besides those given here, are mentioned, but the fulfillment of these requirements can only be ascertained at the belt factory, while the points mentioned here can be examined at the factory of the user.

It is possible to treat a belt so as to increase its strength or reduce its stretch, or increase its flexibility or its adhesive qualities, but it is not possible to do all of these things at the same time; so that when limits are given for all of these qualities and a belt meets them all, it may be assumed that it will be of the desired quality.

Extract of Belt Specificitions

The thickness of a belt must not vary more than $\frac{3}{64}$ inch from the thinnest to the thickest portion of the belt.

The width of belt, 8 in. or less, must not vary more than $\frac{1}{16}$ in. Belts over 8 in. in width must be within $\frac{1}{8}$ inch.

The tensile strength of single belt must not be less than 700 lb. and for double belt not less than 1,400 lb. per inch of width.

The elongation shall be not less than fourteen per cent nor more than twenty-eight per cent at breaking load.

Laps must not be less than 3 in. long and must have a tensile strength of not less than 700 lb. per inch width for single and 1,400 lb. for double belt.

Animal oils or greases, only, shall be used for stuffing. The total stuffing must not be less than 8 per cent.

Other tests are prescribed, requiring apparatus not often found in the machine shop.

Of all questions asked about belting, no one is more common than this: Which side of the belt should be on the pulley? The flesh side appears to be much rougher than the hair side, and many people are inclined to think that this roughness will give better traction. As a matter of fact, the opposite is true. It is just because a rough surface gives little traction that a belt should be tested for so-called piping. Piping is the name for the wrinkles which appear on the surface of an inferior belt when it is sharply bent, and which do not entirely disappear when the belt is again straightened out. Not only does this piping diminish the traction but, because of this reduced tractive power, there is an additional amount of slippage which is apt to burn out the surface of the belt. As the hair side is the smoother, it should be placed on the pulley. A little thought would have answered the question even for one who does not know anything about belts. The fact that the beltmaker makes double belts with the hair side out on both sides shows that he intended the user to put the hair side on the pulley.

Belts are made of relatively short strips of leather, the length varying somewhat according to the length of the hide from which they are cut. They are seldom less than 45 in. or more than 54 in. long. The joints are made by tapering the leather down to a feather edge and cementing the two bevels together under pressure. However well such a lap or joint may be made there is danger of opening it up if we lay the belt flat on a table and push a block against the edge of the lap. This same danger exists when the belt is put on the pulley the wrong way. Fig. 33 shows the right and the wrong way of putting a belt on the pulley, so far as the laps are concerned. It might seem at first glance as if a crossed belt cannot lie right on both pulleys, but Fig. 34 shows that when it is laid properly for one pulley it must necessarily be right for the other.

The speed at which belting may be run and the horsepower it can transmit have been subjects for a great deal of controversy and are not yet entirely settled. As with all matters of engineering, different viewpoints may be held under different conditions. The writer has seen belts run at a speed of 7,500 ft. per minute and under a tension very much in excess of what is ordinarily considered good practice. Though under these conditions the belt did not have a long life, yet it was the best that could be done under the circumstances. Until quite recently, belt speeds higher than 3,000 ft. per minute were considered excessive. Nowadays speeds of 4,000 to 4,500 ft. per minute are considered permissible.

As to the allowable tension, from 40 to 45 lb. per inch width is good practice for single belts, and from 60 to 75 lb. for double belts. Much higher tensions are used but are not advisable for machine tools which are often called upon to perform a duty very much in excess of their rated capacity. If we mill a piece of steel with an average cut of $\frac{1}{8}$ in. deep and we should meet a lump $\frac{1}{4}$ in. high, suddenly increasing the cut 200 per cent, we expect the belt t pull this cut, and for that reason it is necessary to figure on a relatively low tension when the machine is performing according to its rated capacity. Whenever possible a belt should be run horizontally with the slack side on top. The most unfavorable condition presents itself when we are compelled to run the belt vertically with the driving pulley at the top. The initial tension is reduced by the weight of the belt. Not only that, but when the machine is running one side will be stretched while the other side will be relaxed, so that the belt contact with the lower pulley is only a fraction of the theoretical amount. If we should not be able to run the belt horizontally, we should at least try to get as much horizontal distance as possible between machine and countershaft centers, and to have the slack side of the belt run at the top.

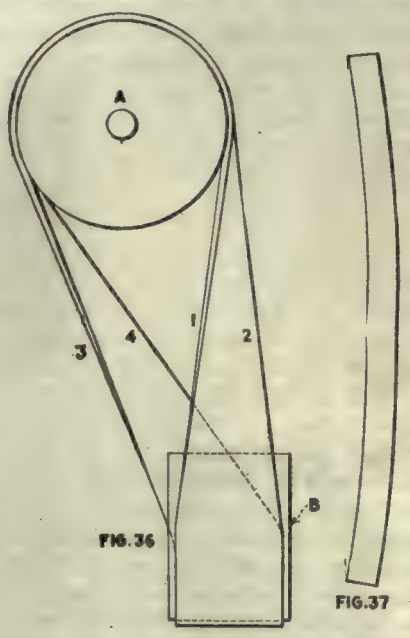


FIG. 36. QUARTER-TURN BELT WITH BAD FEATURE EXAGGERATED. FIG. 37. BOWED BELT FOR QUARTER TURN

A belt shows two kinds of stretch. That part of the belt which is under tension will stretch but the belt will resume its original length as soon as the tension is released; in other words, the belt shows elasticity. However, when a belt is run for a considerable period of time, and especially when it is new, it will gradually become longer and this lengthening of the belt is not a temporary affair but a permanent one. As a result of this permanent stretch, the initial tension of a belt gradually diminishes and it needs to be taken up. There are various ways in which this take up can be arranged for. In ordinary practice a piece is taken out of the belt, after which it is relaced. Where metallic belt fasteners are used, of the type of the Peerless lace, the following method for taking up belts in a factory is recommended:

All belts are made of two pieces—a long and a short piece. The short piece is about 8 to 10 in. in length. The millwright keeps in stock various pieces or patches of belt of lengths of 8—7½—7—6½—6 in., etc. When a belt with an 8-in. patch has become too long, he removes the rawhide pin, takes out a patch and substitutes another one, ½ in. shorter, or perhaps 1 in. shorter.

Where endless belts are used, or where metallic belt fasteners are not permissible, a belt tightener may be employed. Such a tightener can be arranged in various ways, such, for instance, as a pulley on a swinging arm pressing against the outside of the belt by means of a weight or spring, or which can be positively pushed up against the belt by means of slide rails and a screw. A peculiar use was made of such belt tighteners in the Mitchell planer drive, of which more later on.

We naturally visualize a belt drive as having a pulley at each end, one of them being the driver and the other the driven one. However, there are drives in which one of the end pulleys is really an idler. Such a drive is represented in Fig. 35, in which pulley *A* is the driver. Pulleys *B*, *C* and *D* belong to the machine and pulley *E* is an idler. Such an arrangement may be found, for instance, where the column of a floor boring or a milling machine moves along a bed and the mechanism on that column must be driven from the stationary pulley *A*. In such an arrangement either pulley *E* or *B* may be used for the take up.

The use of open and crossed belts is too well known to be discussed here in a general way. However, attention is called to the necessity of having a long center distance between the pulleys when using crossed belt. Preferably, the center distance should not be less than four times the mean diameter of the pulleys. For instance, two pulleys 24 and 16 in. in diameter, connected by a crossed belt, should have a center distance of not less than $4 \times \frac{24 + 16}{2} = 80$ in. This rule should not be considered as a law, but rather as a warning.

A very narrow belt could get along with a shorter distance; a wide belt might require a longer one. The main thing is to avoid appreciable twist where the driving and slack stretches of the belt pass each other. Unless this is taken care of there will be rubbing, with consequent excessive wear, and a tendency to open up the edges.

Crossed and Quarter-Turn Belts

Belts are crossed for two reasons: To give the driven pulley the proper direction, or to obtain a sufficient amount of belt contact when the pulleys differ much in diameter and their center-distance is short. As was mentioned before, crossed belts on short center-distances are not desirable, so that wherever possible the problem of providing belt contact should be solved some other way.

Quarter-turn belts should be avoided as much as possible. They are a source of trouble and the amount of trouble increases rapidly with increasing belt width and decreasing center-distance. The main sources of trouble are the lack of sufficient belt contact on the pulleys, and the fact that the two edges of the belt are

stretched unevenly. If we should measure the two edges of the belt after it has been placed around the pulleys, we would find that they are of unequal length.

In Fig. 36 a quarter-turn belt is shown with the objectionable conditions much exaggerated. The edges Nos. 1 and 2 of the belt are evidently of the same length, and just as clearly edges Nos. 3 and 4 must be of different lengths. It follows then, that in order to have the same tension in front and rear edges of the belt, we should make these edges of different lengths; in other words, the belt should be bowed as shown in Fig. 37. This is sometimes done, but a careful look at Fig. 36 will show that the problem cannot be solved that way. If the belt is made as in Fig. 37 the edges Nos. 1 and 2 will be under different tensions, so that we have merely displaced our trouble. However, it is possible to diminish the amount of this trouble somewhat in this manner. The proper way to overcome it as much as possible is to make the center-distance large and guide the belt by idler pulleys.

(Continued in next week's issue.)

How Surface Affects Measurement With Plug and Ring Gages

By Frank C. Hudson

One old shop conundrum, on which thousands of cubic feet of vocalized air (heated and otherwise), has been expended, has been answered. Can a 2-in. plug be inserted in a 2-in. ring? Yes—and then some—to the tune of about a half thousandth.

It seems foolish of course, even to intimate that a hardened plug measuring 2 in. can be put in a hardened ring measuring 1.995 in. without a sledge hammer or an arbor press. But after you watch John Bath, of Worcester, Mass., show you what can be done with bare hands you cannot help wondering just what we have been doing with plugs and gages during the past twenty years. One thing is certain, however, you see beyond question that the condition of the surface being measured affects the apparent size as indicated by a plug and ring.

Take a ring and a plug which will barely enter when dry. Clean them both carefully. Bath has found a little soap and water the best. Wipe them perfectly dry. Put on a little castor oil, or other good oil, well distributed and see how easily the plug slips into the ring. It will probably slide down of its own weight.

Wipe off the oil each side of the ring, and clean it thoroughly, move the ring and repeat the cleaning. When you get it clean the ring is liable to stay right where it is unless you use force. And yet we naturally assume that the oil film occupies some space.

Now take a 2-in. plug and a ring with the hole about a half-thousandth small. Oil them both well and see if you can't push them together without undue pressure. Why? Does the ring stretch or the plug compress? Isn't it one or the other? And what is its bearing on inspecting work with plug and ring gages?

The fact that there is a distinct difference between the apparent diameter with the surface dry or oiled, shows that the condition of the surface does make a difference. Even breathing on the perfectly dry surface makes a little difference. Knowing this, isn't it reasonable to question the accuracy we think we are getting with plug and ring gages? Isn't it especially necessary to have the surfaces of pieces being inspected in an exactly similar condition to compare them?

The Passing of a Pioneer

AN APPRECIATION OF THE WORK OF WILLIAM GLEASON

It is to be regretted that with the passing of William Gleason, founder of the Gleason Works, Rochester, N. Y., we have lost one of the last of the pioneers in the machine-tool business of this country. Away back in 1865 William Gleason founded the nucleus of what has grown to be the Gleason Works, with its extensive buildings and its world-wide reputation.

Born in Tipperary, Ireland, in 1836, William Gleason came to this country in 1851, at the age of 15, and started to work for Asa R. Swift, of Rochester. His apprenticeship was served there and in the shop of I. Angell & Sons. During the Civil War he went to Colt's Armory in Hartford, Conn., but went back to Rochester in 1865 and formed a partnership with John Connel and James S. Graham to manufacture machine tools and woodworking machinery. The fact that this partnership was dissolved in 1873 and that William Gleason perfected his first bevel gear planer in that year, has made us lose sight of his earlier achievements in the machine-tool field.

Change of Firm

With the dissolving of the firm of Connel, Gleason & Graham, William Gleason went with the Kidd Iron Works in 1873, taking it over two years later. The Kidd Iron Works was located down in the old power section of Rochester known as Brown's Race because of the mill race which supplied power to the shops in this vicinity. The business grew steadily, all energies being concentrated on the development of machines for cutting bevel gears more accurately and more economically than had ever been done before. Additions were made to the plant, but in 1910 it became necessary to abandon the old site and the plant was moved out to the present location on University Avenue. Great care was given to the architecture of the buildings and they present a pleasing appearance without being ornate or garish in any way. They may still be considered as models of modern shop buildings.

Phenomenal Growth of the Business

The growth of the shop from one of six men to a plant occupying twenty acres and employing 1,700 men during the rush of work during the war was very gratifying to its founder, but he liked to talk of the days when he built lathes and planers, some of which are still in operation. The memories of his older achievements, however, did not prevent his being keenly interested in the development of the Gleason gear planer. This machine which was almost entirely developed by his two sons James E. and Andrew Gleason has a world-wide reputation for the production of accurate bevel gears.

Active almost to the last, William Gleason never lost touch with his older employees, a few of whom had been with him for over 45 years. And during an illness, about a year ago when business was very bad, he was anxious lest some of the older and most deserving men should suffer in any way. Always genial, always fair in his dealings, he will long be remembered as a shining light in the machine-tool industry. He leaves a widow by a second marriage, two sons, James E. and Andrew, and two daughters Kate and Eleanor.

Decimal Series for Tap Drills

By A. J. Schwartz

A firm manufacturing large quantities of screw thread products for the U. S. Government, found it impossible to obtain commercial size drills that would be entirely satisfactory for use in drilling all the holes to be tapped in accordance with the report of the National Screw Thread Commission, even though advantage had been taken of the permitted tolerance. This firm had to resort to special drills, or to boring some of the holes in order to meet the requirements of the limits of tolerance specified in the report, as the law authorizing the commission made it mandatory upon the U. S. Government to use the uniform screw thread products made in agreement with the report of the commission.

PROPOSED TABLE OF DECIMAL TAP DRILLS FOR CLASS 11-B MEDIUM FIT THREADS

Coarse Thread Series						Fine Thread Series					
Size	Thds.	Tapped Hole Minor Diam. Min.	Tapped Hole Minor Diam. Max.	Drill Size	Stock Drills	Size	Thds.	Tapped Hole Minor Diam. Min.	Tapped Hole Minor Diam. Max.	Drill Size	Stock Drills
0	..	.....	.....	.....	.....	0	80	0.0465	0.0478	0.047	1.2mm.
1	64	0.0561	0.0578	0.057	.....	1	72	0.0580	0.0595	0.059	1.5mm.
2	56	0.0667	0.0686	0.067	.....	2	64	0.0691	0.0708	0.070	No. 50
3	48	0.0764	0.0787	0.077	5/64	3	56	0.0797	0.0816	0.080	No. 46
4	40	0.0849	0.0876	0.085	2.2mm.	4	48	0.0894	0.0917	0.090	.....
5	40	0.0979	0.1006	0.100	No. 39	5	44	0.1004	0.1029	0.102	2.6mm.
6	32	0.1042	0.1076	0.105	2.7mm.	6	40	0.1109	0.1136	0.113	No. 33
8	32	0.1302	0.1336	0.130	.....	8	36	0.1339	0.1369	0.135	No. 29
10	24	0.1449	0.1494	0.145	3.75mm.	10	32	0.1562	0.1596	0.159	No. 21
12	24	0.1709	0.1754	0.170	4.4mm.	12	28	0.1773	0.1812	0.180	No. 15
1/4	20	0.1959	0.2013	0.200	No. 8	1/4	28	0.2113	0.2152	0.215	No. 3
5/16	18	0.2524	0.2584	0.255	6.5mm.	5/16	24	0.2674	0.2719	0.270	.....
3/8	16	0.2073	0.3141	0.310	7.9mm.	3/8	24	0.3299	0.3314	0.330	No. Q
7/16	14	0.3602	0.3679	0.365	9.25mm.	7/16	20	0.3834	0.3888	0.385	No. W
1/2	13	0.4167	0.4251	0.420	11/64	1/2	20	0.4459	0.4513	0.450	.....
9/16	12	0.4723	0.4813	0.480	.....	9/16	18	0.5024	0.5083	0.505	.....
5/8	11	0.5266	0.5364	0.530	13.5mm.	5/8	18	0.5649	0.5709	0.570	.....
3/4	10	0.6417	0.6526	0.650	.....	3/4	16	0.6823	0.6891	0.685	11/64
7/8	9	0.7547	0.7667	0.760	.....	7/8	14	0.7977	0.8054	0.800	.....
1.0	8	0.8647	0.8782	0.875	7/8	1.0	14	0.9227	0.9304	0.925	.....
1 1/8	7	0.9704	0.9858	0.980	.....	1 1/8	12	1.0348	1.0438	1.040	.....
1 1/4	7	1.0954	1.1108	1.100	28mm.	1 1/4	12	1.1598	1.1688	1.165	.....
1 3/8	6	1.3196	1.3376	1.330	1 11/64	1 3/8	12	1.4098	1.4188	1.415	.....
1 1/2	5	1.5335	1.5551	1.550	.....	1 1/2	12	1.6598	1.6688	1.665	.....
2	4 1/2	1.7594	1.7835	1.780	45mm.	2	12	1.9098	1.9188	1.915	.....

In order that there may be a uniformity in drill sizes, the plea is made for a new system or series of tap drills that will be suitable for the minimum diameter of the hole given in the tables of the report of the commission. We already have established the following systems for drills, viz., numbered sizes and letter sizes, the actual diameter of which are not known offhand, nor can be remembered by the average mechanic. Then we have the fractional system of drills, which when the size is in 64ths, is just about as vague to the same class of mechanics. While during the World War we adopted the millimeter series, that series requires interpretation if conversion is made to decimals. Decimal drills are made and kept in stock by some firms, but these sizes are as a general rule ordered as specials.

If all the foregoing sizes were arranged in a table according to a decimal series, it would show that drill manufacturers are obliged to carry in stock over 550 different so called standard drills, from No. 0 to 3½ in. varying in some instances between sizes by only 0.0002, 0,0003 and 0.0004 in. These differences correspond to toolmaker's gage tolerance, and it is thought that such sizes should not be required from drill manufacturers. There are carried in stock by some firms, as many as fifteen sizes of commercial drills between 0.75 and 0.875 inch.

An appeal is made to designers and draftsmen to adopt a table of sizes of the different drill series and, preferably, adopt the decimal size series so that the number and letter series will gradually be forgotten and the great quantity of sizes reduced to a minimum, thereby permitting the jobber to keep in stock a complete set of one standard drill for tapped holes. Of course, we will always have with us the metric and fractional series, and some day it is the hope that they will be superseded by the standard uniform decimal series. The accompanying table is submitted for a three decimal-size drill series, to be used for the screw thread products specified in the report of the commission. These sizes have not, however, been given a practical test.

It will be noted that some of the drill sizes exceed the recommended working-gage tolerance, but the sizes are all within the tolerance specified in the report, and at the same time, there is ample tolerance and allowance for wear permitted for the manufacture of the drills. The commission report having adopted the minimum hole as standard, reduces the system to the use of only one series of forty-nine drills for both its coarse and fine screw threads. As the minimum hole is expressed in decimals, the drill series should also be expressed in decimals. These drills should be marked with the normal size of the screw, the threads per inch and the nominal size of the drill. Each set of drills to be labeled "National Standard Screw-Thread Tap Drills." These sets to be made up in three units: (1) Drills for 1⅛ to 3 in. inclusive; (2) 1 to ¼ in. and (3) Nos. 12 to 0.

The drill manufacturers may substitute some of their present stocks of standard drills for the sizes given in the table, if the drills fall within the tolerance of the tapped hole, but the drills should be marked as noted above. The sizes of the drills do not vary by a uniform constant, but it will be noticed that with the exception of the first few sizes, the decimal size drills end in a zero or a five.

A little investigation will show that there is a very large amount of money expended for broken drills and taps and spoiled work, due solely to the lack of knowledge regarding drill and tap performances on the part of all concerned. The investigation of drill sizes for screw thread work is very urgently needed at the present time, and in particular the standardization of drill sizes for the National Screw Thread System for both the coarse and fine thread series. To quote from a paragraph given in an advertisement of a large drill manufacturer "The National Screw Thread System is a development of the manufacturing hell arising during the World War, and at that time the obvious lack of standardization in thread tolerance resulted in untold delay, grief, misunderstanding and tremendous expense." Our present knowledge regarding the drill question is about in the same condition as it was of screw threads during the World War. A practical investigation should be made as to the drill sizes to be used for the holes recommended by the commission, as chance and haphazard methods used in drilling are very expensive propositions.

It is well known that accurately drilled holes insure more perfect threads and consequently make the parts fit better and closer when screwed together, thus assuring rigidity and reliability; and that a complete knowledge on the use of drills to get the most out of them and the confidence in such knowledge that the drills used are cutting within the prescribed accuracy, will greatly increase production and with a corresponding decrease in the cost.

Ideas from Practical Men

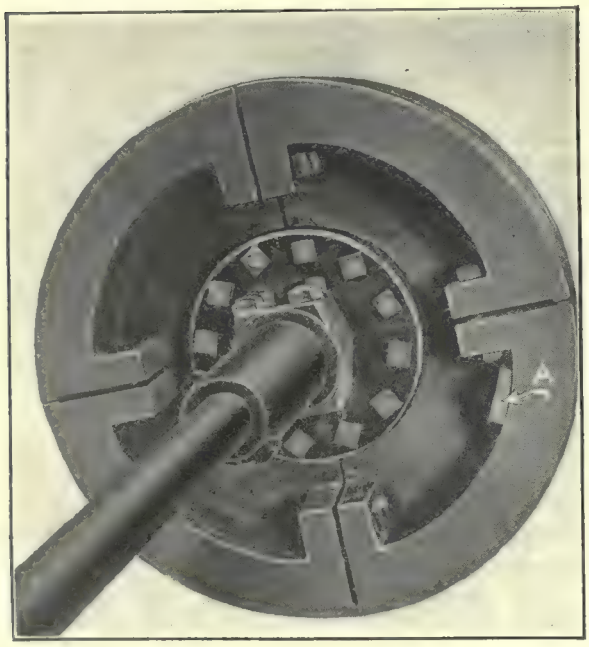
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Building a Flywheel Under Difficulties

By R. Grant

We had occasion to make a flywheel of about 3,000 lb. weight, 3 ft. in diameter and with a rim 13 in. wide by 4 in. thick. As our largest turning equipment was a 16-in. Hendey lathe we were somewhat handicapped, and were obliged to resort to building up the wheel as shown in the cut.

The hubs and flanges, made in halves, were as large



FLYWHEEL BUILT BY HAND

as the lathe would swing and were completed by the usual machining operations. A pattern was made to cast the rim in quarter sections and our machine equipment allowed us to drill all the bolt holes by power, but this was the extent of the machine work possible on the web and rim.

With the rim sections bolted together, a seat was made on one side of the web for the flange by chipping, using a surface gage and checking to the rim to get this face true. To chip the opposite side of the web the wheel was laid on one of the hubs so that the surface of the web already chipped rested on the finished face of the hub. The hub was held centrally by pins in the bolt holes. A short shaft was placed through the hub and web and the second hub put on the projecting end of the shaft. The finished face of this second hub was used as a surface plate to indicate the truth of the chipping as the work progressed.

Notwithstanding the crude method of producing it, the completed wheel needed only a small block, shown at *A*, to balance it.

Hooks for Handling Locomotive Tires

By J. Robert Phelps

The illustrations herewith show a pair of hooks used in the Atchison, Topeka & Santa Fe shops at San Bernardino, Cal., for handling locomotive tires. In



FIG. 1. THE TIRE HOOKS

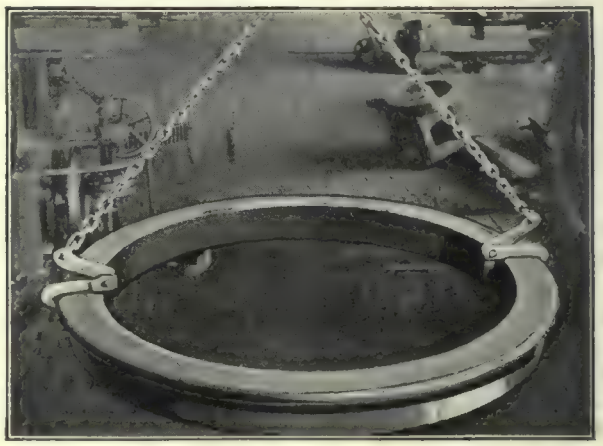


FIG. 2. TIRE SUSPENDED BY HOOKS

Fig. 1 the hooks are shown by themselves and in Fig. 2 their application to a tire is illustrated.

With these hooks tires can be picked up either when lying flat on the floor or standing on edge, and delivered where wanted.

Plan of Maintenance for Spline Broaches

By George E. Hodges

The chief requisite of a spline broach is that it shall cut a clean, smooth, accurate hole. Because of the nature of the material upon which such broaches are ordinarily used and the severity of the service, such a tool is comparatively short lived and the tool cost of the operation is, therefore, relatively high. The purpose of this article is to show how the maintenance cost of spline broaches may be reduced to a minimum.

The width of the spline is the most arbitrary dimension, the size that must be maintained within the closest limits, for in a well designed job there should

be clearance between both the large and the small diameters of the shafts and their respective seats so that the sides of the several splines would bear the brunt of the work.

To maintain the necessary accuracy, high-priced broaching tools are used and, for the reason that the facilities at hand for regrinding them are usually inadequate, the tools are kept in service just as long as possible. The moment the resultant hole shows signs of having reached the low limit, they are scrapped.

It is scarcely advisable to grind broaches on the faces of the teeth. Few men can, or will, do this without changing the rake angles or drawing the temper. Rather should the teeth be honed on top with an oil-stone to restore the cutting edge. When the broach becomes too small to produce holes that will pass the gages, the plan here outlined may be employed. Though but one size of broach is shown in the sketch, the plan may be adapted to other sizes.

The broach selected to demonstrate the plan is of a size used extensively for popular priced transmissions on nickel-steel gear blanks presenting a 2-in. length of hole. Sections 1B are shown reground twice, although if thought advisable they may be reground twice more by using the 3B type of finisher and making necessary allowances on the pilot.

The original broach is used singly until it wears below size, when it may be reground by the following method: The broach is first straightened as accurately as possible, and its outer diameter ground and the teeth relieved on a plain cylindrical grinding machine. It is then mounted upon a planer type grinding machine and the splines ground, after touching up the body of the tool (marked *a*) to bring it concentric with the outer circumference.

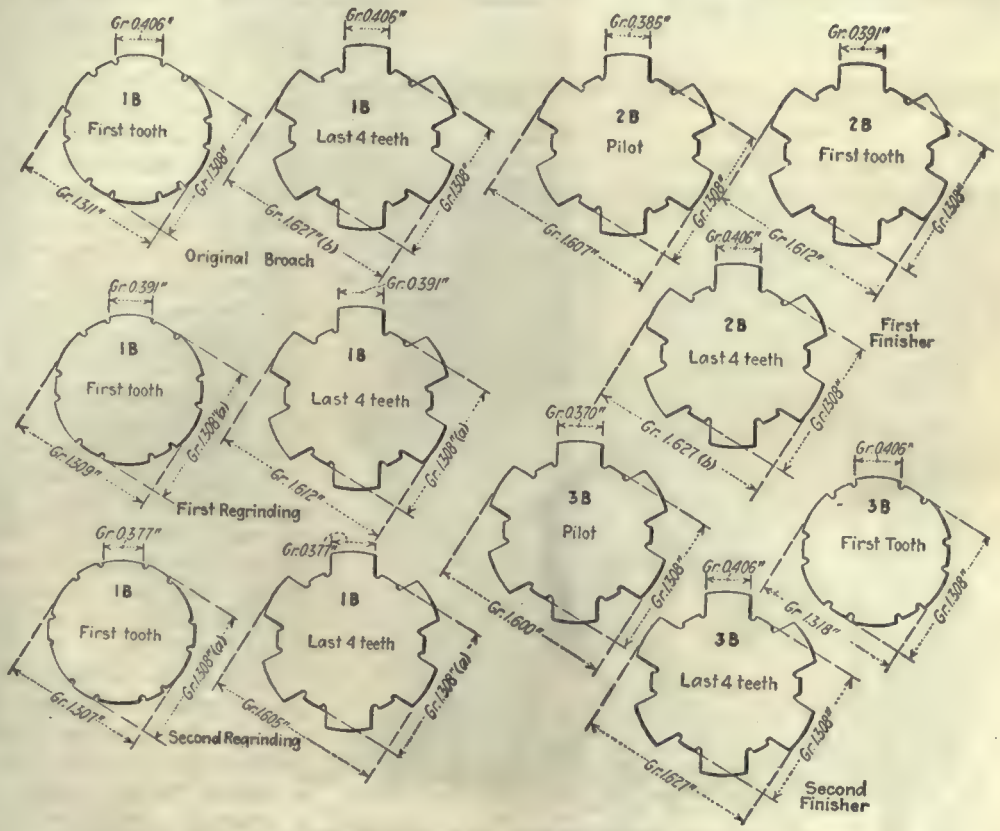
The splines may have some tolerance, but the finisher 2B should enter the work easily. This finisher is a short tool and cuts on the tops as well as on the sides of the splines. It has little more to do than to clean up the hole and if it is properly made should hold its size well.

When the reground broach begins to cut small it shoul again be reground to the sizes shown in the sketch marked "second regrinding." When placed in production this time the finisher should be of the same length as the stocking broach, and for this reason. The finisher may, by regrinding, be brought to the original size of the 1B section if in designing the set the dimension marked *b* is kept to the maximum on the finisher and to the minimum on the 1B section. This would affect only the clearance between the outer circle of the shaft and its seat.

It will be noted that the figures given on the sketch indicate not more than 0.015 in. reduction on any of the dimensions. If more than this amount seems to be needed the broach is not straight and should be corrected before starting to regrind.

The cost of any of these regrinding operations should not exceed $15. Of course, a new tool is taken to start with and the two finishers are new. The 2B is the least expensive to make as it is shorter, and with the work it is called upon to do should stand up longer than the 1B. Although the regrinding calls for two operations, the saving in tool cost will more than repay the labor and machine cost.

The 3B type of finisher will outlast any of the other broaches and, when worn, may be reground to the 1B type and be as good as a new broach of that type.

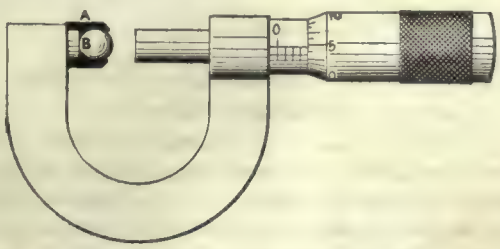


REGRINDING SPLINE BROACHES

A Micrometer Attachment

BY THEODORE C. HUMPHREYS

The attachment shown in the sketch may be found useful in measuring the thickness of the wall of tubing, and other similar jobs. *B* is a hardened ball 0.25 in.



MICROMETER ATTACHMENT

in diameter. *A* is a tube with a small shoulder to prevent the ball from falling out, but allowing it to extend through and rest against the anvil of the

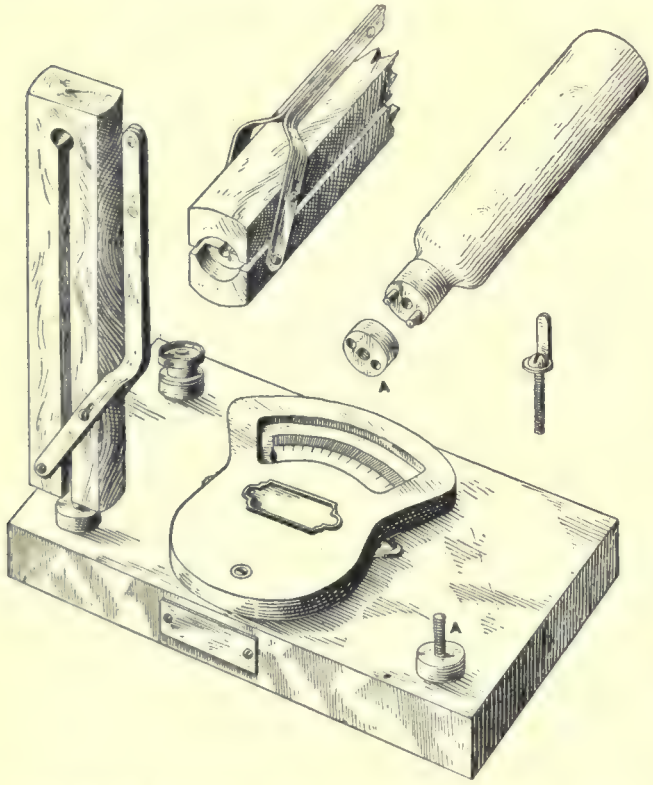
micrometer. The end of the tube is slightly spun over to hold the ball in place after it is inserted.

The tube should fit snugly on the anvil so that it will hold and yet be readily removed when not in use. In measuring, the diameter of the ball should be subtracted from the actual micrometer reading.

Tool for Assembling Polished Binding Posts

By Charles H. Willey

In assembling certain electrical instruments that were mounted on polished mahogany bases, the nickeled binding posts, or terminals, were run on the screw with a spanner wrench having two pins to match corresponding holes in the binding post. The work of drilling these two holes in many thousand pieces was costly and



FRICTION WRENCH FOR NICKELED BINDING POSTS

the shop foreman eliminated it by making up several tools of hardwood, as shown in the sketch.

They were simple to make and were used as follows: The piece *A* was run on the screw with the fingers, being tapped an easy fit, then this wrench was applied and by gripping the lever, closed tightly on the piece. It was then turned a little and released, closed and again turned until the nut was tight.

Enlarging Gas-Engine Pistons

By Robert Tait

On page 638 of *American Machinist*, Ivan C. Beach gives his experience in expanding pistons of automobile engines by heating them to a red heat and allowing them to cool under a weight. In compliance with the Editor's request for data from readers I submit our experience.

We have been making automotive parts and doing general machine work for garages for a number of years and, of course, the work in this line which comes to us is generally accompanied by a request to "hurry it up" as the owner simply "has to have it right away," etc., and in the interest of universal peace we have enlarged, or attempted to enlarge, a good many pistons by the heat method.

There is nothing definite about the job. For instance: A car which has been quite popular in this territory has a 4⅛-in. bore and another has a 3⅜-in. bore. Repeated attempts to expand the 4⅛-in. pistons always met with flat failure, the expansion never being sufficient to allow of refinishing the pistons, while on the other hand the 3⅜-in. pistons, while containing much less iron, would always expand approximately 0.015 in. which would give stock enough to permit regrinding to several thousandths oversize.

Some piston manufacturers heat-treat their product as a means of relieving foundry stresses while others allow the rough castings to age before being finished to accomplish the result, and our supposition is that those pistons which have been heat-treated at the factory will not expand to any great extent, while those which have not been so treated, will expand.

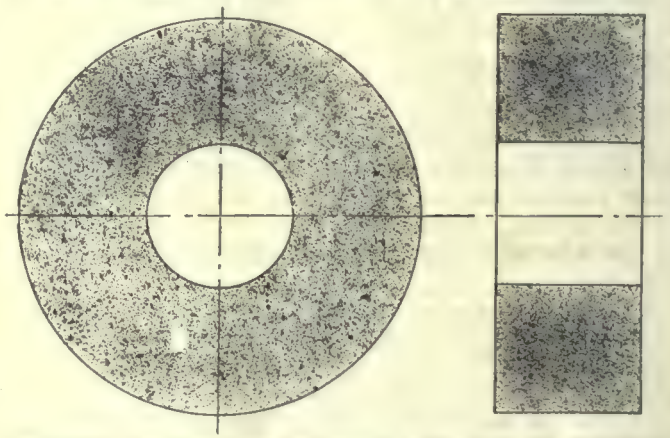
Weights, in our experience, have never helped. If enough force is exerted in this way there is a tendency to make the piston barrel shaped, but without any appreciable increase in expansion at the open end of the skirt. The most important point in this operation is the heat, which should be as high as possible without scaling the iron.

As regards the wearing qualities we have never had any complaints on this score and doubt if the slight difference enlarging causes in the structure of the iron would effect its wearing qualities. At best it is a makeshift job, rather in the nature of a court of last resort to which we have to appeal at times.

Stippling Drawings

By E. H. Bruce

In stippling drawings of abrasive wheels or stone work, time can be saved by covering all parts of the drawing, except that to be stippled, with a paper stencil which should be weighted down. Then take a brush such as a tooth or typewriter brush and dip it in drawing ink. Hold the brush at an angle about 4 in. above the drawing and by drawing a pencil or



DRAWING OF ABRASIVE WHEEL STIPPLED BY METHOD DESCRIBED ABOVE

stiff wire over the bristles, the ink can be directed to and splashed over the exposed parts of the drawing.

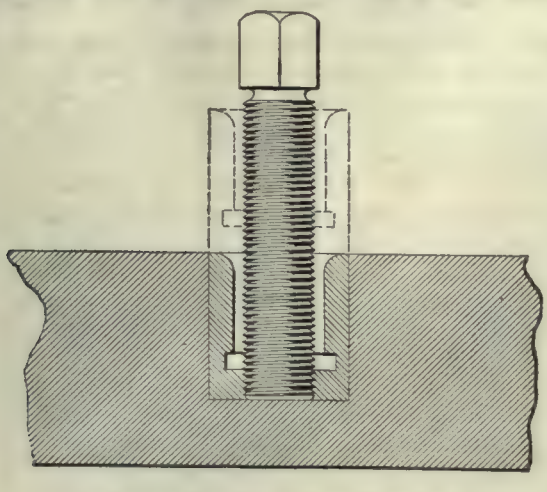
The accompanying illustration was made by this method. By a little care the ink can be distributed so that flat surfaces may appear convex or concave.

Removing a Bushing from a Blind Hole

By Art Weiss

On page 677 of *American Machinist*, W. H. Storey shows a method of extracting a bushing from a blind hole that is somewhat of an improvement over that first method suggested by C. Reimschissel.

Mr. Storey's method also requires some previous



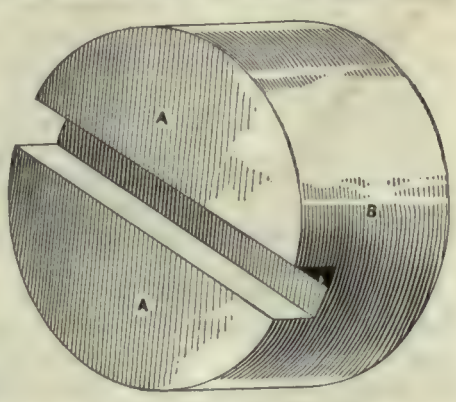
BUSHING FOR A BLIND HOLE

preparation and, like all the others, involves hunting up washers, etc., when the bushing is to be removed. Therefore, why not make the bushing as shown in the accompanying sketch and avoid having to hunt up anything with which to extract it? For years I have made bushings in this way and when they are to be taken out all that is necessary is to take a setscrew of the proper size and length, insert it in the tapped hole, and the bushing may be lifted out without further trouble.

A Kink in Local Hardening

By John F. Shunney

Having fifty pieces, like the one shown in the sketch, to be hardened upon the face *A*, we tried holding the heated pieces by means of tongs so that the face to be hardened would just touch the surface of the water. We were unable to get satisfactory results in this way, however, as the hardening would extend up the sides at *B*, where we did not want the pieces to be hard. We secured a plate of cast iron of suitable size and about 1 in. thick and cut narrow, closely-spaced grooves across it at right-angles so as to present a checkered surface. This plate we suspended in the hardening tank with the upper, or checked, face about even with the surface of the water so that the water would flow through the grooves but would not stand to any appreciable depth upon the plate.



PIECES TO BE LOCALLY HARDENED

By setting the pieces on this plate as fast as they were heated we were able to harden the whole batch very quickly and in a satisfactory manner. The material was carbonized machinery steel.

Dangerous Swing Saw Guarded by Novel Device

By George F. Paul

A novel safeguard for a swing saw has been developed at one of the big factories at Niagara Falls, N. Y. An automatic guard is provided at the front of the saw and



GUARD FOR A SWING SAW

is actuated by a rod. An automatic latch prevents the saw from coming forward while the workman is placing material in position. A stop limits the backward movement of the saw. On the saw frame is mounted a light that serves to illuminate the cutting edge. The belt is guarded by the wire mesh in front and the frames on the sides.

Recommended Practice for Heat-Treatment of Carbon Steel Castings

The report of Committee A-4 of the American Society for Testing Materials has been prepared and copies are ready for distribution. The report will be presented at the annual meeting of the society in Atlantic City on June 26 to 30. Reprints have been distributed to the members with a view of stimulating discussion at the meeting. H. M. Boylston is chairman of the committee.

Sub-committees have been at work on the following subjects: Desirability of annealing iron chain at intervals; heat-treatment of rolled and forged carbon steel; heat-treatment of alloy steels; and the heat-treatment of carbon-steel castings.

On the last subject the committee has recommended that the castings be heated slowly and uniformly to temperatures varying with the carbon content of the steel. The recommendations are intended solely for guidance and are not to be construed as specifications of the society.

Copies of the paper can be obtained from the society, and criticisms are invited.

Editorial

Scientific Management

ON OTHER pages of this issue we present an Englishman's views on scientific management as related to British shops.

It would seem that this article carries under its surface more of a message to managers of industrial plants—here as well as abroad—than will be apparent on casual reading. The author emphasizes the fact that methods and systems must be fitted to the shops in which they are to be used. Some of us know to our sorrow that costly mistakes have been made in trying to adopt a particular system by swallowing it "Horse, foot and dragoons."

Scientific management is not new, however recently the name may have been coined. Noah followed a well defined system in building and loading the ark, but where he fell down was in its navigation. 'Tis true he finally made port, but it was not one of his own choosing.

Where Are the Good Machinists?

ONCE more the words of the economic prophets seem likely to be fulfilled. A shortage of skilled labor is in sight if it is not already upon us. It is not universal as yet, but it is spreading as the tide of increasing business rises.

As a result the machinery builder is soon going to be face to face with the problem of how to find the kind of men he needs to keep his shop going. When the first ripples of the business tide reach his door he is certain to find that the best men have been washed into the employ of his customers and he must bid high to get them.

Ample warning of the imminence of skilled labor scarcity has been given to members of the National Machine Tool Builders' Association by their general manager. The machine tool men are always the ones hardest hit by this ever-recurring condition by reason of the fact that their orders are about the last to pick up of any group in the manufacturing cycle. Their situation is a particularly difficult one because the nature of their product requires the highest type of machinists.

In the past they have had the very doubtful pleasure of seeing their best men and most promising apprentices attracted to other industries, notably the automobile industry, by wages much higher than they could afford to pay. Training machinists for the other fellow is not a very profitable undertaking for the man who does the training even though the industry as a whole gains thereby.

However, under existing circumstances the best way to have good men coming along seems to be to have apprentices in a carefully planned course in your plant and so to instill in them a spirit of loyalty to the company that they will stick with you even when temporary higher wages offer a tempting lure to other fields. Some companies have done this with marked success and they will be in an enviable position when business gets into full swing.

How the Army Could Help Civil Aviation

ONE of the recognized needs of civil aviation is landing fields where fuel, oil, etc., can be obtained. We are constantly urging the establishment of more fields and yet we are not utilizing as fully as we should the fields we already have.

There are army landing fields in various parts of the country and yet not one of them is available for civil use, even for an emergency supply of fuel, oil or other supplies. Of course the authorities do not prevent a pilot making a forced landing on an army field, but so far as assistance is concerned, he might as well land in the desert of Sahara.

A civil pilot in Ohio was recently forced to seek a landing owing to shortage of gasoline, and thought himself lucky to be within gliding distance of a large army field. But after landing he was unable to buy, beg or borrow a drop of fuel. Not through any lack of courtesy or consideration on the part of the officers in charge, but because the army regulations forbade it. He had to walk two miles to a town and hire a truck to bring him a supply of fuel.

It hardly seems possible that there can be any justification for such a ruling in times of peace. Everyone recognizes that the more civil aviators there are the better for an army in time of war.

Eternal Vigilance Is the Price of Eyesight

A RECENT bulletin issued by the Eyesight Conservation Council gives extracts from the study of Waste in Industry, under the auspices of the Federated American Engineering Societies. It points out the loss to industry still resulting from preventable accidents. In Pennsylvania alone in one year (1920) eighteen persons lost both eyes and 652 lost one eye, with a total of $826,724 as the cost in compensation only. The total for the industrially blinded is given at 15,000, or 13.5 per cent of the total blind population. The American Locomotive Company reports a great reduction in the number of eye accidents by the use of safety goggles.

Proper glasses are shown to be very necessary for the best results and a careful study of the conditions must be made. Without this, safety glasses may very easily be annoying in the extreme and not always an element of safety.

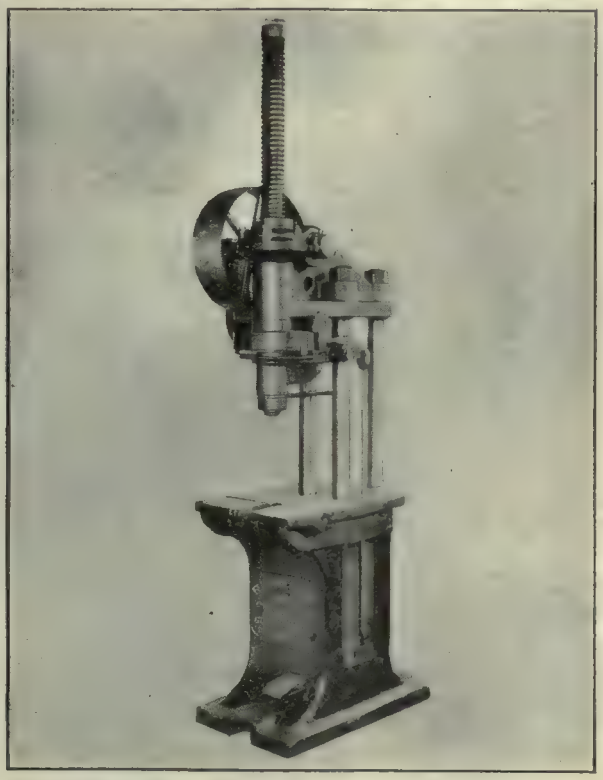
Nor are accidents the only things to be considered. The kind of light and the way in which it strikes the eyes of the worker are both important. This involves the proper location of machines with regard to the light, both natural and artificial.

The great need is for campaigns in the smaller plants, especially as the cost per man for bringing the light up to a good standard is usually greater than in larger plants. The cost of providing adequate illumination for the whole industry is given as being one-half of one per cent of the wages paid. This is a small sum as compared to the loss to industry, or to the possible burden on the community and the resulting suffering on the part of the individual.

Shop Equipment News

General Manufacturing Co. Flexible Power Press

The General Manufacturing Co., 255 Meldrum Ave., Detroit, Mich., has just placed on the market a flexible power press similar in principle to that described on page 117 of *American Machinist*. This machine, as the name implies, is flexible at the will of the operator as to the pressure applied, which may vary from a few pounds up to 8 tons. Because of this control feature, the press is especially adapted for straightening, for pressing in bushings, or for assembling parts having press fits. Having a stroke of 9 in., it may also be used advantageously for push broaching and similar jobs because of its adaptability.



"GENERAL" FLEXIBLE POWER PRESS

The press, shown in the accompanying illustration, is a three-post machine, mounted on a base with the table top 30 in. from the floor. Two of the posts are in tension, the third post is under compression. The ram is threaded with a long lead Acme thread and runs through a nut 4 in. in length, which nut is also the brake drum

Power is applied to the pulley by the belt; thence through a worm gear and spline key, driving the ram at constant speed in one direction. The nut turns with the ram until pressure is applied on the foot pedal. This pressure closes the asbestos-lined brake band on the nut and the ram passes down immediately through the latter until the pressure on the foot pedal is released, or until the pressure applied by the ram on the work equalizes the pressure applied on the foot pedal. The return stroke is obtained by a spring around the top of the ram, which raises the ram immediately after operation to its up, or normal, position, the nut turning freely on the ram as it rises.

The height between the end of the ram and the table in this machine is 12 in. Any other dimension, however, may be secured by using a different set of columns and length of control rod. The speed of travel of the ram depends entirely on the speed at which the pulley is run. For example, with the pulley running at 300 r.p.m., the ram travel will be 150 in. per minute. The end thrust is taken on a ball bearing between the nut and main casting.

Nicholls Portable Duplex Molding Machines

The William H. Nicholls Co., Inc., 2 College Place, Brooklyn, N. Y., has just placed on the market two models of portable, duplex molding machines. The machines are intended for use on long, narrow floors, and they can be moved along so as to minimize the distance which the sand, flasks and molds have to be carried.

The Model 14-42 machine, shown in Fig. 1, is intended principally for making copes and drags simultaneously. There are two adjustable screw heads, so that the height can be adjusted for different depths of cope and drag. In many cases the cope can be made on the split pattern plate attached to the jolt head, and the drag made on a right-hand side and rolled over before

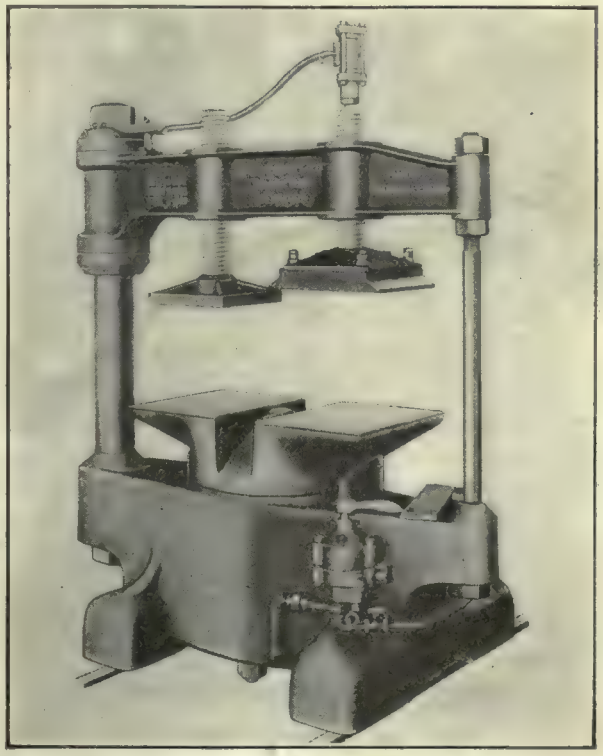


FIG. 1. NICHOLLS 14-42 PORTABLE DUPLEX MOLDING MACHINE

squeezing. The pattern can be drawn with the electromagnetic drawing device and both halves squeezed at the same time.

The squeeze is made on the up-stroke of the piston, and the draw on the magnetic side is made while the

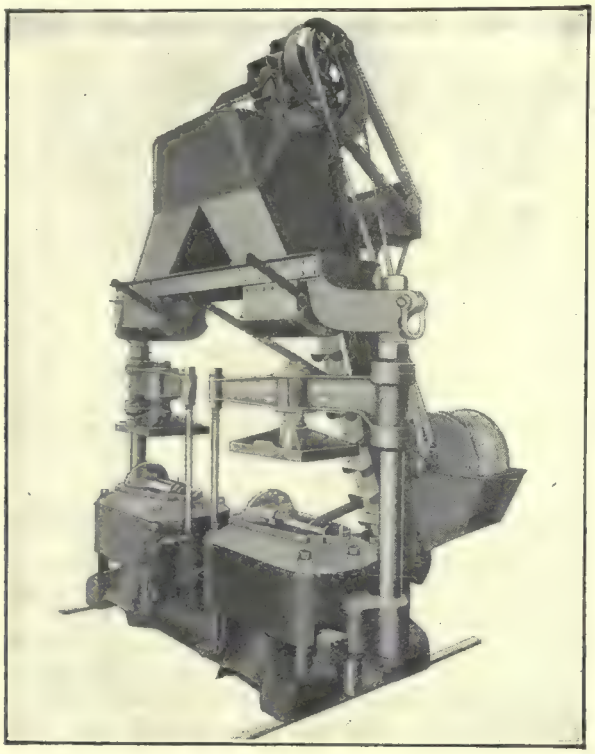


FIG. 2. NICHOLLS 12-36 TYPE D DUPLEX SELF-CONTAINED MOLDING MACHINE

mold is being withdrawn by gravity on the return stroke of the piston. The valve is placed low and has a horizontal handle. The position of the valve permits easy and quick operation in starting the jolting.

The machine has a 6-in. length of jolt and a 14-in. squeeze. All cast parts are made of semi-steel. The pins, bushings and contacting and drawing parts are of steel, hardened and ground.

The Model 12-36, Type D machine, shown in Fig. 2, consists of two stripping-plate molding machines mounted on the same base and made portable. A riddle, sand conveyor and a double boot hopper with sand gates are provided. The machine is set lower than the standard machines, and is about 10 ft. high to the top of the conveyor. It is self-contained and mounted on four wheels running on steel rails in the concrete floor. It is intended especially for large production in foundries where there are no sand or mold conveyors for bringing the materials to the machine.

The molds are shaken out and the sand piled the whole length of the floor. One man shovels the sand into the riddle, which cleans and mixes it. The sand is conveyed to the hopper, dropped into the flask and made into molds, which are set on the floor directly in front of the machine as it travels along. When the molds are shaken out, the flasks are placed in two rows, the copes on one side of the sand heaps and the drags on the other.

One operator can fill the two flasks with sand and jolt them while the other sets the cores. The two operators then strike off the drag and cope, squeeze them and help one another to put the molds on the floor. This machine is complete, and it not only mixes and conveys the sand into the mold, but gives a strong jolting action. The combination squeeze and drawing action semi-automatically squeezes on the up-stroke of the piston and draws by gravity on the down-stroke. Each half of the machine is operated separately by means of one valve for jolting, squeezing and drawing the patterns. All castings are semi-steel. The wearing parts are steel, hardened and ground. The equipment can be employed for continuous pouring, as it can be arranged for any degree of flexibility required.

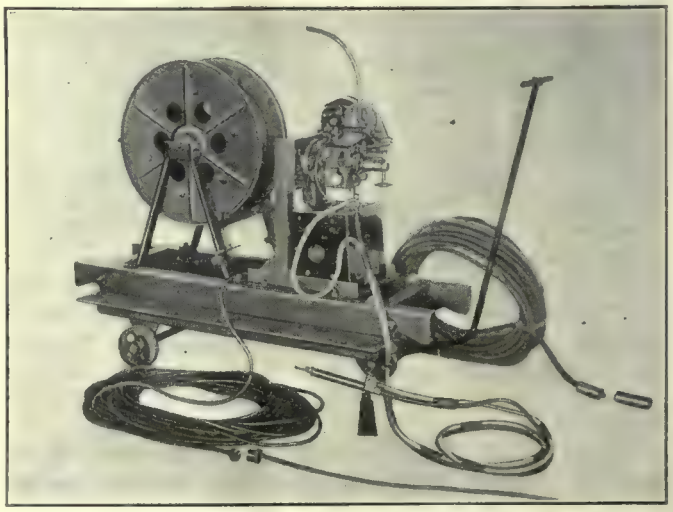
G.E. Portable Semi-Automatic Arc Welding Set

The General Electric Co., Schenectady, N. Y., has recently placed on the market a portable, semi-automatic electric arc welding set. The ability to move the machine easily increases the applicability of the apparatus, and makes it available for use in any part of the factory or shop. The set comprises complete semi-automatic equipment, all mounted on a small truck that can be pulled by hand or lifted by a crane. The complete outfit weighs about 400 pounds.

The welding equipment consists of a semi-automatic lead, an automatic welding head with control mechanism, and a standard for holding a reel of electrode wire. Power is supplied to the arc through a flexible cable with a plug for attaching it to the nearest welding circuit. The reel carrier is equipped with a brake and is intended to hold any size of reel up to 2½ ft. in diameter.

The portable outfit is particularly useful for repairing parts of machines in place when these parts are too bulky, inconvenient or otherwise impractical to move, as well as for doing routine welding of all sorts, such as filling holes in castings and welding seams in pipes or tanks.

It is stated that time can be saved in welding with the outfit because the electrode is fed continuously, and because the speed of deposition is from 25 to 100 per cent faster than that for hand welding. Material is saved by the elimination of waste ends, which usually amount to from 10 to 25 per cent of the total amount of electrode wire when it is used in short pieces. Since



G. E. PORTABLE SEMI-AUTOMATIC ARC WELDING SET

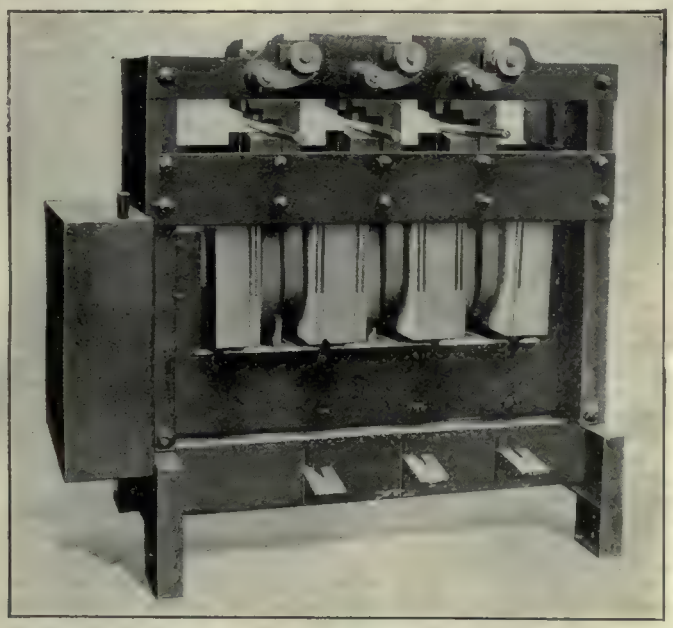
the welding operation is continuous, interruptions, which tend to affect the strength of the weld, are greatly reduced.

Berwick Electric Heater for Forging

The American Car and Foundry Co., New York, N. Y., has recently brought out the Berwick two-path electric heater illustrated herewith. The machine is intended especially for forging operations requiring the heating of the ends of bar stock or points along the length of the material. This heating is accomplished without burning or melting the metal. Either 220 or 440-volt current can be used.

The heaters are ordinarily built with one, two or three electrodes, and may be supplied with four or five electrodes if necessary. The length of the heat on the stock can be varied from 1 to 8 in., or the machine can be arranged to heat lengths from 3 to 11 in. With slight changes in the heater, this length can be increased to 16 or 18 in. The range of diameter of the stock heated on the No. 3 heater varies from $\frac{3}{8}$ to $\frac{7}{8}$ in. to obtain a high production rate, although larger stock can be handled.

The heater is similar in method of operation to the



BERWICK TWO-PATH ELECTRIC HEATER

Berwick rivet heater. The lower or left-hand electrode of each unit is stationary, while the upper or right-hand electrode has a vertical movement operated by depression of the treadle, which raises the electrode sufficiently to insert or remove the material.

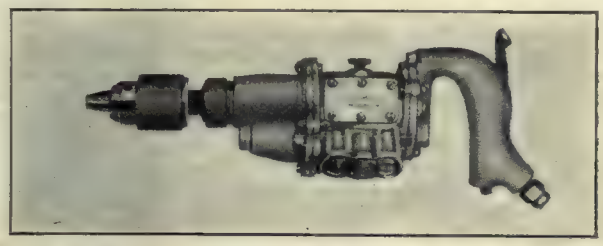
Each unit of the heater has two pairs of electrodes, insulated from each other. The right-hand electrode has at its two upper ends projecting blocks which overhang, but which are not allowed to touch the left-hand one. The left-hand electrode is stationary, so far as vertical motion is concerned, but may be adjusted horizontally by means of two bolts at the rear of the heater. Horizontal motion of the right-hand electrode is obtained by sliding the electrode-clamping device along the shaft on which it is mounted. Depression of the pedal causes rotation of the shaft, which through cams raises the shaft carrying the electrode.

Flexibility of the rear half of the bottom electrode is provided by a spring. The top face of the electrode is set at an angle so that when the upper electrode is dropped into position, contact is assured at four points on the material. Marring of the stock is decreased because of the increased number of points.

Thor "Pigmy" Portable Pneumatic Drill

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., has recently placed on the market the Thor "Pigmy" portable pneumatic drill that is illustrated herewith. The drill has a pistol-grip handle, with the control valve within easy reach. It is non-reversible. The device is very light in weight.

The drill is made in three sizes, the No. 25 size having a drilling capacity of $\frac{1}{4}$ in. and weighing only



THOR "PIGMY" PORTABLE PNEUMATIC DRILL

5 lb., the No. 375 size having a capacity of $\frac{3}{8}$ in. and weighing $5\frac{1}{2}$ lb., and the No. 50 size having a capacity of $\frac{1}{2}$ in. and weighing 6 lb. The speeds of the tools are 2,200, 1,400 and 1,000 r.p.m., respectively.

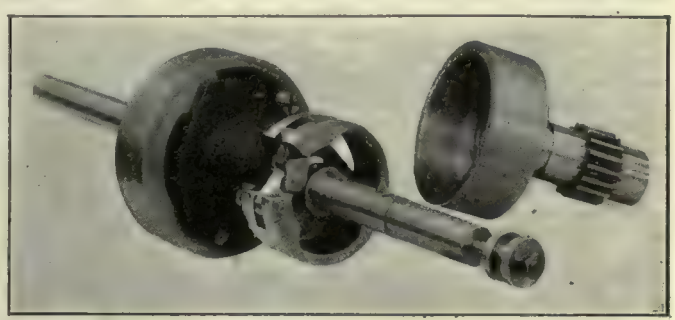
The drills are fitted with Jacobs chucks, the No. 25 having a No. 1B chuck, the No. 375 a 2B, and the No. 50 a 6B. A screwdriver attachment can be furnished; it is recommended especially for the No. 375 drill. A wire brush for cleaning purposes can be furnished for use on the No. 50 drill. The tool can, of course, be employed for reaming and wood boring, as well as drilling.

Friction Clutch for Greaves-Klusman Geared-Head Lathes

The accompanying illustration shows a friction clutch just placed on the market by the Greaves-Klusman Tool Co., of Cincinnati, Ohio, for use on its G-K geared-head lathes.

As compared with the former model, which expanded the ring on one side only and had one-sided fingers for spreading the ring, the present design expands the ring on both sides. The expanders are in the center of the clutch ring, operating to produce pressure directly on the toggle levers. Adjustment of the levers is by means of eccentric studs, so that the leverage applied always can be maintained the same. The driving hub is in one piece for both the forward and reverse clutches, giving a long bearing on the shaft and a long driving key.

The friction clutch has 50 per cent wider face, larger diameters on some sizes, and greater belt speed than in the former model.



GREAVES-KLUSMAN LATHE FRICTION CLUTCH

squeezing. The pattern can be drawn with the electromagnetic drawing device and both halves squeezed at the same time.

The squeeze is made on the up-stroke of the piston, and the draw on the magnetic side is made while the

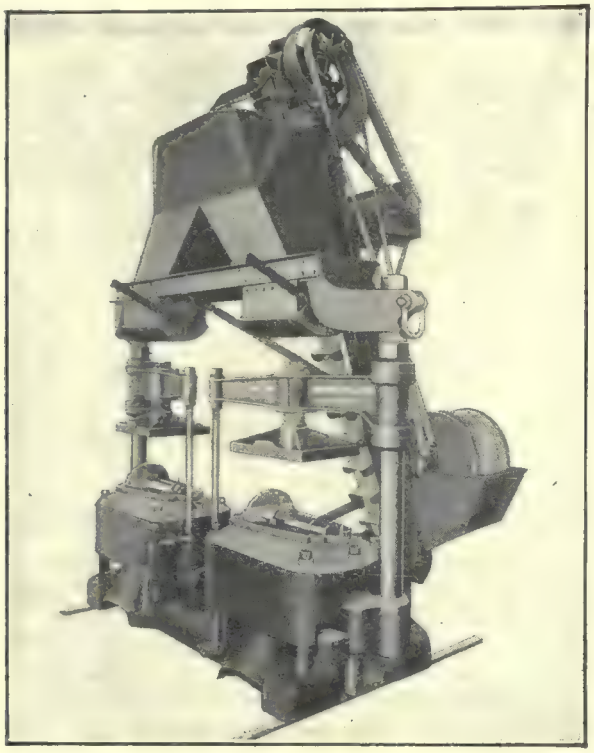


FIG. 2. NICHOLLS 12-36 TYPE D DUPLEX SELF-CONTAINED MOLDING MACHINE

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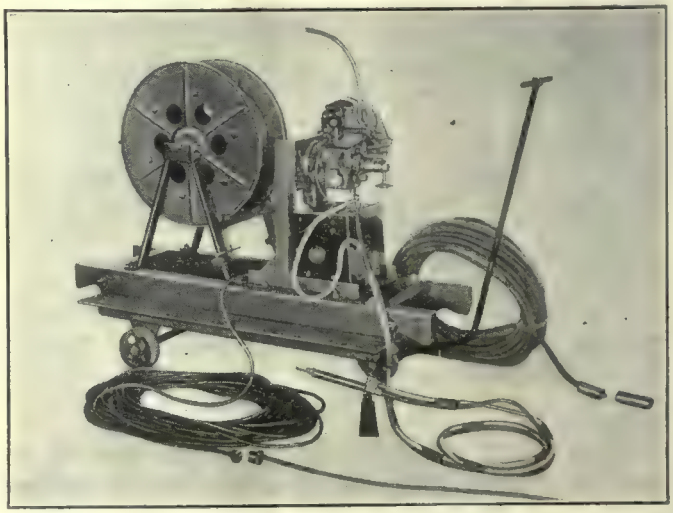
G.E. Portable Semi-Automatic Arc Welding Set

The General Electric Co., Schenectady, N. Y., has recently placed on the market a portable, semi-automatic electric arc welding set. The ability to move the machine easily increases the applicability of the apparatus, and makes it available for use in any part of the factory or shop. The set comprises complete semi-automatic equipment, all mounted on a small truck that can be pulled by hand or lifted by a crane. The complete outfit weighs about 400 pounds.

The welding equipment consists of a semi-automatic lead, an automatic welding head with control mechanism, and a standard for holding a reel of electrode wire. Power is supplied to the arc through a flexible cable with a plug for attaching it to the nearest welding circuit. The reel carrier is equipped with a brake and is intended to hold any size of reel up to 2½ ft. in diameter.

The portable outfit is particularly useful for repairing parts of machines in place when these parts are too bulky, inconvenient or otherwise impractical to move, as well as for doing routine welding of all sorts, such as filling holes in castings and welding seams in pipes or tanks.

It is stated that time can be saved in welding with the outfit because the electrode is fed continuously, and because the speed of deposition is from 25 to 100 per cent faster than that for hand welding. Material is saved by the elimination of waste ends, which usually amount to from 10 to 25 per cent of the total amount of electrode wire when it is used in short pieces. Since



G. E. PORTABLE SEMI-AUTOMATIC ARC WELDING SET

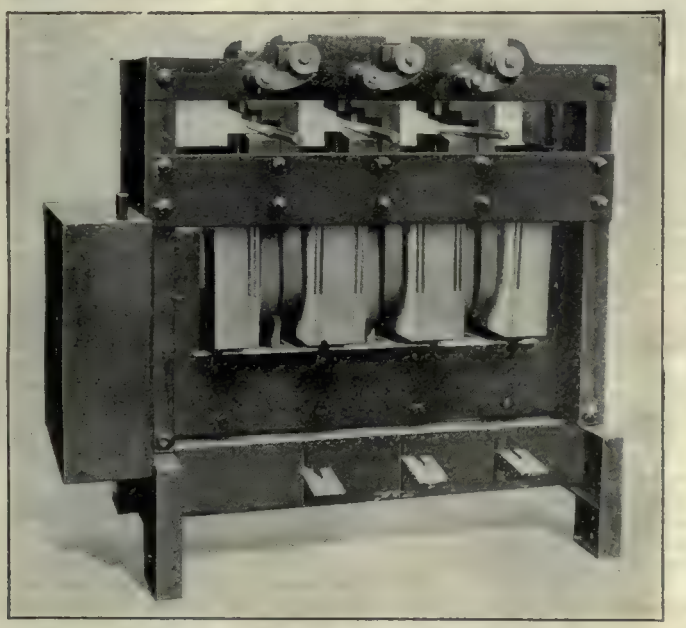
the welding operation is continuous, interruptions, which tend to affect the strength of the weld, are greatly reduced.

Berwick Electric Heater for Forging

The American Car and Foundry Co., New York, N. Y., has recently brought out the Berwick two-path electric heater illustrated herewith. The machine is intended especially for forging operations requiring the heating of the ends of bar stock or points along the length of the material. This heating is accomplished without burning or melting the metal. Either 220 or 440-volt current can be used.

The heaters are ordinarily built with one, two or three electrodes, and may be supplied with four or five electrodes if necessary. The length of the heat on the stock can be varied from 1 to 8 in., or the machine can be arranged to heat lengths from 3 to 11 in. With slight changes in the heater, this length can be increased to 16 or 18 in. The range of diameter of the stock heated on the No. 3 heater varies from $\frac{3}{8}$ to $\frac{7}{8}$ in. to obtain a high production rate, although larger stock can be handled.

The heater is similar in method of operation to the



BERWICK TWO-PATH ELECTRIC HEATER

Berwick rivet heater. The lower or left-hand electrode of each unit is stationary, while the upper or right-hand electrode has a vertical movement operated by depression of the treadle, which raises the electrode sufficiently to insert or remove the material.

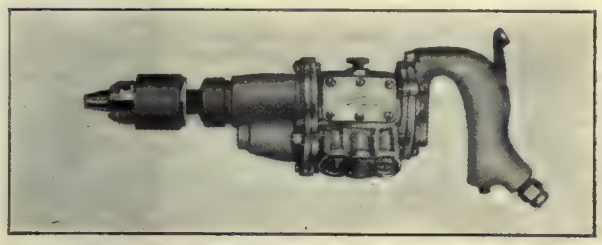
Each unit of the heater has two pairs of electrodes, insulated from each other. The right-hand electrode has at its two upper ends projecting blocks which overhang, but which are not allowed to touch the left-hand one. The left-hand electrode is stationary, so far as vertical motion is concerned, but may be adjusted horizontally by means of two bolts at the rear of the heater. Horizontal motion of the right-hand electrode is obtained by sliding the electrode-clamping device along the shaft on which it is mounted. Depression of the pedal causes rotation of the shaft, which through cams raises the shaft carrying the electrode.

Flexibility of the rear half of the bottom electrode is provided by a spring. The top face of the electrode is set at an angle so that when the upper electrode is dropped into position, contact is assured at four points on the material. Marring of the stock is decreased because of the increased number of points.

Thor "Pigmy" Portable Pneumatic Drill

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., has recently placed on the narket the Thor "Pigmy" portable pneumatic drill that is illustrated herewith. The drill has a pistol-grip handle, with the control valve within easy reach. It is non-reversible. The device is very light in weight.

The drill is made in three sizes, the No. 25 size having a drilling capacity of $\frac{1}{4}$ in. and weighing only



THOR "PIGMY" PORTABLE PNEUMATIC DRILL

5 lb., the No. 375 size having a capacity of $\frac{3}{8}$ in. and weighing $5\frac{1}{2}$ lb., and the No. 50 size having a capacity of $\frac{1}{2}$ in. and weighing 6 lb. The speeds of the tools are 2,200, 1,400 and 1,000 r.p.m., respectively.

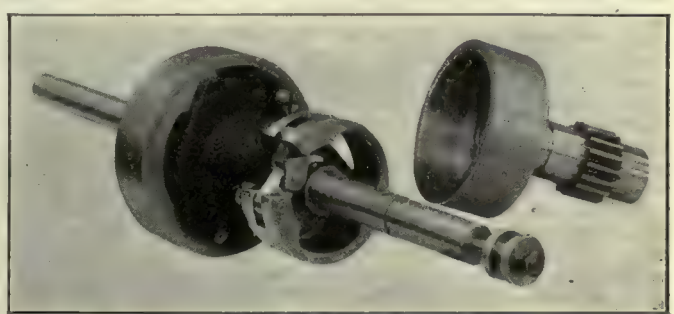
The drills are fitted with Jacobs chucks, the No. 25 having a No. 1B chuck, the No. 375 a 2B, and the No. 50 a 6B. A screwdriver attachment can be furnished; it is recommended especially for the No. 375 drill. A wire brush for cleaning purposes can be furnished for use on the No. 50 drill. The tool can, of course, be employed for reaming and wood boring, as well as drilling.

Friction Clutch for Greaves-Klusman Geared-Head Lathes

The accompanying illustration shows a friction clutch just placed on the market by the Greaves-Klusman Tool Co., of Cincinnati, Ohio, for use on its G-K geared-head lathes.

As compared with the former model, which expanded the ring on one side only and had one-sided fingers for spreading the ring, the present design expands the ring on both sides. The expanders are in the center of the clutch ring, operating to produce pressure directly on the toggle levers. Adjustment of the levers is by means of eccentric studs, so that the leverage applied always can be maintained the same. The driving hub is in one piece for both the forward and reverse clutches, giving a long bearing on the shaft and a long driving key.

The friction clutch has 50 per cent wider face, larger diameters on some sizes, and greater belt speed than in the former model.



GREAVES-KLUSMAN LATHE FRICTION CLUTCH

News Section

Structural Steel Sales Near Capacity

Orders for fabricated structural steel placed during April were almost equal to the capacity of fabricating firms, according to reports made to the Department of Commerce by firms comprising two-thirds of the fabricating capacity of the United States. Sales reported during April amounted to 115,247 tons by seventy-five firms having a capacity of 116,918 tons, or at the rate of 99 per cent of capacity.

At this rate, the total sales throughout the United States, based on a total capacity of 180,000 tons, were 177,600 tons in April. This compares with 139-300 tons reported for March by the Bridge Builders and Structural Society, based on reports of sixty-four firms showing sales at 77 per cent of capacity.

Experiments With Chilled Iron Car Wheels

Owing to the desirability of obtaining definite information concerning the magnitude and distribution of stresses in chilled iron car wheels and of determining the limit of these wheels as used today, with a further view of improving the chilled iron wheels in order to meet future requirements, an investigation was entered into by the Association of Manufacturers of Chilled Car Wheels and the University of Illinois. A bulletin presenting the results of the first part of this investigation has just been issued by the engineering experiment station of the University of Illinois. It is known as Bulletin 129 and gives the results of tests made to determine strain produced within the wheel by mounting it on its axle and by the application of wheel loads. The bulletin includes the general discussion of the general problem of wheel loading, the determination of the physical properties of chilled car wheel iron, a description of the apparatus and method used in the test, and a summary of the conclusions drawn therefrom.

Autos Growing Popular in Mexico

Imports of American motor vehicles into Mexico, consisting of 6,750 cars and 1,482 trucks, showed an increase in 1921 compared with the preceding year. Shipments are expected to be even greater this year, as automobiles are sure to contribute considerably in developing outlying sections. Already mining companies and oil operators, who have constructed roads between their properties and the railroads, are replacing ox teams with motor trucks. Much interest from official circles has been taken in matters of organizing automobile shows and fostering highway projects. Several shows have already been held in Mexico City and a national highway has been proposed to cover the entire country.

Weights and Measures Conference Urges Standardization

"Unity of action is impossible without organized conferences and established methods," said Secretary of Commerce Hoover in addressing the fifteenth annual conference on weights and measures, held recently at the Bureau of Standards in Washington. Speaking particularly to the state officials charged with the enforcement of laws pertaining to weights and measures, Secretary Hoover said: "Your work is not so much the prevention of crookedness and the apprehension of crooks, as it is the protection of the honest producer and distributor. I believe the vast majority of producers and distributors, as well as the whole of the consumers, are anxious that there be consistent scientific expansion in standardization."

There will be no legitimate objection to centralization, Representative Vestal, chairman of the Committee on Coinage, Weights and Measures, of the House of Representatives, told the conference, if the prosecution of offenders be left to the state and local authorities. "Let us have one central authority," he said, "to set up uniformity. Many manufacturers are writing to me asking for this very thing. This entire question is merely a matter of educating the people in standardization. Lack of standardization does not make for economy or for efficiency."

The program of the conference was so crowded that no opportunity was afforded C. A. Briggs, of the Bureau of Standards, to present his talk on the metric system.

Railway Mechanics Meeting and Exhibit

The third annual meeting of the mechanical division of the American Railway Association will be held in Atlantic City, N. J., June 14 to 21. This division comprises the former Master Car Builders and Master Mechanics Associations, and is the largest subdivision of the parent association. The exhibition this year will be the greatest ever attempted by the Railway Supply Manufacturers' Association, which acts in conjunction with the car builders. Over 100,000 sq.ft. of floor space has been prepared on the famous Million Dollar Pier, and the largest manufacturers of railway supplies will have display booths on the pier.

Headquarters of the convention will be the Marlborough-Blenheim Hotel, where the technical sessions will be held. These sessions will include discussions on prices, material, safety appliances, freight loading and equipment, brakes, car wheels, signals, locomotive construction, heating and boiler maintenance and sanitation. Committee reports will be received on welding, design, mechanical stokers, car dumping machines, tonnage rating and car repair shop layouts.

Final Declaration of Foreign Trade Council

At the close of the Ninth National Foreign Trade Convention, held last month in Philadelphia, the final declaration, which is a feature of the annual meeting of this body, was prepared and passed upon by the thirteen hundred delegates present from all parts of the country. The declaration, which is really a prescription or a suggested remedy for present business conditions, starts off with the statement that "the recovery of prosperity in the United States depends upon the ability of our people to sell at remunerative prices practically all they produce, running approximately full time and full handed."

The declaration, which covers every phase of business and manufacturing enterprise, includes the following subjects:

The need of foreign trade, foreign loans, foreign trade zones, credit to other nations, creation of loan corporations under the provisions of the Edge Act, reorganization to some extent of the Federal Reserve System, national taxation, merchant marine and marine insurance, simplification and standardization of procedure in trade practice, enactment of a trade act with China, a bargaining tariff, education in foreign trade, transportation, agriculture, and a final paragraph counseling courage and tenacity in the pursuance of foreign markets.

Scientific Paper on Testing Gage Blocks

The Bureau of Standards has just issued a paper, or rather a technical abstract of a paper, on the interference methods for standardizing and testing precision gage blocks. The experiment which led to the preparation of this paper was made by C. G. Peters and H. S. Boyd, of the bureau. The paper gives some interesting as well as new features of this very absorbing operation and the apparatus used for calibrating standards and comparing other gages with these standards is illustrated by line drawings and is thoroughly explained. The complete paper may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents.

Bill to Supervise Weights and Measures

A bill regulating and controlling the manufacture, sale and use of weights and measures and of weighing and measuring devices has been introduced in the House by Representative Vestal, of Indiana, chairman of the Committee on Coinage, Weights and Measures The bill confers jurisdiction over weighing and measuring devices on the Bureau of Standards, of the Department of Commerce, with authority to pass on their various types.

Business Outlook in Foreign Markets

The gradual return to a healthy business condition in foreign markets is evidenced by the cable dispatches to the Department of Commerce from the market places of the world. Conditions seem to be improving in all quarters, particularly in manufacturing centers. Unemployment is gradually disappearing and a final resumption of normal conditions is awaiting the bolstering up of the financial condition of the various nations involved.

The situation in Sweden in the iron and steel market shows a slight improvement. Production is slightly increased and prices are tending toward stabilization. Iron and steel production for the first quarter of 1922 is summarized as follows: Pig iron, 67,400 tons; Martin ingots, 41,500 tons; rolled iron and steel, 49,900 tons. Several foreign orders received during the spring have caused a resumption of work in three or four iron and steel mills.

In England there are distinct signs of improvement in the automotive field. A record trade was reported in some quarters before the dispute arose between the Engineering Employers' Federation and the Amalgamated Engineering Union, which began on March 11. Most of the manufacturers of motor cars and motorcycles are members of the federation. Since the lockout they have been short of toolmakers and machinists.

In Japan the manufacturing industries in the iron and steel trade are gradually resuming. Iron and steel imported into Japan in 1921 amounted to 1,500,000 long tons, and this year present indications are that this amount will be greatly exceeded.

The prospects for the introduction of American tractors into the Netherlands at the present time are considered fair, though the market is limited. The matter of credit terms for the sale of tractors and farm implements is of little importance, as the farmers can well afford to pay for what they are willing to buy.

In Poland the automotive field is hampered by high prices. A high-class make of American automobile costs about 20,000,000 Polish marks, a sum which only four or five people in Poland could afford to pay. There is little demand for American trucks in Poland at the present time, especially since used trucks may be procured from army stocks at low prices. Also, the low quality and high price of gasoline and oil are not conducive to motor-car popularity. It is estimated that there are no more than 6,000 gasoline motor vehicles in Poland.

The American market continues to offer a profitable market for American goods. Tractors and all kinds of farm machinery find a ready sale in many of the southern republics. Mexico is also improving along these lines. All the implements and farm machinery used in the various agricultural regions in Mexico are imported from the United States and there is always a good demand among the farmers of the Yaqui Valley and also in the Mayo and Sonora Valleys.

Other markets show encouraging signs of resumption of business and it is expected that heavy buying will prevail when exchange rates are stabilized.

British Merchandise Act

An important bill amending the present merchandise mark act which prescribes the requirements for the marking of goods imported into the United Kingdom, has recently been submitted to the British Parliament, according to advices received by the Department of Commerce. The provisions of the act deal primarily with the marking of goods as to class and origin and are intended to protect British industries from unfair competition by foreigners. The act also prohibits the importation into the United Kingdom of goods to which there is applied a forged trade mark or description, or any goods bearing a trade mark of those manufactured in the United Kingdom. American exporters to the United Kingdom would do well to follow this bill and its course through the British legislature.

Duty on Auto Bodies

Automobile bodies recently imported have been held by the United States Court of Customs Appeals to be dutiable of 20 per cent as manufactures in chief value of metal. The merchandise had been assessed as automobile bodies, dutiable at 45 per cent. The Board of Appraisers, in considering the complaint of the importers, held the merchandise dutiable at 15 per cent as manufactures in chief value of wood. The court however held the merchandise dutiable at 20 per cent as manufactures in chief value of metal.

Diesel Engines on Swedish Railroads

A report from Consul W. H. Sholes, of Goteborg, Sweden, states that high operating costs on Swedish railways have caused a number of transportation companies in western Sweden to experiment with Diesel motor railway engines. Among these companies should be mentioned the Sarobanan (The Saro Railway Co.) and the Goteborg-Boras Jarnvag (Goteborg-Boras Railway Co.). In the light of the Halmstad Nassjo Railway Co.'s success with such engines it is not unlikely that they will be more generally adopted in this section of the country.

The first Diesel motor railway engine (75 hp.) was put in operation in Sweden in 1914 and has been in constant use ever since. Larger engines have since been found necessary, and now the 160-hp. type is preferred. Considerable savings in fuel consumption are said to have been effected, and the fact that only one attendant is required, as compared with two on a steam locomotive, is another argument advanced in its favor. Its advent seems to have set at rest the oft-expressed fear that such engines might not be quite safe on railways with great traffic.

American manufacturers of Diesel motor railway engines and similar substitutes for the steam locomotive should find this section of Sweden a prominent field for their products. A list of the State and privately owned railways in western Sweden may be consulted by interested parties on addressing the Transportation Division of the Department of Commerce, and referring to Exhibit No. 52451.

Austrian Industries Had Poor Year in 1921

The Department of Commerce has received an interesting report on Austrian industrial conditions from Consul C. H. Foster, of Vienna. The report states that the year 1921 was a somewhat difficult period for those Austrian industries making finished iron and steel goods. Prices increased considerably, particularly for files and rasps, wire ropes, ordinary wire, iron furniture, and machinery, so that exports became more and more difficult. Cables and wire ropes were almost barred from Czechoslovakia and Hungary.

At the beginning of the year orders were scarce in the wire, copper, and brass industries, as well as for tubings, tools, motors, presses and hydraulic plants, and agricultural machinery, but conditions became better toward the end of the year. Unfavorable conditions prevailed throughout the whole year for pumps, wire ropes, lifts, and elevators. Until spring conditions were good in those industries turning out pitchforks, cables, and Diesel motors, but toward the end of the year German competition grew threatening. A lack of raw material was felt in the industries for metal goods and plows.

Plenty of orders were received for piano wire, so that the one Austrian factory was well occupied. Plows, files, and rasps were in good demand. Cutlery was exported to the extent of 90 per cent of the production, the percentage being especially high for agricultural knives and saw blades. Locksmith's goods equaled only 80 per cent of their 1913 production but sold well. Screws and rivets, iron furniture, metal goods, machines, scales and weights, bicycles, and firearms were frequently ordered and these industries kept well occupied. The machine industry worked under favorable conditions; factories making specialties had many orders and exports were numerous.

Locomotive factories worked mostly for deliveries to other countries. In 1921, 300 locomotives were delivered, as against 211 and 144 in the two preceeding years, but difficulties in procuring raw materials were felt. To meet all demands some factories had to erect new buildings and make great investments. The Austrian railway-car factories produced one-third of their output for inland use and were, therefore obliged to work for export.

Pneumatic Tube Service in Postal Appropriation Bill

In consideration of the conference report on the postal appropriation bill for next year, the House adopted the Senate amendment for the transmission of mail by pneumatic tubes or other similar devices in New York and Brooklyn, at an annual expenditure not exceeding $18,500 per mile of double line of tubes, making a total appropriation therefor of $513,911. It is provided that either party to the contract may apply to the Interstate Commerce Commission for a revision of this rate before July 1, 1923, its decision to be effective after July 1, 1923, but in no case shall the rate exceed $19,500 per mile.

Kinsey Exhibition of Mechanical Equipment

Under the auspices of the E. A. Kinsey Co., and in the showrooms of that concern in the Kinsey Building, 331 West Fourth St., Cincinnati, Ohio, an exhibition of machinery and mechanical equipment will be held on June 7 to 10. The show will be a complete exhibition of machine tools, accessories, labor and time-saving devices of the latest models in design and construction. Over forty of the largest manufacturers of such equipment will be represented at the show, which is intended to benefit factory executies, purchasing agents, superintendents, foremen and master mechanics. Experts from the factories manufacturing the various equipment and tools will be on hand to demonstrate and explain.

There will be no selling during the exhibition, so that the entire time can be devoted to an undisturbed study of the machinery on exhibition.

Office Managers Meet at Washington

The third annual conference of the National Association of Office Managers was held in Washington, D. C., May 18 to 20. One hundred representatives of many of the largest concerns in the country were present to discuss principles of office management, and to exchange ideas looking to the more economical and efficient operation of large offices.

The meeting was addressed by speakers of note on such topics as: "Possibilities and Limitations of Psychology in the Office," by Dr. John B. Watson of New York; "United States Budget Bureau and Principles of Budget Making," by Gen. H. M. Lord, U. S. A.; "Personnel Work in the Office," by Dr. Charles R. Mann, of the War Department; and "Modern Office Planning," by Harry A. Hopf of New York.

The officers of the association are: President, F. L. Rowland, Gilbert & Barker Manufacturing Co.; first vice-president, G. R. Hulverson, Burroughs Adding Machine Co.; second vice-president, L. E. Stacy, Spirella Company; secretary, G. S. Childs, Alexander Hamilton Institute; treasurer, C. W. Kirkpatrick, Fisk Rubber Company.

Chemical Industries To Exhibit Machinery

The Eighth National Exposition of Chemical Industries will be held this year in the Grand Central Palace, New York City, during the week of September 11. It will follow immediately upon the fall meeting of the American Chemical Society.

The raw materials to be exhibited will be of the natural resources from out of the earth and above the earth. The machinery exhibits will consist of apparatus and equipment and instruments for control, precision, recording, gaging, measuring, and machinery for every mechanical operation in the manufacture of products from the raw materials. Many new things upon which manufacturers were working when the war ended, and which have since been more leisurely perfected, will be shown for the first time.

Engineering Council Recounts Its Achievements in 1921

The annual meeting of Engineering Council, of the Federated American Engineering Societies, was held in Pittsburgh May 26 and 27. It was the most successful meeting in the history of the council, and the reports of committees and officers showed great progress and recognition of the position of the engineer in public life. President Mortimer E. Cooley presided and in speaking of his tours throughout the country during the year, said that everywhere he found evidence that the federation idea was growing, and that substantial additions to membership might be expected in the near future. The most important discussion of the meeting was the registration of engineers, to control which laws have been passed, or are in process of legislation, in many states. The council expressed the opinion that such legislation may properly cover engineers and architects charged with the responsibility of public works, but not mining engineers. A resolution that the employment committee of the council go on with its investigation of the employment situation was adopted. The committee was requested to study and report any possibility of co-ordinating existing and local employment services into a national service. Another resolution adopted directs the council's committee on water power to place before the President the facts of the situation with regard to water power development in this country. A movement to conserve our national forests was set in motion by the appointment of a committee to study this phase of our national development. The board pledged its support to President Harding in his plan of government reorganization, and decided to keep up a nation-wide movement for the establishment of a Department of Public Works in the Cabinet. It was also brought out that committees are at work on a general policy of affiliation of American engineers with the engineering bodies of other nations. A movement is now on foot in Europe, led by Sir Robert Hadfield to form an Anglo-Saxon union of engineers, which shall include all the English speaking people of the world. Secretary Wallace's report recounted the achievements of the council during the past year. He gave some interesting figures, showing how the organization has helped the Government and business men in various ways.

Southern Metal Trades in Savannah

The fifth annual convention of the Southern Metal Trades Association is to be held in the Savannah Hotel, Savannah, Ga., June 19 and 20. This meeting will be devoted mostly to the hearing of reports from the officers of the association. Only two papers will be presented according to present arrangements. These are "Signs of the Times," by T. M. Cunningham, Jr., of Savannah; and "Sidelights on Cupola Practice," by Patrick Dwyer, editor, *The Foundry*, Cleveland, Ohio. G. F. Meehan, president of the association, will preside. The annual banquet will be held on the evening of the nineteenth in the banquet room of the hotel.

Invitation to Meeting of Construction Council

Lacking facilities at present for direct communication with the thousands of important men in the construction industry, the temporary directing committee of American Construction Council extends a personal invitation to each member of the industry to attend the organizing meeting in Washington, D. C., on June 19 and 20.

The step contemplated, that of bringing together for co-operation in behalf of the industry and of the public all the elements of construction activity—engineers, architects, labor, the contractors, the manufacturers and dealers, and the financial interests—is epochal in American industry. It deserves and promises to have, the full support of the entire industry.

Full details of the plan are set forth in a comprehensive pamphlet, procurable from the temporary office, 1053 Munsey Building, Washington, D. C. The meeting will be held in the Washington Hotel. Secretary of Commerce Hoover will preside. R. C. Marshall, Jr. is chairman of the temporary directing committee.

Advertising Conference at Milwaukee

The program for the first National Industrial Advertising Conference, to be held in Milwaukee from June 11 to 13, has been just announced by the chairman of the conference, Keith J. Evans, advertising manager of Joseph T. Ryerson & Sons, Chicago. At the technical session, the speakers have been selected from a variety of industries and professions in the country. Some of the papers scheduled for presentation are: "Advertising as a Factor in Inter-Industrial Marketing," by W. W. Coleman, president of the Bucyrus Company, Milwaukee; "What the Department of Commerce is Doing to Aid Inter-Industrial Marketing," by F. M. Feiker, vice-president, McGraw-Hill Company, Inc., formerly assistant to the Secretary of Commerce; "Cutting the Cost of Distribution or Marketing in its Relation to Industrial Development," by Congressman Anderson, of Minnesota; "Advertising in Its Relation to the Four Points of Contact in Industry," by Bennett Chapple, director of publicity, American Rolling Mills. Speakers at some of the other sessions will be: Charles H. MacIntosh, of LaSalle Extension University; J. C. McQuiston, manager, Westinghouse Electric and Manufacturing Co.; H. Colin Campbell, manager of publicity, Portland Cement Association; Morris W. Leith, formerly Hill, Clark & Co.

Power Plant Exposition in New York

Announcement has been made of the National Exposition of Power and Mechanical Engineering to be held at the Grand Central Palace, New York, from Dec. 7 to 13.

The exposition will immediately follow the annual meeting of the American Society of Mechanical Engineers and it is expected that the exhibits will supplement the programs and discussions at the professional meetings of the society.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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By an unusual coincidence last week included "Derby Day," "Memorial Day" and "Whitsuntide." The first is practically though not legally a holiday in England; the second, "Memorial Day," is widely observed as a legal holiday throughout the United States; and the third, "Whitsuntide," has become a vacation period in most of western Europe.

The result, in so far as business is concerned, was comparative quietude, of which we may take advantage to survey and interpret conditions. The revival has now reached the median stage and it is more difficult to read the future when things are on an even keel when they are at one extreme or the other.

At present every one is fairly cheerful. President Harding, and all his administration, is loudly proclaiming the advent of prosperity. Election day is approaching and there is, of course, a factor of political self interest in the cheerfulness, but there is also a substantial basis for it. As always, there are some things that are not as they should be but "normalcy" is not perfection and the ideal will not be attained this side the millenium. But good times are due to the dominance of the constructive spirit, and that spirit seems now to be spreading. It was thwarted at Genoa, but it has reasserted itself in the bankers conference at Paris as a result of which a loan of $1,000,000,000 will probably be made to Germany now that she has accepted the terms imposed.

Effect of the Loan

The stimulating and stabilizing effect that this loan will have in Europe is hardly appreciated in America as yet. It has already lifted sterling exchange to the highest figure touched since July, 1919, and even marks have advanced slightly in anticipation of German deflation.

That they can ever recover their prewar value seems impossible, but it is thinkable that a revival of speculative activity may carry them much higher, for at their present value of 38 cents a 100 the entire 142 billion marks now outstanding are worth only $539,000,000; this is hardly more than half the loan that is under consideration. If marks go up it is probable that the other depreciated currencies of the Old World would advance concurrently.

The result would be a sudden and substantial increase in the purchasing power of Eur . It is plain that this would mean much to America as well as to England and its tonic effect is to be reckoned with as a possible and a very important influence. Certainly the program of reconstruction in Western Europe seems sufficiently advanced to justify reliance upon its ultimate completion and there is reason to hope that as it progresses sane government may be established in Russia.

So much for conditions overseas. Turning from them to our domestic affairs there is equal reason for confidence. Unemployment continues to decrease, bank clearings are steadily improving, retail trade is gaining.

With the exception of wheat, which has declined sharply because the "May deal" has collapsed, the great agricultural staples are selling at prices that are fairly satisfactory. The steel mills are getting busier; some of them are working up to capacity. The automobile business is booming.

Railroad earnings for April were surprisingly good when the curtailment of coal traffic is considered. Good judges expect a further improvement after July 1 when the lower freight rates become effective.

The reduction in employees' wages ordered by the Labor Board has led some of the Brotherhoods to order a vote upon the question of striking, but no one expects that it will be anything more than a gesture. The textile strike in New England is gradually settling itself as the hands return to work and the mills reopen one by one. By "moral suasion" Secretary Hoover is trying to fix the price of bituminous coal at $3.50 f.o.b. West Virginia mines during the continuance of the strike. He may not succeed but if he fails Congress will probably give him the legal authority that he lacks in order to deal effectively with a very perplexing and difficult problem. Credit is abundant. Money is easy and the weekly statement of the Federal Reserve System shows a gain of one-half of 1 per cent in the reserve ratio, which now stands at 78 per cent. This is apparently due to a decrease of 40 millions in deposits for there has been no change in the amount of gold held.

Winter Wheat Promising

It is too early to say much about the condition of the crops, though the indicated yield of winter wheat is slightly in excess of last year, but barring the unforeseen and assuming a satisfactory harvest it seems reasonable to count upon good and improving business for at least six months. This will carry us up to and over the elections and while it is not to be inferred that their effect will be disturbing it is admittedly uncertain and business abhors uncertainty. With this conservatively optimistic view the security and financial markets seem to be in agreement. A renewed demand for bonds was met with a number of new issues, including a loan of $24,000,000 to the Republic of Bolivia, which was offered and well taken on a basis which yields 7.92 per cent.

The stock market has been relatively quiet. The Supreme Court has severed the Central Pacific from the Southern Pacific Railway, but the union forbidden would probably be legal under the Esch-Cummins Bill and it is doubtful whether the severance decreed will ever become a fact. The reorganization of the International & Great Northern has been completed. It probably presages the acquisition of that railroad by the Frisco.

The merger of the Republic Iron and Steel Co. with the Midvale and the Inland Steel Co. is also announced, but many legal hurdles will have to be cleared before it can be consummated. The Tobacco Products Co., the United Retail Stores Corporation and the United Cigar Stores Co. have also been put together, but the market effect of these combinations has been negligible, for speculators have ceased to believe that the whole can be made greater than the sum of all its parts.

This is one reason why the recent advance in securities represents an appreciation of real rather than fictitious values. It rests upon the substantial basis of intelligent investigation, for at no time since it commenced last January has there been much reckless speculation. Therefore there is reason to expect a further advance as the prosperity of the country is reflected by increased earnings, and it is among the railway stocks that the most striking examples of the relation between larger corporate profits and higher market values will probably be found.

Commodity Markets Firm

The commodity markets call for but little comment. Sugar has been conspicuously firm and substantially higher prices seem indicated by the rapidity with which the supply has been absorbed. Rubber is also in better demand at a slight advance. Cotton halts around 20 cents with the trade in doubt as to the accuracy of the many crop reports, public and private, that have been issued. The statistics indicate ultimate scarcity, but a present sufficiency and with every one bullish experience suggests caution rather than blind confidence in a further advance.

The sensational losses sustained by those who were long of May wheat have had a sobering effect upon the Chicago Board of Trade, but the market there now has a healthier tone and present prices are probably below intrinsic values. Petroleum and most of its products are higher. The supply is increasing but so is the demand.

The dry goods trade in both woolen and cotton goods is more active and prices are higher. Small stocks and a shortage in many lines are reported. An unusual demand for women's footwear is noted, though men do not seem to need as many shoes as formerly. Tariff uncertainties are creating some areas of dull trade in imported goods and the bonus bogy has been revived.

But the vagaries of Congress and the coal strike are about the only clouds in the June skies. They are not sufficiently dark to obscure the sunshine. The public has become accustomed to them. They are no longer feared, and those who are unafraid are not easily depressed.

Machinery Exports Drop Lower in April

Exports of metal-working machinery dropped back again in April. The value of all exports of such machinery in April of this year was $786,951. This is a quarter of a million dollars less than in March and but little more than one-third of the value of such exports in April of 1921. The detailed figures, taken from the work sheets just compiled by the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS OF METAL-WORKING MACHINERY

	April, 1921	April, 1922
Lathes	$335,614	$45,608
Boring and drilling machines	.....	25,280
Planers, sharpeners and slotters	.....	25,685
Bending and power presses	.....	644
Gear cutters	.....	3,307
Milling machines	.....	17,591
Sawing machines	.....	1,329
Thread cutting and screw machines	.....	15,229
Punching and shearing machines	.....	8,700
Power hammers	.....	5,723
Rolling machines	.....	221
Wire-drawing machines	.....	808
Polishing and burnishing machines	.....	2,879
Sharpening and grinding machines	84,946	67,804
Chucks, centering, lathe, drill and other	.....	10,105
Reamers, cutters, drills and other parts for machine tools	.....	122,851
Pneumatic portable tools	.....	17,919
Foundry and molding machinery	.....	35,834
Other metal-working machinery and parts of	.....	379,434
Total metal-working machinery	$2,055,422	$786,951

IMPORTS

Machine tools	$29,412	$10,818

AUTOMOTIVE EXPORT FIGURES

	April 1921	April 1922	Up to May 1 1921	Up to May 1 1922
Passenger cars	$2,931,233	$4,822,737	$15,338,322	$13,236,698
Trucks		647,747	5,346,896	2,054,970
Parts	3,195,698	3,933,438	19,399,931	12,428,855
Total	$6,126,931	$9,403,922	$40,085,149	$27,720,523

Metal Trades Grow in San Francisco District

"Payrolls are what make for improvement in banks, stores, buildings, homes, education and culture, and the manufacturing metal trades provide the steadiest and biggest yearly payrolls of any industry."

This statement of the importance of the metal trades industry in San Francisco's economic life was made by Fred Metcalf, commissioner of the California Metal Trades, in a discussion of this subject prepared for the San Francisco Chamber of Commerce. The recently completed industrial survey of 1920 business made by this chamber was the first definite and planned attempt at such local inventory, and while it was probably incomplete because of the newness of the idea, it showed very concisely the principal sources of the city's income.

With only 380 metal trades firms reporting, the survey showed the metal group near the head of the list in point of payroll, number of men employed and value of plant equipment. The totals make impressive reading for business men. The $28,349,763 paid to the 21,816 workmen in wages was either spent in the stores, or for homes, or deposited in savings banks. A good part of the $137,281,180, representing the value of the products, was in local supply houses and by them put into circulation on their payrolls.

Plant and equipment represent an investment of over fifty million dollars, which is being devoted to build up an industry to compete with other sections of the country.

A large part of the machine shop equipment in San Francisco is up to date, says the report, but more machinery is needed in other trades and particularly automatic machinery for quantity production.

Briefly summarized, the metal trades industry of the San Francisco Bay District is today equipped to handle practically everything that is required in its line. The report further states that there are five shipyards, equipped with accommodations for the smallest up to the largest vessel. There are six marine ways that will handle up to a 5,000-ton ship. All of the six larger yards are equipped to do machine and boiler work, and the three largest have fully equipped machine and boiler shops to handle jobs of any nature and size.

There are forty-five foundries, both iron and brass. Five steel mills are in operation. Mining machinery, pumps, pulleys and conveyors, refrigerating equipment, overhead cranes, hoisting machinery, boilers, tanks, compressors, canning machinery, hydraulic and electric presses, tools, gears, saws, bolts, nuts, elevators, heating plants, oil-burners, dredging equipment, cars and running gear, filters, water wheels and such lines are specialized in by approximately thirty-five firms in San Francisco.

Selling the World

Through the efforts of a committee of trade association executives, appointed by Gordon Lee, chief of the automotive division of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, a booklet has just been issued by that department, entitled "Selling the World." It is really a piece of sales promotion literature and this is probably the first time that a Government department ever used this means of offering its services to the industry which it represents. The report outlines the opportunities available for American automotive manufacturers in international trade, and shows how practical commercial assistance is being given by the automotive division of the Bureau of Foreign and Domestic Commerce, under direction of Mr. Lee.

Associations which aided in the preparation of this book were: The National Automobile Chamber of Commerce; Motor and Accessories Manufacturers Association; Automotive Equipment Association; Motorcycle and Allied Trade Association; National Association of Engine and Boat Manufacturers; Association of Automotive Equipment Manufacturers; The Black & Decker Manufacturing Company.

British Manufacturer Here on Business Trip

Arthur Hungerford Pollen, chairman of the board of Burton, Griffiths & Co., Ltd., and of the B. S. A. Tools, Ltd., of England, has arrived in the United States to visit the manufacturers which his company represents in Great Britain.

Mr. Pollen is a writer of international reputation on naval subjects, is a graduate of Oxford University, a keen student of economic developments and for many years has been a director of important British manufacturing corporations. He is also chairman of the executive committee of the British Commonwealth Union, an association of leading manufacturers and industrial corporations in Great Britain organized for the study of legislative questions affecting industry, and for presentation of economic facts to the public. Mr. Pollen is a director of the Linotype and Machinery, Ltd., and also a director of the Mergenthaler Linotype Co. of New Jersey. The companies affiliated with Burton Griffiths & Co., Ltd., and the B. S. A. Tools, Ltd., are: Wm. Jessop & Sons, Ltd., Brightside Works, Sheffield, England; B. S. A. Tools, Ltd., Sparkbrook, Birmingham, England; B. S. A. Guns, Ltd., Small Heath, Birmingham, England; B. S. A. Cycles, Ltd., Small Heath, Birmingham, England; B. S. A. Company, Ltd., Small Heath, Birmingham, England; the Daimler Co., Ltd., Coventry, England.

Engineer Delivers Books to Russian Library

Theodore Weinshank, engineer, of Indianapolis, and member of the American Society of Mechanical Engineers, has just returned from Russia, whence he went as the emissary of the society, to deliver the nucleus of a technical library of 810 volumes of books on scientific and engineering subjects. Mr. Weinshank delivered a package of thirty volumes of up-to-date engineering books at the Bolshevik headquarters at Kremlin. There he talked to the head of the mechanical rehabilitation division of the Bolshevik government, G. Krjijanovski. The library, which will consist of the full 810 volumes when complete, will be in English, French and German, and will be opened at Kremlin, in charge of a Soviet official. The society believes that it will be a good investment for American manufacturers, because it will make it possible for Russian engineers to so develop their industry that the need for American machinery and manufactured products will be necessary to the complete reorganization of their industries.

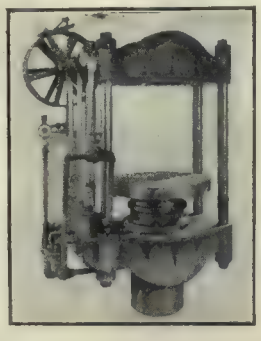
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Press, Tire, Hydraulic

West Tire Setter Co., Rochester, N. Y.

"American Machinist," February 23, 1922



The press is used in pressing solid rubber tires on and off automobile truck wheels. A ram 16 in. in diameter gives a maximum pressure of 250 tons at the platens. The press is driven by belt on a 30-in. pulley running at 175 r.p.m. The pump, located at the side of the lower resistance member, has three plungers, one large and two small. Platens, 42 in. in diameter; maximum vertical distance between platens, 37 in. Ram stroke, 33 in. Vertical strain rods: diameter, 4¼ in.; distance apart, 43 in. Height, 9 ft. 3 in.

Drive, Line Shaft, Worm

Cleveland Worm and Gear Co., Cleveland, Ohio

"American Machinist," Feb[illegible] 23, 1922

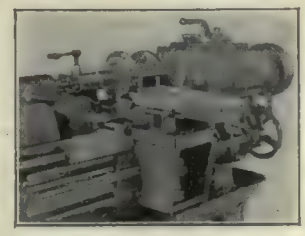


The connection between motor and shaft through the worm and worm wheel eliminates speed fluctuation due to belt slip. With the large speed reduction ratio, a motor operating at 1,800 r.p.m. can be used, even for shafts running at low speed. The reduction unit is mounted on a bed plate with the motor, and the whole attached to the ceiling, or placed upright on a platform. The drive mechanism is compact and completely inclosed.

Attachment, Lathe, Back-Facing, Semi-Automatic

Seneca Falls Manufacturing Co., Inc., Seneca Falls, N. Y.

"American Machinist," February 23, 1922

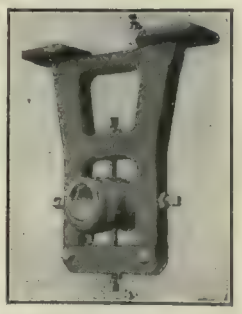


The device is adapted to bevel gear work, bevel cuts being made at the same time the shank is turned. It has nine in-feeds from 0.003 to 0.050 in. per spindle revolution, and 27 reverse feeds from 3 to 15 times the forward feed, to secure the proper timing for back-facing, necking, under-cutting and grooving. The in-feed stop will reverse automatically, and the out-feed automatically stops at the end of the cycle.

Hanger, Line-Shaft, Pressed-Steel

Dodge Sales and Engineering Co., Mishawaka, Ind.

"American Machinist," February 23, 1922

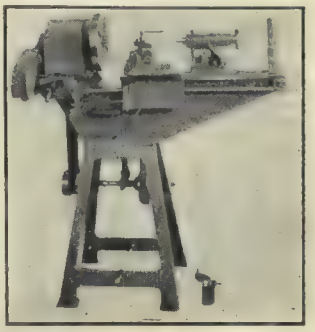


The hanger is intended for general use where extreme vibration is not encountered, and is not adaptable to heavy-duty. It is light and strong, being made of sheet steel pressed to shape and riveted and bolted together. The bearing floats in the hanger so as to align itself to the shaft. By setscrews with locknuts, the bearing can be brought to the proper height and lateral position.

Lathe, Gap, 11 x 24 In.

Artisan Manufacturing Co., Cincinnati, Ohio

"American Machinist," February 23, 1922

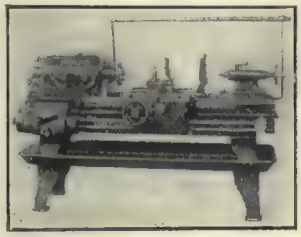


The lathe has a quick-change feed box containing the gears and a clutch for engaging and disengaging the feed, operated by a lever. The double-crank handle at the right of the feed box is for manipulating the feed by hand. Standard threads from 8 to 224 per in. can be cut, including a 11½-in. pipe thread. The cross-slide can be swiveled for turning angles. A ½-hp. motor may be attached to the machine. Sliding back gears with a three-step cone pulley give six speeds, in geometrical progression. Swing: over carriage, 6½-in.; in gap, 16-in.

Lathe, Toolroom, 14-In., Sundstrand

Rockford Tool Co., Rockford, Ill.

"American Machinist," February 23, 1922

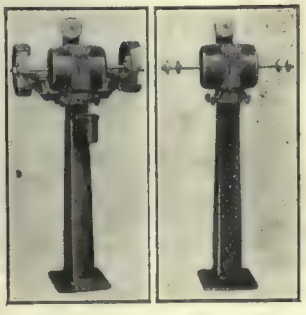


The lathe can be furnished with either cone or geared headstocks. The 4-step cone headstock is single back-geared with ratio of 8½ to 1, and takes a 2½ in. belt. The carriage is controlled by a handle on the stop rod at the right of the apron. When cutting threads, the carriage can be automatically stopped by collars on the stop rod. A threading dial is furnished for thread cutting. Forty-eight thread and feed changes ranging from 1½ to 92 are provided. Swing: over bed, 15 in.; over carriage, 8¾ in. Feeds, 6 to 268 r.p.m. per inch. Floor space, 27 x 82 in. Weight, 2,500 lb.

Grinder and Buffer, Electric

Columbia Manufacturing Co., Belleville, Ill.

"American Machinist," February 23, 1922

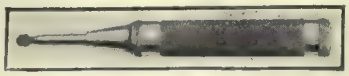


The machine is used for sharpening tools and for general light machine shop or garage grinding. It is driven by a ½ hp. electric motor, operating at 1,800 r.p.m. on single-phase, alternating current of 60 cycles and either 110 or 220 volts. The grinder is supplied also for bench use, and is equipped with adjustable tool rests, wheel guards and water pot. Wheels 8 in. in diameter and 1 or 1½ in. thick are used. A switch is mounted on the motor. Spindle: ⅝ in. diameter; length, 23 in.; height from floor, 36½ in. Weight, 145 lb.

Hardness Testing Punch, Portable, "Auto Punch"

Case Hardening Service Co., 2283 Scranton Road, Cleveland, Ohio

"American Machinist," January 19, 1922



The device is made in two sizes, the 12-in. size for work on steel, iron and hard metals, and the 6-in. size for sheet brass and thin metals. By pressure on the barrel the spring hammer is released and strikes the ball. The resulting depression in the work is then measured, as in the Brinell test. The tested piece must rest on a solid support, but usually can be tested in position. The hardness of steel plate, stampings, forgings and castings, as well as that of case-hardened and heat-treated work, can be determined. A pressure of 850 kg. on a ½-in. ball gives a depression of the same size as that of the 12-in. punch when testing mild steel.

[This clipping supersedes the one appearing on page 688g.]

Tractor Company to Build Motor Car

The Cleveland Tractor Co., well known as makers of Cletrac tractors will shortly be reorganized as the Allyne-Zeder Motors Co., and will take up the manufacture and distribution of a new six-cylinder automobile, which is being designed by F. M. Zeder, formerly chief engineer of the Willys Corporation and also at one time connected with the Studebaker interests. The new corporation will have a capital stock of approximately $10,000,000.

A subsidiary company, to be known under the old name of the Cleveland Tractor Co., will continue the marketing of Cletracs through the present distributors and dealers. A new one-ton truck, designed by R. H. White, will be added to the Cletrac line in the near future. Two of the Studebaker family will return to the automobile industry in the organization of the Allyne-Zeder Co. Clement Studebaker, Jr., and his brother, George M. Studebaker, former directors of the Studebaker Corporation, will be stockholders in the new automobile company. Rollin H. White, president of the Cleveland Tractor Co. and a director of the Aluminum Manufacturers' Inc., will be president of the new corporation. Other officers will be: R. T. Hodgkins, vice-president and general sales manager; A. F. Knobloch, vice-president and works manager; F. M. Zeder, vice-president and chief engineer; T. D. Fleming, treasurer: E. D. Wilson, motor car sales manager; O. R. Skelton, assistant chief engineer; Carl Breer, assistant engineer; and J. O. Hahn, associate engineer.

Promoters of the reorganization expect that a production of 12,000 automobiles and 12,000 tractors will be reached in 1923.

Business Items

The name of the Napier-Bliss Co., Meriden, Conn., has been changed to the Napier Co. Officers of the company will remain as follows: J. H. Napier, president; W. E. Bliss, vice-president; H. M. Smith, secretary; F. W. Rettenmeyer, assistant secretary; and E. A. Schwartz, sales manager.

The Asa S. Cook Co., of Hartford, Conn., has opened an office in Room 505, Superior Bldg., Cleveland, Ohio. Ernest W. Duston is in charge.

The New Process Gear Co., a subsidiary of the Willys Corporation has been awarded a contract for gears for the Durant car. The plant is now running night shifts to keep up the production schedule.

The Eastern Brass and Ingot Corporation, a New York corporation maintaining a brass reclaiming plant in Waterbury, Conn., has gone into the hands of a receiver. G. E. Dalbey, former metallurgist of the company, has been appointed receiver by Judge Edwin S. Thomas of the United States District Court. It was announced that the plant will be closed down for several months.

The Pioneer Metal Goods Corporation, 317 West 125th St., New York, has filed notice of dissolution.

The General Steel and Machinery Co., Detroit, Mich., has arranged for a change of name to the General Steel Corporation, to operate with a capital of $50,000.

The Cleveland Duplex Machinery Co., Inc., of 1224 West Sixth St., Cleveland, Ohio, has been appointed the exclusive representative of the Diamant Tool and Manufacturing Co., Inc., of Newark, N. J. The territory included in the agreement takes in all of Northeastern Ohio.

The Spare Turn Tractor Co., Norfolk, Va., manufacturer of motor tractors, has filed notice of increase in capital from $1,000,000 to $2,000,000, for proposed expansion.

The Illinois Wire and Cable Co., Sycamore, Ill., has arranged for an increase in capital to $450,000.

The Bloomsburg Locomotive Works, Bloomsburg, Pa., recently organized, is said to be arranging for operations at the plant of the Bell Locomotive Works. Improvements will be made in different departments.

The Worm Piston Ring Co., 1002 First National Bank Building, Detroit, Mich., has been organized under state laws with a capital of $50,000, to operate a plant for the manufacture of piston rings, automobile parts, etc. The company is headed by Emil Kottusch, Edgar J. Geist and J. Charles Wood, 4746 Second Ave., Detroit.

The Northwest Foundries, Inc., Rochester, N. Y., has filed notice of increase in capital to $250,000 for proposed expansion.

Officials of the Underwood Typewriter Co., Hartford, Conn., have voted to continue the profit-sharing system at the plant, making the fifth year of operation under the bonus plan. Employees who will share during the present year will include those who have been connected with the company continuously for three years prior to Jan. 1, 1922. As an extension to the plan, arrangements have been made to permit employees who have been with the company for one full year, prior to Jan. 1, to subscribe to either the common stock of the corporation or participation certificates.

Plans for developing the tap, die and screw plate business of the Gardner-Bryan Co., Cleveland, Ohio, are included in the incorporation of the Gardner Tap and Die Co., that city. The new organization will be headed by F. W. Wood, president of the Wood & Spencer Co. and the Cleveland Castings Pattern Co. Associated with him will be J. M. Gardner, vice-president and sales manager of the Gardner-Bryan Co., who will be vice-president of the new company; R. H. Smart, also of the old concern, as treasurer; and D. B. Miller, of the Wood & Spencer Co., as secretary.

The Star Welding Works, at New Orleans, La., has been purchased by Claibourne Andrews and Edward Pickett. A general reorganization of plant and methods will be made.

The Tuthill Supply Co., of Hartford, Conn., has been incorporated under the laws of Connecticut to deal in mill supplies, machinery, etc. The capital stock of the concern is $50,000 and the incorporators are: William D. Tuthill, of 41 Brownell Ave., Hartford; J. C. Kirk, of Hartford; and H. W. Stacy, of Springfield, Mass.

The Rensselaer Machine Co., Inc., has been organized at Rensselaer, N. Y. to manufacture tools, machinery and factory equipment. Incorporators are Henry Billings, 19 Cleveland St., Albany, N. Y.; W. E. Gordon and H. M. Van Alstyne.

The foundry and pattern shop of the Turner-Frick Gas Engine Works, at Sharon, Pa., has been purchased by a group of foundrymen and reorganized as the Star Foundry and Machine Co. Directors include Fred Lutz, J. A. Turner, Joseph Stahl and Lawrence Conway, of Sharon.

Announcement has been made of the merger of the Christopher & Simpson Gear Works, of St. Louis, Mo., with the Decatur Bridge Co., of Decatur, Ill. The new organization will be known as the Mississippi Valley Structural Steel Co., and will have a capital of a million and a half dollars.

The Blake-Fitchburg Pump Co., of Fitchburg, Mass., will move its entire equipment to a new plant in Akron, Ohio.

Worthington Pump and Machinery Corporation has purchased the drawings and patterns covering centrifugal pumps and pumping machinery manufactured by the Camden Iron Works, Camden, N. J.

United Alloy Steel Corporation has taken over the Canton Sheet Steel Co., owned by the Hydraulic Steel Co., of Cleveland, it was announced by E. A. Langenback president of United Alloy. By taking over the new company, 12,000 to 15,000 tons will be added to United's production.

Personals

CHARLES S. CRAWFORD has been appointed chief engineer of the Stutz Motor Car Co. of America, Inc., Indianapolis, Ind. He has at different times been connected with the Lozier, Cole and Premier companies.

B. L. MORGAN has been appointed superintendent of the Erie Specialty Co., Erie, Pa.

JOHN F. SCHURCH has been elected a vice-president of Manning, Maxwell & Moore, Inc., of New York. He will be in charge of the Western sales division, with headquarters in the company's Chicago office at 27 North Jefferson St.

NORMAN R. SEIDLE has resigned as assistant general manager of the Jas. G. Heggie Co., of Joliet, Ill., to become works manager of the General Boilers Co., Waukegan, Ill.

FREDERICK R. PRATT, machinery construction superintendent in Japan for the Whitin Machine Works, manufacturer of cotton mill machinery, of Whitinsville, Mass., left the United States on June 6 for the Orient. Mr. Pratt has been in the United States a short while visiting the plant in Whitinsville.

B. H. BRISTOW DRAPER, vice-president of the Draper Corporation, manufacturer of cotton mill machinery, Hopedale, Mass., sailed from New York recently on a business trip to Europe.

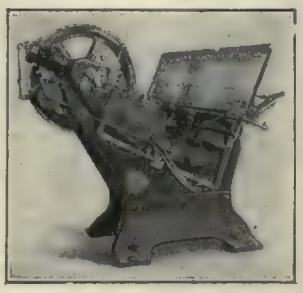
HAROLD P. DAHLQUIST has been promoted to the position of office manager of the Chicago branch office of the Walworth Mfg. Co., wrench manufacturers, Boston, Mass.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

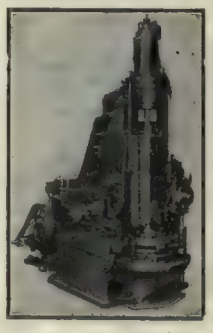
Press, Punch, Stagger-Feed, Automatic, Inclined, No. 564-A.
Adriance Machine Works, Inc., Brooklyn, N. Y.
"American Machinist," March 2, 1922

The machine is intended for the production of cans, small shells and jar closures. Lithographic designs can be accurately fed and registered. The scrap is ejected automatically and cut into skeleton frames. Due to the staggered feed arrangement, blanks are punched out with but a thread of metal between them. Only one die is used. The speed is obtained by the continuous action of the punch. The sheet carrier can travel in either direction, holes being punched on both the forward and back movements.



Shaper, Gear, tiple, Vertical-Spindle, Down-Stroke, 6-A
Stevenson Gear Co., Indianapolis, Ind.
"American Machinist," March 2, 1922

The machine operates as a vertical shaper or slotter, except that the tools are stationary and the gear blanks are reciprocated past them. A feed mechanism brings the tools gradually to depth on successive cuts, and an indexing mechanism rotates the gear blank an amount equal to one tooth at every stroke of the ram. The toolhead, a flat steel plate 30-in. in diameter, has a hole in the center and a number of radial grooves in its face. Each machine has two toolheads, one being used while tools on the other are sharpened and reset. Driving power is furnished by a motor in the rear while power for elevating the ram is obtained from a small motor mounted at the back at the right.



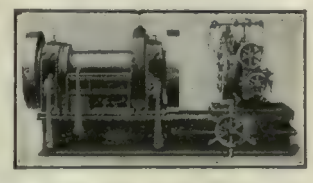
Die, Re-Threading, Hexagon, for Ford Hubs
Greenfield Tap and Die Corporation, Greenfield, Mass.
"American Machinist," March 2, 1922

The die is 2⅛ in. in diameter, and has 24 threads per inch. There are eight flutes. The tool is for the use of repair men to refinish the threads on the hub. The threads may thus be put in proper condition after they have been injured.



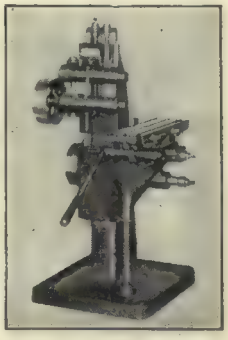
Threading and Cutting Machine, Pipe, 12-In.
Landis Machine Co., Waynesboro, Pa.
"American Machinist," March 2, 1922

The machine uses two dieheads and may be equipped for threading line pipe, oil well casing and hydraulic pipe, or to thread and cut pipe as small as 2½ in. It has a normal range from 4 to 12 in. pipe. The power traverse movement operates either forward or backward, controlled by a lever. Automatic stops prevent the diehead from coming in contact with the chuck, and the carriage from running off the guides. The reamer is fed to the pipe by rotating the cutting-off feed handwheel. Eight variations of speed can be obtained in the speed box.



Milling Machine, Hand, Duplex
Superior Machine and Engineering Co., Detroit, Mich.
"American Machinist," March 2, 1922

The machine is used for slitting step-type piston rings, for sawing apart babbitt-lined automobile crank-shaft bearings and for milling two keyways or slots at the same time. It is driven from the main-line shaft, or can be furnished with a 1½ hp. motor. Graduated dials are provided on all adjusting screws for indicating accurate adjustments. The table is operated by a hand lever, through a rack and pinion. Weight, 900 pounds.



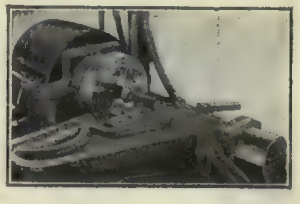
Torch, Cutting, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," March 2, 1922



The torch is lighter than the former model, and has two tubes instead of three connecting the head with the handle. Oxygen and acetylene are mixed in a chamber between the handle and the head in a ratio controlled by two needle valves. A special tip is used. The back end of the torch can be removed for cleaning. The number of preheating holes varies from two to six, depending on the combustible gas, the application and the metal to be cut. Bent tips for cutting off rivets are furnished. Butane, hydrogen or even illuminating gas, may be used.

Spindles, Grinding Machine, Belt or Air-Driven, Parker
Ex-Cell-O Tool and Manufacturing Co., 1214 Beaubien St., Detroit, Mich.
"American Machinist," March 2, 1922

The spindles, used for very high speeds, can be furnished to fit any make of grinding machine. A special mounting holds the spindle. The turbine is at the right, inside the cylindrical case. The steel rotor is equipped with thirty buckets on its periphery to which air is carried through two nozzles. Air pressure varies from 40 to 60 lb. per sq. in., depending on speed, which may be as high as 100,000 r.p.m. The belt-driven spindle has two ball bearings for both the spindle and the pulley shaft. No belt pull is placed on the spindle.



Chuck, Drill and Tap, No. 12
SaveAll Tool Co., 49 River St., Waltham, Mass.
"American Machinist," March 2, 1922

The chuck has a friction drive, a positive safety device and a No. 2 Morse taper shank. Its capacity is from ⅛ to ⅜ in. Collets can be furnished with the size of hole required to hold the drill. The drill is fastened in the collet by a hollow-head setscrew. The device is equipped with a shearing pin and allows drilling at high speed.



Clip, paste on 3 x 5-in. cards and file as desired

T. M. HAMER has recently joined the general sales department of the Gilbert & Barker Manufacturing Co., Springfield, Mass., and will handle the company's interests in Montreal, Canada.

C. C. WELLS, formerly of the Butterfield division, Union Twist Drill Co., Derby Line, Vt., has assumed charge of production for the Vermont Tap and Die Corporation, Newport, Vt.

HENRY WANNAMAKER, formerly of the New York Central Railroad, is now superintendent of motive power for the Boston & Albany Railroad.

FRANK GIBBONS, who has been in the general offices of the Central Steel Co., Massillon, Ohio, for a number of years, has been appointed sales manager for the Cleveland district.

C. C. UPHAM has been elected a director of the Superior Sheet Steel Co., Canton, Ohio. He succeeds E. W. Stevens, who resigned.

WILLIAM J. MERTEN, metallurgical engineer of the Westinghouse Electric and Manufacturing Co., has been elected vice-chairman of the Pittsburgh chapter of the American Society for Steel Treating.

HARRY T. BUSICK, formerly export manager for Young, Corley & Donald, Inc., 115 Broadway, New York, is going abroad to introduce American metal-working machinery in continental Europe. His headquarters will be in Paris. Mr. Busick is undertaking this venture solely on his own account, having no connection with any export firm.

A. H. G. FOKKER, famous Dutch airplane manufacturer, has arrived in the United States to introduce two of his latest model air machines.

Book Reviews

Manual for Engineers. By Charles E. Ferris, B. S., Dean of the College of Engineering, University of Tennessee. Published by the University Press, Knoxville, Tenn. Price 75 cents.

This book, which is pocket size, is in its twenty-fourth edition and contains about fifty tables and other data for engineers and business men. In addition to the tables there are paragraphs here and there which explain the value of education to the individual and to the state, and the value of manual training to negroes. The author states that the object of these paragraphs is to bring before the minds of men who control the affairs of the South, the strongest possible arguments in favor of technical education as a means of developing their resources.

The tables are very complete and cover an unusual variety of engineering data, including: bending moments and shearing force, properties of saturated steam, chimney sizes for boiler horsepower, tensile strains of bolts, calorific values of fuels, draft capacities, logarithms, square and cube roots, areas, specific heats, properties of copper wire, screw thread sizes, equivalent electrical and mechanical units, wiring for circuits and for motor service, as well as interest tables. The advertisements are so worded that they furnish additional information.

Heating and Ventilating. By the late John R. Allen and J. H. Walker. Second edition. Green cloth boards. Three hundred twenty-five 6 x 9-in. pages, numerous illustrations and tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City. Price $3.50.

The second edition was written because of the advances in heating and ventilating that have been made during the last few years. Much of the new material was taken directly from Prof. Allen's writings while director of the research laboratory of the American Society of Heating and Ventilating Engineers during the last year of his life. The book is offered as a text-book for use in engineering and architectural schools and as a handbook for the practicing engineer and architect.

For thorough and exact treatment this volume is to be highly recommended. Equal care has been taken with text and illustrations. Beginning with the subject of heat, the methods of heating and kindred subjects are treated including heat losses from buildings, hot-air furnace heating, properties of steam, radiators, steam boilers, steam heating systems, pipe fittings, valves and accessories, steam piping, hot-water systems, temperature control.

That part of the book devoted to ventilation includes the consideration of air and its properties, fan systems for various types of buildings, design of fan systems, air-washers and air conditioning, central heating.

The appendix includes twenty-six tables that give data on coefficients of heat transmission through building materials and static pressure and capacities for fans.

Better Business Libraries, Talks with Executives—By Louise B. Krause, Librarian. H. M. Byllesby & Co., Chicago, The Indexers Press. Cloth; 5 x 7 in.; pp. 98. $1.30

Many valuable suggestions for the formation, arrangement and use of business libraries are given in this volume. The first two chapters deal with the why and the function of business libraries. The next one is a good plea for the employment of trained librarians. There are chapters on books, periodicals, indexes and digests of periodicals, financial and trade services, government publications (unfortunately confined to Federal Government only), library arrangement and putting business libraries to work. The book deserves the careful attention of all business houses that have or ought to have a good library.

Pamphlets Received

Pistons. Aluminum Manufactures, Inc. Cleveland, Ohio. A reference book for dealers, salesmen, garagemen, mechanics and repairmen. It gives many facts concerning aluminum pistons with explanations of all statements made. The subject matter is divided into sections covering functions of the piston, advantages of aluminum pistons, piston troubles, design, machining aluminum pistons and advantages of lynite pistons. The book has a real message to automotive men.

Professional and Business Books: Scovelle, Wellington & Co., Boston, Mass. A very valuable pamphlet compiled by this company, containing a list of 400 books on accounting, engineering and business topics. Considering the great number of such books published today, this selected list should be of great assistance to anyone seeking to procure a library of high-class reading matter.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A government official in Mexico desires to secure the representation of firms for the sale of construction material (iron and steel), wire cable, plates for shipbuilding, rivets, etc. Quotations should be given f. o. b. New York or New Orleans. Reference No. 2023.

A request has been received from a firm in Sweden desiring to purchase and secure an agency for machinery, tools, pipes and fittings and sanitary appliances. Quotations preferred f.o.b. New York. Reference No. 2066.

A merchant from New South Wales, Australia, is in the United States, and wishes to be placed in touch with manufacturers of agricultural machinery, railway equipment, and other lines which would find a market in that country. Reference No. 2099.

Iron works in Palestine desires to purchase and secure an agency for machine tools, small tools, ice-making machinery, and agricultural machinery. Quotations should be given c.i.f. Jaffa. Reference No. 2018.

A mercantile firm in England desires to secure an agency or the sale of machines for mechanically filling and weighing into sacks from the floor level, granular materials, particularly cement. Quotations preferred c.i.f. English port. Reference No. 2026.

An agency is desired by a firm in Italy for the sale of automobiles and motor cycles, typewriters, and calculating machines. Quotations should be given c.i.f. Italian port. Reference No. 2051.

Trade Catalogs

Thermometers and Pyrometers. Arthur Sachsse Corporation, 6 West 32nd St., New York City. Pamphlet describing a line of Keiser & Schmidt thermo-electric remote-control thermometers and pyrometers.

Cleveland Tramrail Systems. Cleveland Crane and Engineering Co., Wickliffe, Ohio. A catalog illustrating by a series of folders the working of a Cleveland tramrail system in automatic dipping and painting processes.

Ingersoll-Rand Oil Engines. Ingersoll-Rand Company, 11 Broadway, New York City. Bulletin No. 10,004, describing the Price Type "PO" oil engine. The features of this engine are the shape of the combustion chamber and the arrangement and construction of the spray nozzles used for direct-injection of fuel. The engine is illustrated in various stages of completion, showing the individual important parts.

Cross Gear Tooth Rounding Machine. Cross Gear and Engine Co., Detroit, Mich., Circular describing the gear tooth rounding machine made by this company for rounding spur gears, bevel and spiral gear pinions, and for removing burrs on large gears.

Heat-Treating Equipment. The Brown Instrument Co., Philadelphia, Pa. Circular illustrating use of Brown pyrometers and other apparatus in heat-treating operations of manufacturing plants.

Powdered Fuel Equipment. Grindle Fuel Equipment Co., Harvey, Ill., Bulletin No. 4 containing 40 pages of text and illustrations showing various applications of Grindle powdered fuel equipment.

Flexible Shaft Equipment. The Hergi Manufacturing Co., 250 Fifth St., Bridgeport, Conn. Catalog No. 16. describing a line of flexible shaft equipment especially adapted for grinding and screwdriving mechanisms. Several types are illustrated, as well as parts and special attachments for doing different kinds of work.

Catalogs Wanted

The Foreign Trade Department of the Banca Commerciale Italiana, 62-64 William St., New York City, would like to receive catalogs, price lists, statistics and photographs of American-made aircraft, engines, airships, accessories, materials and supplies.

Forthcoming Meetings

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

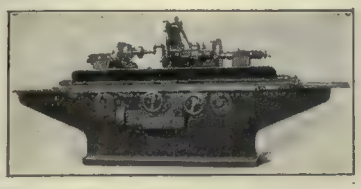
Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

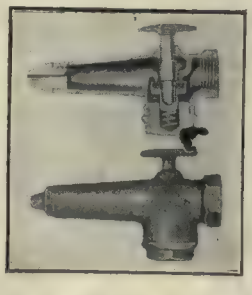
Patented Aug. 20, 1918

Grinding Machine, Automotive Parts, Power or Hand Feed
Cincinnati Grinder Co., Cincinnati, Ohio
"American Machinist," March 2, 1922



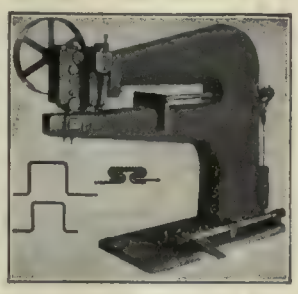
The power-feed machine provides power traverse and automatic reverse to the table, and automatic in-feed to the grinding wheel. The hand-feed machine lacks these, but has fast and slow hand traverse movements. Two back rests with wooden shoes, two adaptors for holding flanged-end cranks, two crankheads, and a universal piston fixture are furnished. For plain cylindrical grinding, footstock and headstock centers, a driving plate and three sizes of driving dogs can be provided. Swing over table, 17 in. Maximum distance between centers, 72 in. Drive, 7 hp. motor. Floor space, 58 x 226 in. Weight, with power feed, 8,030 lb.; with hand feed, 6,600 lb.

Air Gun, Brass
Jenkins Bros., 80 White St., New York, N. Y.
"American Machinist," March 2, 1922



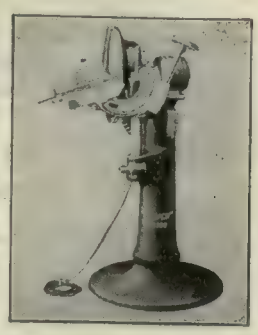
The gun is for use in foundries, machine shops, wood-working and textile mills, electrical stations and garages. The valve, which has a renewable disk, holds tight under pressure and eliminates waste of compressed air from leakage. The disk and seat can be easily removed for cleaning. The air gun is made in ¼ in. size, and with different hose nipples can be used for ⅜, ½, ¾ and 1 in. hose.

Seam-Closing Machine, Compound, No. 42
Niagara Machine and Tool Works, Buffalo, N. Y.
"American Machinist," March 2, 1922



The machine is for closing side seams of sheet-metal drums. The work is moved forward along the horn by pressure on the treadle and fed between the first set of rolls. These horizontal rolls squeeze the seams together at the bottom, and feed the work automatically through the machine. The second set of rolls flattens and closes the double-locked seam. The pulley runs at 100 r.p.m. Capacity: maximum length, 42 in.; diameter, 13½ in. Weight, 2,700 pounds.

Sanding Machine, Disk, 15-In., No. 182
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," March 2, 1922



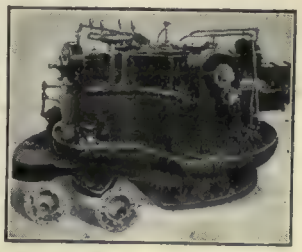
The machine is used chiefly for sanding circular work up to 15 in. in diameter and duplicating work up to 7 in. wide. The disk head contains the disk shaft, the ball thrust bearing, the exhaust fan which deposits the dust within the column, and the removable disk running at a speed of 1,725 r.p.m. The motor, furnished for either direct or alternating current of 110 or 220 volts, is controlled by a push-button. The table can be tilted 45 deg. downward, or 25 deg. upward by a handwheel. Table: size, 9¼ x 21 in.; height, 37 in.

Drilling Machine, High-Duty, 20-In., No 23
Foote-Burt Co., Cleveland, Ohio
"American Machinist," March 2, 1922



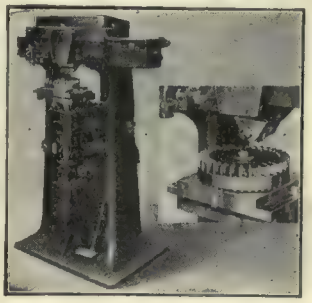
The machine can drive 1¼-in. diameter drills in steel. It has nine changes of spindle speed. When the driving pulley runs at 500 r.p.m., the speeds range from 75 to 610 r.p.m. Three changes of feed give feeds of 0.006, 0.012, and 0.026 in. per revolution, controlled by the levers shown on the head. Table: size, 20 x 16 in.; vertical movement, 22 in. Weight, 2,700 lb.

Drilling Machine, Four-Way, Horizontal
Reed-Prentice Co., Worcester, Mass.
"American Machinist," March 2, 1922



The machine drills simultaneously four holes at right angles and in the same plane, and is intended primarily for drilling gear housings for automobile rear axles. Its spindles can be moved simultaneously by a hand wheel. Power feed can be applied to the four spindles simultaneously by means of a lever at the left, and an automatic trip releases it when the drills break through the work. Maximum distance between opposing spindles, 26 in. Distance spindle to table, 6 in. Spindle travel, 3½ in. Height, 49½ in. Width, 85 in. Length, 96 in. Weight, 7,550 pounds.

Marking Machine, Hydraulic, with Circular Table, No. 12
Martin Machine Co., Inc., Turner Falls, Mass.
"American Machinist," March 2, 1922



The machine has recently been equipped for circular marking. The disk or cutter to be marked is placed on the revolving table, which can be adjusted so as to mark at any radius. Power delivered by a belt operates a rotary oil pump. The oil pressure actuates both the vertical table, raising the work to the die, and the horizontal die-holding slide. Travel: slide, ⅛ to 7 in.; table, up to 6 in. Height, 50 in. Floor space, 27 x 22 in. Weight, 1,050 pounds.

Saw, Band, Motor-Driven, Portable, 16-In.
J. D. Wallace & Co., 1401 West Jackson Blvd., Chicago, Ill.
"American Machinist," March 2, 1922



The machine is intended for general use in pattern and carpenter shops. The ½-hp. motor runs at a speed of 1,750 r.p.m., driving the saw at a speed of 3,150 ft. per minute. The removable table, mounted on a large rocker bearing, may be adjusted 45 deg. forward or 5 deg. to the rear. All adjustments are made by handwheels or thumbscrews. The wheels carrying the saw are steel disks 16 in. in diameter. Table, 19 x 21 in., 52 in. high. Capacity, 3 in. in thickness. Height, 5 ft. 9 in. Floor space, 15 x 29 in.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

Rise and Fall of Market

Advances—Tone of copper market stronger; electrolytic quoted in New York at 14⅝c. as against 14½c. Increased supplies of tin on market, quotations reach 32⅝c. as compared with 32½c. per lb. last week. Zinc market unusually strong; minimum price 6c. per lb., New York warehouses. Lead quiet, firm. Recent rapid advances in prices of lead and lead products causes advance of ¼c. per lb. in red and white lead, both dry and in oil. Both copper and brass sheets and tubing up ¼c.; brass wire up ¼c. and copper wire 1c.; copper rods up ¼c. and brass rods ½c. per lb., New York warehouses. Solder also advanced 2c. Slight rise in copper sheets and old metals in Cleveland.

Declines—Break in flax seed market reflected in raw linseed oil quotations of 88c. as against 91c in New York, and 98c. as compared with $1.04 per gal., 5 bbl. lots, one week ago in Chicago.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$25.52
Northern Basic	25.02
Southern Ohio No. 2	22.50
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.56
BIRMINGHAM	
No. 2 Foundry	17.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.36
Virginia No. 2	28.34
Basic	23.50@25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	22.50@24.00
No. 2 Foundry, Southern, sil 2.25@2.75	24.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	24.16
Basic	25.00
Bessemer	26.96

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.48	3.15	3.38
No. 12	2.45	3.53	3.20	3.43
No. 14	2.50	3.58	3.25	3.48
No. 16	2.70	3.68	3.35	3.58
Black				
Nos. 17 and 21.	3.00	3.15	3.55	4.10
Nos. 22 and 24.	3.05	3.20	3.60	4.15
Nos. 25 and 26.	3.10	4.25	3.65	4.20
No. 28	3.15	4.35	3.90	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.30	4.35	3.75	4.30
Nos. 12 and 14.	3.40	4.45	3.85	4.40
Nos. 17 and 21.	3.55	4.75	4.15	4.70
Nos. 22 and 24.	3.70	4.90	4.45	4.85
No. 26	3.85	5.05	4.60	5.00
No 28	4.15	5.35	4.90	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¾ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	8.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.81	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.70	4.66	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.58	2.41	2.38
Soft steel bars (base)	2.48	2.31	2.28
Soft steel bar shapes (base)	2.48	2.31	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.58	2.41	2.38
Bar iron (2.00@2.10 at mill)	2.48	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.90; New York	6.25
Zinc (up to carlots), St. Louis, 5.65; New York	6.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6.50	7.50	6.25
Copper sheets, base	20.50	20@21	23.00
Copper wire (carlots)	16.00	16.50	16.25
Copper rods (ton lots)	19.00	21.50	19.50
Copper tubing (100-lb. lots)	22.50	23.00	23.00
Brass sheets (100-lb. lots)	16.75	17.50	18.75
Brass tubing (100-lb. lots)	19.75	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	15.50	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	....
Solder (½ and ½), (caselots)	23.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.00	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	5.75	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	8.00
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.88	.95	.98
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$7.00@$7.25	
Coke, prompt foundry, Connellsville	per net ton	$7.00@$7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60–5%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50–5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, (h.h. plus std. extra of 10%)	15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.70	$3.25	$3.00
Cone heads, ditto (net)	3.80	3.35	3.10
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60–5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather.			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Montgomery—Janney & Co., founders and machinists, C. L. Carr, Purch. Agt.—sheet metal working machine for pressing small parts about 6 x 12 in.

Cal., Oakland—H. A. Werum, 2150 34th St.—one turret lathe, automatic, with at least 4⅛ in. hole through spindle.

Ga., Rome—Davis Fdry. & Machine Wks., I. F. Davis, Pres.—one 10 x 14 ft. boring and turning mill.

Ill., Chicago—The Illinois Central R.R., 29 South La Salle St., J. J. Bennett, Purch. Agt.—

Three 18 in., one 20 in., three 24 in. and two 30 in. engine lathes.

One 2½ x 24 in., three 3 x 36 in., one 24-28 in. heavy duty type with 7 in. hole through spindle five 54 in. vertical, four 42 in. vertical, one 15 in. brass and one 15 in. spring turret lathes for miscellaneous brass work.

Four combination axle lathes for turning axles with wheels mounted.

One 54 in. car and one 90 in. driving wheel lathes.

Thirteen 12 or 14 in. x 6 ft. bolt lathes.

One heavy duty type suitable for machining locomotive rods, rod threads and similar parts, one No. 3 vertical and one No. 3 horizontal E type heavy duty milling machines.

One 2 in. double head, one ¾ in. triple head and one 2½ in. double head bolt threading machines.

One 1 in. rapid bolt heading, one 2 in. and one 3 in. forging machines.

One heavy duty punch and shear.

One combination punch and shear with capacity to punch and shear plate up to 3-16 in.

Eight 36 in. special railroad draw cut and one 32 in. heavy duty crank shaper.

Two 96 in. 600 ton driving wheel presses.

Three 36-40 in. heavy duty upright drill presses, one 20 in., and one 36-40 in. vertical drill presses.

One 72 in. heavy duty radio drill.

Two Universal reamer and cutter and one guide bar grinders.

Seven 18 x 3 x 1½ in. double floor grinders with 2 grinding wheels.

One twist drill grinder and one 96 in. link grinder for general radius grinding of locomotive links.

One 6 in. metal hack saw.

One set of 6-7 ft. and one set of 6 ft. bending rolls with capacity for bending sheets up to ⅝ in. in thickness.

One 300 lb .power hammer.

One 56 in. x 18 ft. heavy duty planer with 2 heads on cross rail and 2 side heads.

Two 100 in. vertical boring mills.

One heavy duty type slab miller.

Two 11 lb., one 2,500 lb. and one 5,000 lb. steam hammers.

Four 48 in. car wheel bores.

Two 75 ton forging presses.

Kan., Cheney—E. J. Robinson—forging machinery, forge, set of blacksmiths tools, drill, press, lathe, grinding machine, all power equipment.

Kan., Hutchinson—The Hutchinson Fdry. and Machine Co.—Cincinnati, Norton or Landis grinder, 60 in. between center, 17 in. over carrier, fitted for crank shaft grinding swivel head to permit surface grinding, and an attachment for piston grinding.

Kan., McPherson—Pitts Machine Shop—one power lathe.

Kan., Newton—The Jones Motor Co.—small bench lathe for turning armatures, and one large upright drill with 16 in. travel.

Kan., Wichita—E. L. Billings, 221 South Lawrence St.—complete equipment for garage including drill press, lathe and emery wheel, power driven.

Kan., Wichita—Brown Bros., 217½ West Douglass St.—one power lathe.

Kan., Wichita—De Long Machine Wks, 703 East Murdock St.—one power lathe.

Kan., Wichita—W. Dyer, 229 South Lawrence St. (garage)—drill press, lathe, emery wheel and cylinder grinder for power equipment.

Kan., Wichita—East Central Garage, 923 East Central St., L. J. Campbell, Purch. Agt.—power drill press, emery wheel, and lathe.

Kan., Wichita—J. A. Kammerer, 1016 East Murdock Ave., (auto parts)—one emery wheel and one drill press for power equipment.

Kan., Wichita—H. Loffinger, 118 North Emporia St. (garage)—lathe, drill press and emery wheel for power equipment.

Kan., Wichita—R. McMillian, 204 South Topeka St.—one power lathe.

Kan., Wichita—Wichita Welding & Machine Wks., 200 South Topeka St., P. Eikman, Purch. Agt.—power lathe and drill press.

Mich., Grand Rapids—New Era Spring and Specialty Co., Cottage Grove Ave., S. W.—punch press, back geared, with 5 in. stroke.

Mich., Grand Rapids—Northland Lumber Co.—power shear and punch, with 24 in. throat, to shear 2½ in. bars.

Mich., Saginaw—C. F. Berger, 209 North Water St.—machine shop equipment.

Mo., Kansas City—Solomon & Barnett, 1509 Main St.—small tools for machine shop.

Mo., St. Louis—J. O. Coleman, 106 North 3rd St.—foot power lathe and electric grinders.

N. J., Jersey City—H. E. Cooper, 339 Grand St.—2 presses and rotary slitting shears.

N. J., Mt. Holly—A. Shreve (accessories and repair shop)—foot power screw-cutting lathe and vulcanizing machine.

N. J., Plainfield—W. Woltz, 1244 Arlington Ave.—one rivet, back geared precision lathe.

N. Y., Buffalo—Jerge Motor Co., Inc., 1647 East Genesee St.—equipment for proposed service station and machine shop.

N. Y., Copenhagen—Deer River Power Co., Central Sta.—one portable electric drill, 110 volts; portable forge and blower for field shop.

N. Y., New York—F. and M. Novelty Co., 75 Spring St., S. Marcus, Purch. Agt.—one small size screw machine.

N. Y., New York—The Superior Skylight Co., Inc., 456 4th Ave.—three drill presses, 2 power saws, emery wheels, several vises, 4 combination punch and shears.

N. Y., Watertown—L. Sager Co., Court St.—small lathe suitable for tool room, (new or used).

N. Y., West Falls—W. Reader—machinery, repair tools and equipment for garage now in course of construction.

O., Cincinnati—Economy Mchy. Co., 428 East Pearl St., J. Flynn, Sr., Purch. Agt.—6 small speed lathes 8 in. swing; 2 Brown and Sharpe, small screw machines, (used).

O., Cincinnati—Jones Machine Tool Co., 435 East Pearl St., dealer in used machinery, W. F. Jones, Purch. Agt.—one 14 ft. vertical boring mill, arranged for motor drive, (used).

O., Columbus—Higgy-Avery Co., 1199 Franklin Ave., (radio and electrical apparatus), F. E. Avery, Vice-Pres.—two screw machines, 1 drill press, 2 grinders, and 1 cutting machine.

O., Lima—W. H. Harper, Jr., 1021 West High St.—hand power straight shear for ¼ in. plate.

Pa., Erie—Erie Metal Furniture Co., E. Bauschard, Secy.—Welders, lathes, and miscellaneous machinery for new factory.

Pa., Phila.—Alfred Box Co., Front and Poplar Sts., manufacturers of elevators and hoists—boring machine, drills, riveting machine, small tools etc.

Pa., Phila.—Fidelity Machine & Mfg. Co., 4015 Paul St.—equipment for shop addition.

Pa., Phila.—O. Hoffman, 3rd and Cayuga Sts. (machinist)—several new machines for addition, including boring machine, lathe, etc.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St.—additional equipment for machine shop.

Pa., Pittsburgh—The Levenson Co., 33 Pride St.—single end punch with architectural jaw to punch holes in ⅝ in. plate.

Pa., Titusville — Titusville Tank and Constr. Co., c/o W. O. Carlson and J. Martin—machinery and equipment to manufacture and repair steel tanks, tank cars, boilers and all kinds of metal plate construction work.

Wis., Iron River—M. Happle—one belt driven lathe mill.

Wis., Kenosha—E. B. Moericke, 915 Salem Ave.—repair machinery for proposed garage.

Wis., Milwaukee—J. L. Austin Mfg. Co., 419 Van Buren St., (hardware specialties and power heads)—machine tools including lathe, drill press, etc.

Wis., Milwaukee—H. E. Krueger, 1040 Holton St.—mechanical baking equipment.

Wis., Milwaukee—Rundle Mfg. Co., 27th and Cleveland Ave. (plumbing fixtures), H. Held, Purch. Agt.—edge grinders.

Ont., Owen Sound—Bd. of Educ., F. H. Rutherford, Secy.—equipment for manual training department, and for physics and chemistry laboratories of proposed technical school.

Ont., Tillsonburg—S. E. Barrett—equipment for garage and auto repair shop now under construction.

Que., Montreal—P. Beaubien, 1675 Masson St.—equipment for garage and repair shop.

Que., Montreal—C. Day, 49 Lincoln Ave.—machinery and equipment for garage and repair shop.

Que., Montreal—A. Fortier, 1875 Cote de Neiges Rd.—bench tools for auto repair shop.

S. A., Para, Brazil—A. de Albuauerque, caixa postal 230—machines for cutlery work, also machines for making axes, hatchets, etc.

Machinery Wanted

Fla., Jacksonville — Florida Fly Exit Screen Co. c/o T. B. Elton, Mgr.—screening and woodworking machinery for proposed factory.

Ga., Rome—Battery Mchy. Co., L. D. Yeargon, Purch. Agt.—one 10 x 10 latest model Ingersoll-Rand belt-driven air compressor (used).

Ill., Chicago—Alemite Die Castings and Mfg. Co., 2640 Belmont Ave.—nickel plating outfit, 6 volts, 2,000 amperes.

Ill., Chicago—M. Lange, 3735 North Whipple St.—cylinder press and job press.

Ill., Freeport—C. E. Meyer & Co., 327 East Spring St.—vinegar presses.

Ill., Oak Park—Oak Park Oak Leaves, 1112-24 North Blvd.—new power cylinder press, linotypes and printing equipment for daily newspaper.

Ia., Des Moines—Des Moines News, The Arcade — newspaper equipment, presses, linotype machines, etc.

Kan., Wichita—The Star, 1241 Wabash Ave., H. T. Simms, Purch. Agt.—one 6 column power cylinder press for newspaper work; prefer Babcock press.

Ky., Franklin—Vi-Car Oil & Refining Co., Inc., J. L. Nimal, Purch. Agt.—machinery and equipment for new refining.

Mich., Detroit — A. Rosenthal, 636 Catherine St. — woodworking machinery suitable for making store fixtures.

Minn., Minneapolis—Ry-Krisp Co., 2120 Lyndale Ave., S., food products, J. G. Priedeman, Secy.—two motors, hangers and shafting, for building now in course of construction.

Mo., St. Louis—Kitlark Electric Mfg. Co., 3940 Easton Ave.—polishing machinery and power equipment.

N. J., Camden—Kieckhofer Container Co., Thorne and Cooperwood Sts., manufacturers of containers—saw tables, cutting knives, moulding machines, riveting machines for paper boxes, and metal working machines.

N. Y., Alleghany—J. Eisert—medium size, power, cream separating machine.

N. Y., Attica—W. Ranger—1 rip saw with table, either wood or iron.

N. Y., Binghamton—T. Snopek, R. F. D. No. 5—machinery and equipment for saw and planing mill.

N. Y., Buffalo—Buffalo Smelting Co., Inc., 12 Peoria St., G. Giesser, pres.—machinery and equipment to smelter and refine copper, brass and other metals, for proposed plant on Tonawanda and Pacific Sts.

N. Y., Buffalo—Buffalo Tool & Supply Co., 20 Henry St.—woodworking machinery.

N. Y., Buffalo—City of Buffalo, Commissioner of Parks and Bldgs., Room 6, Municipal Bldg.—will receive bids until June 12 for refrigeration machines.

N. Y., Buffalo—F. W. Fidler, 19 Lovering Ave.—welding machines.

N. Y., Buffalo—J. W. Kawczynski, 27 LaTour St.—machinery to manufacture ice boxes, show cases, counters and soda fountains.

N. Y., Buffalo—Natl. Biscuit Co., Inc., 217 Ellicott St.—air washing, purifying machinery, heating and cooling devices and electric power plant for new bakery now under construction.

N. Y., Buffalo—L. P. Reimann, 69 North Division St., contractor and manufacturer of ladders—small machinery and equipment for proposed addition to ladder shop.

N. Y., Buffalo—Standard Oil Co. of N. Y., 1103 Elk St.—machinery and equipment for proposed pump house.

N. Y., Buffalo—A. R. Ziebarth, 217 Leroy Ave.—machinery to manufacture wood and metal automobile bodies.

N. Y., Chaumont—Adams, Duford Co., (quarrys), E. B. Johnson, Purch. Agt.—heavy duty swing cut-off saw and limestone rock drills for compressed air operation.

N. Y., Lewiston—Cuyler Packing Co., Inc.—machinery and equipment for new packing house.

N. Y., New York—Erie R.R., 50 Church St., W. R. Collins, Mgr. Purch.—machinery for locomotive repair shops at Hornell, N. Y. List not yet compiled.

N. Y., Niagara Falls—Defiance Paper Co., Walnut and 3rd Sts.—large paper making machine, capacity 30 ton per day, for new $200,000 addition.

N. Y., Rochester—C. F. Dietz, 81½ Adams St.—saw mills, new or used.

N. Y., Rochester—E. T. Gilbert Mfg. Co., 228 South Ave.—1 power paper cutting machine, 32 in. or larger.

N. Y., Rochester—F. E. Wyner, Portland Ave.—small machinery air compressor, etc., for accessory and gas station.

N. Y., Waterloo—Geneva Preserving Co., 59 Swift St.—special machinery and equipment to manufacture and pack sauerkraut.

N. Y., Webster—Webster Co-operative Cold Storage Assn., machinery and equipment for proposed cold storage plant.

N. C., Asheville—Felstone Co., Haywood Bldg.—machinery for the manufacture of concrete blocks and some woodworking machinery.

N. D., Valley City—Valley City Peoples Opinion, W. G. Strieb, Purch. Agt.—printing equipment and book folder.

O., Columbus—Henderson Tire and Rubber Co., Goodale St. and Hocking Valley R.R., C. O. Henderson, Pres. and Mgr.—2 vulcanizing machines.

O., Zanesville—C. Findeiss & Son, Muskingum Ave., (manufacturer of leather)—modern tanning machinery, belt driven.

Pa., Chester—Chester Lace Mills, Clayton and Trainer Sts.—spindles and knitters.

Pa., Marienville—Marienville Express, J. A. Haas, Purch. Agt.—cylinder newspaper press and one 8 x 12 Price job press.

Pa., McKeesport—W. R. Dillon, 1406 Jenny Lind St.—machinery and complete outfit for the manufacture of pop beverages.

Pa., Phila.—G. Barrie & Sons Co., 1313 Walnut St.—equipment for printing plant.

Pa., Phila.—Dearnley Bros. Worsted Co., Chetlen Ave. and Boynton St., J. S. Dearnley, Purch. Agt.—cards, combs, spinning spindles, etc.

Pa., Phila.—C. H. Mastland & Sons, Westmoreland and Collins Sts., (carpet weavers)—broad looms and narrow looms.

Pa., Phila.—A. J. Reach & Co., Tulip and Palmer Sts.—leather working machines, winding machines, small tools, lathe, etc.

Pa., Phila.—Thompson Printing Co., 312 Cherry St.—additional presses and equipment for new plant.

Pa., Phila.—T. Wolstenholme & Sons Co., Frankford Ave. and Westmoreland St.—L. F. Schaeffer, Purch. Agt.—spindles, worsted card and combs.

Pa., Pittsburgh—South Pennsylvania Oil Co., 331 4th Ave.—machinery and equipment for large gasoline plant now in course of construction at Van, Pa.

Pa., Rochester—Amer. Borax Co., Inc., c/o W. C. McKinney, Dir., 6334 Forbes St., Pittsburgh— machinery for the manufacture or cultivating of raw borax.

Pa., Sharon—Star Fdry. and Machine Co., North Water Ave., J. Brahney, Genl. Mgr.—equipment for cast iron and steel foundry now under extensive repairs.

Pa., York—Frick Co. Inc., 48 East Market St.—equipment for new foundry now in course of construction.

Va., Roanoke—White Fdry. Co., 613 10th Ave.—foundry equipment and machinery.

Wis., Cudahy—Bd. of Vocational Educ., J. P. Beuscher, Secy.—equipment and machinery for proposed vocational school.

Wis., Milwaukee—Callaway Fuel Co., 703 North Water St., E. Callaway, Purch. Agt.—motor driven coal handling machinery.

Wis., Milwaukee—C. Hach, 694 Linus St.—mechanical baking equipment, electric motor.

Wis., Milwaukee—The Van Buren Garage Co., Martin and Van Buren Sts.—gas storage tank with pump for proposed garage.

Wis., Niagara—Niagara Journal, R. R. Elliot, Purch. Agt.—typesetting machine.

Wyo., Casper—Mid-Western Torpedo Co., Inc., J. L. Wilson, Genl. Mgr.—special machinery to manufacture nitro-glycerine.

N. S., Halifax—Hillis & Son, 209 Hollis St.—equipment for proposed foundry.

Ont., Tara—Hespeler Novelty Co. Ltd.—equipment and machinery to manufacture novelties.

Ont., Toronto—F. F. Fry, Ltd., 43 Scott St., G. O. McClay, Purch. Agt.—air compressing outfit with drills, also drilling steel.

Mex., Mexicali—Italian Fruit Packing Co., Ltd., J. B. Scolari, Treas.—machinery and equipment for a chain of fruit packing houses to be constructed along western coast of Mexico.

Metal Working Shops

Cal., Merced — The Directors of the Merced Irrigation District will soon award the contract for the construction of a 1 story garage and machine shop. I. W. Hoover, Planada, Archt.

Conn., Stamford—Victor-Page Motors Corp., Farmingtondale, N. Y., has awarded the contract for the construction of a 1 story, 60 x 90 ft. factory addition here, on Melrose St. Estimated cost $30,000. Private plans.

Ill., Chicago—G. S. Kingsley, Archt., 109 North Dearborn St., is receiving bids for the construction of a 1 story, 125 x 150 ft., garage at 3301-3309 North Halsted St., for G. Wittbold Co., 745 Buckingham Pl. Estimated cost $90,000.

Ia., Atlantic—Shranger & Johnson, Inc., manufacturer of lightning rods and specialties, has awarded the contract for the construction of a 1 story factory.

Mass., Cambridgeport—Simplex Wire & Cable Co. has awarded the contract for the construction of a 4 story, 90 x 100 ft. factory addition on Green St. Estimated cost $75,000.

Mass., East Cambridge (Boston P. O.)—Boston & Maine R.R., North Station, Boston, is receiving bids for the construction of a 1 story 80 x 250 ft. repair shop, here. Estimated cost $100,000. A. B. Corthell, c/o owner, Ch. Engr.

Mass., Lowell—Middlesex Machine Co., Paige St., has awarded the contract for the construction of a 1 story, 50 x 75 ft. shop, on Lee St., for the manufacture of plumbing supplies. Estimated cost $20,000. Private plans.

Mass., Salem—The Hygrade Lamp Co., 60 Boston St., has awarded the contract for the construction of a 4 story, 50 x 100 ft. factory. Estimated cost $75,000.

Mass., Westfield—The Foster Machine Co., South Broad St., manufacturer of textile machinery, has awarded the contract for the construction of a 1 story, 80 x 120 ft. addition to its plant, also for 3 other structures, each 30 x 50 ft., for various uses. Estimated cost $40,000.

Mich., Detroit—The Hupp Motor Car Co., East Milwaukee St., is building a 4 story 79 x 400 ft., and a 4 story 52 x 396 ft. addition to its plant on East Milwaukee and Mount Elliott Aves. Estimated cost $200,000. C. D. Hastings, Pres. and Genl. Mgr.

N. J., Belleville—Thompson Machine Co. is receiving bids for the construction of a 2 story factory. Estimated cost $150,000. Fletcher-Thompson, Inc., 542 Fairfield Ave., Bridgeport, Conn., Engrs. and Archts. Incorrectly noted in May 15 issue, under "Melville."

N. J., Camden—W. C. Davis, 731 Hunter St., has awarded the contract for the construction of a 1 story, 45 x 100 ft. garage, at 1388 Haddon Ave. Estimated cost $60,000.

N. J., De Lair—The Kieckhofer Container Co., Thorne and Cooperwood St., Camden, has awarded the contract for the construction of a 1 and 2 story container factory, here. Estimated cost $500,000.

N. Y., Buffalo—Hotel Statler, Inc., Washington and Swan Sts., plans to build a garage, 800 car capacity, on Mohawk St.

N. Y., Buffalo—Jerge Motor Co., Inc., 1647 East Genesee St., plans to build a 102 x 105 ft. service station and machine shop. Estimated cost $18,000. Architect not announced.

N. Y., Glendale (Long Island)—V & O Press Co., Dry Harbor Rd., manufacturer of power presses and sheet metal working machinery, will soon receive bids for the construction of a 1 story, 100 x 500 ft. factory addition. Private plans.

N. Y., New York—Dochterman Realty Co., c/o J. M. Felson, Archt. and Engr., 1133 Bway., will soon receive bids for the construction of a 2 story garage at 11 Jane St. Estimated cost $100,000.

N. Y., Syracuse—Gere & Willis, Inc., 320 West Genesee St., plans to build a 60 x 264 ft. garage, service station and repair shop, on West Genesee St. Estimated cost $100,000.

O., Cleveland—The J. L. Free Co., real estate, 1004 Prospect Ave., has had plans prepared for the construction of a 2 story, 110 x 110 ft., garage on Prospect Ave. Estimated cost $75,000. Watoon Eng. Co., Cook Bldg., Archts and Engrs.

O., Cleveland—R. Haldi, 10020 Detroit Ave., has awarded the contract for the construction of a 1 story, 60 x 80 ft. garage. Estimated cost $40,000.

O., Cleveland—The Independent Towel & Supply Co., 1822 Central Ave., is receiving bids for the construction of a 1 and 3 story, 80 x 100 ft. and 70 x 90 ft. laundry and garage, at 1822 Central Ave. Estimated cost $100,000. Christian, Schwarzenbery & Gaeda, 1900 Euclid Ave., Archts.

O., Cleveland—I. Margolin, 10527 Churchill Ave., is having plans prepared for the construction of a 2 story, 50 x 123 ft. garage on East 105th St. Estimated cost $60,000. M. Weis, Union Bldg., Archt.

O., Cleveland—The Ohio Crank Shaft Co., 982 East 152nd St., had plans prepared for the construction of a 1 story, 60 x 200 ft. factory, at 6600 Clement Ave. Estimated cost $60,000. W. J. Wefel, 1836 Euclid Ave., Archt.

O., Cleveland—Sands Mfg. Co., 5407 Sweeney Ave., has awarded the contract for the construction of a 2 story, 65 x 100 ft. factory for the manufacture of water heaters, on East 55th St. and Sweeney Ave. Estimated cost $40,000. Private plans.

O., Cleveland—The York Ohio Ice Machine Co., 1106 Woodland Ave., has had plans prepared for the construction of a 1 and 2 story, 100 x 132 ft., office, warehouse and factory on West 28th St. and Washington Ave. Estimated cost $60,000. E. McGeorge & A. G. Simon, 1900 Euclid Ave., Archts.

O., Euclid—O. E. Brown, c/o Elf Motor Co., 7000 Euclid Ave., Cleveland, is having plans prepared for the construction of a 1 story garage. Estimated cost $40,000. Private plans.

O., Lakewood (Cleveland P. O.)—W. C. Schultz, 11913 Detroit Ave., will soon award the contract for the construction of a 1 story 76 x 97 ft. garage and commercial building, on Detroit and Love Aves. Estimated cost $40,000. O. N. Chamberlin, 1532 Spring Garden Ave., Archt.

Pa., Bradford—Bradford Refining Co. has awarded the contract for the construction of a refinery on Foster Brook. Estimated cost $50,000. L. E. Mallory, Jr., Newell Bldg., Secy. Private plans.

Pa., Enola—Pennsylvania R.R., Broad St. Sta., Phila., will soon receive bids for the construction of a 1 story 100 x 600 ft. repair shop, here. Estimated cost $500,000. A. C. Shand, Ch. Engr.

Pa., Phila.—The Commercial Truck Co., Hunting Park and Rising Sun Ave., has awarded the contract for the construction of a 3 story, 160 x 175 ft. garage and service station on Franklin Sq. Estimated cost $500,000.

Pa., Phila.—H. S. French, c/o P. H. Tyre, Archt., 1509 Arch St., will soon receive bids for the construction of a 5 story, 80 x 100 ft. sales and service station on Girard and Frankford Aves. Estimated cost $250,000.

Pa., Phila.—G. W. Lindsay, 5120 Wakefield St., has awarded the contract for the construction of a 2 story, 40 x 100 ft. machine shop at 5116 Wakefield St. Estimated cost $35,000. H. N. Miller, 34 South 17th St., Archt.

Pa., Phila.—Philadelphia Trainrail Co., 109 East Tusculum St., has awarded the contract for the construction of a 1 story, 60 x 90 ft. factory, for the manufacture of switches and frogs, on Ontario and Weckel Sts. Private plans.

Pa., Pittsburgh—Fleischmann Co., 701 Washington St., New York City, is having plans prepared for the construction of a 2 story, 75 x 175 ft. garage, warehouse and office building on Allegheny and Western Sts., here. Estimated cost $50,000.

Pa., Pittsburgh—Jones & Laughlin Steel Co., 3rd Ave. and Ross St., is having plans prepared for the construction of a 1 story, 200 x 200 ft. roll plant, machine shop and polishing plant, on South 27th and 28th Sts. D. L. McKeel, c/o owner, Engr.

Pa., Primos—Jones Machine Wks., 53rd St. and Landsdown Ave., Phila., has awarded the contract for the construction of a 1 story, 60 x 200 ft. machine shop, here. Estimated cost $50,000. Private plans.

Pa., Titusville—Titusville Iron Wks. Co., plans to build a large foundry. Estimated cost $40,000. Private plans. J. W. Boone, Secy. and Treas.

Pa., Williamsport—C. F. Dietrick, Windsor Café, Pine St., plans to build a 2 story, 90 x 150 ft. garage and repair shop on Hepburn St. Estimated cost $100,000.

R. I., Providence—The Winsor & Jerauld Mfg. Co., 223 Harrison St., manufacturer of textile machinery, has awarded the contract for the construction of a 1 story, 50 x 150 ft. and 20 x 60 ft. addition to its factory, on Harrison St. Estimated cost $40,000.

Wis., Appleton—Wisconsin Traction, Heat, Light & Power Co., is taking bids for the construction of a 1 story, 50 x 86 ft. garage and service station. Estimated cost $45,000. D. C. Beaulieu, Appleton, Engr.

Wis., Kenosha—E. B. Moericke, 915 Salem Ave., is receiving bids for the construction of a 1 story 50 x 125 ft. garage. Estimated cost $50,000. Private plans.

Wis., Milwaukee—Nash Motors Co., Clement Ave., has awarded the contract for the construction of a 3 story, 100 x 400 ft. addition to its factory. Estimated cost $250,000. Private plans.

Wis., Milwaukee—Van Buren Garage Co., Martin and Van Buren Sts., has awarded the contract for the construction of a 1 and 2 story 90 x 126 ft. garage. Estimated cost $65,000.

Wis., Racine—Belle City Incubator Co., 15th St., has awarded the contract for the construction of a 2 story, 60 x 85 ft. factory for the manufacture of incubators. Estimated cost $25,000. J. Robar, Pres. Private plans.

Wis., Waukesha—The Spring City Auto Co., 220 West Main St., is having revised plans prepared for the construction of a 1 story, 34 x 150 ft., addition to its garage. Estimated cost $40,000. M. F. White, 68 Wisconsin St., Milwaukee, Archt.

N. S., Halifax—Hillis & Son, 209 Hollis St., has awarded the contract for the construction of a foundry. Estimated cost $50,000. Engineer not announced.

Ont., Port Colborne—The International Nickel Co. of Canada, Ltd., is receiving bids for the construction of a 1 story, 94 x 384 ft. electrolytic nickel refinery. J. T. Kemp, Asst. Genl. Mgr.

Ont., Tillsonburg—S. E. Barrett is building a garage and auto repair shop. Estimated cost $42,000.

General Manufacturing

Cal., Colusa—California Prune and Apricot Growers, Market and San Antonio Sts., San José, are having plans prepared by their engineering and construction dept., A. Grubb, in charge, for the construction of a 1½ story packing plant on Coopers Extension Tract, here. Estimated cost $125,000.

Ill., Chicago—Roberts & Oakes, 141 West Jackson Blvd., plans to build a packing plant on 45th St. and Racine Ave. Estimated cost $500,000. Architect not selected.

Me., Lewiston—The Lewiston Bleachery & Dye Wks., Lisbon St., will soon award the contract for the construction of a 3 story, 40 x 110 ft., addition to its sheeting department. Estimated cost $45,000. Private plans.

Me., Pittsfield—Amer. Woolen Co., Lawrence, Mass., will soon award the contract for the construction of a 3 story 50 x 90 mill addition, here. Estimated cost $40,000. Private plans.

Me., Rumford—The Oxford Paper Co., has awarded the contract for the construction of a 2 story addition to its plant. Estimated cost $50,000.

Mass., Easthampton—Hampton Co., Pleasant St., has awarded the contract for the constructon of a 5 story, 70 x 100 ft. addition to its cotton mercerizing plant. Estimated cost $300,000.

Mass., Newton—Shepherd Worsted Mills has awarded the contract for the construction of a 1 story, 45 x 145 ft. dyehouse on California St. Estimated cost $35,000. Private plans.

Mass., North Andover—Suttons Mills will soon award the contract for the construction of a 1 story, 70 x 105 ft. (worsted) weave shed. Estimated cost $35,000. The Russell Co., 50 State St., Boston, Plant Mgrs.

Minn., South St. Paul—R. N. Katz Packing Co., South St. Paul, and 352 East 6th St., St. Paul, is having plans prepared for the construction of a 3 story, 50 x 130 ft. packing plant and a 1 story, 34 x 36 ft. office building. Estimated cost $100,000. Henschien & McLaren, 37 West Van Buren St., Chicago, Archts.

N. H. Laconia—The Pitman Mfg. Co. has awarded the contract for the construction of a 3 story, 65 x 100 ft. dyehouse for textile plant. Estimated cost $60,000.

N. J., Camden—Haddon Press Co., New Park Ave. and Whitehorse Pike, has awarded the contract for the construction of a 1 story, 90 x 440 ft. printing plant, on 19th and Federal Sts. Estimated cost $225,000.

N. Y., Alden—Erie County, Court House, Buffalo, is having plans prepared for the construction of various buildings including administration building, shop, laundry, bakery, women and juvenile buildings, on the County Farm, here. Estimated cost $150,000. G. Diehl, Ellicott Sq., Buffalo, County Engr. W. J. Beardsley, c/o County Engineer, Archt.

N. Y., Clyde—A. D. Collier plans to build a cold storage plant of 60,000 bbl. capacity. Estimated cost $180,000 to $200,000. Architect not selected.

N. Y., Newark—Phillips-Werth Optical Co., Rochester, N. Y., has awarded the contract for the construction of a 1 story 52 x 175 ft. optical factory on North Main St.

N. Y., Palmyra—Meadowbrooks Products Co., Inc., extracts and toilet preparations, C. B. Beal, Purch. Agt.—small machinery for manufacture of extracts.

N. Y., Yonkers—Alexander Smith & Son, Elm Ave., has awarded the contract for the construction of a 4 story, 16 x 206 ft. addition to its plant for the manufacture of carpets. Estimated cost $300,000.

N. Y., Webster—Webster Co-operative Cold Storage Assn., has awarded the contract for the construction of a 4 story cold storage plant.

N. C., Asheville—Felstone Co., Haywood Bldg., will soon receive bids for the construction of a 1 story, 50 x 100 ft. factory for the manufacture of concrete blocks, etc. Estimated cost $15,000-$18,000. Private plans. W. L. Gravatt, Secy.

O., Canton—The Hygienic Products Co., 715 Walnut St., S. E., manufacturer of cleaning powder, has awarded the contract for the construction of a 2 story, 50 x 70 ft. factory. Estimated cost $40,000. Noted June 1.

O., Cleveland—The Ingraham Waste & Supply Co., 1539 Columbus Rd., plans to construct a 2 story, factory and warehouse at 1450 Hamilton Ave. Estimated cost $50,000. Architect not selected. W. E. Monsor, Pres.

O., Cleveland—Rothkopf Bros., 6112 Central Ave., will soon award the contract for the construction of a 2 story 36 x 130 ft. dairy at 10712 Superior Ave. Estimated cost $75,000. A. Sogg, 319 Hippodrome Bldg., Archt.

O., Cleveland—The Ward Baking Co., c/o J. B. Arthur, St. Marys St. and Southern Blvd., New York, has awarded the contract for the construction of a 3 and 5 story, 240 x 315 ft. bakery on East 45th St. and Windsor Ave., here. Estimated cost $500,000. Noted March 23.

O., Dayton—The Dayton Biscuit Co., Webster St., has awarded the contract for the construction of a 3 story, 75 x 90 ft. factory. Estimated cost $75,000.

O., Eaton—Eaton Farmers Equity Co. has awarded the contract for the construction of a grain elevator and mill. Estimated cost $17,500.

O., Youngstown—The Ward Baking Co., St. Marys St. and Southern Blvd., New York, has awarded the contract for the construction of a 3 story, 114 x 231 ft. bakery, here. Estimated cost $250,000. Noted April 6.

Pa., Chester—Chester Lace Co. has awarded the contract for the construction of a 1 story, 60 x 80 ft. lace factory. Private plans.

Pa., McKees Rocks—The Chesebrough Mfg. Co., 17 State St., New York City, is having plans prepared for the construction of a 2 and 3 story, 143 x 195 ft. plant for the manufacture of vaseline, consisting of 7 buildings, including power house, boiler house, warehouse and manufacturing buildings. Estimated cost $500,000. Hunting Davis Co., Century Bldg., Pittsburgh, Archts.

Pa., Phila.—H. Barton & Sons Co., 109 South 3rd St., will soon award the contract for the construction of a 2 story, 40 x 105 ft. factory, for the manufacture of sand paper and abrasives, in the Holmesburg Dist. Estimated cost $25,000. Tilden & Register, 1525 Locust St., Archt.

Pa., Phila.—The Deamley Bros., Chester Ave., has awarded the contract for the construction of a 3 story, 74 x 98 ft., spinning factory on Chester Ave. and Boynton St. Noted April 27.

Pa., Phila.—Sax & Hilbert, Engrs., Penfield Bldg., will soon receive bids for the construction of a 4 story, 100 x 133 ft. factory, for the manufacture of sporting goods, on Memphis and Eyre Sts., for A. J. Reach Co., Tulip and Palmer Sts. Estimated cost $200,000.

Pa., Phila.—Thompson Printing Co., 312 Cherry St., has awarded the contract for the construction of a 5 story, 80 x 120 ft. printing plant, at 1127 Callowhill St. Estimated cost $200,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Rochester—Amer. Borax Co., Inc., c/o W. C. McKinney, Dir., 6334 Forbes St., Pittsburgh, plans to build a 3 story, 400 x 600 ft. borax factory. Estimated cost $150,000. Architect not announced.

Pa., Rochester—Davies Ahrens McKiney Co. is having plans prepared for the construction of a 1 story 30 x 50 ft. power plant and two 3 story 50 x 100 ft. factory buildings, for the manufacture of boracic acid. Estimated cost $90,000. Austin Co., 16112 Euclid Ave., Cleveland, O., Engrs.

Pa., Washington—Observer Publishing Co. is having revised plans prepared for the construction of a 2 story, 60 x 150 ft. printing plant on Main St. Estimated cost $150,000. W. L. Stoddard, 9 East 40th St., New York City, Archt.

R. I., Woonsocket—The Peerless Dyeing & Finishing Co., c/o Woonsocket Spinning Co., plans to construct two 1 story dye houses on Fairmount St. Estimated cost $50,000. Private plans.

Wis., Racine—Wright Rubber Products Co. has awarded the contract for the construction of a 1 story, 60 x 120 ft. rubber factory on Lazard St. Estimated cost $40,000. Private plans.

Ont., Hamilton—Firestone Tire & Rubber Co., South Main St., Akron, O., will soon receive bids for the completion of a tire and rubber factory, here, 3,500 tires daily capacity. Private plans.

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Tools in a Virginia Railroad Shop

Special Planing Tools—Gages Made on a Boiler-Shop Punch—Testing Pneumatic Drills—A Home-made Machine for Grinding Links

By S. ASHTON HAND
Associate Editor, *American Machinist*

LOCOMOTIVE driving boxes cannot be bored to receive the crown brasses on account of the lips necessary to retain the brasses. They are often machined on a slotter or shaper but these tools can only handle one box at a time, requiring a new set-up

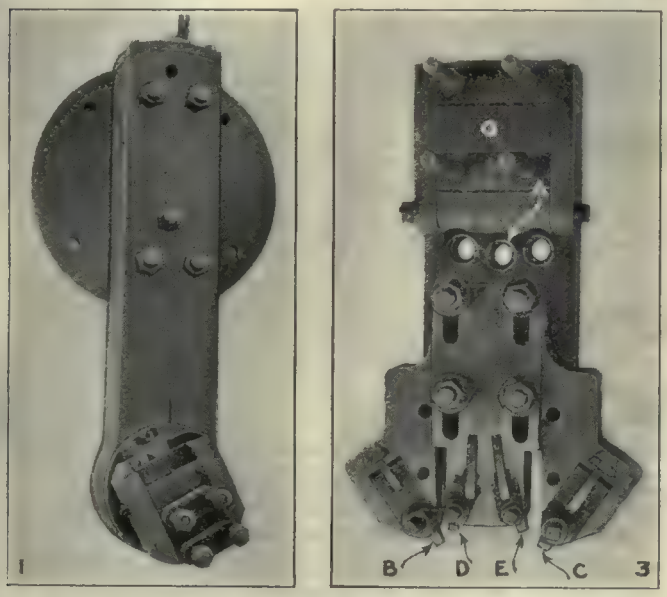


FIG. 1. TOOL FOR PLANING CROWN-BRASS SEATS IN DRIVING BOXES. FIG. 3. TOOL FOR PLANING SHOES AND WEDGES

for each box. The planer, however, is an ideal machine for this operation providing the proper tools are furnished, as the boxes can be set up in a string of as many as the table will hold. A tool for planing driving boxes is shown in Fig. 1. It is attached to the planer saddle by the bolts that hold the swiveling plate, that part having been removed. At the lower end is a worm-driven plate on which is mounted a sliding toolblock fitted with the conventional clapper and box. The toolblock can be revolved by hand by applying a crank to the squared end of the worm shaft at *A* or by power through a miter gear on the worm shaft meshing with a like gear in the saddle and used in the regular down feed. The feed for depth of cut is controlled by a capstan-headed screw on the tool slide. Details of this tool are given in Fig. 2.

Another job to which the planer is admirably adapted is that of machining shoes and wedges. Here, with suitable holding fixtures, they can be strung out in quantities limited only by the length of the planer table. A tool for planing shoes and wedges is shown in Fig. 3. It is attached to the toolslide in place of the apron and clapper box and is arranged to swivel on a stud at *A*. The two tools *B* and *C* take cuts on the outer edges of the work while those at *D* and *E* take their cuts on the inner edges, the feed, of course, being downward. The toolposts are mounted in individual spring-actuated clappers.

It will be noted that the block carrying the tools is a separate piece from the main body of the device to which it is attached by four studs, so that it can be removed for the substitution of other toolholding blocks, and that slots are provided for vertical adjustment. For traversing cuts, the whole arrangement can be revolved 180 deg., presenting to the work a tool held in the clapper *G*.

Machining Crown Brasses

Machining the outsides of crown brasses to fit driving boxes can be done in the lathe, vertical boring mill, slotting machine or shaper, but the vertical boring-mill, owing to the ease in mounting and locating the work and in the adjustment of the tools is, perhaps, the most satisfactory machine for the purpose. A fixture for holding crown brasses for machining in a vertical boring-mill is shown in Fig. 4. Bolts through the slots to be seen in the base hold the fixture to the machine table, while the work is held between the checkered plates above and below.

Clamping is done by the nut shown at the top of the central stud augmented by cup-pointed setscrews in the upper plate. The upper plate is reversible to accommodate brasses of more than one size without interfering with the tool at the start of the cut.

Piston rings are cut from a pot casting that has been bored and turned to the proper diameters. Five rings are cut off at, or almost at, the same time by the multiple tool shown in Fig. 5, in which the tools vary enough in length to part the first ring a little ahead of the second and so on progressively through the lot. The cutting tools are of the circular type, mounted on gear segments and clamped in adjustment by the nut *A*. The tools are not removed from the holder for grinding but are all ground as a unit. Adjustment for height of points is made by revolving the toothed segments by means of a wide faced pinion operated by a socket wrench through the hole *B*. After adjustment the wedge *C*, bearing on the pinion shaft, is drawn tight by a nut underneath, holding both pinion and segments from movement.

Tire-turning tools are forged to shape in dies and mounted in holders such as shown in Fig. 6. The upper edges of the tools are forced up around the contour in forging so they may readily be sharpened by grinding on the top. The holder has recesses in the top and bottom so that both the tools shown in the illustration

can be mounted in the one holder and either one brought into service by turning the holder over.

A set of tools for cutting small gaskets, or washers from sheet packing is shown in Figs. 7 and 8. The blanking and piercing dies are in the base of the tool at *A*, Fig. 7, and the blanking and piercing punches are shown at *B* and *C* respectively. The sheet packing is entered in the slot *D* and after blanking the gasket,

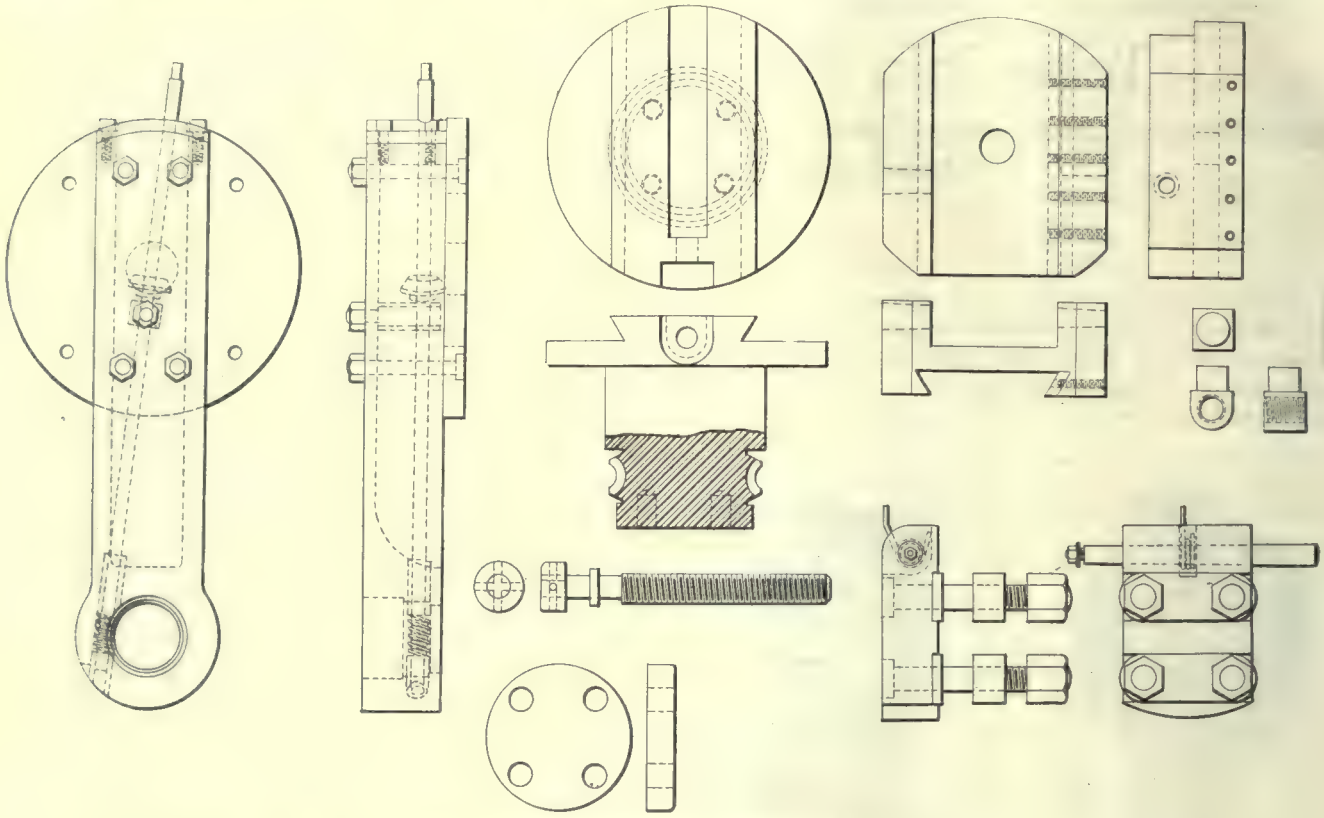


FIG. 2. DETAILS OF TOOL SHOWN IN FIG. 1



FIG. 4. FIXTURE FOR HOLDING CROWN BRASSES

the punch *B* carries it down and holds it on the piercing die. The punch *C* fits inside the blanking punch and, on being forced down by the handle, pierces the gasket. Fig. 8 shows the tool assembled and some of the gaskets cut by it. While production by a combination die in a punching machine would be much greater, the limited demand for the gaskets can be supplied by this simple and inexpensive tool and one of the tool-

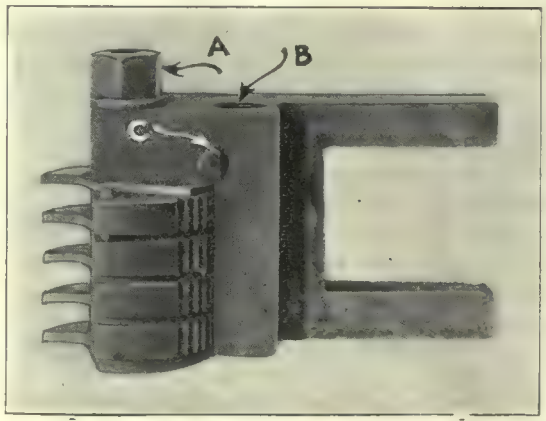


FIG. 5. MULTIPLE TOOL FOR CUTTING OFF PISTON RINGS

crib attendants can cut all that are needed in his spare time.

Master Car Builders' gages for wheel defect, worn journal collars and journal fillets are supplied to a large number of employees and, with the exception of those used by shop foremen do not need to be extremely

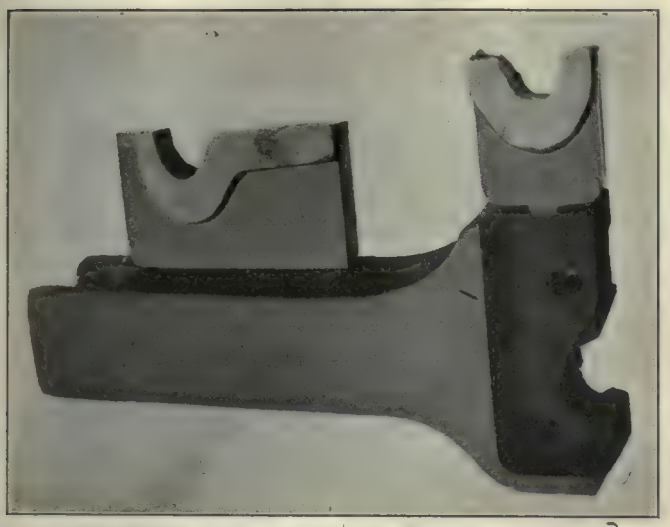


FIG. 6. TIRE TURNING TOOLS

accurate. Gages for distribution to outside men are punched out of sheet steel by the tools shown in Fig. 9. at a cost of a few cents each and answer all the purposes of hardened and ground gages costing several dollars each. One of the gages punched is shown at *A*.

The die is set in a block having a box guide in which the punch holder fits. The reason for this construction is that the tools are used in one of the boiler shop presses in which the ram is not guided with sufficient accuracy for work of this kind.

Portable air drills are tested for efficiency at stated times in the apparatus illustrated in Fig. 10. The spindle of the drill *A* rests on the plunger of an oil cylinder connected to gage *B*. Pressure similar to that of drilling is applied by the screw *C* operated by hand wheel *D*. Air is supplied from the line through the tank *E*. The efficiency of the drill is noted by the amount of air consumed as shown by the "tool-o-meter" *G* in connection with the pressure on the air line registered by gage *H* and the drilling pressure shown on gage *B*. Comparing these readings with readings taken from new drills gives a very good indication as to whether or not a drill needs overhauling.

Repaired drills are tested in this apparatus to see if the repairs have been properly made.

In making and repairing seats for pipes taking steam from the dry pipes to the cylinders the general practice is to use spherical reamers. Such tools are expensive both as to first cost and upkeep. The device shown in Fig. 11 will machine spherical seats in all sizes of dry pipes to be found on locomotives. In use, the spool

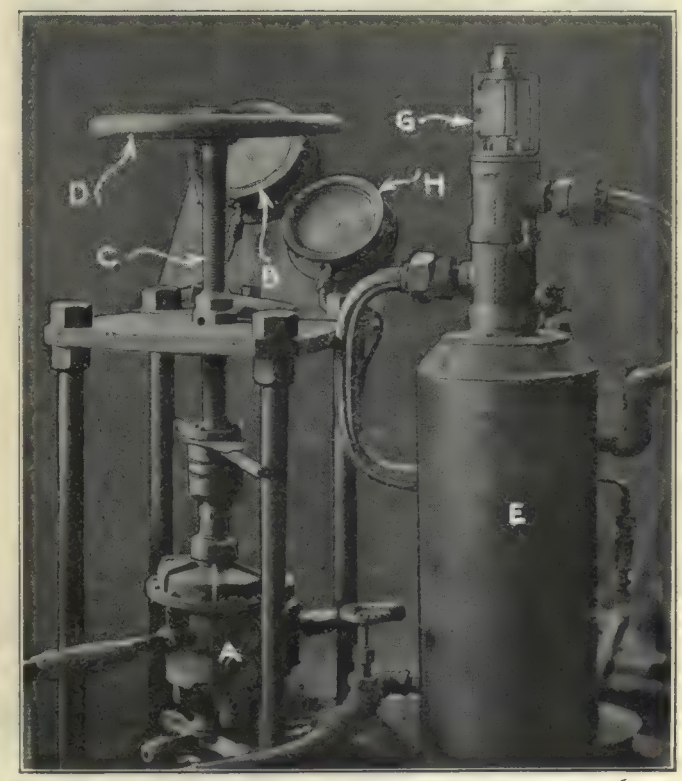


FIG. 10. DEVICE FOR TESTING AIR DRILLS

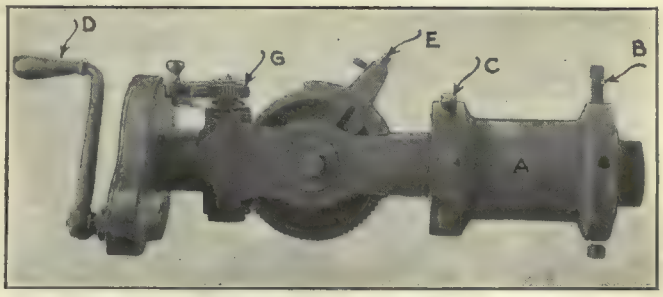


FIG. 11. DEVICE FOR SPHERICAL SEATING





FIGS. 7 AND 8. TOOLS FOR PUNCHING GASKETS

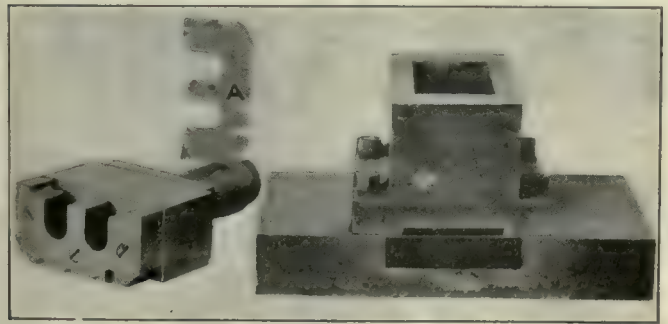


FIG. 9. TOOLS FOR PUNCHING M. C. B. GAGES

A is inserted in the dry pipe where it is centered by the screws *B* and securely held by screwing out the screws *C*.

The device is rotated on its axis by means of the crank *D*, the inner part of the spool acting as a bearing. As the tool *E* is swept around the seat, it is given an intermittent circular motion in a direction at a right-angle to the axis of the device through worm gearing actuated by the ratchet *G*. The ratchet can be operated by hand, or automatically by a stop clamped to any convenient part of the boiler or smoke box, a helical pull-spring returning the pawls to the starting position after each movement. Seats of any radius within the range of the device can be made by adjusting the position of the tool in relation to its center of rotation. As arranged, the device is intended to be operated by hand, though there is no reason why it cannot be easily arranged for operation by a motor.

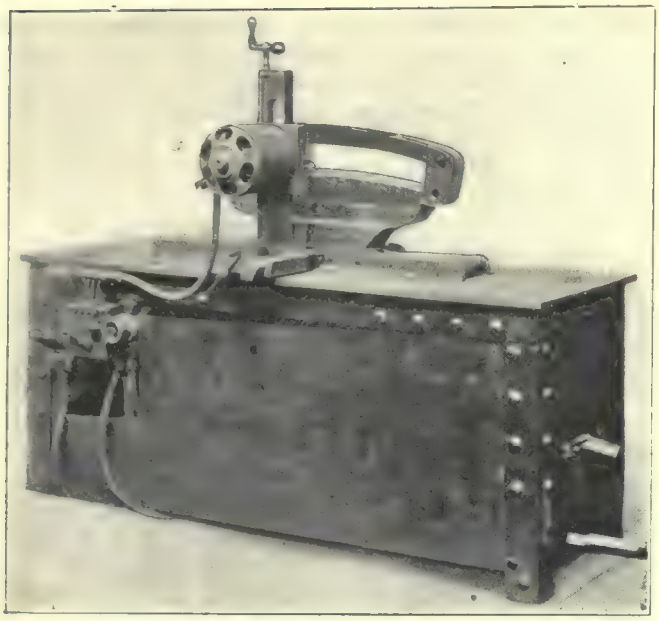


FIG. 12. HOME-MADE LINK GRINDING MACHINE

A very compact, home-made machine for grinding valve-motion links is shown in Fig. 12 and in detail in Fig. 13. The link is clamped to the carriage which oscillates on bars set at an angle. The angle to which the bars are set determines the grinding radius of the link and provision is made for changing this angle by a screw operated by the crank shown at the right of the machine. The grinding head can be either raised or

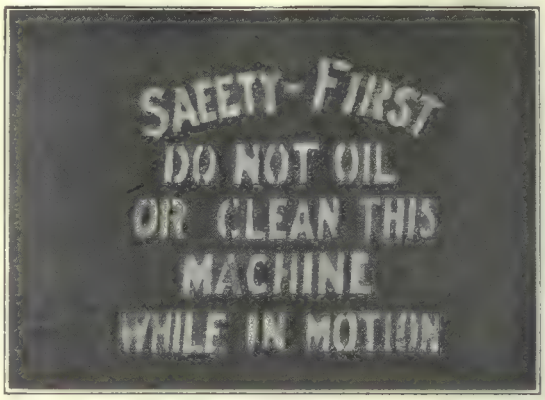


FIG. 14. CAUTIONARY NOTICE ON MACHINE TOOLS

lowered by a micrometer screw. The wheel runs at 5,400 r.p.m. and has a traverse across the link of 4 in. As originally constructed the oscillating motion was operated through a reversing screw, the traveling nut being connected to the carriage by a swinging connecting rod and all motions were driven by belt from a single motor. Alterations have since been made so that the carriage is now oscillated by a crank motion from

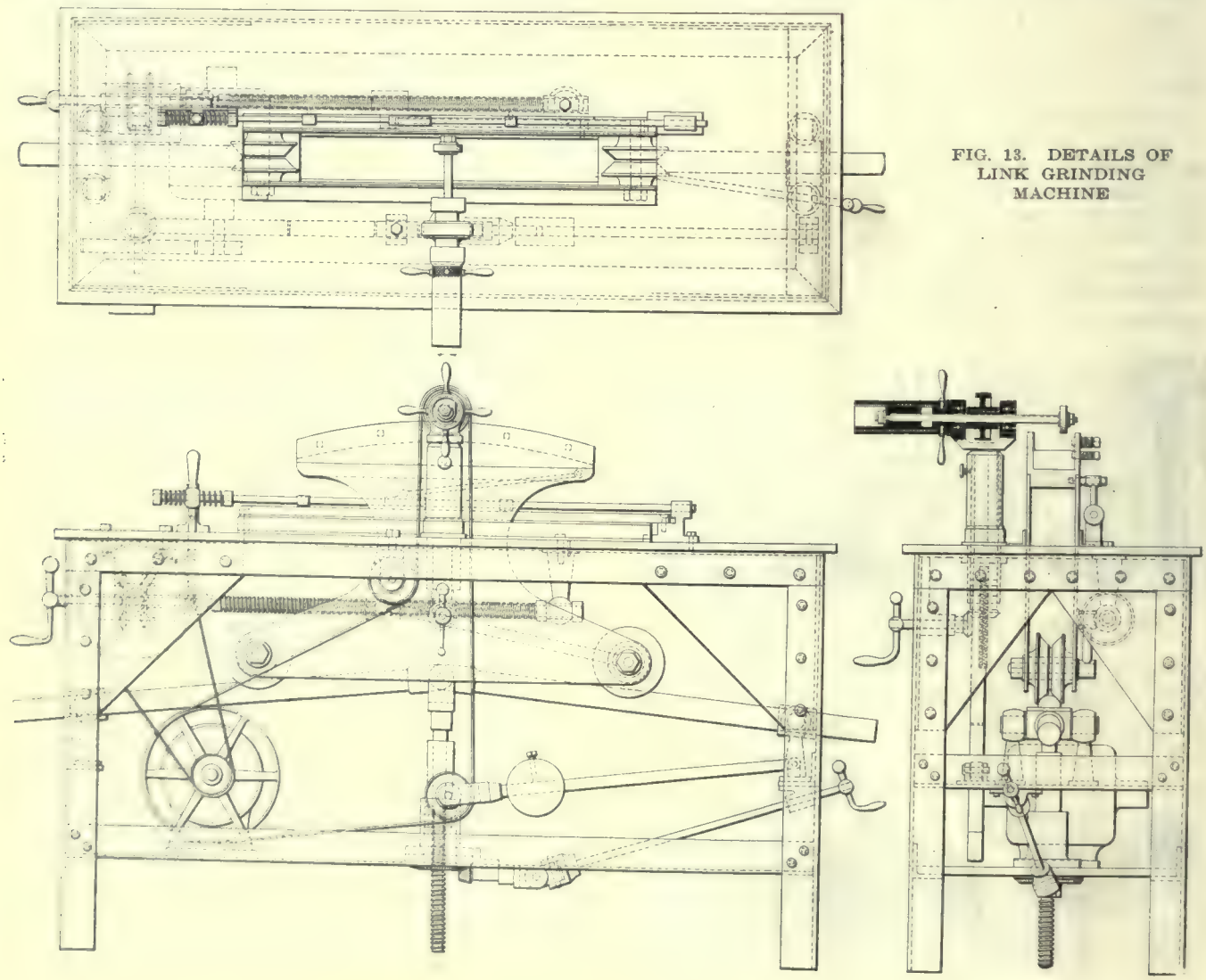


FIG. 13. DETAILS OF LINK GRINDING MACHINE

one motor while the wheel is driven by another motor mounted on the grinding head.

The tools and appliances illustrated and described in this article were made in the shops of the Chesapeake & Ohio Railway, Clifton Forge, Va., where they are in constant use.

That "Safety First" is uppermost in the minds of the management of this shop, is evidenced by the fact that every machine on the premises has stencilled on it in large white letters the cautionary notice shown in Fig. 14.

Super-Standards

By Frank B. and L. M. Gilbreth

The value and importance of standards and of standardization as factors and causes of cost reduction is generally acknowledged by all people today, both inside and outside the industries, who have given both the theory and the practice proper investigation and study.

Dr. Taylor was a firm advocate of standardization as applied not only to tools, appliances and implements, but also to methods, and we desire to acknowledge our appreciation of the great value of the Taylor philosophy and our emphasis on super-standardization due to Dr. Taylor's emphasis on standardization.

Mr. Cooke's definition of a standard as "a carefully thought out method of performing a function, or carefully drawn specification covering an implement or some article of stores or of product" is undoubtedly the best definition to date, but it embodies a thought that is quite different from that which we are emphasizing in considering the subject of super-standardization. The super-standard is the *best known* method of performing a function, etc., attained through the use of the best known units, methods and devices of research. The principle is the same for all standards, but the difference in the degree of refinement of method brings about differences in results that are comparable with the usual results of important inventions.

The super-standard is a logical growth of management as a science. It supplements and does not supersede the standard which remains accepted practice during the transitory or installation period. Standardization has great significance from the management, the economic, the psychological and even the psychiatric standpoint. This is evidenced by the fact that it is universally advocated by management men; that it is endorsed and recommended in the report of the Committee of Waste in Industry; that it is estimated as one of the most important elements of scientific management by present day psychologists and appreciated as a possible solution of certain cases of mal-adjustment by the progressive psychiatrist.

Super-standardization, having all the advantages and none of the limitations of the less accurate standardization, must be conceded to have greater value from all these standpoints. In addition it elminates fatigue, both directly and indirectly, in that it standardizes conditions and methods which induce minimum fatigue and methods which produce efficient habits and utilize the finest, most carefully taught type of automaticity. Concerning itself, as it does, primarily, with elements of motions, it facilitates the transference of skill and thus vitally affects the problem of industrial education.

There is imperative need today for such super-standardization, as evidenced by the need for increased production, elimination of waste and stability.

This country is suffering from unnecessary and wasteful changes, based upon nothing but a desire for novelty and embodying no element of permanence. This does not necessarily mean that there should be no change or less change—it may mean more change. It does mean that changes must be definite, progressive and stabilizing and must pay in money or in durable satisfaction.

On the other hand, Europe has made the most astonishing progress during the last few years. For example, in 1917 the Verein Deutscher Ingenieure, at the suggestion of the German government, organized a central national body, called the "Normenausschuss der Deutschen Industrie." Its members are engineering societies, manufacturing concerns, industrial associations and various departments of the government.

The organization, whose purpose is to foster standardization and to promulgate standards, has attacked many fields and published much material, ranging from standardization of lines and letters in the draughting room, to standardization of window frames for small houses.

Holland has been equally progressive, and the work of the Hoofdcommissie voor de Normalisatie in Nederland is both extensive and intensive. Nothing but a painstaking study of standards issued by these countries can make plain their overwhelming importance. This lies not so much in what they contain, as in what they imply.

Our Hope Lies in Super-standardization

Europe realizes the necessity of standardization as this country does not. Moreover careful investigators confirm our findings that Teutonic Europe will, partly because of temperament, go into this matter more fundamentally than we of the Anglo-Saxon race will be apt to do, if governed only by temperament. An unceasing and costly passion for expediency has already proved a menace to the development of scientific management. Our one hope lies in super-standardization, in reducing all possible practice to standards based on accurate measurement. Here we can be supreme, for we have both the knowledge and the equipment to do the work easily, quickly and inexpensively.

An immediate effort of super-standardization will be the simplification of the problems of maintenance. These have to do with the relation between the engineer and the production manager and the stability of the work begun by the engineer after he leaves the plant and the production manager takes over the entire responsibility. The super-standard adequately applied builds up a super-standardized practice that insures maintenance of that which is best until superseded by proved, better super-standard practice.

An important means toward arousing interest and co-operation in super-standardization consists of definite examples of its application which induce the plant, the industry, or the entire country to think in terms of standards.

In the first cost super-standardization competes successfully with inaccurate methods. In ultimate cost it need fear no possible competition. It is the one best way for obtaining lower production costs and higher wages simultaneously and an immediate way to reduce the cost of living.

Outline of address before the Taylor Society, Philadelphia, March 18, 1922.

Methods of Machine Tool Design

Second Part of the Fourth Section—Belting Applications with Particular Reference to Countershafts, Belt-shifting Apparatus and Tightners

By A. L. DeLEEUW

THERE are cases where it is desirable to use a belt as part of the mechanism of a machine, either because some part must run at a very high speed, or because a geared transmission might cause vibrations. An instance of the first kind is the internal grinder, and one of the second kind is the drive for the work spindle of a cylindrical grinder. Though in this latter case there are machines in existence which have a very satisfactory geared drive, many people prefer the belted drive because it does not require the great care and fine workmanship, and, as a result, is less liable to cause trouble. In cases like the above, endless belts are required because any kind of belt fastener would cause shock when passing over the pulleys. The designer should make some provision for take up and for removal of belt.

There are many ways of joining the two ends of a belt, besides the method of cementing them together, but these various methods have no relation to the design of the machine, so that we do not need to discuss them here. This much should be mentioned, however, that a lumpy joint should never be tolerated.

The endless belt finds a good application in the belted motor drive of which Fig. 38 is a diagrammatic drawing. The motor is fastened to a hinged plate. The hinge is so located that the combined weight of motor and plate produces the desired tension in the belt. An adjustable screw limits the possible movement of the plate. As the illustration shows, the weight causes tension in the belt and pressure against the hinge. The diagram of these forces should be analyzed if one

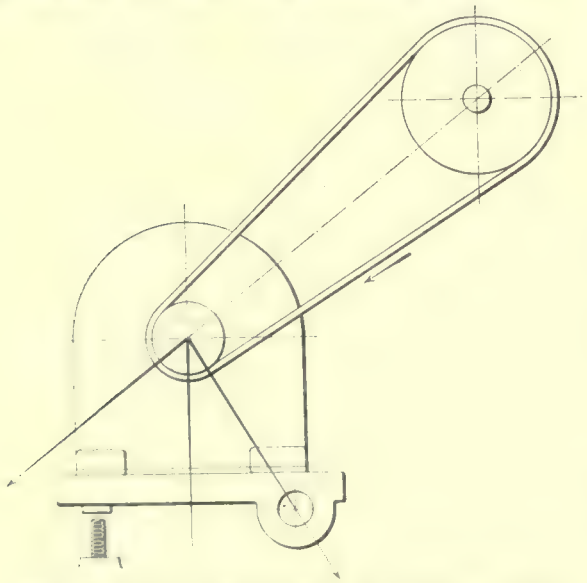


FIG. 38. GOOD APPLICATION OF ENDLESS BELT

wishes to obtain the proper tension. When the belt stretches, the limiting screw is lowered. In this manner a belt may be used during its entire life without any change whatsoever, and with absolute assurance that the proper tension will be maintained.

Idlers are used for four different purposes: To guide the belt in the desired direction; to take up slack; to give the belt the desired amount of tension; and to increase the arc of contact between belt and pulley. In this last capacity the idler has an important bearing on the success of some belt drives. The net tension in the belt—that is, the difference between the tension on the pulley and slack sides—depends, among other things, on the expression $\frac{e^{f\theta}-1}{e^{f\theta}}$ in which e is the base of the natural logarithm system, f is the coefficient of friction, and θ is the arc of contact, expressed in radians. If we compare arcs of 120 and 240 deg. and assume the

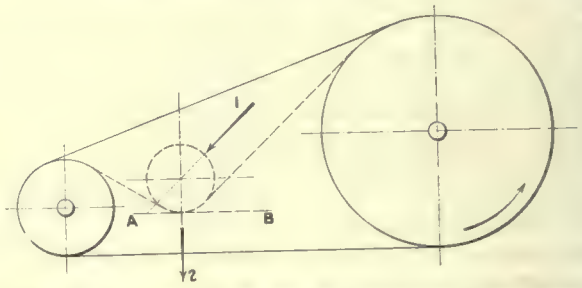


FIG. 39. DIAGRAM TO SHOW SHIFTING OF BELT TIGHTENER

coefficient of friction to be 0.45, we will find the value of $\frac{e^{f\theta}-1}{e^{f\theta}}$ to be

0.6 for 120° and
0.84 for 240°

This indicates the importance of a large arc of contact.

In Fig. 39 is shown the application of the idler pulley for this purpose. It should be located close to that pulley where normally a small arc of contact would be. In order to make the arc as great as possible, the idler should approach the pulling belt as closely as possible. When conditions permit, this idler should also be utilized for the take up. As the distance between the line AB and the pulling side of the belt is necessarily small, it might seem that the movement of the idler for the purpose of belt take up must be limited. However, by moving the idler in the direction of arrow No. 1 rather than in the direction of arrow No. 2, it will be found possible to obtain all the take up required.

It is important that the idler press on the slack side of the belt only enough to insure the proper wrapping of the belt around the pulley and the proper initial tension. Additional pressure causes more pressure on the bearings, without compensating features. For that reason weights are used, whenever possible, to insure the correct amount of pressure. Springs are also used, but are not to be recommended, as a spring exerts a variable amount of pressure for various positions of the idler.

Tight and loose pulleys form, perhaps, the most simple means for starting and stopping a machine. Nevertheless, the tendency is toward friction clutches, although these latter have been the source of a good

deal of trouble and are necessarily more complicated and, therefore, more apt to get out of order than tight and loose pulleys. The reason for this preference lies in the fact that it is extremely important to be able to stop the machine with the least possible delay and a single jerk at the shipper lever will accomplish this with a friction clutch; whereas the shifting of a wide belt from one pulley to another takes an appreciable amount of time, however quick the operator may be. The various constructions for tight and loose pulleys

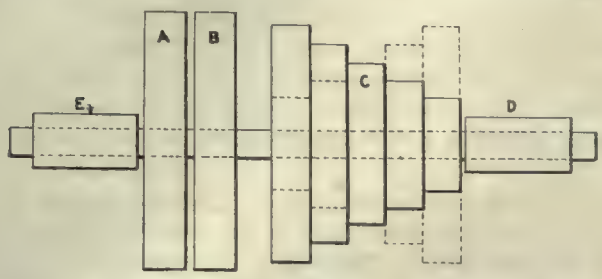


FIG. 40. ELEMENTS OF A SIMPLE COUNTERSHAFT

will not be given here as they may be found in almost any book on machine design.

Countershafts may be arranged for one or more speeds as well as for one or two directions. As a rule very little thought is given to the requirements of a good countershaft, though a great many troubles and delays may be traced to this element of the machine. In late years the countershaft has become of less and less importance, due to the introduction of the single pulley drives which permit of direct drive from the line shaft, from a motor or from a simple jack shaft. Nevertheless, there remains a large percentage of machines still driven from a countershaft, and there will probably be such a class for all time.

Simple Countershafts

A simple countershaft, one speed and one direction only, is shown in Fig. 40. The following points should be considered by the designer, and apart from the design of the various elements which, as has been stated repeatedly, will not be taken up here.

(1) Which shall be the tight pulley, *A* or *B*?

(2) Should the cone be placed as shown in full or dotted lines?

(3) What is the proper diameter and face of the tight pulley, supposing the size of the cone is given?

We can only point out here how to arrive at an answer to the first two questions. A direct answer can be given to the third question: The product of diameter and belt width for the driving pulley should be from 15 to 25 per cent more than the corresponding product for the large step of the cone.

As to the first and second questions, the following points should be considered and balanced against each other and the designer will often have to do something wrong, because doing it right might compel him to commit a greater sin elsewhere.

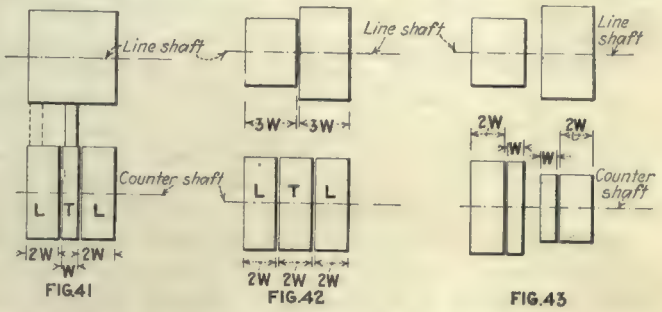
(1) The shaft should be as short as possible to avoid excessive deflection, due to weight of parts and belt pull.

(2) For the same reason the diameter of the shaft should be as large as practical. In a *large percentage of cases*, shafts are made *too small*.

(3) To minimize tension, the tight pulley should be close to the cone (or its equivalent).

(4) To minimize bending, the tight pulley should be as close to the bearing as possible.

Note: Requirements 3 and 4 clash and it is up to



FIGS. 41 TO 43. ARRANGEMENTS OF LINE AND COUNTERSHAFT PULLEYS

the designer to determine in each individual case which requirement is the more important.

(5) To minimize bending, that step of the cone which is called upon to do the heaviest work should be close to the bearing.

(6) The pulleys should be so placed on the countershaft as to bring the shipper lever within easy reach of the operator.

(7) The shipper lever should be so located in relation to the operator that the operation of stopping the machine requires a movement of the hand *toward* the body.

It will be seen that, as a rule, it will not be possible to meet all of the requirements and that a choice must be made.

Arrangements of Pulleys

A countershaft may have more than one set of pulleys, either for the purpose of obtaining more than one speed or for reversal. In many cases a difference of speed is combined with a reversal of direction, as, for instance, in lathes. When there is merely a reversal without change of speed, there is no need for different sizes of pulleys. An arrangement such as shown in Fig. 41 can be used. Here we have *one* tight and *two* loose pulleys, the tight pulley having a width sufficient for the belt used, and the loose pulleys having a face about twice as wide. The dimension *W* in Fig. 41 and subsequent sketches is supposed to be the width of the belt, no allowance being made in the sketch for clearance.

A single shipper lever, with one shifter rod and two sets of shifter fingers can be used. As will be noticed, the operator's movement for stopping the machine is sometimes correct and sometimes wrong.

In Fig. 42 we have the same conditions except that the line shaft pulleys are of different diameter, though the countershaft pulleys are of even size. Here again it is possible to do the shifting with one shipper lever. The total width of the pulleys on the shaft is here 6 *W* plus clearance, whereas in the previous case it was 5 *W* plus clearance.

In Fig. 43 countershaft as well as line shaft pulleys are of different sizes, so that there is no longer any benefit in placing them close together. They can be put anywhere on the countershaft. Here again a single lever will do the shifting. The total room required on the shaft is 6 *W* plus clearance.

In Fig. 44 the idea is dropped of shifting both belts by means of two sets of fingers fastened to one rod, and, as a result, we need only 4 *W* plus clearance on

the shaft. Furthermore, we are no longer compelled to place the loose pulleys on opposite sides of the tight pulley, but can place them as may be most desirable.

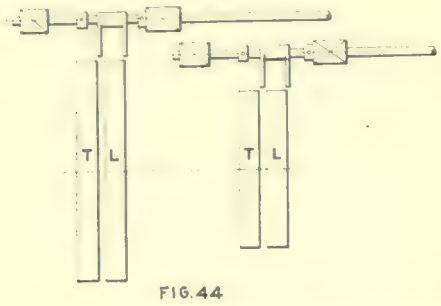


FIG. 44

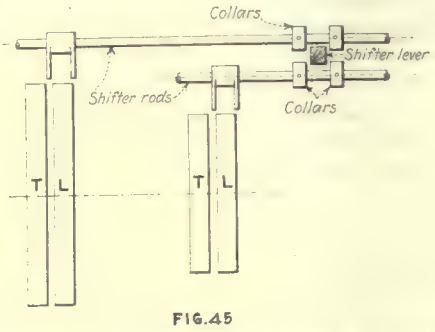


FIG. 45

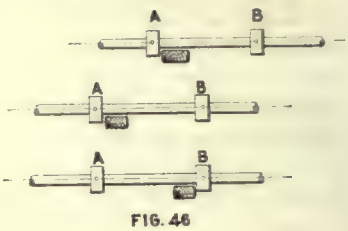


FIG. 46

FIGS. 44 TO 46. ARRANGEMENTS OF SHAFTS, PULLEYS AND SHIFTER RODS

We can so place them, for instance, that we obtain the correct movement for stopping the machine.

It is very important to arrange the stopping and starting device of any machine so that the *operator makes the movements which he would make if he were in personal danger.* A man is liable to lose his head when trouble suddenly appears and drop the habits of a lifetime to follow his animal instincts. Recognizing this in the design of machine may save the machine from being wrecked or some man from being injured or killed.

To do the shifting by means of two shipper levers is not desirable; it leads to confusion and both belts might be thrown on at the same time. To avoid this a construction is used resembling, at least in principle, the gear shift lever of an automobile. There are two shifter rods, each with its own set of belt fingers. Each of these rods has a set of collars between which one may bring the shipper lever, which is hung from a ball or universal joint. Fig. 45 shows this arrangement in diagrammatic form, and Fig. 47 shows the manner in which some of the details are worked out.

Unless a shipper lever is locked it has a tendency to fall back to its normal position (vertical), and this means that the belt will be thrown off or on when this is not wanted. A common way of overcoming this difficulty is illustrated in Fig. 46. It consists of providing the shifter rod, that is the rod which carries the belt shifting fingers, with collars or pins which are to be engaged by the shipper lever. The collars or pins are so placed that one of them is against the shipper when the belt is on, and the other when the belt is off. If A and B are the two collars, and the shipper moves in the direction from B to A, in order to put the belt on the tight pulley, then collar A is against the shipper when the belt is off, thus giving the shipper the chance to work against A without any lost motion. When the belt is on and the shipper is released, it falls back and against collar B, thus making it possible to throw the belt off, again without lost motion.

Some such arrangement is even more necessary when two belts must be manipulated. Not only is there danger that the shipper may fall back, but the operator might easily make the mistake of pushing it forward again and throw the wrong belt on. To avoid this the collars A_1B_1 and A_2B_2 are spaced as in Fig. 47. The shipper E is hung from a ball joint and can engage either of these sets of collars by being moved sideways. A forward movement will then move rod C_1 or C_2 and throw one of the belts on. While on this forward movement the shipper is guided by guide D. When the shipper is released it will fall back and be in position to operate against collar B_1 or B_2. It also falls sideways into its original position and as the collars are positioned as shown in Fig. 46, there is nothing to prevent the operator from making a false move and pushing the other belt onto its tight pulley. To avoid this, collars B_1 and B_2 are provided with projections or hooks, so arranged that the hook of B_2 shuts off the pathway of the shipper for B_1 and vice versa. These hooks are in different planes and both are in a plane different

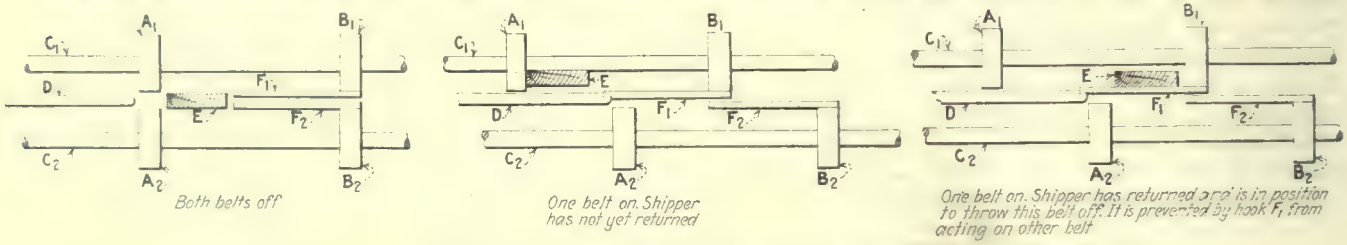


FIG. 47. DETAILS OF SHIPPER ACTION

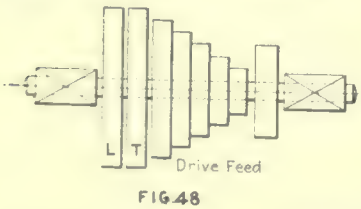


FIG. 48

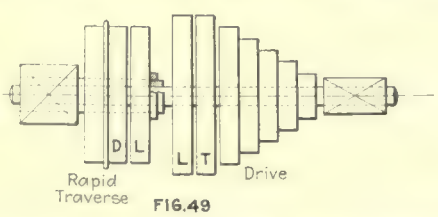


FIG. 49

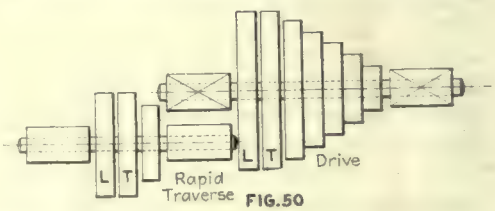


FIG. 50

FIGS. 48 TO 50. COUNTERSHAFTS FOR COMBINATION OF DRIVES

from that of guide D, so that there can be no interference. Similar arrangements might be made for more than two speeds.

It often happens that the countershaft must furnish power for some other function of the machine besides the drive, such as feed or quick traverse or oil pump, or it may be that there is more than one drive to the machine, such as for duplex machines or special machines with a number of independent spindles. Sometimes these various drives bear such a relation to each other that all of them should be started and stopped simultaneously, and sometimes the opposite is required—that is, that one drive should be independent of the other. Fig. 48 shows a countershaft arranged for the drive and the feed of a machine.

Though such an arrangement is not desirable, generally speaking, there are cases where some special machine can be materially simplified by driving the feed from the countershaft. It is very important to stop the feed at the same time as the drive, for if the feed should continue after the drive has stopped tools would be broken or the machine wrecked. Fig. 49, on the other hand, shows a combination to be used when it is desirable to start the two functions of the countershaft separately. In this case the secondary drive is for a quick traverse motion of the machine or for an oil pump or for any other function which we may desire to continue after the drive has been disconnected. It would be possible, of course, to build an entirely independent countershaft, and this is often done. This scheme has certain disadvantages.

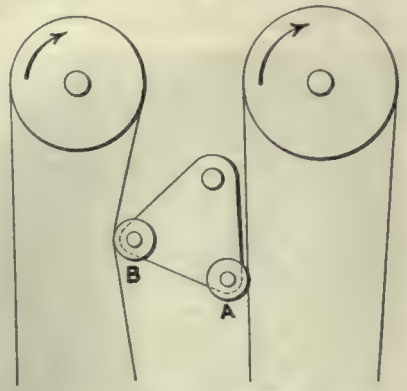


FIG. 51. ROCKING IDLER FRAME



FIG. 52. COUNTERSHAFT WITH THREE DRIVES

In Fig. 50 is shown how it becomes necessary to place the quick traverse drive further away from the main drive so as to allow the belt coming from the line shaft to clear the hanger of the main countershaft, and this, in its turn, means that the machine itself is to occupy more space than necessary. The arrangement of Fig. 49 is this:

A sleeve is attached to the hanger or box of the countershaft and on this sleeve two loose pulleys are mounted. One of these is a single pulley and acts as the loose pulley for this system. The other pulley, also running loose on the sleeve, is divided in two parts by a flange, one part receiving the belt from the line-shaft and the other delivering the driving belt to the machine. Sometimes these pulleys run directly on the countershaft, but this is not advisable on account of the difficulty of properly lubricating the pulleys. The part *D* or the pulley may drive more than one machine pulley, such, for instance, as one for the quick traverse and one for an oil pump.

The chief objection to driving the feed by means of a separate belt from the countershaft is the fear that the driving belt may break or fly off. The arrangement shown in Fig. 51 is sometimes used to overcome this objection at least partially. It consists of two idlers hung in a rocking frame. A weight or spring, not shown in the drawing, forces pulley *A* against the tight side of the main belt. Pulley *B* bears against the slack side of the feed belt. This belt becomes slack and fails to drive the feed if the main belt breaks. As will be seen, this is only a partial remedy, for the feed belt would continue to function if the main belt should slip. Fig. 52 shows a countershaft with main drive, drive for feed and independently operated drive for quick traverse.

It is advisable to keep the countershaft as simple as possible. Should conditions compel the use of a complicated countershaft, this piece of apparatus should be constructed self-contained and with as much care and forethought as any other part of the machine—something which, as a rule, is not done.

Be Fair in Your Criticism

By F. H. Sweet

Effective supervision demands on the part of the executive a thorough and complete knowledge of methods and results. Too often a subordinate is allowed to proceed without supervision until he has finished his task, or until he has accumulated considerable results. You find these results not to your liking, and you censure him for not having requested supervision, when you yourself are at fault for not having furnished it in the first place. I do not mean to say that you cannot often judge by the results you are getting. In fact, it becomes necessary sometimes to limit supervision to a judgment of results.

It should be emphasized, however, that when you choose to supervise in this way, you yourself take the risk. Your criticism of the result, if adverse, must be made in a spirit of suggestion, to be used solely as a guide for future procedure and not as a criticism that might cause disappointment and discouragement, for you are responsible for the manner in which you elected to apply your supervision.

What Is Management?

By Robert Grimshaw

Management has been somewhat inaccurately defined by some bright individual as "earning one's living by the sweat of another's brow." In some sense it is correct, in that the manager, or contractor, or *entrepreneur*, as the term now goes, does at least *get* a living by others'—not one other's—exertions. If he is a good manager, he cannot merely get a living but earn it, by increasing the output and efficiency of the workers confided to his direction, and while decreasing the unit product cost, increase the workers' daily earnings, without unduly fatiguing them.

Steering Knuckles for the Mack Truck

Milling, Drilling and Boring Operations on a Heavy Forged Steering Knuckle—Fixtures Used Are of More Than Usual Interest

BY FRED H. COLVIN
Editor, *American Machinist*

THE steering knuckles of any motor-driven vehicle receive severe punishment and not only must the material be strong and tough, but it must also be carefully machined. The fixtures and operations used in finishing the steering knuckles for the Mack trucks at the Allentown, Pa., plant of the International Motor

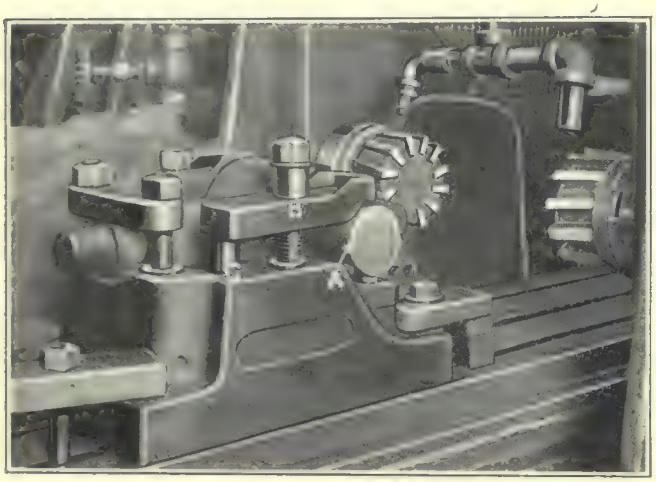


FIG. 1. MILLING THE ENDS

Company, are of more than usual interest, the main operations being illustrated herewith.

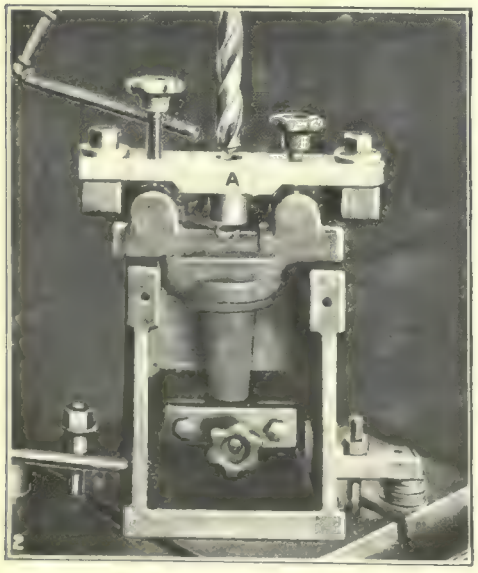
After heat-treating, the ends of the forgings are milled to length and squared for the boring of the spindle hole. This is done in the Cincinnati duplex milling machine, shown in Fig. 1. The fixture is a substantial block fitted with locating pins *A*, while the axle end of the knuckle rests in suitable V's. The clamp *B* is slotted on the under side, this slot guiding it on the upper end of the stud *C*, which serves both as a guide and a support for the outer end of the clamp.

A clearance hole is then drilled in the center of the knuckle, as shown in Fig. 2. This hole gives a clearance space for the rough-drilling which is done from each end, and also gives a starting point for the ball end milling cutter which roughs out the space for the axle. The fixture is comparatively simple, the spindle end of the knuckle rests in a V at each side, while the plate *A*, which carries the guide bushing, swings over the knuckle and holds it in place by the two screws shown.

The ends are then centered and rough-drilled into the clearance hole, a $1\frac{3}{8}$-in. drill being used for this preliminary operation, which is shown at the right of Fig. 3. The next drilling enlarges this hole, the knuckle being held in the fixture shown at the left in Fig. 3. Here the knuckle is again drilled from each end, the fixture being turned by the handle *A*, and indexed by the pins *B*.

The knuckles next go to a knee-type milling machine equipped with a special fixture and a ball cutter, as shown in Fig. 4. Starting with the clearance hole previously drilled, this cutter mills away the central portion, after which the knuckle goes to the horizontal boring machine shown in Fig. 5. Here the central portion is cut away as at *A* by sweep cutters inserted through the bar *B*, after it has been passed through the hole in the knuckle. The holes are also reamed in this operation, the reamer *C* passing clear through both sides and correcting any error in alignment which may have existed up to this point. The opening left by this operation receives the end of the axle and gives it sufficient clearance for turning.

The turning of the stub or axle end is done in the Gisholt lathe shown in Fig. 6. The knuckle is clamped at the ends as at *A*, and steadied against side movement by screws *B* on each side. The axle or stub is



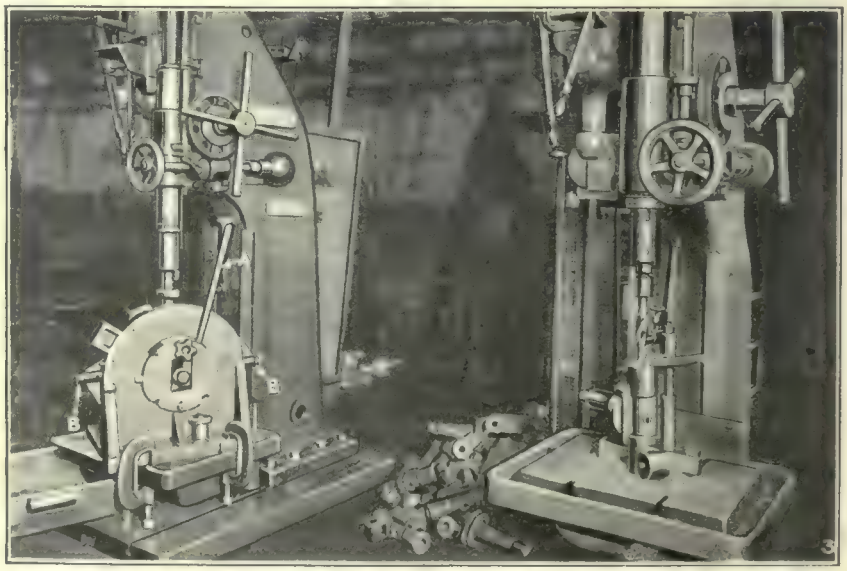
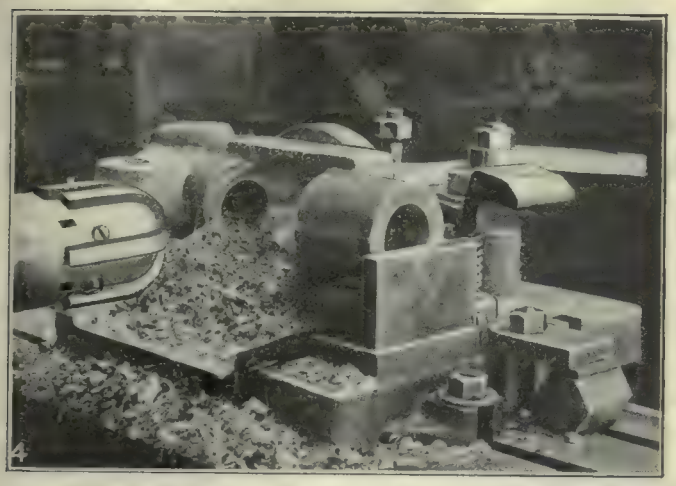


FIG. 2. DRILLING A CENTRAL CLEARANCE HOLE. FIG. 3. TWO OF THE DRILLING OPERATIONS



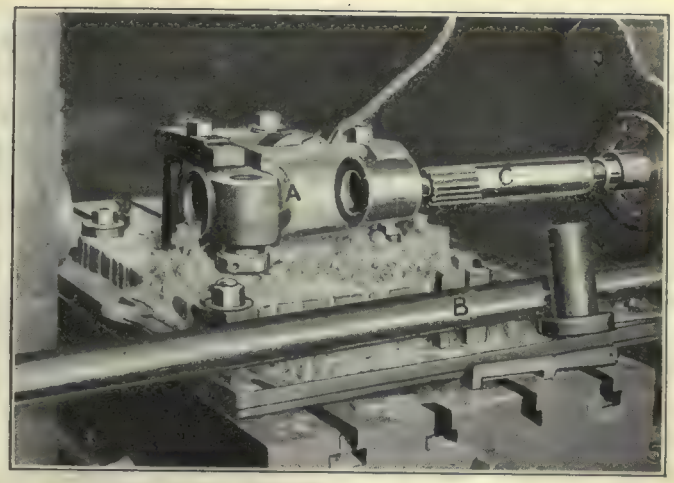
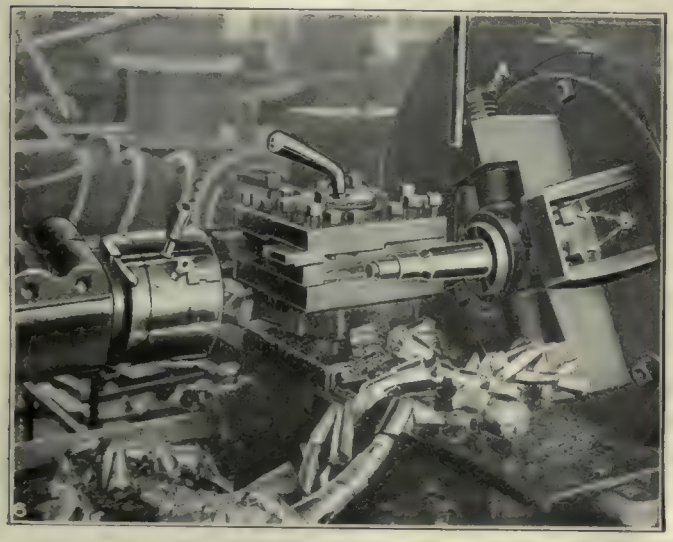


FIG. 4. MILLING THE CENTRAL OPENING. FIG. 5. COUNTERBORING AND LINE REAMING



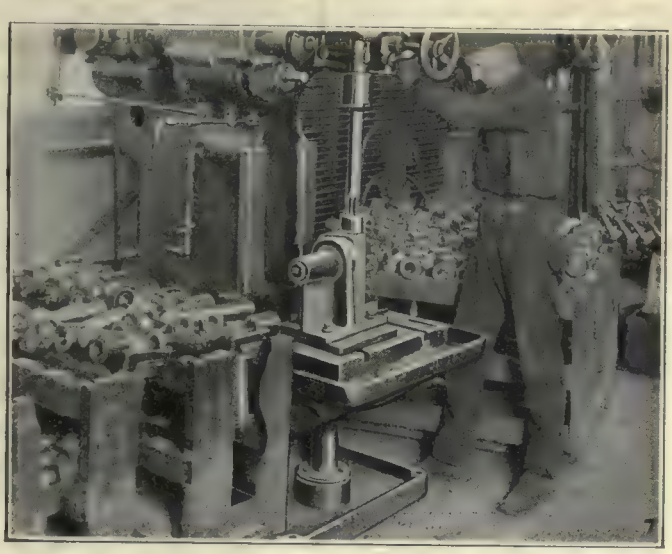


FIG. 6. TURNING THE AXLE END. FIG. 7. THE FINAL REAMING

then turned and formed by tools in the square turret, after which the end is threaded with a geometric die head for the retaining nut.

The final reaming is done with the knuckle held in the special fixture shown in Fig. 7 under a Colburn heavy-duty machine. This view also shows the type of carrying tray used for handling the work so as to be easily accessible and at the same time protecting it against damage.

Simple Method of Marking Patterns and Keeping Records

By P. H. White

There are many excellent methods of marking patterns on engineering drawings, and any system that is well established and giving satisfaction should not be cast aside except for very good reasons. Among the different systems that have come under my observation, none is more simple than the one described below.

Each drawing is given a number, according to whatever numbering system is used. If the complete drawing requires more than one sheet, each sheet bears the same drawing number, but a different sheet number. Thus if drawing 476 consisted of four sheets, the designation would be "476, 4 sheets—sheet 1," "476, 4 sheets —sheet 2," etc. The details are all numbered consecutively, and these numbers are shown in the material list as well as under each detail part.

Every detail requiring a pattern is so indicated on the detail drawing by calling for a pattern number. The pattern number is designated by giving both the drawing number and the detail number. For example, if detail number three on drawing 476 required a pattern, the pattern number would be 476-3.

This method eliminates the necessity of keeping a separate book for pattern numbers, and enables any workman to call for the correct drawing, simply by reading the pattern number which appears on the casting. It might truthfully be called "An automatic pattern numbering system."

For keeping a record of patterns when completed, an index card is used, bearing the number of the pattern in the upper left-hand corner, and the name of the pattern just below. Next follows a brief description of the pattern, such as wood, wood master, metal, gated, plate, etc.; and in case of gated or plate patterns, the number of patterns per gate or plate. Another line indicates the number and kind of core boxes. At the bottom of the card is indicated where the pattern was made, the date and cost.

On the reverse side of the card is indicated the date and the place to which the pattern is to be transferred. When the pattern is returned from the foundry, the date of its return, and its location in the pattern vault are designated. These cards are filed consecutively, so that it is an easy matter to locate any pattern and read its complete life history in a very short time.

Factory Storekeeping and Material Control

The Fourth Article—Duties of the Purchasing Department—Speculative and Routine Buying—Distribution of Order Copies—Follow-Up Procedure

BY HENRY H. FARQUHAR

IN PREVIOUS discussions I have indicated why I felt that the regulation of material was logically and necessarily the job of the production department. There is no more important function in material work, however, than that performed by the purchasing department, since irregularities here will emasculate an otherwise perfect stores routine. In modern business it is no longer the exceptional and spectacular transaction that makes one plant stand out above another. It is largely the penny saved here and there that makes up the dividends. Such savings may be accomplished only through a well-rounded and balanced organization. Since material routine leads into purchasing at so many points, it is essential to take the view that material control includes all officials who are in any way responsible for or deal with this part of the business. From this viewpoint, therefore, purchasing forms a most important link in this chain. It does not, however, follow that the purchasing agent must in all cases report to production from an administrative standpoint (see Organization Chart of Material Personnel on page 735 of *American Machinist*).

WITH A CLEAR definition of duties controlled through a logical and simple routine, the purchasing agent may devote more attention to the important purchasing features and may become a specialist in his own line.

Speculative buying may be justified by traffic conditions, supply and demand, probable price movement, sales tendencies, labor market, storage considerations or the company's financial state.

The purchase order should leave no doubt in the mind of the vendor, as to exactly what and how much is wanted, when shipment is desired and how it is to be made, and the terms of purchase.

The purchasing office has a chance to affect profits at every turn, and at many times the difference between dividends and bankruptcy may rest upon the transactions of this department. The instance shown in Table I illustrates the directness of this effect, where by a decrease of 6.37 per cent in the cost of the raw materials themselves an increase of 9.7 per cent in the *net profit* was obtained.

It is not with technical purchasing, however, that this article deals. This part of the work of the purchasing office is conducted extremely well in the average plant, for the modern purchasing agent has been trained to the specific duty of securing suitable material at the best price, and various works upon the subject may be found in any library. I feel, however, that the more routine part of his work has not been sufficiently emphasized, particularly as it affects the degree of control which may be exercised over functions other than buying proper.

I have found, moreover, so many purchasing agents who could really be lifted out of the rut into which they had fallen, through standardizing the many little irregularities that distract so much attention from the work which constitutes their main interest. The importance of the many points of contact between the purchasing office and the rest of the organization dealing with materials, and some of the means by which this contact may be made more effective in practice, I trust will be clear from the following discussion.

After the engineering department has made up lists and specifications of materials to be kept on hand, after the traffic and purchasing departments have in conjunctions furnished the time necessary to renew, to which has been added other allowances for clerical work and for necessary delays, and after the balance sheet has been put in operation through a passage for entry of all necessary papers, the replenishment order for originating from the balance sheet, or otherwise, sets the purchasing machinery in operation. It is not strictly the purchasing agent's province to originate requests for material, although it is his duty to notify the production department or the specific man responsible for material control routine, as to any probable changes in the market or other factors which in his judgment make purchase desirable. In the case of speculative purchasing he may originate the replenishment orders. In general, however, his duties start with the receipt of the replenishment order, and on this authority all of his future actions are based. It therefore follows without argument that no oral requests for replenishment must be acted upon by the purchasing agent unless they be immediately followed with a written confirmation on the proper form properly approved. A relaxation in this respect will very soon put the purchasing agent on the defensive if he has not the replenishment order to fall back upon.

TABLE I—EFFECT OF COST OF RAW MATERIALS ON PROFITS

	Original Per Piece	New Per Piece	
Material	$0.63	$0.59	Decrease of 6.37%
Labor	0.10	0.10	
Overhead	0.05	0.05	
Total cost	$0.78	$0.74	
Selling price	1.40	1.40	
Profit	$0.62	$0.66	
% of cost	79.5%	89.2%	Increase of 9.7%

The discussion up to this point, applies equally to speculative and to routine purchasing. Upon the receipt of the replenishment order, however, the procedure varies until the contract is closed. It is there-

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fore necessary to treat this intermediate stage under these two divisions.

Whether or not both kinds of purchasing are done by one man or by different men, the only difference in the procedure between speculative and routine purchasing is that in the former case the amount of any item in the speculative class called for on the replenishment order must be looked upon simply as indicating production's actual needs for the time being and not as a hard and fast amount which must be bought. In other words, the purchasing agent is not governed so strictly by the amount called for on the replenishment order as he is in the case of routine purchasing. Depending on the state of the market and other factors, he may order either more or less, at a given time, than the replenishment order requires.

The replenishment order, however, is production's best judgment as to how much of any material should be ordered. If the purchasing agent wishes to depart from this judgment in any specific case, he may:

(1) Consult the production department or possibly the general manager, or both.

(2) Have blanket authority to increase by a definite amount or by a certain percentage the amount called for on the replenishment order.

(3) Be required to secure written approval for each transaction.

Buying More or Less Than Required Justified by Conditions

In any event, however, it must be made perfectly clear to the purchasing agent that it is not only his privilege but his duty to take up such cases as he thinks desirable, since production is not infallible in these matters. Any one of the following factors may, in the purchasing agent's opinion, justify buying more or less than the quantity called for:

(1) The traffic conditions: A freight embargo which gives the appearance of lasting any considerable period would immediately call for an adjustment upward of the amount to order. Here co-operation with the traffic department is required.

(2) The supply and demand for the particular article to be purchased: The purchasing agent should keep himself informed as to the state of production in each article and as to the probable demand for it throughout the country.

(3) The probable price movement, particularly in articles subject to stock market speculation.

(4) The sales tendencies for the product in which the article is to be used: Is the demand increasing or diminishing, and is production able to keep up with or ahead of any increase? Here co-operation with both sales and production is necessary, but such conditions must not be overlooked by the purchasing agent. Keen insight into the vagaries of the business cycle is necessary to relate purchases to price and sales trends.

(5) The labor market: Is an ample supply of labor available? Here again this is primarily production's concern, and yet the purchasing agent from his contact with traveling salesmen and others is in a position to furnish production with accurate and current information in regard to such conditions.

(6) The storage considerations: Have we sufficient room to store all that we would like, and if not, where and at what cost may adequate accommodation be secured? Will the additional cost of such storage counterbalance any probable saving due to buying in quantities far in excess of known production needs?

(7) The state of the finances of the company: Is money available for buying an excess of material, no matter how desirable, and will the loss of interest on such idle money counteract any price reduction from buying in quantity?

Since most of these matters are largely questions of judgment the only safe procedure is for the purchasing agent to receive the regular replenishment orders emanating from the balance sheets. This will back up production. In order to back himself up, the purchasing agent may secure the written approval of the general manager or some other official when the amount called for on the replenishment order is not followed.

A form for approval to change the amount requisitioned refers to the replenishment order received from the balance clerk and makes the recommendation that a different amount be purchased. Reasons for the change are given. The order is signed by the purchasing agent and space is provided for a notation of the action taken by the general manager or other official and his signature.

In times of hand to mouth buying, the replenishment order will prevent overstocking. On a rising market where long contracts may be placed it may still serve to secure deliveries in accordance with production needs. It may, therefore, serve a useful purpose at all times. As indicated previously, the purchasing agent is expected to initiate action even before the receipt of the replenishment order if, in his judgment, conditions appear to require or render advisable immediate or heavy purchase.

After a decision to purchase is made and approval secured, technical purchasing then comes into play until the terms are made and the contract closed. The procedure from then on is identical under both speculative and routine purchasing.

Routine Purchasing Most Satisfactory in Many Plants

It may be objected that such a division of work and responsibility is limiting the purchasing agent and giving him a smaller place within the organization than that to which he is rightfully entitled. This, indeed, is almost the invariable reaction when such a reorganization is proposed to an existing purchasing agent. That the reverse is actually true, however, in that the purchasing agent is given a much better opportunity to measure up to his responsibilities, would seem to be proved by the number of plants and purchasing agents which have found such an arrangement entirely satisfactory.

By such a clear definition of duties according to functional lines and abilities, assisted and controlled through a logical and simple routine, many purchasing agents have found that they could give more attention to those features of the work for which they have long desired more time. They can stand absolutely within their own ground as defined and yet have an ample chance to influence others with whom their work is connected. It is simply a further logical extension of the modern subdivision in administrative duties whereby each man may become a real specialist in his own particular line, unhampered by irrelevant or distasteful routine, or wrongly placed responsibility.

After the decision to purchase is reached, therefore,

the formal purchase order is issued. This must provide for:

(1) The serial number of the purchase order. This gives a cross index between the replenishment order and the purchase order, since when the latter is made out its number must be entered on the replenishment order and the replenishment order number entered on the purchase order. In case one replenishment order calls for several articles requiring several corresponding purchase orders, care must be taken to see that these cross reference entries be completed.
(2) The name of the company making the purchase.
(3) The date of the order.
(4) The name of the vendor from whom the purchase is to be made.
(5) The quantity and description of the goods ordered. This should be specific, so that if there is any mistake in the goods the vendor cannot lay it to a lack of definite detail.
(6) The date the delivery is wanted. This again is just as important on the purchase order for the information of the vendor as it is on the replenishment order for the guidance of the purchasing agent.
(7) The shipping and billing directions. Much trouble is caused in every receiving department because incoming packages are improperly marked. The necessity for marking all packages on the outside with the purchase order number should be emphasized in a prominent place on the face of the purchase order.
(8) The symbol or other short designation of the article ordered. This is for definiteness and to save clerical work in writing and re-writing long names.
(9) The name of the requisitioner.
(10) The department or person for whom ordered.
(11) The replenishment order number (see use under No. 1 above).
(12) The signature of the purchasing agent.

The matter listed under numbers 1, 2 and 7 as far as standard shipping and billing directions go, may, of course, be printed on the form when it is set up, as the form in Fig. 7 shows.

The purchase order must be made in varying numbers of carbon copies according to circumstances and procedure. Ordinarily as a minimum there must be the following:

(1) The original copy to be mailed to the vendor. Fig. 7 shows a form for this copy.
(2) A copy for the requisitioner.
(3) A copy for the purchasing agent's office to be filed by the serial number of the purchase order.
(4) A copy for the purchasing agent's office to serve as a follow-up tickler. Fig. 8 illustrates a form for this use.
(5) A copy for the balance and receiving men.

In addition to these, various other copies may be needed; for instance, one for each department foreman who is to work upon the material ordered, one for the auditor, and so on. Ordinarily, however, the five copies listed serve as a simple and effective basis for strict control and follow-up.

The purchasing agent's obligation should by no means cease with the dispatch of the purchasing order. Upon him falls the duty of specifying the time necessary to renew. His responsibility, therefore, commences with the receipt of the replenishment order and continues until the goods are laid down at the factory door in the time allotted. It therefore behooves him not only to allow himself plenty of margin in quoting such delivery time, but also to notify the production department immediately if for any reason he receives a replenishment order calling for delivery at a date which he knows cannot be lived up to. His acceptance of this date throws upon him the responsibility of having the goods on hand at the time set provided the request is made within the allowable time.

In order that all data in regard to each transaction be readily available, and that adequate supervision of outstanding orders be possible, it is necessary first that an automatic follow-up of each order be secured, second, that complete information covering the articles ordered themselves and the amounts of various articles outstanding with any vendor be obtainable, and third, that adequate files of catalogs, specifications, quotations and similar material be readily available.

The uses of the copies of the purchase order enumerated above by which this follow-up of each order is obtained are as follows:

(1) The original goes to the vendor and should leave no doubt in his mind as to exactly what and how much is wanted, when the shipment is desired and how it is to be made, and terms of purchase. The form in Fig. 7 provides for these details.

The Requisitioner's Duty

(2) When the requisitioner's copy reaches him, it is the requisitioner's duty to check its accuracy and to report back immediately to the purchasing agent if it is not satisfactory in every way. His failure to do so throws back upon him the responsibility for mistakes in the order itself, since the purchasing agent becomes relieved of this responsibility by forwarding a duplicate copy of a correct transcription of the replenishment order.

(3) The purchasing agent's copy should be made out on paper suitable for permanent filing by the purchasing order number in a loose-leaf binder, where each new order should be filed by serial number when issued. On this copy may be entered all notations of the action taken in the case, so that a summary of all transactions may be instantly available. If the terms of purchase are modified after the original order has been mailed, if a new delivery date has been agreed upon, or in fact if anything has occurred to modify the original agreement, notation to this effect should be made on this copy. Progress of fulfillment of the contract should appear here, and when it has been completed this copy should be so stamped. It remains as the permanent purchasing office record of the transaction, supplemented by correspondence and other matter in the letter file.

(4) The purchasing agent's tickler copy: Every purchase order sent out should have a delivery date indicated on it. This date may be of vital concern or of comparatively little moment as the case may be. Nevertheless, some date must appear. This date, moreover, must go out with the expectation that the vendor will live up to it or notify the agent to the contrary immediately upon its receipt or when he finds it impossible to do so. The burden of the follow-up, however, must rest upon the purchasing agent, since no

one will look after our business for us if we fail to do our part.

Depending upon the urgency of the order, therefore, the purchasing agent will enter a date on the tickler copy when he wishes the transaction brought to his attention. The form in Fig. 8 allows space for several of these dates. The date of delivery may be, say, August 1, and since it is imperative that the goods be received not later than that date, it is desirable to follow up the order on July 25. This date, July 25, would then be entered as the tickler date.

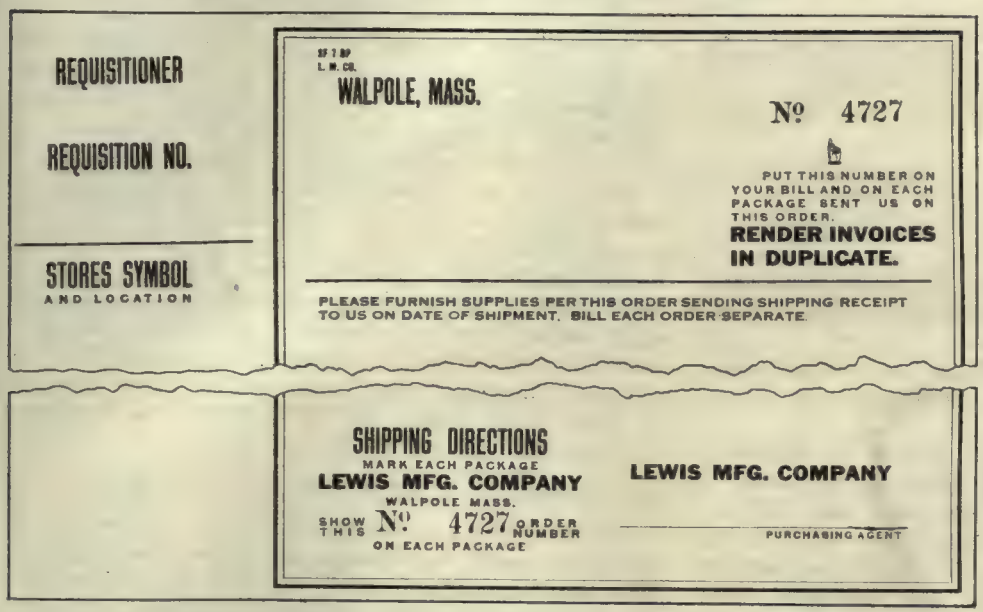


FIG. 7. A FORM FOR THE ORIGINAL PURCHASE ORDER COPY FOR THE VENDOR

The tickler copy would then be filed in a special tickler cabinet with drawers and guides for each month of the year and folders for each day of the month. When July 25 arrives, the clerk will remove all papers in that folder, which may contain not only this copy of the purchase order but also any other matters to which the purchasing agent desires his attention called on this date. The tickler copy will be laid on the purchasing agent's desk, when he will take up such follow-up measures as he deems desirable.

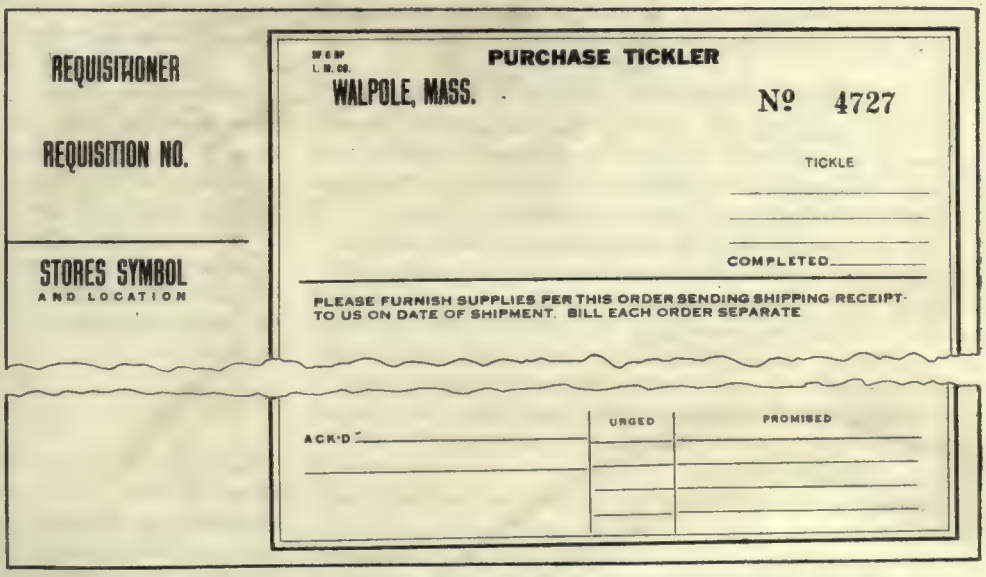


FIG. 8. A FORM FOR THE TICKLER COPY OF THE PURCHASE ORDER

A form card with an attached reply card to give the required information has been found satisfactory for this purpose, and results in a considerably higher percentage of replies than where the routine formal letter is used, requiring on the part of the vendor the repetition of information identifying the order.

When the delivery of an outstanding order is delayed, or when the purchasing agent obtains the information that it will be delayed, he must immediately notify the requisitioner to this effect. Of course, it may not be considered necessary to follow every order before shipment is due from the vendor, for to do so entails much additional work. On the other hand, some plants find it advisable to systematically follow-up all orders three or four days before they are due. Such procedure is recommended particularly during upset traffic conditions.

In any event, however, the purchasing agent is not ordinarily in a position himself, and should not be expected to differentiate between those articles for which there is urgent need and those which may come along somewhat after the date promised. If delivery is to be delayed he must immediately send a notice to that effect to the requisitioner. Then, according to the requisitioner's reply as to the urgency of delivery, he may deal with the exceptions only, letting the shipment go for a few days or bringing all possible pressure to bear for quick delivery as the particular case demands.

After the follow-up is obtained and a new delivery date is set, another follow-up date is entered on the bottom of the tickler copy and it is again filed under that date, and when shipment is complete it may be destroyed or otherwise filed as desired.

(5) The receiving clerk's copy of the purchase order may first be sent to the balance clerk for posting to the proper balance sheet, either classified or unclassified. It then goes to the receiving man who posts it temporarily for the inspector to note and then files it by the name of the vendor. A separate copy may also be made for information and retention by the balance clerk.

It is well to let the inspector look over the receiving man's copy of the purchase order as soon as it is received, particularly in the case of large orders, so that he may make arrangements for the inspection

himself, delegate this work to another, or give any necessary directions.

Before taking up the final stages in the purchasing department, that is, the routine after receipt and notification of goods received, the other records necessary to adequate purchasing regulation may be pointed out. We have described so far, and quite fully, the following records:

(1) Original replenishment order: After the resulting purchase order has been made out, this replenishment order is filed by date of requisition.

(2) Copy of the purchase order filed by serial number.

(3) Requisitioner's copy of the purchase order.

(4) Tickler copy of the purchase order.

(5) Balance and receiving clerks' copy of the purchase order.

In order to make the data of all transactions available, it is necessary further that the purchasing department have records as follows:

(6) An alphabetical letter file for correspondence with the various vendors: This file should be supplemented by a tickler file.

(7) A card index or other record by material: These records may be filed by name of material, or preferably by symbol if symbols are used. In any event, this form should show description of material, dates of various replenishment and purchase orders, from whom purchased, quotation and delivery. Such extensive data are unnecessary in the smaller plants and I have found some purchasing offices conducted satisfactorily where this record shows only the name of the article and the changes in price.

A Vendor's File Not Always Necessary

(8) A vendor's file, showing the name and address of each vendor with whom the company deals, the articles purchased, the terms and deliveries: This record may be unnecessary in smaller plants.

(9) A catalog file: Some systematic method should be adopted for filing catalogs, since in the average purchasing office constructive use is not made of them due simply to their inaccessibility. A system of numbering at least each catalog should be employed, and a card index by article should refer to every catalog where this article is described. Another card index by manufacturers should show the file number of each manufacturer's catalog.

Depending on the type of balance sheet used and the information which is summarized on it, some of the above records can be eliminated. For instance, suppose it is desired to find the names of the various vendors from whom we have ordered a certain article during the past year. Instead of requiring the purchasing agent to keep such data, we may request the balance clerk to give us from the proper balance sheet the purchase order numbers for each purchase of this article. These will enable us to turn at once to the copy of the purchase order filed by serial number. Similarly, information covering promptness of delivery may be obtained from the balance record.

No attempt is made here to specify what shall and what shall not be kept in each place, since this is a question to be determined in each case and depends on various factors. With these records, however, or with suitable combinations or substitutes, any question in regard to material, vendors, prices, or follow-up may be readily ascertained.

Prospective Machinery Markets in China

By W. C. Murphy
Treasurer, Providence Mill Supply Co.

A recent six-months' trip to the Far East has given me some first-hand information on machinery markets there which may be interesting to your readers. In what follows I have set down a few impressions as they occurred to me.

The things to consider in this proposition are: The monetary situation as relating to the rate of exchange, European competition, the mental attitude of the buyer, the matter of credit, the care used in the packing of the merchandise, and the political situation in China.

Take first the matter of exchange. At present the gold dollar is worth twice the silver dollar of China and it can readily be seen that this has a deterrent influence in the fluent purchasing of American goods by the Chinese. As the rate stood two years ago, the silver dollar being on a par with gold, the securing of orders in our line was a comparatively easy matter, and the writer secured some important business, possibly to some extent caused by the fact that the European countries had not arrived in the field.

European Competition on the Increase

At the present time, the European competition is strong and will continue to be stronger and keener. With this to contend with and with the depreciated value of the silver dollar, our recent trip was not nearly so successful as that of two years ago.

A very important thing, however, is the fact that the Chinese generally have a very friendly feeling toward the Americans and American merchandise and the attitude of the buyer indicates a strong desire to trade with us. We were told on various occasions that they liked to have us come to China and wanted to do business with us because we did not come to exploit their country or to ask for special concessions or privileges of any kind.

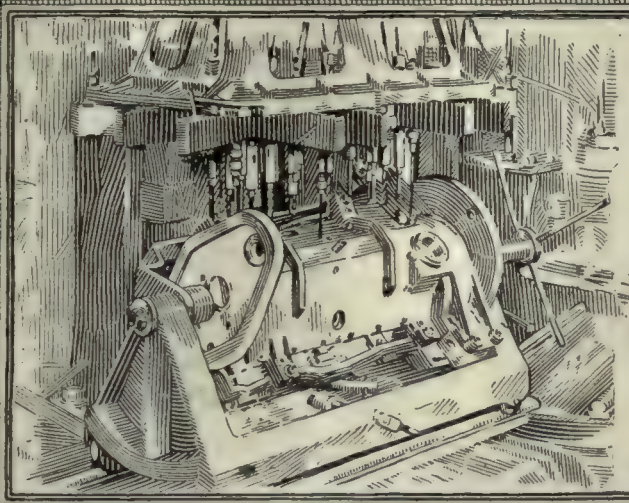
In the matter of credit, the Germans and English are very lenient, especially the Germans, and arrangements are made so that long terms and easy payment are allowed.

European Shipper Packs His Merchandise Better Than the American

Another thing in which the European shipper is ahead of us is in the packing of the merchandise. He exercises far greater care than we do in this important matter. The writer talked with the American Consul in one of the large Chinese cities and was informed by him that he was constantly taking up the matter of claims of the native merchants who had received goods in a damaged condition on account of inferior packing.

There seems to be plenty of money in the Orient and a strong desire to invest in manufacturing enterprises, particularly textiles and metals, but the greatest drawback is the instability of the government and the consequent fear of internal strife which carries with it the possibility of property destruction.

When this great and wonderful land of nearly five hundred million people gets straightened out, and a united national spirit is established, what a market there will be. With the feeling toward America that now exists among the Chinese, it would appear that the securing of a large proportion of this huge business depends largely upon ourselves.



Tool Engineering

By
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Tooling Vertical Turret Lathes and Boring Mills — Points of Importance in Design of Chucks and Faceplates — Special Fixtures for Holding Irregular Work

IN OUR previous articles we have described methods of handling work on turret and engine lathes. These machines are used for work up to 16 or 18 in. in diameter, and occasionally for pieces of even larger size. For heavy work of large diameter, and even for some kinds of work of comparatively small diameter, the vertical turret lathe and vertical boring mill are more suitable. One of the principal reasons for this fact is the difficulty experienced in chucking large and heavy work on the horizontal type of machines.

It is necessary to discuss the relative merits of vertical and horizontal types of machines for boring, turning and facing, as the field of one overlaps that of the other to some extent, so that it becomes largely a matter of the selection of a machine most suited for a given piece of work. Speaking generally, the vertical turret lathe and vertical boring mill are suited to heavy work requiring the removal of considerable stock. Machines of this type are very powerful and adapted to heavy cutting with corse feeds. The tools and fixtures for vertical boring mills bear a strong family resemblance to those used on turret lathes; they are, however, considerably heavier and capable of withstanding greater pressures.

There are several types of vertical boring machines, differing from each other in their general details of construction. One of these types is the vertical turret lathe, another the vertical boring mill, another the multiple-spindle semi-automatic chucking machine. The first of these approaches the horizontal machine most closely in its general features of construction. The application of tools is also quite similar, although there are distinct points of difference. In order that the designer may understand the general details of construction of vertical turret lathes and boring mills, a diagram of each type is shown in Fig. 387. These diagrams are not intended to reveal details of the machines, but only to show general points in construction.

The diagram at *A* shows a vertical turret lathe having a heavy table *B* in which chuck jaws are mounted. The turret *C* has five sides and is located on a vertical slide *D*. The saddle *E* slides horizontally along the guides *F*, a positive stop being provided for determining the central position of the saddle. The turret slide is so mounted that it can be swiveled to an angle of 45 deg. on either side of the center line, thus adapting it for angular work. The sidehead *G* is of very heavy construction, and is located on a vertical slide *H*. A four-sided turret toolpost *K* is provided with slots for holding tools.

The speeds are obtained through a transmission gear case and clutches quite similar to the type used for automobiles. A wide range of feeds is obtainable through a gear box conveniently located. The necessary changes can be made rapidly, and suitable markings enable the operator to know just what feeds he is using. The slides have power rapid traverse in order to assist in setting for various positions. Diameter readings are obtained by means of graduated slides, micrometer dials and observation stops arranged so that they can be conveniently read by the operator. The machines are capable of the heaviest kind of cutting on steel and a very high degree of accuracy can be obtained. Machines of this type are made in capacities ranging from 24 to 54 in. in diameter.

The vertical boring mill at *L* is similar in general construction to the vertical turret lathe just described, except that there is no sidehead or turret. In some cases a special slide on this type of machine is furnished with a five or six-sided turret, but this is not standard on all types of machines. The points of difference between the vertical turret lathe and vertical boring mill can be readily appreciated by a reference to the illustration. The table *M* is provided with chuck jaws and T-slots for holding fixtures when necessary. The toolslides *N* and *O* are held in saddles *P* and *Q*, which are adjustable along the horizontal guides *R* and *S*. Occasionally both heads are arranged so that they can be swiveled through an arc of about 45 deg. Standard toolholders with forged tools of suitable shape are located in a hole in the lower end of each toolslide. A positive means of clamping and locating is provided. Rapid power traverse of toolslides and saddle is given, to avoid the necessity for long and tedius hand adjust-

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ments. A wide range of speeds and feeds is obtainable through a transmission case, clutch and gear box.

These two types of machines are the only ones for which we shall consider tooling methods. The multi-spindle semi-automatic chucking machine requires special study, and as this work is somewhat specialized we do not feel justified in going into the subject in detail. In general, the principles which we have mentioned and the methods described will apply to all varieties of turning and boring machines, with modifications to suit the different types.

The method of holding work on boring mill tables is of interest, and while the chuck and jaws are similar to those used on a horizontal turret lathe, the application of fixtures to the table is somewhat different. Fig. 388 shows a perspective view of a boring mill table at *A*. This example has a three-jaw universal chuck built into the table. The jaws *B* are held down on sub-jaws *F* by means of bolts shown at *C* and *D*. The table itself is slotted in a number of places, as indicated at *K* and *L*, in order to facilitate clamping work or attaching fixtures. The center hole in the table is often used for obtaining the correct position of the fixture by using a locating plug in the hole.

The jaw arrangement is rather unusual, as each sub-jaw *F* is so constructed that its under side meshes with a scroll ring operated by a pinion. The movement of the jaws is obtained by using a socket wrench on the square head of the operating shaft *H*. Three of these shafts are located in the table so that they are easily accessible. Through the scroll ring the jaws are operated uniformly, but there is also an independent movement of each jaw obtainable by means of the screw *G*. This movement is convenient when chucking irregular work, as it allows the jaws to be set in different positions from the center, yet at the same time they can be operated with a universal movement.

The top of each jaw is grooved deeply across its face, so as to allow various settings of standard jaws. To keep the scroll ring covered and prevent chips from clogging the mechanism of the chuck, the sub-jaws are very long so that protection is assured at all times. The amount of movement of the sub-jaws is small, the top jaws being set in whatever position may be required for holding a given diameter of work. The detail illustrates the method of clamping the top jaws to the sub-jaws.

It must be remembered that the vertical turret lathe or boring mill has a table of large diameter, and it is therefore of great importance that it should be rigid and capable of withstanding a great deal of pressure during the cutting action. The sectional view through the spindle shows the table *A*, on the under side of which is a large bevel ring gear *N* driven by a pinion O. The table is attached to a spindle having a conical bearing seat *P*, which not only stabilizes the table but provides an ideal bearing surface. The hole *Q* in the center of the table is useful in locating fixtures or bushings. A filler plug *R* is placed as shown, in order to prevent chips and dirt from working down into the moving parts of the machine.

Fixtures used on vertical boring mills are for the most part simple in design, although exceptional cases may require a fixture more or less elaborate, according to the nature of the work. Such matters as the production required and the number of pieces which are machined in each lot have an effect on the design of fixtures. A great deal of work which is handled on boring mills is put through the factory in comparatively small lots, say twenty-five or fifty pieces at a time. When fixtures are required for work of this kind,

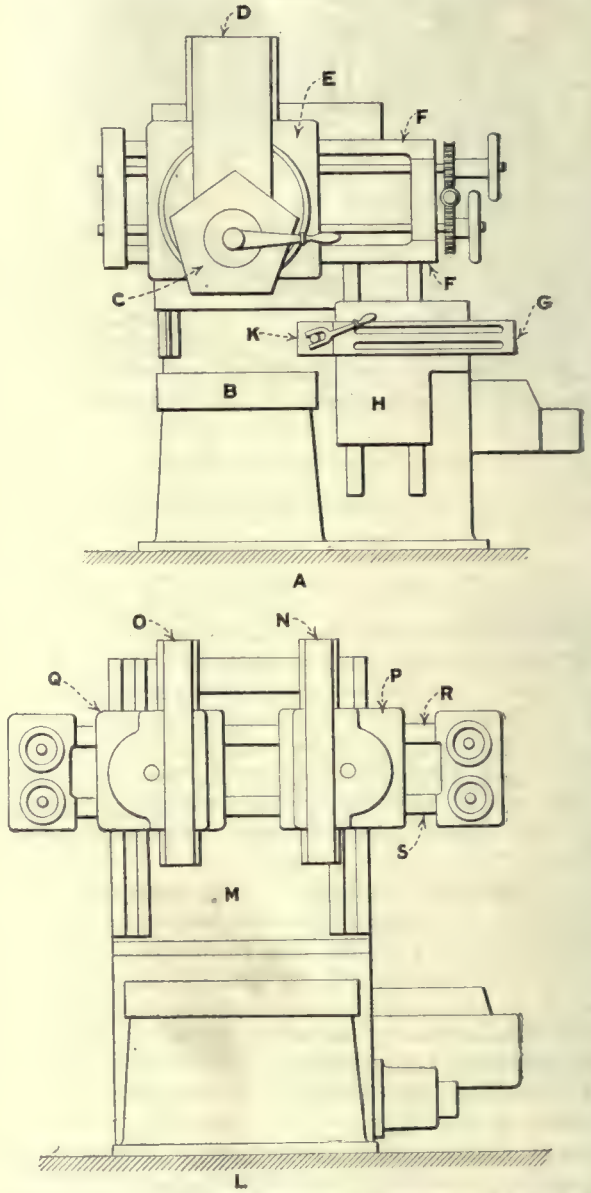


FIG. 387. DIAGRAMS OF VERTICAL TURRET LATHE AND BORING MILL

it is necessary to make them so that they will withstand rough handling and a considerable amount of wear on the various finished surfaces.

General matters connected with the design are much the same as those which have been previously mentioned on the subject of turret lathe fixtures. The only difference is in the size of the parts, which naturally require heavier fixtures and those capable of withstanding more severe usage. The following points must be considered in the design:

(1) The location of the work is of primary importance, whether it is the first setting of a piece of rough work or another setting in which the piece must be located from a previously finished surface. Points of location and surfaces on which the work rests should be made in such a way that they can either be trued up readily to preserve the accuracy or replaced by other units when worn.

(2) The rigidity and driving power of fixtures used for this kind of work is of supreme importance, as the

cuts which are taken are heavy and there must be no vibration if first-class work is to be obtained. Even when work is held in chuck jaws, the shape of the work and the amount of material which is to be removed may make it necessary to provide additional means of holding and driving, in order to withstand the excessive pressure resulting from the cut. There is an old story told of a manufacturer of vertical boring mills; when asked how many machines one man could run he replied that "It takes two men to run one machine, one man to operate the machine and the other to carry away the chips." While we must admit that this statement is somewhat exaggerated, it illustrates the

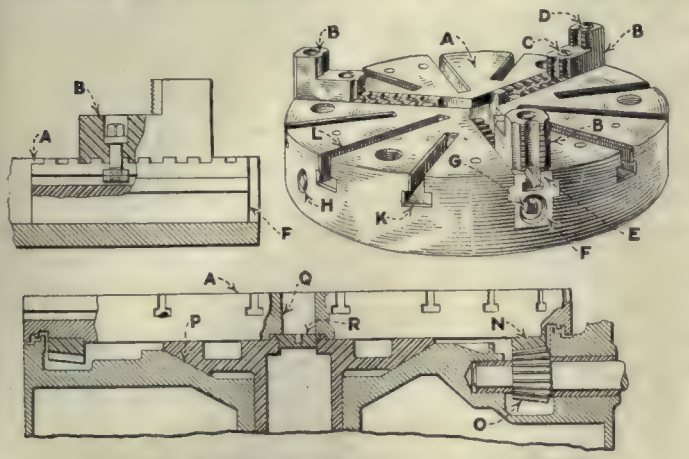


FIG. 388. BORING MILL TABLE AND CHUCK

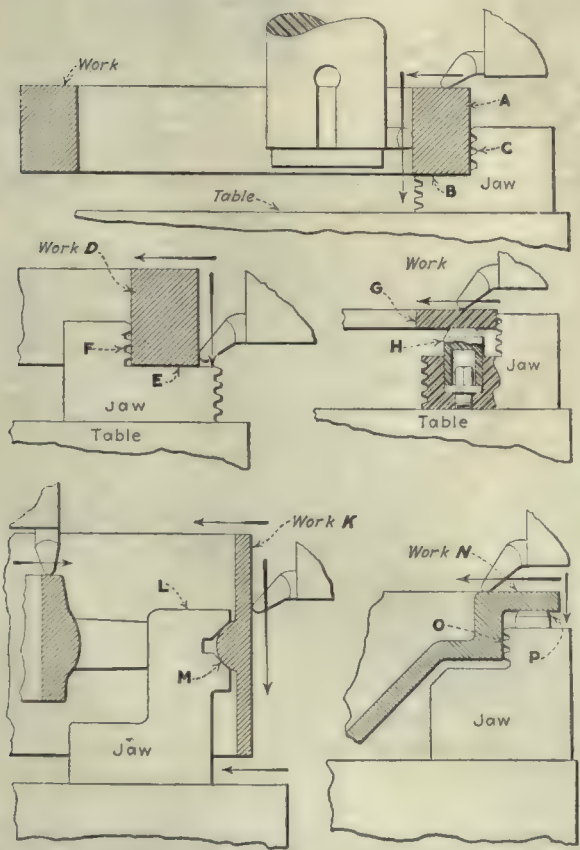


FIG. 389. METHODS OF HOLDING WORK IN CHUCK JAWS

point and indicates the tremendous power and production possibilities of these machines.

(3) Economy in the design of fixtures for vertical turret lathes should be carefully studied, as the fixtures are often so large that the cost of patterns and cast iron alone may be excessive, unless considerable thought is given to the design. Another point in this connection is that the large size of the fixtures makes them somewhat awkward to machine, and it may be better to make them in several units, rather than to use a single casting of large size which would be difficult to machine. The methods of clamping do not generally require much of a special nature, but the necessity for holding the work rigidly makes it obligatory to use clamps to which sufficient pressure can be applied.

(4) Convenience and the accessibility of various movable parts on the fixture are quite important, and should be studied with care when designing. Locating points should, if possible, be arranged so that they can be seen, even if it is necessary to core openings in the side of the fixture to allow the operator to look through and see where he is placing the work. The method of setting up a piece in the fixture should be such that it will be as convenient for the operator as possible. Certain kinds of irregular work may require a fixture having a latch which can be swung to one side when placing the work in position. When anything of this kind is necessary, the direction in which the latch swings should be such that the accidental starting of the machine will not cause the swinging member to come in contact with the sidehead or some other portion of the machine and cause breakage. The pivot should be so placed as to avoid any trouble of this sort.

(5) The removal of chips from fixtures often causes trouble, unless proper provision is made so that they can be readily swept out. A pot fixture, for example, may be excellent for holding the work; but if it is so constructed that it will soon fill up with chips, it will cause much loss of time in manufacturing. Cored openings can usually be provided so that chips will fall out by themselves. The experienced designer takes these points into consideration when making up a tool, no matter whether it is for a jig, cutter or fixture.

(6) The accuracy of the finished product may often effect the design of the fixture; hence, the tool engineer must consider this in the early stages of the design. For important surfaces which are to be machined in accurate relation to each other, the tool equipment must be designed with this point in mind. In the location of the work, also, the matter must be considered and proper methods of clamping and locating used.

Holding Work in Chuck Jaws

A great deal of the work done on the machines of the types just mentioned is held by means of standard or special chuck jaws. We have previously shown a number of applications of chuck jaws to turret lathe work, and many of the points in design mentioned there are equally important for jaws used in holding work on boring mills. One point, however, which is quite different is the fact that the work is held in a horizontal plane, so that it is only necessary to lay it down in the chuck jaws in the proper position, its own weight keeping it in place while the jaws are being tightened.

There are exceptional cases when work is of such shape that it requires a special chucking device on the turret, but these cases are rare and can usually be solved by a designer of average intelligence. Standard chuck jaws can often be used for holding work, unless it is of peculiar shape or would not permit the tool to pass over the surface to be machined if standard jaws were used.

In Fig. 389 are shown a number of examples of

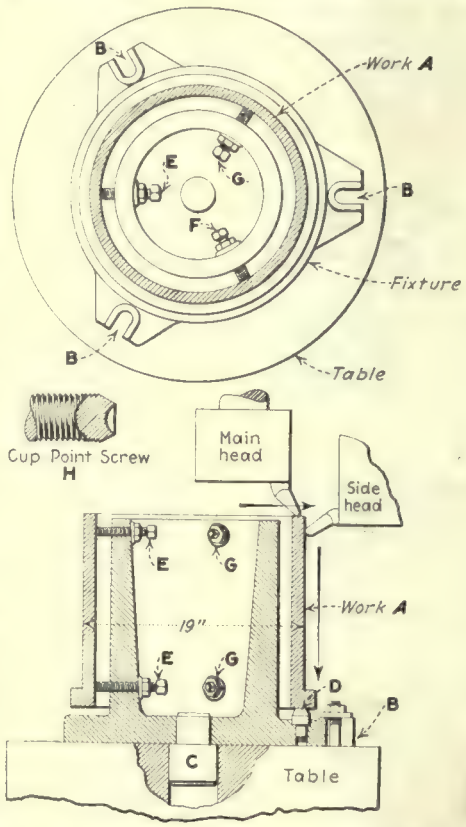
standard and special chuck jaws in their application to various pieces of work. In the example *A* the work rests on the surface *B* of a standard jaw, and is held by the outside as shown at *C*. Since this piece of work is to be bored and faced, as indicated by the arrows, it is clear that these jaws can be used for holding so that nothing special will be required.

In the example *D* the work rests on a standard jaw at *E*, being gripped by the inside as shown at *F*. The work which is to be done is facing the upper surface and turning the outside diameter, as indicated by the arrows. If set up in the manner shown, the outside turning tools could not be used without running into the jaws. It is not by any means necessary, however, to provide special jaws, as raising blocks can be placed under the rim of the work, thus providing clearance between the jaw and the work so that the tools can pass by. Another method of holding a piece of work in order to allow clearance for the tool is shown at *G*. Hardened buttons *H* are placed in the bolt holes of the jaws, and the work rests on these buttons.

The work shown at *K* is a large pulley which is machined on the outside, the two rims, the hub and the hole. In order to hold the rim so that these surfaces can be finished in one setting, a special form of jaw *L* is used. This jaw is cut out in V-form, as shown at *M*, so that it grips the inside of the flange and at the same time locates it in a vertical direction. The example shown at *N* also requires the use of special chuck jaws on account of the shape of the work. The jaw is made so that it grips the piece at the point *O*, and the flange rests on a hardened stud *P* on top of the jaw.

It must be remembered that the chucks on these machines are very powerful, and that, therefore, care must be used in gripping the work so that it is not distorted and thrown out of shape by the pressure of the jaws. Special methods may be necessary for thin work, in order to prevent trouble being caused by distortion. Other points in connection with the design of chuck jaws have been fully treated in our previous articles. Cases which require special treatment can usually be handled by an application of principles which have been mentioned.

It is very necessary to make fixtures for vertical turret lathes and vertical boring mills of a substantial nature, so that they will withstand the heavy cutting action. Not only must the fixtures be made strongly, but the method of holding the work must be such that the latter will not turn or change its position when heavy cutting is necessary. Certain kinds of work are of such a nature that they cannot be readily held in chuck jaws, and when such a part is encountered a fixture must be designed expressly for it. An example of this kind is shown in Fig. 390, in which the work *A* is a large cast-iron drum which is to be machined on the top, outside diameter and the flange. On account of the shape of the work it cannot be held easily in chuck jaws, as these would need to be made very high in order to grip the piece securely. The fixture *B* is substantially made of cast iron and located on a plug *C* which fits the center hole in the boring mill table. The outside diameter of the drum is 19 in. when finished. The drum slips over the central portion of the fixture and rests on three hardened plugs *D*, spaced equidistantly under the flange.



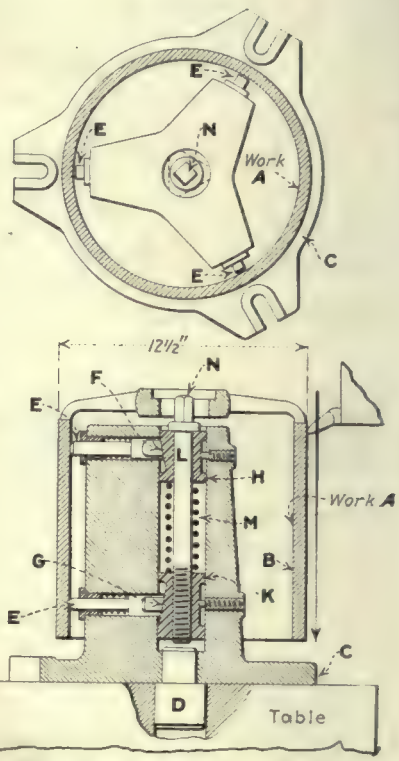


FIG. 390 (LEFT). VERTICAL TURRET LATHE FIXTURE FOR DRUM. FIG. 391 (RIGHT). PIN CHUCK FOR ELECTRICAL UNIT

A central location for the work is obtained by the use of setscrews *E* and *F* which are fixed in position. They are not disturbed when setting up the work on the fixture; but the setscrews *G* are easily accessible, and they are tightened by the operator with a wrench. It will be seen that the principle used here is similar to others which have been described in connection with fixtures for horizontal turret lathes.

A point of importance is the shape of the setscrews used. The cone-point type is unsuited to work of this kind, as it is very difficult to set up this type of screw with sufficient pressure so that it will withstand the vibrations produced by the heavy cutting action. A cup-point screw like that shown in detail at *H* will give much better results, as considerably more than a point contact is obtained from this variety. On short cuts which do not require the removal of a great deal of stock, a cone-point screw may answer the purpose, but for general use a cup point is much superior as its contact with the work is so much greater.

Fixtures used for vertical boring mills are frequently very simple. Oftentimes some of the work required in finishing the fixtures can be done on the boring mill table, which is of course an advantage, as it is then certain that the fixture will run perfectly true with the table. Patterns used for large fixtures are generally simple and they are not finished carefully in the majority of cases. In order to prevent cracks and

ruptures of the castings, all fillets should be made large.

Many cases are found in which it is necessary to hold a piece of work by an inside cored surface, in order that the piece may be finished true and concentric with the inside. The last example showed a simple method for holding work of this nature, but the shape of the piece itself made it possible to use a type of fixture which cannot always be adapted to inside holding. Fig. 391 shows an electrical unit *A*, the inside surface of which *B* is cored out, yet it is not possible for the operator to use a wrench to tighten setscrews as in the preceding instance. A simplified form of expanding pin chuck was therefore designed for this particular casting.

The body *C* is located on a plug *D* in the center hole of the boring mill table. Six pins *E* are spaced in suitable positions to give stability to the work and grip it from the inside. The pins in each tier are placed 120 deg. apart and their inner ends come in contact with angular surfaces *F* and *G* on the two cams *H* and *K*. The latter cam is threaded to receive the end of the operating bolt *L*. A coil spring *M* is placed between the two cams. A socket wrench used on the end of the bolt *N* operates the mechanism, thus moving the pins outward as much as is necessary to hold the work firmly. When the operating screw is loosened, the springs in the pin sockets release the pins, thus allowing the work to be removed.

A principle of a similar kind can be used on work where it is not possible to place a wrench on top of the fixture as in this case. Other means for operating the cams must be devised. Occasionally this is done by means of bevel gears and a socket wrench with a long handle extending beyond the edge of the table. Several methods are possible and the nature of the work governs the type of device found most useful.

Wants Standard Tapers

By C. Franklin Rothera

Head of Machine Department, Quincy Industrial School

While discussing standardization of tapers, will some one please consider the poor teacher of related mathematics for the machine shop? Many times have I fervently prayed for one standard taper, preferably the Jarno. I respectfully invite the gentleman who did not believe in standardization to endeavor to answer the queries of my pupils as to the reason for the differences in the tapers per foot of the Morse taper. Also why the Brown & Sharpe unaccountably jumps from the good standard of half-inch per foot to 0.5161 in. per foot in the No. 10.

I feel rather small when I have to confess to them that it seems like the perpetuation of an error, as also does the great diversity of the Morse tapers. These differences do not, and cannot, give the boys entering the machine trade a very exalted notion of the mentality of the heads of the trade.

I believe that standardization of tapers should come, and quickly, with the Jarno, for standard.

Selling a Tough Customer

By Hiram Strong

When I took the Western territory for H. & N. turret lathes, the fellow who had been there for fifteen years told me there were two places I'd better stay away from if I wanted to save doctors' bills. He'd been thrown out so many times he had callouses on his disposition and no sales to show for his pains.

One of these places was the big Jones Brothers plant where they should have been using twenty of our largest machines. Bill Jones who did the buying was a profane sort of a cuss who took delight in browbeating a salesman if he would stand for it, but he was a capable manager and bang-up mechanic just the same.

Well, my disposition has had to stand some pretty rough treatment and it's still about as healthy as it ever was, so I decided I'd see what I could do out there.

I got precious little satisfaction out of the first ten or fifteen visits I made but after that it got so Bill Jones got used to seeing me. When I'd come in he'd say, "Well, got a chip on your shoulder, this morning?" I'd say, "No, but I'll put one there if you want to knock it off." We had a lot of fights but finally I got a chance to figure on a new job to use four of our big machines. I put in my figures and you can gamble I was pretty sure they were right.

He looked over the figures. Then he burst out, "You know d—— well you can't do that!" I came right back at him with, "I know d—— well I can." Well, he fussed and fumed until finally I said, "What are you arguing about? It's up to me to worry about that performance, not you. Put it in writing if you want to."

At last he told me to go ahead and put in the four machines so he could prove I was a liar. That was all I wanted. When they came they had been run in and tested until they were as smooth as grease and I had the best two demonstrators from our shop to run them. I insisted that the Jones people get four days' work piled up around those four machines so there wouldn't be any hitches and then we started.

Things got going pretty good by afternoon of the first day and the word got around the shop that something was doing. Next day we did some better and Bill Jones was down there with a stop watch dancing around from one machine to another and looking sort of upset. I kept away from him until we were all through and checked up and could prove we had done 20 per cent better than my figures. Then I sent in my card.

He called me in and before I could get out a word he said, "Huh, come up here to say 'I told you so' haven't you?" "Yes," I said, "I have; what about it?" "You're all right," he replied, "I didn't think you could do it, but I take my hat off to you, those machines stay and I'll want some more before long."

I've never had any trouble getting orders out of that plant since, but can you imagine my chances if I hadn't made good on that job?

Features of the Reo Apprentice System

The Knowledge That Many Reo Executives Are Graduates Acts as an Incentive to Earnest Effort

SPECIAL CORRESPONDENCE

COURSES in apprentice training vary in many shops and it can be said that their success depends largely upon the attitude of the officers of a company toward the work. Where the training course is installed because it seems necessary in order to get boys, or because it seems the fashion, as in some cases, it is apt to be perfunctory and can hardly reach its maximum value.

One of the outstanding features of the apprentice system at the Reo Motor Car plant in Lansing, Mich., is the great personal interest taken in it by the officials of the company. R. H. Scott, vice-president and general manager, H. T. Thomas, chief engineer, and H. C. Teel, factory manager, served full time as apprentices. A. A. Lauzun, general superintendent, and George Rosa, toolroom superintendent, both well-known executives, served their apprenticeship under Mr. Teel and nearly all the division superintendents and many of the foremen were also apprentices.

With such examples of possible advancement to look forward to, such evidence that men who really learn the trade are sought after by the management for responsible positions, it is little wonder that the apprentices are enthusiastic and interested in their work.

There are three courses of study, each designed to meet specific conditions. The first or junior apprenticeship course takes boys from 16 to 20 years of age and with schooling from the eighth to the eleventh grades. This is a three-year course and includes machinists' work, toolmaking, tool and jig designing and drafting. Ninety per cent are taking the machinist course.

The senior course takes men 21 years or over, all returned soldiers or sailors coming in this class. This is a two-year course and covers the same subjects as the junior course. High school graduates under 21 years form a third class, with a 2½-year course on the same subjects as the others. Students sent by the Federal Board for Vocational Education come under Class II, the length of the course being determined by the Federal Board.

Each apprentice has a trial period of three months. If things are mutually satisfactory, he is asked to sign an agreement to serve the full course of apprenticeship. Graduates are guaranteed good positions with the Reo company, although they are of course free to go elsewhere if they desire.

Courses in the trades mentioned vary with the individual. The course of each apprentice is outlined according to his inclinations and ability. Shop work consists of:

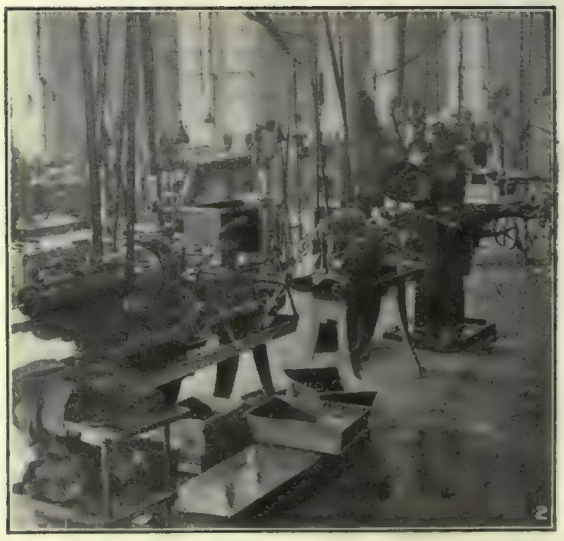
Inspection	2 to 3 months
Milling machine	3 to 5 months
Grinding	2 to 3 months
Bench	2 to 3 months
Motor assembly	3 to 4 months
Drafting	6 to 12 months
Motor test	
Chassis test	
Drilling	2 to 3 months
Gear cutting	3 to 5 months
Lathe	4 to 6 months
Axle assembly	2 to 3 months
Final assembly	3 to 6 months
Toolroom work	1 to 2 months
Coupe and sedan test	

The vacant spaces have times which vary with conditions of the work.

The present apprentice school system began Oct. 1, 1918, and is an outgrowth of an older course that was almost wiped out by enlistment and draft during the war. The founder of the movement is H. C. Teel, the factory manager. The number of students varies, the maximum number which can be accommodated being 200. There were 165 on March 1, 1922. The classroom equipment can handle twenty students each half day, the average being 15.2 per class.

The training shop has forty machines of various kinds for instruction purposes, valued at approximately $10,000. Figs. 1 and 2 give some idea of the varied equipment provided. The shop also acts as a sort of reservoir, apprentices who have no work in their de-





FIGS. 1 AND 2. TWO VIEWS OF THE MACHINE EQUIPMENT OF THE SCHOOL SHOP



FIG. 4. A GROUP OF REO APPRENTICES

partments in the shop return to the training shop for further instruction.

The text books used are "Palmer's Practical Mathematics" (4 vols.), and the "American Machinists' Handbook." Twenty-six special lesson sheets on the latter have been prepared to show the boys how to find data in, and to otherwise use, the handbook to the best advantage. These lessons are mimeographed and consist of from six to twenty questions on various subjects. The solution of each problem is placed on the blackboard and is discussed by the class.



FIG. 3. LEARNING INSPECTION AND THE USE OF INSPECTION GAGES

In addition to the regular apprentice course, a night school is held in the apprentice department in connection with the public school department of Lansing. This covers twenty weeks.

Interest is maintained in the advanced apprentices by giving them opportunity to carry work through various stages and to make designs for simple jigs, tools and fixtures. They also repair machine parts, cut gears, make blueprints from their own tracings and machine parts complete in the apprentice shop. The apprentices work in all departments of the factory, and have the co-operation of all shop executives. One room is especially equipped for instruction on automobiles, and contains motors, axles, transmissions, electrical equipment and a complete chassis of both the passenger car and the speed-wagon.

Careful records are kept of each boy's progress and reports are sent to parents or guardians every three months. Those interested in the boys are urged to visit the plant and see the conditions under which they work. Records of apprentices who have completed the course are on file with the factory superintendent, the employment superintendent and in the apprentice department. These records show the time spent in each department and the rating in each. The complete record card is about 10 in. square and has room for a three-year record in both school and shop. These records make it possible to see at a glance just what each boy's progress has been from start to finish.

A good idea of the training given in inspecting and checking both rough and finished work is shown in Fig. 3. This room is for the more advanced students, all of those shown being ex-service men. Fig. 4 shows a group of 125 apprentices together with a few instructors, in front of the administration building.

Comparison Chart on Screw Threads

The Bureau of Standards of the Department of Commerce has just issued a chart entitled "Graphic Comparison of Screw Thread Pitches," which is now ready for distribution to anyone interested. Copies of this chart may be obtained by addressing the bureau. The chart is accompanied by a table, which shows the relation between English and metric screw thread pitches. Measurement of an English screw thread is ordinarily expressed in terms of the number of threads per inch, while in the case of metric threads the same thing is expressed in terms of the distance from one thread to the next, measured parallel to the axis; that is, in terms of the pitch. In this chart, a simple method has been devised for finding the nearest equivalent to one distance in terms of the other. The table is provided to give extreme values which cannot be conveniently shown in the chart.

Molds for Aluminum Castings

Brass Foundry Practice Modified for Light, Brittle Aluminum—Advantages of Green Sand Cores—Die Castings Stronger—How To Test Aluminum Castings

From Sales Department Condensed Data Prepared by the Technical Department, Aluminum Company of America

ALUMINUM can be cast by the same general methods used in the casting of brass and bronze, but with certain modifications dependent upon its various physical properties. The purpose of the following information is to point out where these changes in method should be made and to state in general what is considered the best practice. In the selection of molding sand for an aluminum foundry the texture or mechanical composition of the sand is much more important than its chemical composition. A good molding sand should be neither "close" nor "open." If it is too fine it will not be free-venting and will, therefore, prevent the escape of air, steam and gases. On the other hand, it should not be too coarse or it will fail to give a smooth and clean surface to the casting.

The sand most generally used in aluminum founding is Albany OO molding sand. The clay in this sand forms such a good natural bond that no artificial binder, such as flour, treacle, dextrin or sulphite-lees, is needed. All that is necessary is to riddle the sand through a No. 4 sieve to remove all large foreign substances, to moisten it and to thoroughly mix it; then it is ready for use. Just enough water should be added to the sand to give it the required bond; additional water only obstructs the escape of the steam generated and the gases given off by the molten metal.

No specially prepared facing sand is required. When riddled through a sieve ranging in size from No. 8 to No. 20, depending upon the casting in question, the regular molding sand makes a good facing for the pattern. Additions to the sand for the purpose of forming a smoother surface for the mold and increasing the bonding qualitis of the sand, are harmful, for they make the sand impervious to steam and gases. The practice of facing the pattern with good sand and using almost any kind of sand as a filler-up is a bad one. The saving realized in the cost of sand is more than offset by the loss in defective castings due to poor molds.

The usual method of putting the new sand into service is to add small quantities of it at frequent intervals to the old sand. With each additional use the molding sand loses some of its bond. The molten metal drives off the water and kills the clay which comes in immediate contact with it. The water bond is easily replaced by the addition of more water each time the sand is used, but due to the loss of clay, a gradual wastage in the strength of the sand takes place. The sand must then be revived by the addition of new sand, and so a few shovelfuls of the new molding sand are thrown into the old pile of sand whenever it exhibits signs of weakness. Inasmuch as sand tempers best when it is steaming, water and new sand are usually added immediately after the castings have been shaken out.

ALUMINUM IS LIGHT in weight and is brittle at a temperature slightly below the melting point. Provision for these two characteristics will obviate many of the aluminum molder's troubles.

Molding sand should provide for the escape of air, steam and gases, but should give a smooth, clean surface.

Chills and risers prevent sponginess and cracks.

A core should be hard at ordinary temperature, but should soften and crush with intense heat.

Small die castings are stronger than sand castings. They also have a greater elongation, more accurate, uniform dimensions, smoother surfaces; and can be produced in large numbers at a lower cost.

Careful observation of the two following characteristics of the common aluminum alloys will obviate most of the troubles of the molder: Aluminum alloys are light, for iron or brass are two to three times as heavy; and they are brittle or "hot short" at temperatures slightly below the melting point. In casting aluminum practically every modification of the usual brass foundry practice is attributable to one or the other of these reasons, and any steps taken which provide for these peculiarities are in the right direction. A consideration of the first characteristic will explain why certain practices in ramming, venting, gating, and feeding the mold employed in brass foundries cannot be used unmodified when casting aluminum. Aluminum is so light that it cannot rid itself of absorbed gases and drive off the steam as readily as brass. Observance of the second characteristic will prevent cracks in the castings due to hard cores or molds. If the cooling metal when in its "hot short" condition encounters very much resistance to further shrinkage it will almost invariably crack.

Because of the lightness of aluminum alloys the mold may be made in a snap flask which may be removed when the mold is completed. The sand should be rammed as lightly as is consistent with safe handling and pouring of the mold. Additional ramming serves only to create an impervious wall which will prevent the escape of the imprisoned air, steam and gas, forming blowholes, and producing a rough surface to the casting because the metal cannot lie close to the mold. Hard ramming is also objectionable as it prevents the mold from giving when the metal shrinks, for it must be remembered that certain parts of the mold, as well as the cores, are called upon to give way to the metal in contraction. To help the mold to keep its shape after the flask has been removed, the outside of the mold may

be rammed fairly hard, but the hard ramming should never extend to the sand immediately adjacent to the pattern. A close adherence to the principle of light ramming will probably obviate most of the aluminum molder's troubles.

The mold should be well vented for the same reason that the sand should be rammed lightly. In the case of large castings especially, the minute openings resulting from the porosity of the molding sand are an inadequate outlet for the steam and gases, and venting must be resorted to. For small castings vents are often unnecessary.

Low Gates and High Risers

No set rules can be laid down to govern the number, size and location of gates, for each particular casting presents a different problem. This must be left largely to the discretion of the molder, who should always bear in mind the two characteristics of aluminum alloys before mentioned. One or two general suggestions, however, may be given. A liberal fillet should always be employed where the gate connects with the casting in order to avoid drawing just beneath that point. If increasing the size of the fillet does not entirely eliminate trouble from drawing, the gate should be so located that the unsound part of the casting caused by the draw will do the least amount of harm. If possible, it is also good practice to so locate the gate that when the mold cavity is filled with metal, the length of the path traveled will have been such that the heavy sections will have filled first and will be colder than the light sections. It is also generally true that the gate should enter the casting at a low rather than high point, for less air is imprisoned in the mold by gradually rising metal than by falling metal. Due to mechanical difficulties, however, all these suggestions are subject to a limited application.

Risers are usually attached to those parts of the casting which solidify last. The parts which first solidify draw metal from the larger, slower-cooling sections, so the latter sections must find a source of supply sufficient to provide metal for both its own shrinkage and that of the smaller fast-cooling sections. Risers are constructed to create such a source of supply. They must be so located and of such a size that they will remain molten longer than the casting. Otherwise, they simply act in the same way the small sections of the castings do, and draw metal from the large section, making matters worse rather than better. If possible, the riser should enter the casting at its highest point so that the air and dross may be forced up into the riser instead of being trapped in the casting. By increasing the height of the riser, the pressure of metal may be increased, and consequently, sounder and sharper castings will result. On small castings risers are seldom necessary.

Chills may also be used as a safeguard against injurious shrinkage, especially in large castings of irregular section. Where light sections of the casting join heavy sections, uneven cooling takes place. The light section cools first and, in cooling, is fed with metal from the still liquid heavy section. When the heavy section finally cools it draws from the light section, causing sponginess and sometimes cracks in the junction between the two. To correct this tendency some means of artificial cooling must be adopted which will make the heavy section set as fast as the light section. Chills are used for this purpose, and the pieces of metal are so placed in the surface of the mold that they will come in immediate contact with the heavy section of the casting.

It will thus be seen that chills serve much the same purpose as risers, the difference lying principally in the method employed. Risers prevent sponginess and cracks in the junction between two sections by supplying the larger section with molten metal as it shrinks, while chills accomplish the same result by making the two sections cool at an equal rate. Chills are also used for other purposes. They are often employed to give a hard, smooth surface to certain parts of the casting. A harder surface than is usually produced is often necessary if a part of the casting is to be subjected to unusual wear, while a smooth surface often eliminates machining.

Cores for aluminum castings should be made as soft as is consistent with safe manipulation. Because of the "hot short" condition of alloys at high temperatures, it is particularly important that they give way to the shrinkage of the cooling metal. A good core should be hard enough to be safely handled at ordinary temperatures, but should soften and crush when subjected to the intense heat of the molten metal, since the slightest resistance to the shrinkage of aluminum when it is in this fragile state, will usually result disastrously.

A good core sand should consist of a mixture of sharp sand and molding sand in varying proportions, held together by some such binder as rosin, flour or core oil. The sharp sand furnishes good venting qualities to the mixture. The molding sand adds strength to the cores before they are baked and produces a smooth surface to the casting. Rosin is probably the best binder to use, for on coming into contact with the molten aluminum it softens, permitting the core to give as the casting shrinks. In some core sands a small amount of flour is used in addition to the rosin to assist in binding the mixture together until the cores are baked. The rosin has no binding power until it has first been melted and then allowed to harden. Linseed oil and various patented core oils are also successfully used as binders by some foundrymen.

A sand mixture for cores that will crush and prevent cracking is composed of the following ingredients:

Sharp Sand	45 parts
Molding Sand	45 "
Powdered Rosin	2 "
Flour	1 "

After this mixture has been moistened to the correct degree of dampness, it is ready for use. The core should be rammed lightly and should be freely vented. This precaution is more important in the construction of the cores than of the mold proper for, unlike the mold, the core is almost completely surrounded by the metal. The completed core should be sprayed with molasses water, baked in an oven hot enough to melt the rosin thoroughly, and then given a soapstone wash to secure a smooth finish.

Green sand cores are molded from the regular sand which is used for the mold itself, and require no binder other than water. They are skin dried with a blow torch, immediately before setting in the mold. At present green sand cores are used principally for large body cores in casting automobile crankcases and oil pans. With proper development there is no reason why their use cannot be greatly extended to such parts as

manifolds, bearings, flywheel housings, and gear cases. They can not be used for small cores of intricate shape for ramming up, nor in places where the core print support is limited in size or position.

A comparison of the costs of each type shows:

Labor of ramming and rodding each type to be about the same.

A saving in the case of green sand cores due to:. Elimination of trucking from core bench to rack, to oven, and from oven to cleaning bench and to stock racks; elimination of baking; elimination of binders other than water.

Green sand cores require less cleaning and patching and can be handled with less breakage.

Loss of defective green sand cores is about one-quarter that of dry sand cores.

Green sand cores, since they are made of the same material as the mold, have an equivalent chilling effect which promotes uniform solidification of the metal. Baked sand cores, on the other hand, have but a fraction of the heat absorbing power of green sand, therefore induce non-uniform solidification with the resultant shrinkage crack.

The crushing strength of green sand cores is from 1 to 3 pounds per square inch or about 1/100 that of baked sand cores. This is an important consideration in connection with the very weak condition of the metal just below the solidification point when the solid shrinkage is taking place.

The green sand core is more easily knocked out with some saving in cost as a result.

Green sand cores give a fine smooth surface.

Green sand cores have a few disadvantages:

The breakage percentage of green sand cores in the mold if not carefully set, is greater than that of baked sand cores.

Side draw boxes are generally used for green sand cores, and are more expensive to make and maintain than the rods for dry sand cores.

The design for a green sand core box is usually more intricate than that for dry sand.

Die Casting

The art of die casting is not new. For many years, zinc, lead, and tin have been successfully cast in this manner. Aluminum die castings, however, are of comparatively recent development. A copper-aluminum alloy is most frequently used with copper content running from 8 per cent to 10 per cent.

It would naturally be supposed that castings made under pressure would be dense and homogeneous. On fracture, however, it is found that only the surface or skin of the casting is dense and close-grained while the inner structure is porous. This applies particularly to the larger castings; smaller ones can usually be cast very satisfactorily. Another cause of trouble has been the cracking of the casting due to resistance to shrinkage offered by the metallic cores, but this trouble has been largely removed by the use of collapsible cores.

When properly cast and when too large castings are not attempted, there is much to be said in favor of die castings. They can be produced in large numbers at a lower cost than sand castings. Their dimensions are more accurate and uniform than similar castings cast in sand. In addition, the surface of die castings is so smooth that machining may often be dispensed with where it ordinarily would be necessary. Die castings are also stronger than sand castings and have a greater elongation. Because of these advantages indications point to the more extensive application of die casting in the future to the larger scale production of small parts.

It is important to standardize methods of testing aluminum castings in order that results obtained in one foundry may be comparable with those obtained in another, or that tests made one day may check up with those made at another time. The test specimen recommended by the Society of Automotive Engineers and the one most generally used is a cast-to-size bar $\frac{1}{2}$ in. in diameter at the breaking section and filleted to a $\frac{3}{4}$ in. diameter threaded end. The fillet should not be less than $\frac{5}{8}$ in. radius. The test bar should be cast in sand, the use of chills or artificial means of cooling is prohibited. The gage length for aluminum should be 2 in. The ends are threaded in order that the bar may be pulled in a self-centering type of machine which exerts a straight pull on the bar.

The American Society for Testing Materials recommends a similar bar, but machined to size rather than cast to size, in order that the diameter at the breaking section may be more accurately measured. In ordinary foundry practice the increased accuracy of the test due to machining the breaking section and threading the ends is not considered sufficient to pay for the cost of machining, and so the test bar is usually cast to size and pulled in wedge grips. Even the ideally designed and cast test specimen is not without its limitations, for it can only be expected to give approximate results for the metal in the casting which it is supposed to represent.

The test bar checks the history of the metal up to the time it goes into the mold. It gives no check whatever upon the molding variables, except when the bar is attached to the casting, when it reflects certain, but not all, of the variables and in addition it gives no check on the design of the casting. The only way in which to secure such checks is to cut the casting up into parts and take test specimens from each part. Such an experiment will indicate considerable variations in the physical properties of the different parts, for unless molding practice and design are perfect the physical properties of a casting are bound to vary from point to point.

These variations are due to shrinkage, gating methods, the chilling effect, the personal element in foundry work and the design. When it is understood thoroughly to what an extent the physical properties of a casting are subject to control by variations in the melting conditions, the molding practice and the design, a long step will have been taken toward a better adaptation of castings to the purposes for which they are intended.

The Foreman and Management

By A. W. Brown

In one sense, the foreman is part of the management; in any case he is by no means to consider the possibility of his being arrayed against it, when the interests of employers and workers conflict or give signs of doing so. Having power delegated from above, he should not consider that he has any right to attempt exerting it upwards. He cannot "run with the hare and chase with the hounds"; cannot "be all things to all men" or "carry water on both shoulders."

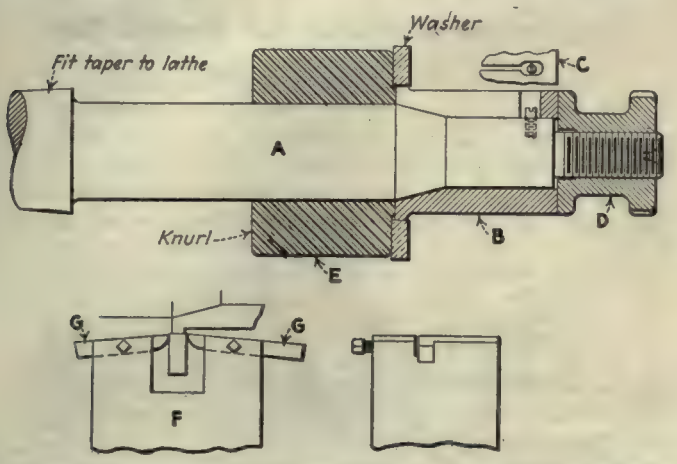
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Arbor and Toolblock for Facing Thrust Washers

BY K. M. HOLT

The arbor shown in the accompanying sketch was used for facing brass alloy thrust washers 3½ in. outside diameter, 2¼ in. inside diameter and ¼ in. thick.



ARBOR AND TOOLBLOCK FOR FACING THRUST WASHERS

The requirements were that the sides should be flat and parallel with one-quarter of a thousandth, and with a smooth polished surface.

The washers were made from castings and were first bored to micrometer size and faced on both sides in a chuck, leaving them approximately 0.010 in. large in respect to thickness. They were then turned on the outside diameter in gangs on an arbor.

The final facing arbor *A*, shown in the sketch, was centered on both ends and one end tapered to fit the lathe spindle. The other end was machined as shown. A cast-iron expansion bushing *B* was made and slotted in four places as shown at *C*. A small screw pin was tapped into the arbor to prevent the expansion bushing from turning. A hand nut *D* was provided for clamping. The outside diameter of the bushing was turned very carefully to size after slotting and being expanded slightly on the arbor.

A thrust washer was passed over the nut and bushing and located in proper position by means of the sliding sleeve *E*. The hand nut was then tightened to clamp the washer, the sleeve *E* moved to the left out of the way and the tail center brought into position.

The double toolblock *F*, with toolbits *G*, was fastened to the toolpost slide and the lathe geared for a very fine crossfeed.

With the arbor stationary and tools set to give the desired thickness, the toolblock was moved in by hand until the tools were up close to the bushing, the tools passing through radial oil grooves previously milled in each side. The lathe was then started and the tools fed outward by power feed.

With the tools properly ground, no trouble at all was experienced in holding the washers to the desired limits of accuracy and finish with only one passage of the tools, and the entire operation of loading, facing and unloading took only about three-quarters of a minute per washer.

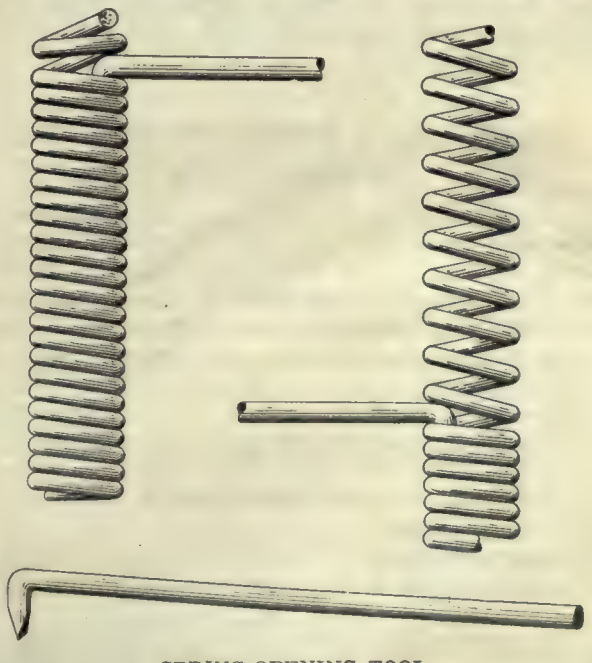
Opening a Coil Spring

BY WALTER E. SCHMIDT

Nearly every machinist has had occasion to open or lengthen a helical spring, and when the spring is tempered and of thick wire it is quite a job by the usual hammer and chisel method, more so when it is a rush repair job. The method I use, while simple, is very efficient and will open almost any helical spring with comparative ease.

Take a piece of round steel or iron of convenient length and bend one end to form a hook; then grind or file the end of the hook to a wedge point as shown in the sketch. With a chisel or other pointed tool pry open the first coil of the spring, insert the wedge end of the hook and force it in until the handle stands at a right-angle. Then clamp the closed end of the spring in a vise and turn the hook in the direction in which spring is wound. The spring will open up with ease.

The diameter of steel used for the hook is governed by the temper, size and length of the spring, or the



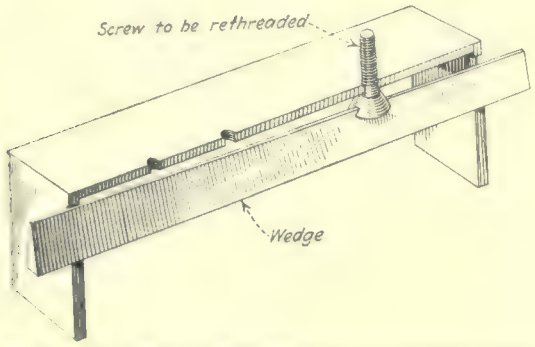
SPRING-OPENING TOOL

pitch of coils desired. I advocate the use of this method only until a new spring of the proper length can be wound.

A Few Kinks for the Machine Shop

By K. Saldiz

A contribution to a recent issue of *American Machinist* advises the use of rubber "wedges" to hold hammer handles in place. It may be of interest to the readers



DEVICE TO HOLD SCREWS FOR RE-THREADING

to know that a properly fitted wooden wedge is much superior to other kinds. The handle should be nicely fitted to the eye of the hammer head, and split by driving in a clean hacksaw blade. The wedge should be coated with shellac and, after driving in place, allowed to dry for a day or two. I have a hammer handle that was so fitted over six years ago and it is still tight.

If a tap binds in cast iron when backing it out of the threaded hole, a little water squirted alongside the flutes will loosen it up and save the tap as well as the temper of the workman.

If a drill binds when drilling aluminum, lubricate it with gasoline. Coal oil will help some but is not as good. If a file clogs when filing aluminum, dip it in lard oil occasionally.

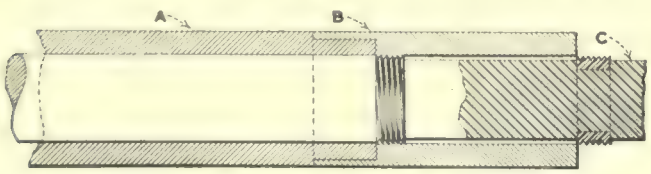
The sketch shows a little device that I made some time ago to assist in re-threading small machine screws. It consists of a piece of heavy sheet iron bent as shown and provided with slots through the legs to admit a wedge. The wedge binds the head of the screw against the under side of the plate and holds any kind of head firmly.

Lengthening a Drilling Machine Quill

By George Wilson

While the quill of the average drilling machine has travel enought for ordinary drilling jobs there are a lot of boring, spot-facing and other machining operations in connection with jigs that could be done if the spindle travel was long enough to permit the removal and insertion of boring bars having comparatively long pilots. A case in point is the machining of pinholes in gas engine pistons where the piston is held in a jig having a drill guide bushing, the drill to be followed by a piloted boring car and reamer, as it is not advisable to swing the table and thus lose the alignments each time the tools are changed.

Having a machine of the sliding head type, in which the spindle was of a good length but the quill too short



EXTENDED QUILL FOR DRILLING MACHINE

for the proposed job, the quill was lengthened as shown in the sketch. The quill *A* was placed on a mandrel and shouldered down on its upper end. A new section of quill *B* was made of machine steel and tightly fitted upon the end of *A*. The new part *B* was left oversize to allow for a cut to be taken off the outside diameter after assembling.

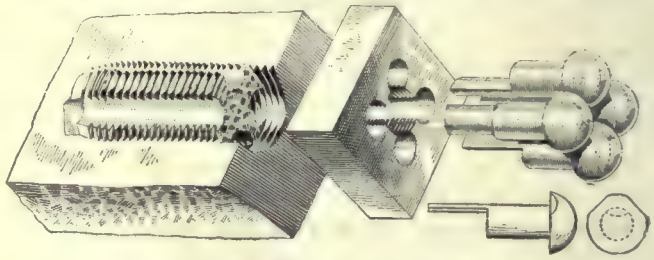
New threads for the retaining nut had to be provided at the end of the extension. This was done by cutting a shallow rectangular shaped groove in the spindle as at *C*. A steel ring was made slightly larger than the outside diameter of the required thread and bored to fit the bottom of the groove. This ring was then split and sweated into the groove with soft solder, after which the spindle was placed in a lathe and the ring turned to size and threaded. The extension was then slabbed off and a new section of rack fastened on.

Improvised Extractor for Broken Taps

By Thomas Davies

The accompanying sketch shows an extractor for broken taps that was improvised from an old solid threading die and four rivets.

The heads of the rivets were of such size that, with two sides of each head flatted, the rivets, when driven



IMPROVISED TAP EXTRACTOR

into the clearance spaces of the die, were locked against turning. The device was placed in the lathe and the shanks turned, as shown in the sketch of one of the rivets, to a diameter that would allow the device to enter the threaded hole, the shanks of the rivets passing into the flutes of the broken tap.

With a wrench upon the square threading die the remains of the tap were easily withdrawn.

A Couple of Shop Kinks

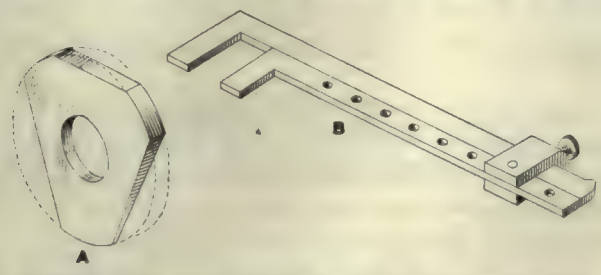
By C. G. Spicer

To make a satisfactory wedge for holding the handle in a hammer, take an ordinary washer of a size suitable to the job and cut it into a triangular shape as shown at *A* in the sketch. By using a file or a disk grinder the lower corner of the crude triangle thus formed can be thinned somewhat until the piece has assumed the shape of a blunt wedge. When it is driven into place in the split end of the handle, the fibers of the wood will sink into the hole and prevent the wedge from backing out. The writer has a number of hammers wedged in this way that have been in service for years.

A cheap and quickly made slide caliper is shown at *B* in the same sketch. The tool is often convenient for the purpose of measuring diameters or distances upon work in confined places that cannot be reached by the ordinary form of caliper. It is not intended as a precision tool.

It may be made of cold-rolled steel of suitable size

by bending over the ends and finishing the surfaces with a file or disk grinder. The yoke must be milled out to go over the slides and is pinned to the lower one. By using a taper pin and making several corresponding holes in the lower slide the yoke may be used anywhere along the length of the slide that may be convenient for the work.



WEDGE FOR A HAMMER HANDLE AND A SIMPLE SLIDE CALIPER

Babbitting Device for Ford Caps

By Walter R. Place

The cost of replacements for Ford automobiles is so insignificant that one would hardly expect worn parts could be reclaimed at a profit, yet the device here shown for rebabbitting bearing caps has proved to be a real money maker. It was designed by Martin Iblaner of the Lorain Machine Works, Roselle, N. J.

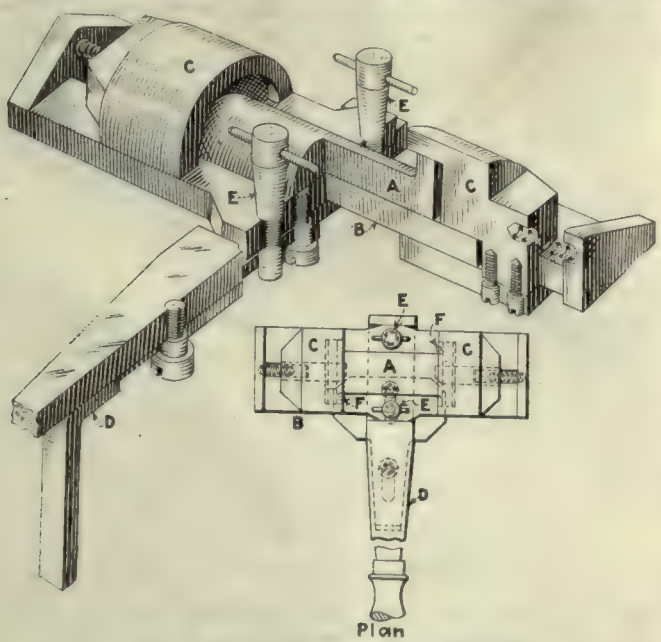
The mandrel *A* is turned to a diameter 0.002 in. under the standard size and the flanges spaced the proper distance apart with the shoulders beveled slightly outward to facilitate the removal of the cap after pouring. This mandrel is secured by screws and dowels, not shown, to the part *B*, which may be considered the base of the device.

Parts *CC* are arranged to slide endwise on the base and are held in closed position by coil springs. They serve to hold the cap in place while the babbitt is being poured and to prevent the liquid metal from leaking out around the end. They can be separated by a movement of the cam plate *D*, located under the handle.

Studs *EE* have tapered bodies which serve to locate the cap in position for pouring the metal. Two small holes *FF* through the base provide gates for casting and also act as air vents. The device is inverted to pour the babbitt.

When the casting has been sufficiently cooled the studs *EE* are removed, the cam plate *D* moved forward by means of the bent handle and the device struck sharply over a block of wood or upon the bench, causing the cap to drop out.

The operations are very quickly repeated and by merely cutting off the two small projections corresponding to the pour holes and scraping the babbitt to fit the shaft, the new cap is ready to go to place.



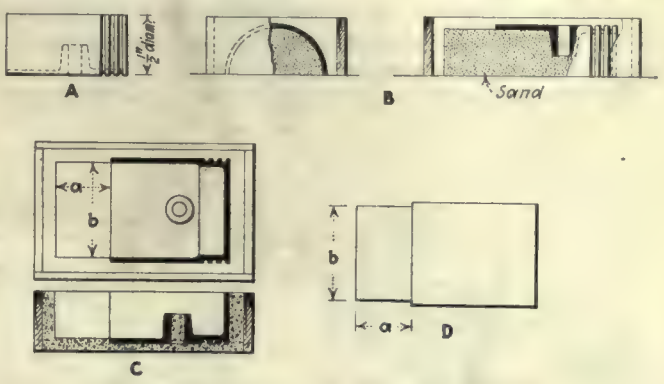
TOOL FOR REBABBITTING FORD CAPS

Simple Corebox for Gas Engine Piston

By Henry H. Knabe

The sketches show a quick and easy way to make a corebox for a gas-engine piston, a job that often has to be performed in small foundries when new pistons are required for repair purposes.

Saw the old piston apart lengthwise, as shown at *A*, so as to get one exact half of the casting. Make a rectangular frame of wood of suitable dimensions and lay it over the half piston as at *B*. Pack moist sand under the piston, being careful not to fill the pinhole, and allow the sand to project beyond the skirt of the piston to form a print, which must be carefully rounded to conform to the contour of the piston.



COREBOX FOR GAS ENGINE PISTON

Next mix plaster of paris to a proper pouring consistence (not too thin) and fill the box level full. When the plaster has hardened invert the box and scoop out the sand, leaving the piston in place. This forms a corebox *C* in which a core is made from core sand in the regular way.

The pattern is now nothing but a shouldered cylinder of wood as at *D*, with the dimensions *a* and *b* conforming to the corresponding dimensions of the corebox.

Planing Flat Gibs—Discussion

By Edward Schroeder

Referring to several articles under the above subject that have appeared in *American Machinist*, the writer would like to say that in the early days of his apprenticeship, he planed quantities of flat gibs.

The gibs, one or more at a setting, were roughed to within $\frac{1}{32}$ in. of finished size. They were held down on the planer by bunters, and pressed against a parallel tongued in one of the T-slots of the planer by setscrews. After the scale had been removed, some of the holding pressure was released and a light cut taken

from one side with a narrow, square-nosed tool. The gib was then released and turned over on the planer table, and if found to be sprung or warped it was gently tapped with a lead hammer to straighten it. If the gib was not out of wind, tissue paper in narrow strips was packed under one corner, or two diagonal corners, and another light cut taken over one side which generally brought that side true. A cut was then taken on the opposite side, bringing it to size and making it ready to be scraped in.

By this method no tapping with a lead hammer is necessary, except after the first roughing cut.

It is most important that packing up the corners be properly done, also that too much pressure is not exerted by the screws at the time of taking the finishing cuts.

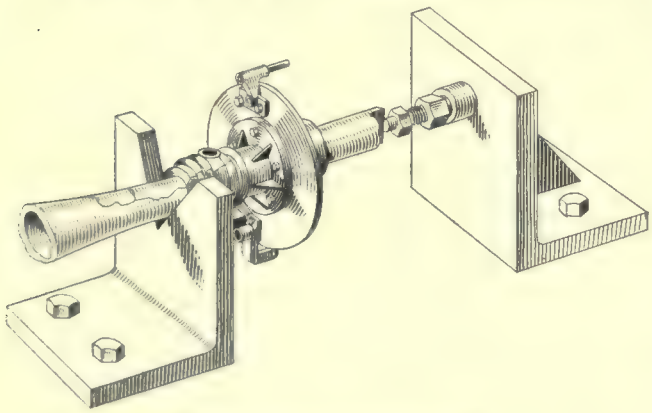
Of course, with a magnetic chuck a quicker job could be done, but we did not have one in the shop when I was planing gibs.

Removing a Cracked Axle Housing

By Daniel F. Smith

The accompanying sketch shows how we pressed a cracked axle housing out of the brake rigging by means of an improvised forcing press, using a small screw jack to apply the pressure.

The shoulder of the brake rigging was placed against



IMPROVISED FORCING PRESS

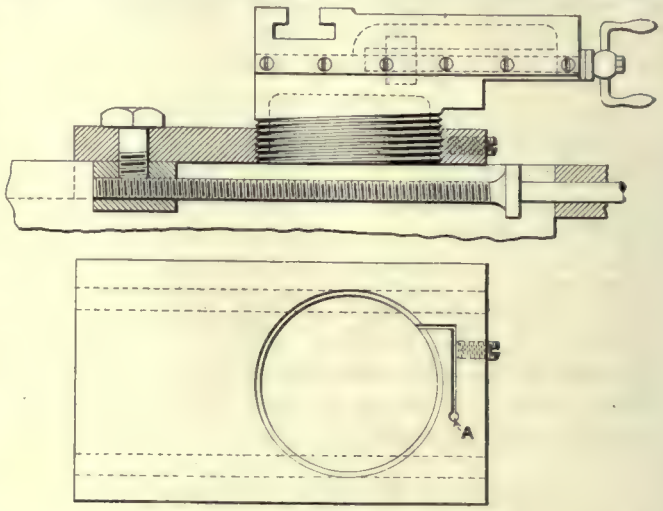
the face of an angle plate, in the top of which was a V-shaped opening, and the jack against the face of an opposed angle plate, both firmly bolted to the table of a large planer. With a short piece of shafting against the end of the housing, and centered over the jack, a pressure of 2,500 lb. was available and by this arrangement the housing was pressed out without injury to any of the parts.

Method of Clamping a Swivel Head

By J. V. Romig

In designing special machinery it is sometimes necessary to provide means of clamping a swivel head in any desired angular position, as the head of a planer or the compound rest of a lathe. For this purpose the writer devised the scheme shown in the cut, which is very easy to apply and will hold the head firmly under any reasonable degree of pressure.

The first job to which I applied it was on the rebuilding of several small lathes that originally had only a plain slide, but which it was desired to fit with compound rests. In this case the cross-slide is bored and threaded with a relatively fine-pinched thread and the bottom of the compound rest is threaded to fit nicely. Then a hole is drilled as at *A*, and a slot is sawed,



CLAMPING SWIVEL HEADS

starting from this hole, to meet a slot that starts from a point on the circumference of the threaded hole. This leaves a weakened section of thread that may be forced against the male thread by the pressure of a setscrew tapped into the end of the slide.

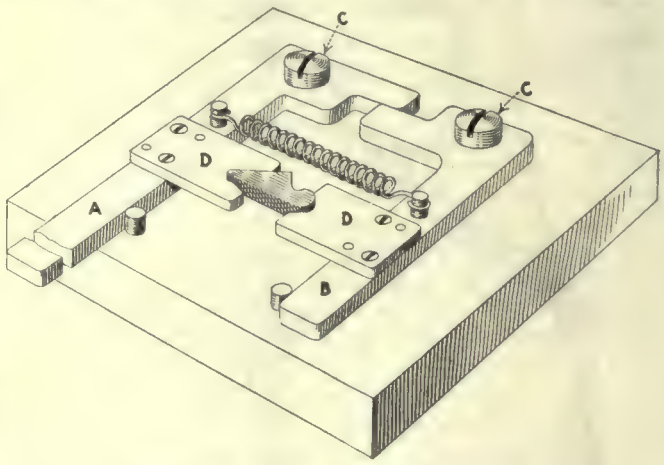
A head so clamped is very firm as it is held in a horizontal position by the threads themselves, while the clamping action of the screw against the weakened section keeps it from turning. This action does not distort the slides, a very valuable feature where accuracy is required.

Convenient Nest for a Shaving Die

By Franklyn Smith

The writer recently constructed the shaving die shown in the cut, which permitted the nest to be operated by one handle, making it much easier and quicker than the usual two handle nest. This nest can be operated with the left hand and loaded with the right hand.

The handle *A* is pushed back, thereby throwing back the handle *B*, the handles pivoting on screws *C*. The nests *D* are doweled and screwed to handles *A* and *B*. After pushing back handle *A* the work is taken out



NESTING WORK ON SHAVING DIE

and the handle released. The spring brings both handles back against their respective stops, when the device is again ready for loading.

Editorial

More Business in Government

POPULAR interest was immediately awakened by the slogan "More Business in Government." It tickled the public fancy and, as usual, the public sat back and waited for somebody else to put into effect the system that was to reduce taxes, decimate the army of office holders in Washington, eliminate waste and accomplish sundry other highly desirable reforms.

Results have hardly come up to expectations. A budget system is in operation so far as the administration is concerned, but Congress has shown little hesitancy in disregarding budget figures where political capital was at stake. A few clerks from government departments have had to find jobs elsewhere but there are very many still on the job. Perhaps the only way to dispense with their services will be to declare them surplus and turn them over to Col. Smither to dispose of. The reorganization of federal departments and bureaus has failed utterly to materialize.

Who is to blame for the failure of the result crop when such good seed was planted and so much was expected of it? To carry the simile a little farther we might say that it is the fault of the husbandman, the citizen of this big country, who has sat on the doorstep and whittled or gone fishing instead of doing his utmost to insure the production of a good crop of the desired results. Nature has been allowed to take its course unaided and little else than what has happened could have been expected.

What is to be done about it? Just this—the merchant and the manufacturer, the employer and the employee, the capitalist and the laborer have got to get over the idea that politics is a dirty business, defiling to all who get mixed up in it, and step in and make it an honorable venture.

When it comes to politics, distinctions of class or station in life seem to fade out and we all become pretty much alike, too busy or too lazy to take the proper interest in a matter which affects all of us vitally. As a result of this general indifference it has become entirely too simple in this country of ours, for the organized and vociferous minority to put things over on the unorganized, passive, and good-natured majority.

Some of us carry hardly enough weight to make much of an impression in national politics, but the political structure is so made up that none of us is so insignificant that he cannot make himself heard in his local unit.

As a nation we are rapidly approaching a point where politics must be one of the first considerations of every citizen. As a world power we need bigger leaders than we did as a relatively isolated country. Their vision must be broader to take in the viewpoints and peculiarities of men of other nations as well as their own. Their political education must be more complete if they are to lead the rest of us who are not so well versed in its windings.

Until we take pains to select men of this character to represent us in legislative bodies and as executives, we can hardly expect to escape from the blowhards and demagogs who are eager for positions of prominence. Unfortunately, the right kind of public official is not an office seeker. He must be sought out and by the right kind of seekers if he is to make the personal sacrifice usually inseparable from public life.

If you men of the machinery industries are anxious for the kind of political representatives you ought to have, it is up to you to take a hand in selecting and electing them. The results will be just about commensurate with your efforts.

Unions Can Be Sued

THE decision of the United States Supreme Court handed down in the Coronado Coal Co. case last week is generally conceded to be the most important labor decision since the case of the Danbury hatters. Under its terms the liability of labor organizations to be sued is clearly defined.

The leaders of organized labor have always contended that as labor unions were not incorporated they could not be sued, and this decision is consequently a body blow to them. They at least have the consolation, however, that according to the court the central organization cannot be held responsible for unauthorized strikes indulged in by local or district bodies. Their power over these smaller units should be greatly increased thereby.

To the general public, which is not particularly partisan in labor disputes, the decision will appeal as the only one possible in common fairness. Just why labor organizations have been immune from the penalties of breaking certain laws has always been a mystery to us, and the Coronado Coal decision consequently goes far to restore our faith in the fairness of the bench.

Incidentally, hot-headed strike leaders will probably be restrained by cooler counsel when it is realized that damages for which the unions are responsible can be levied against their treasuries.

The Commencers

ABOUT this time every year the colleges and technical schools of the country send forth a flood of ambitious young men who have much to learn and perhaps more to unlearn.

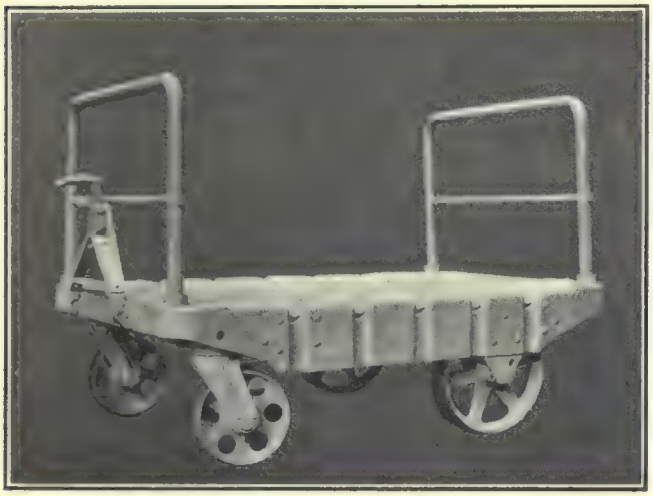
Few of us give the proper significance to the word "Commencement." To most of us it indicates the completion of the young man's period of preparation and he is assumed to be ready to earn a living. A more literal interpretation of the word would really be much nearer the truth, for the great majority of these boys are just ready to commence learning, and their earnings are likely to be small for some time to come.

A word to you hard, practical men who will soon have the job of driving common sense into their heads. It will undoubtedly be a pleasant duty for you to show them how little they know, but remember that it is a terrible drop from the exalted position of a college senior to that of the newest boy in the shop, and you can't expect all of them to land on their feet the first time. Temper justice with mercy.

Shop Equipment News

Elwell-Parker Wheeled-Platform-Trailer

The Elwell-Parker Electric Co. of Cleveland, Ohio, has just placed on the market, to be used with its line of electric elevating platform trucks and tractors, the



ELWELL-PARKER WHEELED-PLATFORM-TRAILER

wheeled-platform-trailer shown in the accompanying illustration. The platform of the trailer is made of corrugated steel plate with deep aprons on each side. This platform rests on 4-in. longitudinal channels which are riveted to malleable castings at the four corners.

In front the trailer is equipped with ball-bearing caster wheels of the swivel type. The fixed rear wheels, on roller bearings, are carried in forged-steel yokes riveted to the top and the side. All bearings are provided with pressure lubrication. The caster wheels are 10 in. and the fixed wheels are 15 in. in diameter. The trailer can also be provided with end or side standards and with a coupler. If desired, it may be equipped with four casters, instead of two casters and two fixed wheels. Where required the wheels may be fitted with 10- and 15-in. solid rubber tires.

For use with electric lift trucks, the trailer has been provided with clearance between the wheels sufficient to permit the lift truck being driven beneath the platform. When the lift truck elevates, the load is supported by the two longitudinal channels under the platform. When used as a trailer, the unit is fitted with hook and eye couplers, or chain couplers.

The unit weighs 600 lb. and has a capacity of 6,000 lb. It is especially adapted for transporting materials in shops and warehouses, and at railway and steamship terminals.

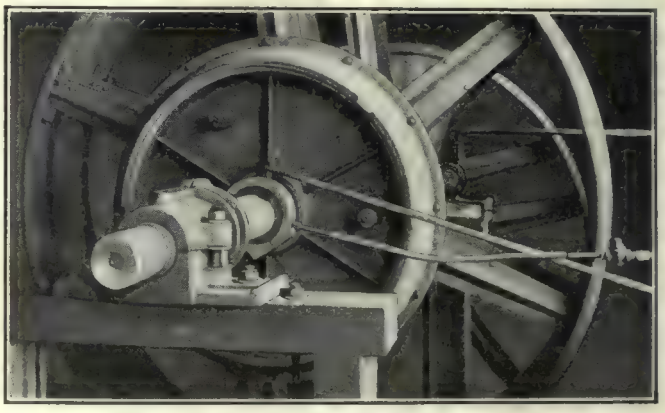
Dickson Pneumatic Clutch

The Rogers Foundry and Manufacturing Co., 11th and Pearl Sts., Joplin, Mo., has just placed on the market the pneumatically operated clutch shown in the accompanying illustration.

The clutch consists of two disks with cork-covered conical faces on their periphery. These disks are closely fitted on a hub and are driven by pins through a triangular plate which is a part of the hub. An air inlet is fitted on the hub in such a manner that the air can be fed through the hub between the disks while the hub is revolving. The two disks are fastened together at the periphery with a flexible, air-tight connection. This arrangement allows the disks to move longitudinally on the hub, although during the slight movement that can occur the flexible connection merely bends and the chamber is kept air tight.

When air under low pressure is admitted between the disks through the air inlet, the disks spread apart. This action forces the conical friction surfaces of the disks into contact with the outer case, which has similar conical faces. This case is carried on the ball-bearing quill. The pins which drive the disks are fitted with springs strong enough to release the clutch and bring the two disks back to normal position when the air pressure is released. Thus, the only effort required of the operator is the movement of a valve.

The clutch is especially adapted to fields where clutches of large horsepower are required, or where it is desired to obtain remote control. Only a small amount of air is required for its operation, from 1 to 3 lb. being ample. One pound of air in a 30-in. clutch gives a spreading power of about 1,400 lb. In places where a gas engine is used for power, the exhaust may be utilized to produce the pressure required for clutch operation. Where electric power is used, a small rotary



DICKSON PNEUMATIC CLUTCH

blower can be driven from the quill to furnish the required air.

Having no toggles or levers, the clutch is not affected by centrifugal force. Since it has two opposed driving cones, there is no end thrust on the bearings. A continuous flow of air is allowed to go into the clutch to take care of any leakage that may occur. As the air inlets are small, breakage is not likely to take place because of too sudden engagement. The horsepower increases rapidly with increase in the diameter of the clutch, the 36-in. clutch, being rated at 165 hp. at 100 r.p.m., and using air at a pressure of 3 lb. per square inch.

Landau Sensitive Multiple Drilling and Tapping Machine

The sensitive multiple-spindle drilling and tapping machine shown in Fig. 1 has recently been placed on the market by the Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y. The machine is of the quick-change type and provides both low and high speeds. By operating the shifting lever, the desired speed can be quickly obtained without jar and while running at full speed. Speeds of 500, 900 and 1,800 r.p.m. are available for drilling. For withdrawing taps, the speeds are 600, 1,000 and 1,800 revolutions per minute.



FIG. 1. LANDAU DRILLING AND TAPPING MACHINE

One cone pulley runs in ball bearings on an eccentrically mounted shaft. The slack of the upper belt can be taken up readily by turning this shaft through a portion of a revolution. An idler roller is used to take up the slack of the lower belt when the speed is changed, and it also automatically exerts the proper amount of tension at all loads. The machine can be driven by means of either tight and loose pulleys or a ½-hp. motor. A view of the multiple-spindle head is shown in Fig. 2 The drilling capacity is up to ¼ in., and the tapping capacity No. 10 x 32. The maximum spread of the spindles is 4½ in., and the minmum center distance is ⅞ in. Each spindle can be instantly converted to drilling or tapping without adding or removing any parts. When through drilling, it is only necessary to remove the drill, insert the tap and release a setscrew, and the machine is ready for tapping. Each spindle is a complete unit and may be used individually with the remaining spindles idle. All spindles may, of course, be operated together for multiple drilling or tapping.

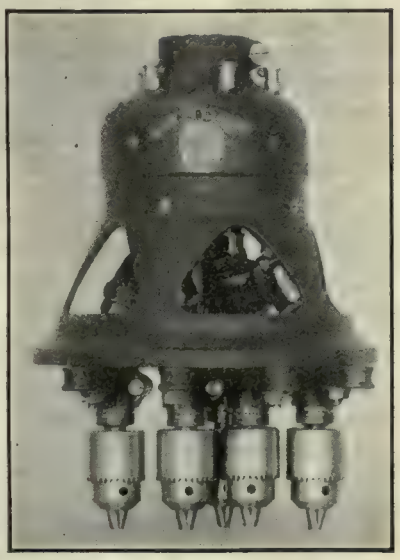


FIG. 2. LANDAU MULTIPLE-SPINDLE HEAD

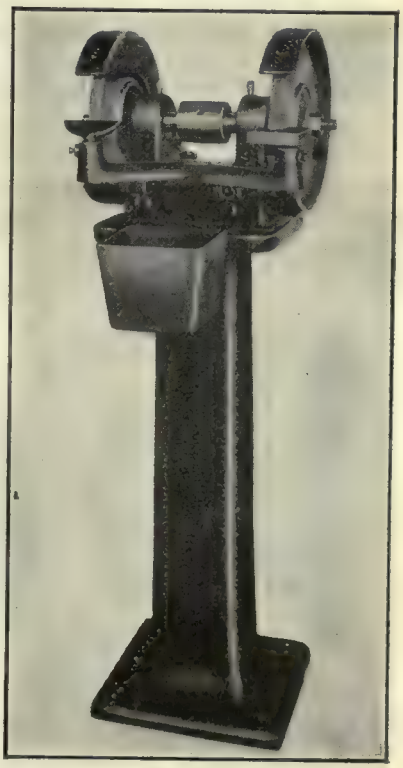
The main drive spindle is centrally located and mounted on ball bearings, which carry the load of the entire head. Each spindle is equipped with upper and lower radial and thrust bearings, and is fully and readily adjustable both radially and vertically. It is but a moment's work to adjust for the shortness of a drill or tap in case of breakage. The spindle arms have triple the strength required to drive the drilling spindles.

The light weight of only 8 lb. makes the head suitable for small work. All operating parts are made of nickel-steel, hardened and ground. The moving mechanism is protected by a ventilated hood which acts as a guard. The feed of the head is operated by means of a rack and pinion, counterbalanced so as to be very sensitive. The head has a travel of 3½ inches.

The table is 10 x 12 in. in size and has a vertical travel of 9 in. The distance from the center of the spindle to the column is 8 in. The height of the machine is 60 in. with the column and 30 in. without it. The floor space required by the motor-driven machine is 20 x 34 in. and by the belt-driven machine 20 x 26 in., the weights being 360 and 300 lb., respectively. It is stated that the machine can produce in eight hours 8,000 holes in a cast-iron plate ½-in. thick.

Fafnir Ball-Bearing Tool Grinder

A ball-bearing tool grinder is a recent development of the Fafnir Bearing Co. of New Britain, Conn. It may be furnished with a bracket to provide the necessary offset where it is desired to bolt the grinder to a post. When it is desired to mount it on a bench, a plate can be provided; or it may be furnished with a pedestal, as shown in the illustration. The chief feature of the grinder is in the method of mounting the spindle, this being accomplished by the use of Fafnir ball bearings. The spindle can be driven by belt direct from the lineshaft, so that it is not necessary to start and stop it each time the grinder is used. Adjustable toolrests, water pot and wheel guards are furnished.



FAFNIR TOOL GRINDER

Landau Plain and Back-Geared Tapping Chucks

The Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y., has recently placed on the market a line of tapping chucks. At the left of Fig. 1 is shown a simple friction device for holding taps, so as to prevent breakage in case a hard spot is encountered in the work. The device, designated as the Model G, can be used with the Models B and E tapping chucks that will be described later, as well as with standard tapping machines. It is made in two styles, the one shown having a tapered shank, for use on drilling machines and lathes. The other style has a straight shank with a reversing sleeve, so that the device can be used in a turret head.

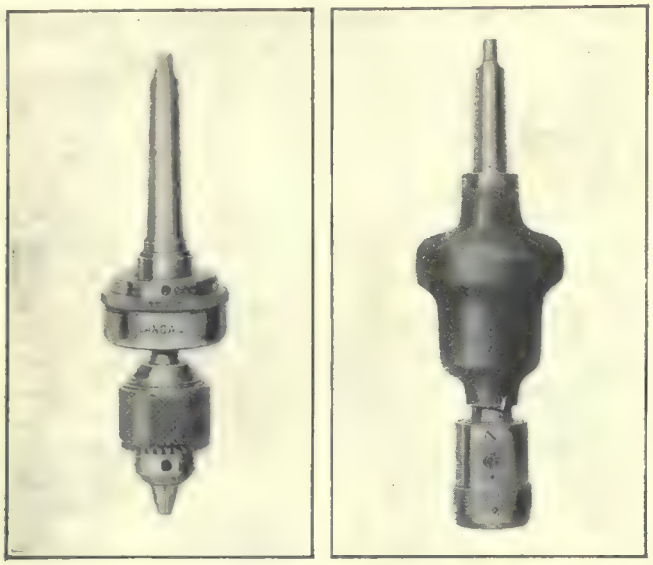


FIG. 1—LANDAU MODEL G (AT LEFT) AND MODEL B (AT RIGHT) TAPPING CHUCKS

At the right of Fig. 1 is shown a single-spindle tapping chuck that can be driven directly from the main spindle of a drilling machine. The device is fitted with ball bearings, and the spindle reverses at higher speed than when feeding downward. The capacity of this Model B chuck is up to ¼ inch.

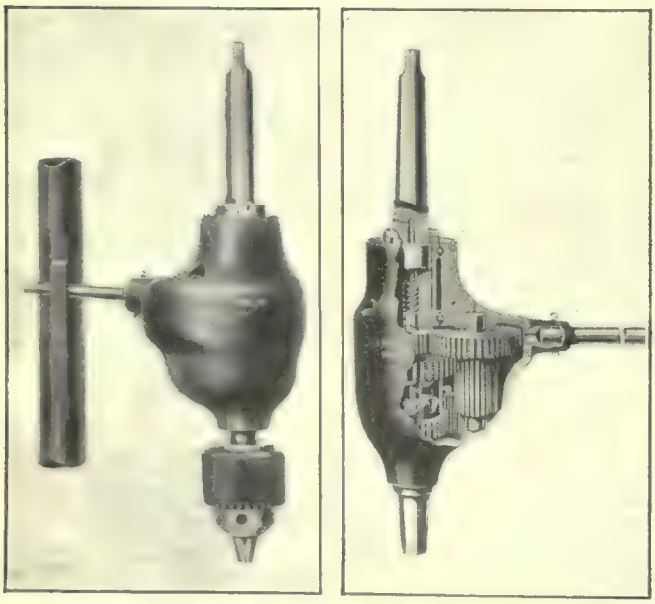


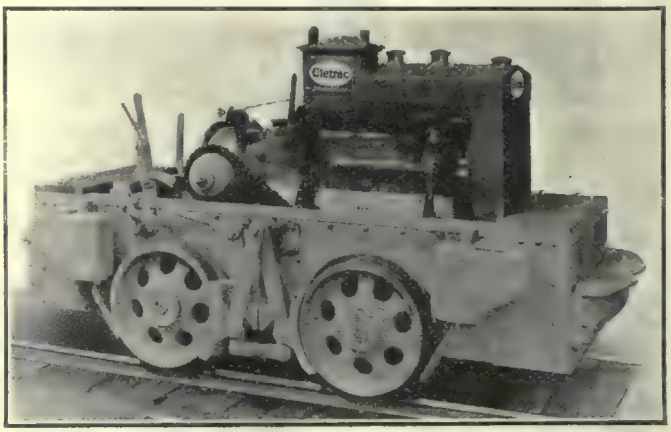
FIG. 2—LANDAU MODEL E BACK-GEARED TAPPING CHUCK

A single-spindle back-geared tapping chuck, known as the Model E, is shown in both external and internal views in Fig. 2. The use of back gears permits of a much higher speed for reversal of the tap than for the forward speed. The arrangement of the clutches can be easily seen. The main drive is fitted with ball bearings, and a standard tap-holding chuck is used. The ratio of the reverse speed to the forward speed is 5 to 1. The chuck holds Nos. 1 and 2 Morse tapers, and it has a capacity up to $\frac{7}{16}$-in. taps. The Model F chuck is similar to the Model E. However, the speed of reversal is three times the forward speed and the capacity is from $\frac{3}{8}$ to $1\frac{1}{8}$ inches.

In the Models E and F chucks, the speed control mechanism and the clutches operate to prevent breakage of the taps in case the movement is hindered by some obstruction in the work. The use of the back gears permits a very small size for the body or housing of the chuck. No screws protrude from the housing, which is perfectly smooth in contour.

Atlas-Cletrac Industrial Locomotive

A light industrial locomotive driven by a gasoline motor and intended for general hauling around industrial plants and for road construction, is shown in the accompanying illustration. It has recently been placed on the market by the Atlas Car & Manufacturing Co. of Cleveland, Ohio.



ATLAS-CLETRAC INDUSTRIAL LOCOMOTIVE

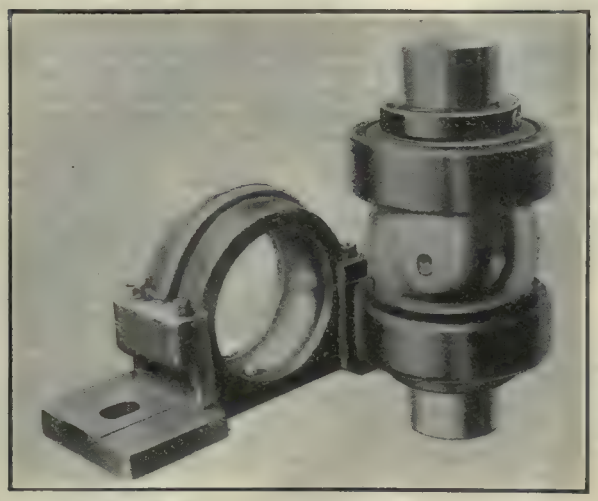
The frame and running gear are similar to those used on the company's electric locomotives and are very heavily made, so that the unit is capable of withstanding severe service. The driving mechanism consists of the complete power plant of the Model F tractor made by the Cleveland Tractor Co. of Cleveland, Ohio.

The 18-hp. motor has four cylinders, and can be run on either gasoline or kerosene. The operating parts are inclosed to give protection, but are readily accessible. A washing device removes dust from the air fed to the motor. The clutch is located in the flywheel of the motor. Both axles are driven from the jackshaft by means of roller chains. Reversal is accomplished by means of a jaw clutch and speed control by the throttle.

Either steel or cast-iron wheels can be furnished. Bumpers, sanders and hand-operated brakes are provided. A cab inclosing the mechanism and the operator can be mounted on the frame. The wheel base is 34 in. and the gage 24 in. or wider. The maximum speed is 8 miles per hour, and the draw-bar pull at 4.8 miles per hour is 800 lb. The tractor weighs about 4,000 lb.

Fafnir Double-Ball-Bearing Self-Aligning Pillow Block

The illustration shows a pillow block that has recently been brought out by the Fafnir Bearing Co. of New Britain, Conn. The essential features of the Fafnir double-ball-bearing hanger box have been adapted to a self-aligning pillow block. The block is



FAFNIR SELF-ALIGNING PILLOW BLOCK

nearly frictionless, since both radial and end-thrust loads are carried by the balls. The block has the minimum distance possible from the base to the shaft center. Although it automatically aligns to compensate for any discrepancy between the bed on which it rests and the position of the shaft, the aligning occurs without affecting the ball bearings, as they are both installed in a box which aligns as a unit.

Each unit contains two Fafnir transmission ball bearings having radial ball contact and deeply grooved races. The inner ring of the bearing is made very wide, in order to give the bearing a firm seat on the shaft and to afford greater support to the shaft. The outer ring of each bearing is mounted against a shoulder near the end of the box. An end cap, held in place by a steel wire which is snapped into a groove machined in the housing, contains a felt washer and prevents the escape of lubricant or the entrance of dirt.

The box contains no bolts, screws nor adjustments. It is secured endwise on the shaft by means of two collars fitted with setscrews. These collars have lugs which engage corresponding slots cut in the wide inner rings of the ball bearing. Consequently, the shaft, collars and inner rings revolve integrally, and the collars drive the inner rings so that they cannot slip and score the shaft.

The pillow block may be easily installed. The base may be bolted to the bed, and the cap secured after the box and the shaft have been fitted in place. When dismounting, the shaft and box may be removed without disturbing the base, or the shaft may be withdrawn merely by loosening the driving collars. The oil cannot leak out of the housing.

The spherical seat in the pillow block and the ball on the box permit the whole box to align as a unit with the shaft. The block is of especial use on large sizes of fans and blowers.

High Production Costs—Discussion

By H. L. Wheeler

In his article entitled "Labor Cost in Building Machine Tools," published on page 438 of American Machinist, Simeon Williams, in taking exception to statements made by Harry Senior on page 305 of the same journal, resorts to vague and somewhat inconsistent explanations that do not explain, in a manner that constitutes rather an approval of Mr. Senior's article than otherwise. The statements above mentioned seem to Mr. Williams to be so at variance with the facts as to require confirmation by first-hand witnesses before he can accept them, yet he would have us believe in refutation of them, statements that are equally vague and that have no more definite backing than those of his opponent.

In a report recently issued by the Committee on Elimination of Waste in Industry, of which Herbert Hoover is chairman, it is stated that the average metal working plant in six representative classes actually engaged in the construction and repair of machinery is about 30 per cent behind the best plant (we may assume the Ford plant) in output per employee. According to this report this class of plants must answer for 28.66 points of waste distributed as follows: Management 23.23; labor 2.55; and outside contracts, which, I presume, includes selling expense, 2.88. It would appear from these figures that management is responsible for 81 per cent of the losses due to nonproduction, labor 9 per cent, and outside contacts 10 per cent.

In comparison with other industries surveyed the metal trades make a very good showing in regard to points of waste as may be seen by the following figures indicating points of waste for the others: Boots and shoes, 40.93; textiles, 49.20; building, 53,00; printing, 57.61; men's clothing, 63.78. On the other hand all these industries make a better showing when it comes to management, their losses in this respect being much less than is found in the metal trades. In any event the report is an indictment of management and many so-called systems of scientific management, and it does not seem to substantiate the statement that "labor costs are the controlling element in every thing we buy."

High rents are often made so by people who want to put on a "front" and trade on credit. High costs of food are often caused by stock jobbers, who regulate the supply but not the demand. In any large city tons of food are allowed to rot in storage rather than place it on the market below a "price."

Labor, it is true, is responsible for many of our present-day embarrassments but I do not think it is by any means the largest item. Labor is not a tangible asset. The manufacturer does not have to invest in labor, so that when labor is idle it does not take anything out of plant investment in the way of interest. Labor saving machines and devices are unquestionably good things if they can be kept going, but when they are idle over prolonged periods they are like a millstone about the neck, or the horse that has to eat whether he works or not. A hundred thousand dollars worth of labor saving machinery lying idle will push a man off Easy Street about as quickly as anything I know of.

News Section

War Department Expenses Cut by Senate

The further manufacture of rifles for the army was opposed by Senator Hitchcock of Nebraska, during debate on the War Department appropriation bill. He took the position that further manufacture of the arm was unnecessary in view of the fact that there are already 2,800,000 rifles on hand. He offered an amendment reducing the appropriation for the manufacture of rifles from $375,000 as proposed by the committee to $75,000, which he said would permit the Springfield, Mass., arsenal, which manufactures the arm, to remain in a stand-by condition. Senator Wadsworth of New York, chairman of the military committee, explained that the committee recommendation covered a minimum production of thirty rifles a day at an expenditure of $900 a day, and that it was desired by this minimum production to preserve the art of making rifles which would be otherwise lost. Senator Hitchcock argued that if the Government would continue to manufacture rifles to continue an art there was sufficient reason for continuing the manufacture of chemicals for chemical warfare, and other implements of war. He denied that the art of making rifles would be lost if production was now stopped. Senator Lodge, Mass., opposed curtailment of the appropriation. The Hitchcock amendment was defeated by a vote of 18 to 47.

Appropriations for the ordnance service of the Army are cut by $1,102,060 from allowances made by the House, by the Senate appropriations committee in reporting the War Department appropriation bill. The appropriations for various purposes are reduced by the following amounts: Ordnance stores, ammunition $258,500; manufacture of arms, $25,000; purchase, manufacture and test of tanks, $100,000; mountain, field and siege cannon, $250,000; ammunition for mountain cannon, $100,000; amunition for subcaliber guns, $10,000; repairs of arsenals, $205,000; civilian ordnance schools, $17,000; seacoast cannon, $50,000; ammunition for seacoast cannon, $50,000; ammunition for subcaliber guns for seacoast defense, $10,000; seacoast cannon insular possessions, $25,000.

Further Work on Screw Threads

Screw thread matters will be considered at three meetings which are being planned for the end of June. The exact date has not been set at the time of this writing. One of the meetings will be that of the National Screw Thread Commission. The sectional committee on general engineering work plans to meet immediately following the meeting of the Commission. The sectional committee on standardization and unification of screw threads also expects to meet at about the same time.

Tariff on Machine Tools Probably to Remain at 15 per Cent

In considering tariff rates for printing presses, the senate on June 8 voted to retain the present rate of 15 per cent ad valorem, foreign valuation plan, rather than adopt the committee rate of 35 per cent. The vote was close, the committee rate being rejected by 28 to 27. The argument used against the rate of 35 per cent was that importations of printing presses are insufficient to justify it.

Machine tools and parts of machine tools, being covered in the same paragraph of the tax bill, will take the same rate. The decision must be considered in detail, after the Senate finishes with the bill, by the committee of conferees composed of three members of the ways and means committee of the House and three members of the finance committee of the Senate. Congress must after that approve the committee agreements. The probabilities are that the 15 per cent rate will stand unless machine tool manufacturers are willing to protest and able to show that importation of machine tools is, or is likely to be, heavy enough to justify a higher rate.

Cash registers, now on the free list, were made dutiable at 25 per cent ad valorem foreign valuation plan. Rates were provided of 25 per cent for cream separators, 50 per cent for knitting, braiding and insulating machines and all other textile machinery, 30 per cent on embroidery machines, including shuttles for sewing and embroidery machines, lace making machines, and machines for making lace curtains, nets and netting.

Belgian Industries Favor Standards

Great progress in standardization, particularly in the construction, metal, mining and electrical industries of Belgium are indicated in a report from the Association Belge de Standardization, which has just been received by the American Engineering Standards Committee. The report shows, among other things, that the Belgian manufacturers have established standards in the following lines: Steel fabrication, steel bridges, shafts and pulleys, bolts and rivets, electrical machinery, and galvanized and corrugated iron and partitions. These standards have all been printed, and copies are available through the American committee. Steps are now being taken in Belgium for establishing standards of rules for the design and inspection of reinforced concrete structures, chains, wire cables for cranes, hoists, elevators and mining purposes. A technical committee is now arranging work to be taken up to establish standards on cast-iron pipes and fittings, and rules for the design of shafting.

Durant Buys Willys Property at Auction

Subject to confirmation by the U. S. District Court, the great plant of the Willys Corporation at Elizabeth, New Jersey, built at a cost of $10,379,416 was sold last Friday at a receivers' sale to Jos. P. Day of New York, acting for W. C. Durant. The sale price was $5,525,000.

The other two bidders on the property were J. Clarence Davies, a New York real estate operator, and Senator James Smith, of New Jersey, acting for Arthur Golston of New York. Mr. Davies refused to divulge the names of his clients.

The sale created a wide-spread interest, evidenced by an attendance of more than 1,000 persons, many of whom are figures prominently identified with the automotive and machinery industries.

Under the terms and conditions governing the sale, laid down by the court, the entire property was divided into four chief subdivisions or parcels. The machine tools and machinery covered in a special catalog, made up a fifth division and these were divided into twenty-three separate lots. These parcels were first offered for sale separately before offering the entire property as a complete unit. Under the terms, announced at the opening of the sale, the total of the individual bids had to exceed the bid for the property as a complete unit, otherwise the individual bids were to be rejected and any deposit already made was to be returned.

The bids on the twenty-three lots of machinery and machine tools aggregated $231,650. On offering the twenty-three lots as a complete unit, the machinery was finally sold to Jos. P. Day, for Mr. Durant, for the sum of $375,000. This brought the total individual bids for the four parcels and the machinery up to $3,030,000 and it was at this figure that the spirited bidding started for the property as a whole.

J. Clarence Davies bidding against Senator Smith with an occasional bid from Mr. Day carried the price to $5,000,000, at which point he retired, and the property was sold finally to Mr. Day for the price already stated.

Mr. Durant, promising a complete announcement of his plans upon confirmation of the sale by the court, stated that the plant would be used to produce the new Star car at the rate of about 500 a day.

British Auto Exports Drop One-Half

Exports of British made motor vehicles and parts during the first three months of 1922 show a decrease of more than 50 per cent, as compared with the exports during the same period of last year, and about 30 per cent as compared with the same period for 1920.

American Foundrymen's Association Discusses Technical Subjects

The best attended and most successful convention yet held by the American Foundrymen's Association took place from June 5 to 9 at the Exposition Park in Rochester, N. Y. The meeting was held in conjunction with the Institute of Metals Division of the American Institute of Mining Engineers.

Technical sessions and entertainment features took place each day, and an exhibit of equipment and supplies was carried on during the entire convention. Over 175 concerns representing all branches of the industry exhibited products, and the completeness of the exposition contributed greatly to the success of the meeting. Since foundry appliances of all sizes and types were exhibited, the industry showed the trend of development in foundry practice and equipment.

After registration on the first day, a joint session of the two societies was held. On Tuesday morning a number of papers on metallography were presented at a session held by the Institute of Metals Division.

One of the high spots of the convention was the International Session that also took place on Tuesday morning. According to an arrangement recently entered into with three European associations of foundrymen, exchange papers were presented by J. Leonard, president of the Association Technique de Fonderie de Liege of Belgium, by the Association Technique de Fonderie de France and by F. J. Cook of the Institution of British Foundrymen. Great interest was shown in the papers, particularly the last one on "American vs. British Cast Iron." It was evident that the exchanging of ideas between the various associations greatly promotes interest in the work done abroad and fosters friendship and co-operation.

On Tuesday afternoon simultaneous sessions were conducted on steel and on non-ferrous metals. Separate sessions on steel, gray iron and aluminum were held simultaneously on Wednesday morning, while in the afternoon the meetings were devoted to discussing practice in the brass foundry and the problems of industrial relations. At the latter session a report was made by a special committee on Safety, Sanitation and Fire Prevention. Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, spoke on "Cycles of Depression and Their Prevention." L. W. Wallace, executive secretary of the Federated American Engineering Societies, discussed the "Prevention of Waste in Industry."

At the banquet on Wednesday evening, held at the Powers Hotel, Governor Henry J. Allen, of Kansas, was the main speaker. The governor delivered his usual spirited address on industrial relations.

Research work on molding sand was reviewed on Thursday. The meeting was particularly important because a report on molding sand research was presented by the joint committee of the American Foundrymen's Association and the National Research Council. On Friday, the last day, the time was devoted to a malleable iron session and a general business session.

Federal Commission Hits Steel Merger

Following the request expressed in Resolution No. 286 agreed on May 12 by the United States Senate, the Federal Trade Commission has formulated a report which has been forwarded to the President. The resolution requested that the commission, and also the Attorney-General, inform the Senate what steps have been taken, or were proposed, to ascertain the purpose and probable effects of the proposed merger of certain steel companies which were named in the resolution. The commission was also asked to state the results of any investigation which it may have conducted and what action it has instituted to protect the public interest.

The matter in question was the proposed merger of several of the more important steel companies of the country, a matter which has been given wide publicity in the daily press during the past month. Regarding the proposed combination of the Bethlehem Steel Corporation and its subsidiaries with the Lackawanna Steel Company and its subsidiaries, the commission reported as follows: "That the proposed Bethlehem-Lackawanna merger when consummated would constitute an unfair method of competition in that it contains a dangerous tendency unduly to injure competition and to restrain trade and commerce and that a proceeding by the commission in this respect is in the public interest." In accordance with this finding the commission on June 3 filed a complaint against the merger.

As regards the merger of the Midvale Steel and Ordnance Co., the Republic Iron and Steel Co. and the Inland Steel Co., these companies proposing to form a new corporation to be shown as the North American Steel Co., the commission reported that the plans for this merger have not progressed far enough for the commission to determine whether the combination would be a direct violation of laws governing the restraint of trade or interstate commerce. The details of this plan are, however, being carefully followed and as soon as the commission is in possession of sufficient information, it will make a further report to the senate.

Hundred Million Business in 1921

The sales of the Westinghouse Electric and Manufacturing Co. during 1921 amounted to almost $100,000,000, as shown by the annual report of the company dated March 31, 1922. This is the largest volume of business handled by this company, except during the three abnormally active years before the war. Manufacturing costs were higher, however, as these could not be reduced as rapidly as prices fell. Furthermore, the expense of development work and about one and a half million dollars for depreciation of inventory were charged against manufacturing costs, so that the increase in surplus was only slightly greater than the amount paid out in dividends. The report states that the current assets of the company are $41,700,000, while its current liabilities are only $11,400,000. In addition, the company shows an inventory of $55,000,000.

Cleveland Drill Co. Scores High Tariff on Raw Materials

In a recent debate on the tariff question before the Tariff Committee, Senator Fletcher called the attention of that body to two letters pertaining to steel duty, and, at his request, they were printed as part of the records of the debate. One of the letters, coming from the Cleveland Twist Drill Co., of Cleveland, Ohio, declared that the economic unsoundness of a high raw-material duty versus a low finished-product duty should be pointed out to those who will be responsible for safeguarding the livlihood of American workmen in the basic and highly technical industry of tool production. The letter presented a comparison of American wage rates and tariff rates with those of foreign countries, and endeavored to show the detrimental effect a high raw-material duty will have on the production of American steel tools. The letter declares that the high-speed steel manufacturing interests will undoubtedly take advantage of the high duty on their products to raise the price of high-speed steel to their customers. Foreign small tools similar to those manufactured by the Cleveland company will pay a duty that will be less than two-thirds of the duty on the raw steel itself.

These tools, which can be made in Germany and England by labor receiving a lower scale of wages than American labor, lets them enjoy a double advantage over American made tools. A tariff which places higher duty on tungsten and tungsten steel than on finished tools containing tungsten will injure the producers of these products, as well as the industries which use materials containing tungsten. The low-priced tools as sold in the American market will deprive American steel makers of just that much of their market for the steel which they manufacture.

Another letter from the Poldi Steel Corporation of America protests vigorously against what is called the destruction of our business, particularly in view of the fact that our Government will not benefit from the standpoint of revenue, but, indeed, will lose the substantial revenue now obtaining. The letter declares that with the passage of the bill with respect to the tariff on fine steel, a substantial revenue now accruing to the Government will be cut off.

During the course of the debate, Senator Underwood remarked that the rates, even as reduced by the Tariff Committee, are still higher than those in the existing law. He said that there is no justification for a higher rate, and that an amendment providing for a reduction will be presented at the proper time.

What to Make in Prisons

The House has passed a resolution for an investigation and report by next December by three members each of the House and Senate Judiciary Committees, of articles desirable to be manufactured by prisoners at U. S. penitentiaries at Leavenworth, Kans., and McNeil Island, Wash., including an estimate of the cost of machinery necessary therefor.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The continued strength of sterling exchange, which carried bills on London to 4.51¼ last Tuesday was the most important development of last week in its bearing on international affairs. It brings the vast British Empire appreciably nearer specie payment and the financial stability that is essential to the normal development of the world's trade. It is due partly to government buying in preparation for the £25,000,000 interest payment which Great Britain will make this fall on her debt to the United States Government, but it also connotes English confidence in the ultimate arrangement of a loan to Germany which was disappointed because of the unwillingness of France to agree to the reduction in the reparation payments to be made her as stipulated by the bankers.

Although it is believed that the logic of events as reflected in Europe's need of credit will in time reopen the *impasse* thus created, the immediate effect has been a further depreciation of the German mark to 33⅜ cents a hundred. The decline was perhaps accelerated by the German Bank statement of May 31 which shows that 151,949,179,000 paper marks were then outstanding as compared with 142,903,593,000 on May 15.

Deflation or Debacle

In some quarters it was inferred from these figures that Germany was afraid to check inflation and would continue to print paper money as long as it would buy anything. But this view is not reasonable. Deflation or a debacle is inevitable in Germany. The former with a loan will be far less ruinous than the latter, and there is no doubt that the less distressing alternative will be accepted, even though France may for a time protest against abating claims no part of which she can collect unless it is made possible for Germany to borrow. The adjournment of the bankers' committee may be in part a strategic move to force France to terms.

It is not therefore unintelligent to expect that marks will advance in value as the facts become understood. Incidentally it is in order to point out that 152 billion marks at 33⅜ cents a hundred are worth considerably less than 143 billion at 38 cents.

The only other important news from abroad is the admission of Lenin's serious illness. It is important because his death or incapacity would probably loosen the grip of the Soviet government in Russia and hasten the complete political reorganization of Europe.

The more significant foreign developments are thus stressed because despite our boasted isolation we are still susceptible to influences which might disturb our foreign trade and it is highly desirable that we should see the facts in their true relation.

Of our domestic situation it is still possible to speak with conservative optimism. Perhaps the most encouraging item of a statistical character published during the week was the news of an increase of 15 per cent over last year in the postal receipts during May. Now that the carriage of parcels is such an important part of the post office business the revenue derived from it is a particularly good reflex of general conditions.

Considered in detail there are only two dark spots in the economic map of the country. One is the coal strike. The other is the low price of wheat. They are both important though the fact that they are so lightly considered attests the widespread and confident cheerfulness of the nation. It is true that a dollar for wheat used to be regarded as a fair price, but that figure is out of line with the present wage scale and the value of most other staple commodities. As to the coal strike Mr. Hoover is still laboring with it but an agreement between the miners and the operators seems no nearer and if after the first of July the mines are still idle there will be genuine reason for concern.

Railroad earnings and traffic are surprisingly good. The Labor Board has decreed another reduction, estimated at $60,000,000 annually, in the pay of the shopmen, and another strike vote is being taken, but good judges say the men will accept the cut and this seems probable. The New England textile strike is approaching its end. The mill owners have won and operators are slowly returning to work but with bitterness in their hearts that bodes ill for the future of the cotton industry in the North. The dry goods trade continues to improve. It might now be called excellent.

Commodity Markets Firm

The cotton market goes up and down as the rain falls or the sun shines. An accurate weather prophet could make a fortune as prices fluctuate between 20 and 21 cents, which will probably be the range until public opinion in regard to the size of the crop has crystallized.

A sharp advance in sugar has justified the views previously expressed in this letter. Refined has been advanced to six cents and Cuban raw has sold at three cents cost and freight, ex duty. If refined should go to seven cents, as seems possible, the raw parity would be about four cents. These figures are not by any means improbable in view of the enormous demand, the reduction in the European production of beet sugar and the rapid distribution of a supply that was considered burdensome only four months ago.

The steel mills are busier. Iron is up. Building continues active notwithstanding the increased cost of brick and lumber. Silk is firm. Rubber is unchanged. The automobile manufacturers say that they will be running at capacity through July, and May production was the largest in our history. Copper hesitates around fourteen cents but at this figure it is moving freely. The stock market is erratic but in the main firm, though prices are not much higher. The steel mergers are held up pending an investigation by the Federal Trade Commission whose ultimate approval is expected upon the theory that the present administration is not unsympathetic with big business. Several new bond issues, including one of $6,000,000 for the city of Montevideo in Uruguay, and another of $7,500,000 for the city of Greater Prague, now the capital of Czecho-Slovakia, were successfully disposed of.

The constant absorption of these foreign obligations and the advance in sterling must in time lead to the loss of some of our gold. This we can well afford for we have too much, but when the outward movement commences the markets will be sensitive to its continuance and the weekly statement of the Federal Reserve System should therefore be closely watched. The figures published last Friday morning show a decline in the reserve ratio from 78.0 to 77.6 per cent, an expansion of $2,500,000 in the gold reserve, and an increase of $40,000,000 in member banks' deposits.

These changes are not significant and there is nothing in the outlook that gives cause for uneasiness or reason to doubt that we shall have fair weather and a high barometer at least until after the election.

Safety Institute Reinstates Seaman Medal for Health Service

The Safety Institute of America has announced that the Louis Livingston Seaman gold medal is to be awarded this year for progress and achievement in the promotion of hygiene and in the mitigation of occupational disease. This medal was first given in 1911, but for the last three years war conditions have prevented the Institute from making the award. Former Surgeon-General Gorgas received the Seaman Medal in 1914 in recognition of his winning fight against the disease-carrying mosquito in Panama. Other recipients have been Dr. Alva H. Doty, former Health Commissioner of the Port of New York for efficient work in protecting the city from foreign invasions of disease; the United States Steel Corporation and the National Cash Register Co. for their pioneer work in the field of employee welfare; William A. Fairburn for the protection of workers in the match industry against phosphorous poisoning; and to the Julius King Optical Co., of New York, for scientific research and practical achievement in overcoming the harmful effects of light to the eyes of arc welders. The most recent award was to Arthur H. Young, Chief Sanitary Expert for the Federal Government during the World War.

Plans for National Transportation Institute

Organization in the near future of a National Transportation Institute is practically assured. While no date has been set for the organization meeting, it will be held before the end of the summer. Bird M. Robinson, the president of the American Short Line Railroad Association, and his associates, who are doing the active work of promotion, are engaged at present in lining up such support as will insure the new organization of representative backing.

The organization of such a national association is being urged by Representative Sidney Anderson and his associates on the joint commission of agricultural inquiry set up by Congress. Formal action endorsing the Institute already has been taken by the following organizations: American Farm Bureau Federation, National Agricultural Conference, American Lumber Congress, National Association of Manufacturers, Joint Commission on Agricultural Inquiry, and the American Short Line Railroad Association.

The Institute is to have its headquarters in Washington "under the supervision and control of men of preeminent ability, standing and learning, with reference to transportation." The organization will attempt to acquaint the public with:

1. The true fundamental principles underlying the various kinds of transportation facilities.
2. The facts as to the present conditions affecting transportation and the relative necessity and important of each class of common carrier.
3. The real effect of each type of legislation and regulation.
4. How and to what extent, the public and the carriers will be benefited, or affected adversely, by any policy or course of action that may be adopted in respect to their transportation problems.

Bosch Branch Managers' Conference

A three-day conference of the branch managers of the American Bosch Magneto Corporation was held on June 1, 2 and 3 at the corporation's plant at Springfield, Mass. The branch managers attending this conference were Charles Shedd, of Detroit; George Shortmeier, of New York; A. K. Chamber, of Chicago, and T. C. Miller, of San Francisco, with their assistants. These men were summoned to confer with the executives of the corporation at Springfield for a discussion of business conditions and plans which should be followed in carrying on the sales and service activities in the field.

A. H. Bartsch, general sales manager, states that the rapidly changing business conditions of the present year do not warrant a fixed and firm sales policy. He believes a more liquid policy is necessary, in order to take full advantage of the changing conditions.

In criticising the spread between the labor cost and duties in the tariff bill Senator Simmons, N. C., said that in the case of electrical machinery, apparatus and supplies, the labor cost is 23.9 per cent while the duties in the bill are 40 per cent.

Bulletin on Prevention of Blindness

The National Committee for the Prevention of Blindness, whose headquarters are in the Russell Sage Foundation Building, New York City, has issued a revised edition of its Bulletin No. 12. This bulletin was originally issued in 1917 and has been out of print since the latter part of 1921. It will combine one complete volume of practically all the available information on the subject of blindness. The committee has been aided in its work of revising the bulletin by the Safety Institute of America, the National Safety Council, the American Society of Safety Engineers and several specialists in this line.

The regulations of the recently developed safety code for the protection of the heads and eyes of industrial workers, adopted by the United States Bureau of Standards and approved by the American Engineering Standards Committee, will be included in this revised bulletin. The publication will be prepared with a view to its distribution among heads of departments of industrial plants, engineering colleges, technical schools and to others interested in the prevention of blindness among industrial workers. It is expected that the bulletin will be ready by the fall.

Business Items

The Dail Steel Products Co., 8751 Grand River Ave., Detroit, Mich., has contracted with the Packard Motor Co., Detroit, for the entire output of its metal-stamping department, and operations will be carried on exclusively for this company for some time to come. Daily shipments will be made by motor truck to the Packard plant.

C. L. Amos, of the C. L. Amos Coal Co., 200 East Genesee St., Syracuse, N. Y., and associates, have formed the Electdrive Co., with capital of $50,000, to manufacture motors, engines and kindred products. Other officials include E. M. Larkin and F. B. Conway, both of Syracuse.

The Fisher Body Corporation, General Motors Building, Detroit, Mich., has acquired the former plant of the Cadillac Motor Car Co., Cass Ave., comprising about 650,000 sq.ft. of floor space. The factory will be used for the manufacture of special automobile bodies, and will give employment to about 2,000 operatives.

The Franklin Automobile Co., Syracuse, N. Y., has awarded prizes to 226 employees for contributions submitted in the second "Suggestion Contest" conducted at the plant. The prizes ranged from three first awards of $400 each, one of $300, three of $200, two of $100, five of $50, and the remainder, $25 each. The prizes were given for: (1) Best suggestions for improvement in the Franklin car; and (2) best suggestions for reducing the cost of production, without in any way impairing the quality of the car.

The Monmouth Plow Factory, Inc., Monmouth, Ill., manufacturer of agricultural machinery, has arranged for a change of company name to the Brown-Lynch-Scott Co.

The Bridgeport Machine Co., Bridgeport, Conn., which recently purchased the plant of the Jones Automobile Co., at Wichita, Kansas, has moved its Bridgeport offices and shop from North Main St. to North Boston St. The plant of the same company at Marietta, Ohio, will also be removed to Wichita as soon as arrangements are completed.

The Firth-Sterling Steel Co., of McKeesport, Pa., has opened a western office at 336 East 3d St., Los Angeles, Calif. This office will be in charge of William E. Nelson, who has been engaged in marketing Firth-Sterling steel for twenty years. Mr. Nelson will be assisted by F. J. Kuhlmann, L. W. Mead, T. D. Moore.

The Pittsburgh Testing Laboratory has opened a sales office, with a complete inspection bureau, at 1864 Railway Exchange Bldg., St. Louis, Mo. Colonel N. C. Hoyles has been appointed district manager. Colonel Hoyles was formerly manager of the Cincinnati branch of the same company.

The Henrici Laundry Machinery Co., Dorchester, Boston, Mass., has recently incorporated the business with a capital stock of $165,000. The incorporators of the company are William P. Everts, 42 Crafts Road, Brookline, Mass.; Thomas W. Morris and Bertha A. McCarthy, Boston, Mass.

The Eastern Shear Co., manufacturer of scissors and shears, New Haven, Conn., recently voted to dissolve the company, and a preliminary certificate of dissolution has been filed with the Secretary of State of Connecticut. All claims are to be sent to L. M. Molloy, Grant street, New Haven.

The Ingersoll-Rand Co. has moved its Dallas, Texas, office from Main St. to the Magnolia Building.

The Atlantic Foundry Co., Akron, Ohio, has announced a decrease in its capital stock from $1,000,000 to $985,300

The plant of the Sandusky Foundry and Machine Co, Sandusky, Ohio, was recently damaged by fire to the extent of $10,000.

The Lomar Manufacturing Co., Middletown, Ohio, has elected the following officers: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president; L. L. Lomar, general superintendent.

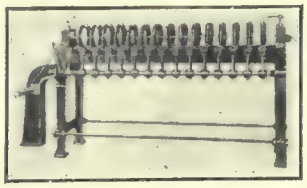
Judge Morton of the United States District Court on June 5, appointed as receivers for the Harley Co., producers of drop forgings and castings in Springfield, Mass., Samuel M. Green, engineer, and George A. Bacon, attorney, both of Springfield. This action followed the petitioning of the concern into bankruptcy. A previous petition for a receivership filed by a stockholder was denied on legal grounds.

The Hendee Manufacturing Co., former owner and now mortgagee of the Harley Co., is restrained by the court from selling the Harley plant by foreclosure, pending an investigation by the receivers. The plant was sold to A. W. Morris and others about six months ago, and the new owners are said to be in default and steps were resorted to for the purpose of preventing foreclosure until a financial dispute between the two companies could be settled. The plant was sold for about $1,000,000 and a mortgage given to the Hendee Co. for $725,000. The receivers furnished bonds of $10,000 each and will enter at once on an investigation of the case.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Filing Machine, Strip-Metal
Duston & Clark Engineering Co., Inc., Cleveland, Ohio
"American Machinist," March 16, 1922



The machine is used for filing the edges of strip metal to special shape and is especially adaptable to cold rolling mills. It is equipped with fifteen pairs of semi-circular heads carrying adjustable files. All the heads at the front can be operated by a lever so as to pull them forward and open the filing space. The strip metal may be of any gage and up to 3 in. in width. The end of the coil of metal on the spindle spool is passed between the two clamps at each end of the table, and then gripped and wound on a power-driven spool. Weight 1,000 pounds.

Platform, Lift-Truck, Steel, "Hallowell"
Standard Pressed Steel Co., Jenkintown, Pa.
"American Machinist," March 16, 1922



The device is made of steel and wood. The runners at each side consist of steel angles, the ends of which are bent outward. The truck slides easily between the runners. The top of the platform is made of wooden planks bolted to the runners. Steel sockets are riveted to the runners for holding the legs, which are wooden blocks inserted in the sockets and bolted in place. Blocks of different lengths can be furnished to suit the type of truck employed.

Hoist, Portable
Manley Manufacturing Co., York, Pa.
"American Machinist," March 16, 1922



The hoist is primarily for garage use. It has two chains, each operating independently, mounted on sliding drums on the horizontal hexagon shaft at the top of the frame. The shaft is turned by a crank operating through a chain and spur gears. Two speed ratios are provided. The leverage with auxiliary pulleys is 400 to 1, and without them 200 to 1. Capacity, 4,000 lb. Width, 8 ft. Height, 7 ft. 9 in. Weight, 450 lb. A larger size having a capacity of 8,000 lb. is made. Width, 9 ft. Height, 9 ft. Weight, 1,000 pounds.

Drill, Electric, Portable, "Jones"
Consolidated Instrument Co. of America, Inc., New York, N. Y.
"American Machinist," March 16, 1922



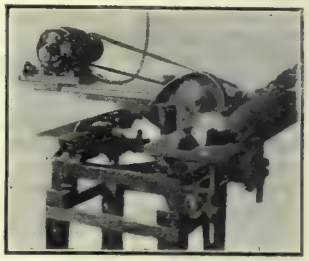
The device is used in general light work and has capacity for driving a ¼-in. twist drill. It is equipped with a universal high-speed motor operating on direct or alternating current of 25 to 60 cycles. The gears are made of heat-treated tool steel, and have helical teeth. The spindle carries a No. 1 Jacobs chuck, and its end thrust is taken on ball bearings. Plug and switch are furnished, with 10 ft. of electric cord. Length, 10 in. Weight, 4 pounds.

Press, Armature, No. 0, "Perfection"
Naperville Machine Co., Inc., Naperville, Ill.
"American Machinist," March 16, 1922



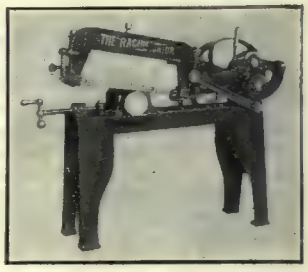
The press is for use chiefly by electrical repair men, but it can be employed also for assembling operations on piston bushings, spindle bushings, gears and similar work. The cast-steel frame can withstand a pressure of 3,000 lb. on the work. A hardened steel plate having three sizes of openings is furnished to accommodate small work. Its two halves can be slipped together underneath the bearings on an armature shaft so that the shaft can be pressed out of the bearing. Height, 17 in. Opening in base, 5 in. in diameter.

Woodworking Machine, Portable, Universal
Hutchinson Manufacturing Co., Norristown, Pa.
"American Machinist," March 16, 1922



The machine, for mounting on a bench or stand, is adapted to a variety of woodworking operations. It carries an 8-in. crosscut saw, an 8-in. rip saw, jointer, boring and mortising attachments, a miter board that can be set at any angle and other devices. It is operated by a ½-hp. motor driven on either d.c. or a.c. and mounted on a swiveling slide. Speeds: saws, 4,200 r.p.m.; jointer, 4,800 r.p.m. Capacity, hard wood up to 2 in. in thickness. Bench space, 18 x 24 in. Weight, 240 pounds.

Cutting Machine, Metal, High-Speed, Junior
Racine Tool and Machine Co., Racine, Wis.
"American Machinist," March 16, 1922



The saw runs at a speed of from 60 to 100 strokes per minute, with strokes 6 in. in length. Blades of 21-gage steel from 10 to 12 in. long are used. There is a positive mechanical lift on the non-cutting stroke, and the cut is taken on the draw stroke. Pressure is applied to the saw blades by gravity. An automatic knock-out stops the saw when the cut is finished. Capacity, 4 x 4 in.; with adjustment, 6 x 6 in. Height, 20 in. Floor space, 38 x 12 in. Weight, 150 pounds.

Grinder, Bench, Electric, Exhausting
Forbes & Myers, Worcester, Mass.
"American Machinist," March 16, 1922



Outside the bearings of the machine are located centrifugal fans which blow the dust directly back through the exhaust pipe connected at the rear of the grinder. The fan does not have sufficient power to carry the dust through long pipes. The inclosed motor of the induction type is made for single-, two- or three-phase alternating current, and in ½ and ¾-hp. sizes. The wheels are guarded. Adjustable toolrests can be located at both ends.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

CHARLES L. WARNER recently resigned as construction superintendent for the Taft-Pierce Mfg. Co., manufacturer of special machinery, Woonsocket, R. I.

G. C. SHIDLE, formerly Pittsburgh manager of the La Belle Iron Works, of Steubenville, Ohio, has become sales manager of the iron and steel department of the Thomas R. Heyward Co. His offices will be in the Bowman Building, Pittsburgh. Mr. Shidle succeeds William M. Orr.

GEORGE W. SCOTT has joined the sales force of the Sheet Metal Manufacturing Co. at Youngstown, Ohio. He was formerly a division manager of the United Alloy Steel Corporation.

H. B. HINMAN, formerly in the sales department of the Stanley Works, New Britain, Conn., has resigned. He will become superintendent of the Trumbull Steel Co., Warren, Ohio.

WILLIAM H. EAGER has assumed the presidency of the Whitman & Barnes Co., Akron, Ohio. He succeeds A. D. Armitage who resigned to devote his entire time to the business of the J. H. Williams Co. of Brooklyn, N. Y., of which he is president.

E. H. SPRINGFORD, assistant to the president of the Goodyear Tire and Rubber Co., of Akron, Ohio, has resigned that position to become president of the Steel and Tube Co., Chicago.

HENRY W. BALSIGER, of the Yale and Towne Mfg. Co., Stamford, Conn., has been appointed to succeed W. W. Brasier, to take charge of the California sales department of the company, with headquarters in San Francisco. Mr. Balsiger was formerly of the Chicago office of the company.

SYDNEY R. MASON, secretary of the Whitin Machine Works, manufacturer of textile and cotton machinery, etc., Whitinsville, Mass., who has been in Japan and the Orient for the past several months, is expected home about the middle of June. Mr. Mason arrived in San Francisco on June 3rd.

RALPH TEMPLETON, for several years manager of the Whitman & Barnes Manufacturing Company's New York office and store, will assume an important position in the company's executive offices in Akron July 1. Mr. Templeton entered the employ of the Whitman & Barnes organization in 1898 and has served it in various capacities continuously since that time. After serving in the Akron office and as Detroit representative he was appointed manager of the New York store in 1910.

W. E. WHITING, formerly connected with the Heald Machine Co. and with the Norton Company, is now connected with the Greenfield Tap and Die Corporation, Greenfield, Mass. Mr. Whiting will be attached to the Detroit office at 75 Congress St., and will represent the machine tool division of the company, specializing on the "Hydroil" internal grinder recently put on the market by that concern.

MELVILLE D. JOHNSON has been selected president of the Syracuse University branch of the American Society of Mechanical Engineers.

W. F. KENTER, works engineer of the Power Specialty Co., New York, has resigned that position and will take up sales work as an independent.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A mercantile firm in Spain desires to purchase faucets for water and steam, domestic and irrigation pumps; machinery for the manufacture of designs made from brass, iron, and other metals; casting machines for iron, copper, etc.; and graphite molds for casting metals. Quotations should be given c. i. f. Spanish ports. Reference No. 2354.

Firm in Spain wishes to purchase hardware, iron and steel products and tools of all kinds. Quotations desired, c. i. f. Spanish port. Correspondence, Spanish or French. Reference No. 2370.

Firm in Italy desires to be placed in touch with exporters of iron, metal, machinery, and tools. Reference No. 2374.

An importing firm in Spain wishes to purchase aluminum sheets for automobile bodies and machinery for working said metal, and electric ovens for varnishing and enameling automobiles. Quotations should be given c. i. f. Spanish port. Terms: Cash against documents or letter of credit. Reference No. 2312.

Automobile supply dealers in Norway desire to purchase and secure an agency for the sale of piston rings (lock joint and step joint). Quotations should be given c. i. f. Norwegian port. Payment to be made through banks in Norway and New York. Reference No. 2361.

Book Reviews

World Metric Standardization: An Urgent Issue. Compiled by Aubrey Drury in collaboration with other members of the World Metric Standardization Council. Five hundred thirteen 6 x 9-in. pages, cloth boards. Published by the World Metric Standardization Council, 681 Market St., San Francisco, Calif. Price $5.

Reviewed by
VERNE L. HAVENS
Editor, *Ingeniería Internacional*

The organization known as "World Metric Standardization Council" is purely voluntary and the members are persons who urge the adoption of the metric system in the United States. Many of the more active members of the association frankly desire that the adoption of the system shall be compulsory, and at the earliest possible moment consistent with existing conditions.

The book recently published by this council contains an enormous amount of data and arguments in favor of the use of the metric system. It is rather unfortunate that the council should have announced in the book that all who purchase it are enrolled as sustaining members of the "World Metric Standardization Council," without the necessity of any other payment. It is quite possible that many purchasers of this really valuable book would not care to become members of a distinctly partisan organization.

Various chapters contain reports of many scientific, commercial and independent associations, and individuals, which set forth cogent reasons for the universal adoption of the metric system. One very important chapter treats of the probable cost of change, in and to the United States, from the present system to the metric. To those who already use the metric measure this book will supply a world of proof as to why they should continue to use it. To those whose minds are open on the subject, it will do much to convince them that the metric system is superior to any other. To those whose opinions are fixed by previous study against the metric system it will have little avail. In any event, it is principally for the ones who have not taken a definite position in favor of or against the metric system.

The writer of this review has read much in pro and contra to the English system and the metric system. He has, for more than twenty years, used both systems every day. He looks upon both systems as being mathematical languages in which one can express any mathematical relation for which there may be need. He is quite familiar with the condition which exists in many countries, where mathematical languages have been made obligatory or legal. In those countries where the average of literacy is low, and only a few well educated people dictate the mathematical language to be used, the change from one form of expression to another is comparatively simple. Even so, at least one generation is required to make a perfect change. Where everybody can read and write to some degree, and really think about a great variety of weights and measures, even though it be in a simple way, the change is more difficult.

Mere laws have not driven Magyar, nor Basque, nor Guarani from the minds of the people of Austria, Spain, France and Paraguay. Neither has our own national effort been successful in eliminating the vara or league from land measure in that territory which we acquired from Mexico so long ago.

It is universally admitted that the old arbitrary English system of weights and measures has many faults. Its greatest advantage to the present generation is that the great mass of the people in many countries think in that system. There have been many opportunities to improve the system, but the people do not want their mathematical language changed and it has been changed very little. The metric system is legal in the United States, but very few ever use it. Those few engaged in international or scientific relations translate from one language to another when necessary. It is no criticism of the metric system to say that the present generation of English-speaking people will think in the present system until they are dead. Just why such efforts should be made to try to compel its use at this time is not apparent. The United States is going through one experience of prohibition at this time. It may prove successful after a period of years because it has the good health and morals of the community in its favor, but there is nothing unsanitary about the English system of feet and pounds, no moral turpitude is involved in speaking of a ton of coal in place of 1,000 kilograms.

The book is full of facts, but it is obviously partisan. For example, it is stated that "Those who obstruct the general adoption of the metric system constitute less than one per cent of the voters." It would probably be equally true, or equally false, to say that less than one per cent of the voters favor it. The plain facts of the case are that a very small group urges the compulsory adoption of the metric system and those most directly aected will oppose it. It is a question of very grave doubt if all those who participate in the combined support and opposition of the plan number one per cent of the voters.

It is a tempest in a teapot from one point of view, but very grave from another. Those most directly concerned might induce quick action for or against the compulsory adoption of the metric system by the national congress, and destroy the present satisfactory condition in the United States, where either system is legal and one's personal interests determine which he shall use.

Modern Methods of Welding As Applied to Workshop Practice. By J. H. Davies. 263 pages, illustrated. Published by D. Van Nostrand Co., New York.

This is a rather complete book in so far as the subjects treated cover a wide variety of practice and much attention is given to apparatus of various kinds. Chapter on pre-heating, on the preparation of welds, on handling cast iron, aluminum, brass and other metals, including lead burning, are given.

Various kinds of welding are included, such as oxy-acetylene, oxy-hydrogen, thermit and electric welding of the different tyes. Spot welding, butt welding and other methods are shown in considerable detail. The illustrations are very complete and are a great aid in making the text clear to the reader.

Many examples of welding of different kinds are shown, making clear such defects as slag enclosed in a welded seam. Examples are given of welding in inaccessible places by the use of mirrors. Attention is also given to the protection of the welder by the use of shields and suitable goggles. The descriptions seem to be quite complete and the reader should have no difficulty in following the directions given. Although most of the illustrations are copied from others and are not particularly clear on that account, they serve their purpose in most cases.

While this book is by an English author and naturally gives much attention to British practice, it also devotes considerable space to American methods and American apparatus. The combination should be of value to all users of welding apparatus.

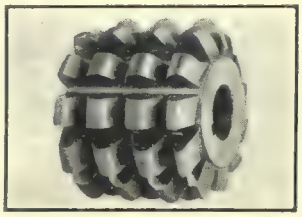
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Hob, Sprocket Tooth, Universal

Diamond Chain and Manufacturing Co., Indianapolis, Ind.

"American Machinist," March 2, 1922

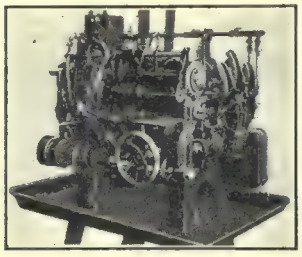


The hob operates on the principle used when cutting gear teeth, each being capable of cutting sprockets with any number of teeth for a given pitch and roller diameter. It is not limited to a small range of teeth. The teeth cut by the hob conform to the specifications for the new "American standard" tooth form, and the space angle gradually decreases as the number of teeth in the sprocket increases, and the tooth angle gradually increases. The generating action of the hob tends to produce these changes, although not at just the same rate as for the true "American standard" form.

Attachment, Slotting, Automatic Screw Machine

Davenport Machine Tool Co., Rochester, N. Y.

"American Machinist," March 2, 1922

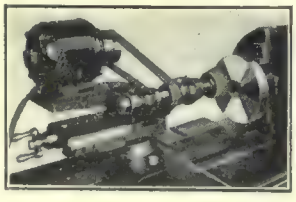


The attachment is used for slotting screws, and consists primarily of a three-hole turret mounted on a bracket, attached to the machine by bolts holding the stationary head caps in place. The saw head mounted over the revolving head uses the same change gears as the machine itself. At each forward movement one screw is picked up, another slotted and a third ejected. With slight modification, the attachment can be used for other second-operation work, such as milling, cross-drilling and burring.

Grinder, Toolpost, Universal, "Elteco"

Liberty Tool Co., Inc., Irvington, N. J.

"American Machinist," March 2, 1922

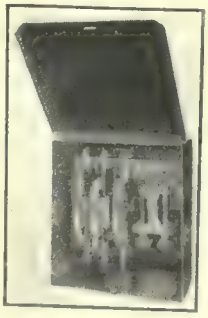


The base of the device is mounted on the swiveling toolslide of the lathe. The spindle is mounted so that its height can be adjusted, and is provided with one adjustable taper bearing. Different types of wheels and spindle extensions can be used. The machine has a 5½ x 1 in. wheel for cylindrical grinding, a cup wheel for face grinding and two extension arbors for internal grinding. The spindle is driven by a belt connected to a ⅓ hp. motor mounted on a slide. Both the longitudinal and transverse feeds are obtained from the lathe slides.

Starter, Induction Motor, "Thermaload"

Monitor Controller Co., Baltimore, Md.

"American Machinist," March 9, 1922



This thermal-limit starting device used with induction motors consists of a three-pole magnetic contactor and a thermal-limit relay, both mounted on a slate panel and inclosed in a metal cabinet. It is adapted to remote control, and operated by means of push buttons. It gives over-load and low-voltage protection, provides for starting at full current, voltage and torque, and automatically prevents overheating the motor. It is available in all sizes up to 3 hp. on 110-volt single-phase current, 5 hp. on either 220-volt single-phase or 110-volt polyphase, and 10 hp. on either 440-volt single-phase or 220-volt polyphase current.

Hanger, Line-Shaft, Ball Bearing

Skayef Ball Bearing Co., 165 Broadway, New York, N. Y.

"American Machinist," March 2, 1922

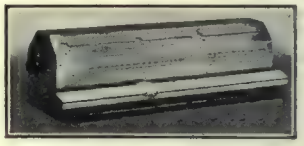


The device has a two-point suspension and carries the bearing in a split housing held by two threaded suspension rods. Vertical or horizontal adjustment can be made at the end of the housing by the locknuts and setscrews. The pressure applied while making adjustments is not transmitted to the bearing. The self-aligning feature of the bearing allows the shaft to turn with a minimum amount of friction, and prevents rubbing, heating and binding.

Calculator, Machine-Time

Simplex Calculator Co., Box 184, York, Pa.

"American Machinist," March 2, 1922

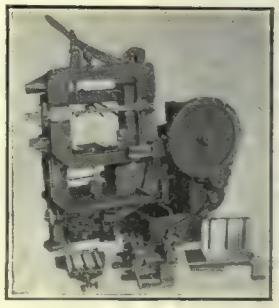


With this calculator the time required for machine-tool operations is computed for either rotating or reciprocating work or tools. For use with rotating work, the cylinder carries tables indicating the r.p.m. for diameters of from ¼ in. to 10 ft. at all ordinary cutting speeds. The range of speeds is shown above the slot on the left-hand end of the case. The slide rule bears four scales for feed, r.p.m., length and time. For reciprocating tool work the cylinder has tables giving the number of square inches planed per minute at forward and return speeds and feeds.

Saw, Shaping, Universal, High-Speed

Peerless Machine Co., Racine, Wis.

"American Machinist," March 9, 1922



The machine has a standard hacksaw blade, but in many features of construction and method of operation resembles a milling machine. The stroke of the machine is 5¾ in. The cutting speed is changed by cone gears in a box at the rear, and three speeds of 50, 85 and 132 strokes per minute are provided. The drive is by belt at 600 r.p.m., or by a 1-hp. motor mounted on the rear and running at 1,700 to 1,800 r.p.m. Feed is adjusted by the small handwheel in the front. The machine is equipped with a vise, angle fixture and a cross-feed fixture. Height, 23 in. Floor space, 24 x 43 in. Weight, 750 pounds.

Filling Machine, Flask, Stationary or Portable

Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio

"American Machinist," March 9, 1922



The machine is used in the foundry for filling large flasks, and is self-contained. Standard link chains carrying specially shaped buckets run on the sprockets driven by an electric motor. The capacity depends upon the amount of sand to be handled. The machine is controlled by push buttons, located at the end of the discharge chute. If the machine is stationary, the flasks may be brought to it on cars.

Clip, paste on 3 x 5-in. cards and file as desired

Trade Catalogs

Boston Gears. Boston Gear Works, Norfolk Downs, Quincy, Mass. Catalog No. 40, 1922 edition, illustrating and describing with specifications and price lists attached, a line of 600,000 standardized Boston gears. A special section of the catalog is devoted to a description of the latest models of steel and iron internal gears for use with Boston pinions of less than twelve teeth. The book presents a small, compact arrangement of material, making it easy to find any type or size of gear wanted.

Small Tools. Greenfield Tap and Die Corporation, Greenfield, Mass. Catalog No. 46-A, containing almost 400 pages of descriptive matter on taps and dies, screw plates, drills and reamers, milling cutters and pipe tools. A large variety of these various tools are described and illustrated with specifications and price lists included. Tables of British standard pipe threads, Morse and Browne & Sharpe tapers, U. S. standard gage, tables of weights of sheet copper, wire gage standards, copper wire tables, squares, cubes, circumferences and areas of circles, decimal equivalent of fractions, metric and English equivalent measures and a variety of other useful information make up this very comprehensive booklet.

Ingersoll Milling Machine. Ingersoll Milling Machine Co., Rockford Ill. A six-page circular describing the latest Ingersoll adjustable rotary milling machine. Most of the space is devoted to photographs of the machine in actual operation in the Ingersoll shops. These photographs show the various special features of the machine and tell the story better than words.

Pneumatic Drills. Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. A small circular describing the latest type of "Pigmy" No. 25, No. 375 and No. 50 pneumatic drills. Specifications for each type are included.

Refrigerating Machinery. Howe Ice Machine Co., 2815 Montrose Ave., Chicago, Ill. A twenty-page catalog illustrating and describing the principal features that make up the Howe ammonia compressors for ice and refrigerating machines. Cross-section drawings and a series of halftone photographs show the intricate details of design and construction of these machines. Several photographs of Howe refrigerating and freezing apparatus at work in factories and in ice plants are shown.

Silent Hoist. The Silent Hoist Co., Brooklyn, N. Y. Bulletin No. 16 describing the silent hoist friction drum hoist and vertical winches with gasoline engine drive, which also can be furnished with electric motor drive up to 50 hp. This new type of hoist is especially adaptable for hoisting girders in industrial plants and for construction work.

Circuit Breakers. Roller-Smith Co., 233 Broadway, New York City. Bulletin No. 560, illustrating and describing types "E" and "T" inclosed circuit breakers. Specifications and price lists are included. Bulletin No. 820, of the same company, describes a line of ammeters and voltmeters, as well as COD indicators, all products of the Roller-Smith Co.

Heat-Treating Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 242, a supplement to the series of educational papers previously issued by this company and intended to illustrate the variety of methods of applying the principles of proper heating and handling to different manufacturing requirements and shop conditions. This bulletin covers the influence and method of heating on the quality and cost of heat-treated products. The illustrations show the Rockwell furnaces in operation and charts show different designs and sizes of the furnaces.

Athol-Starrett Vises. Athol Machine and Foundry Co., Athol, Mass. Catalog No. 35 illustrating and describing a line of Athol-Starrett vises, hardware specialties and machinery. Among the types mentioned are U-beam vise, ratchet handle plumber's vise, combination pipe vise, quick-acting woodworker's vise, machinist's vise, drill press and milling machine vise, clamp base, stationary base and jaw, swivel base and stationary jaw, small portable grindstone, grindstone frame, bench grinder countershaft, and a large variety of parts for the various machines mentioned.

Una-Flow Engine. The Stumpf Una-Flow Engine Co., Inc., Syracuse, N. Y. A leaflet describing this new type of engine, which as its title indicates is an engine in which the steam flows through the cylinder in one direction only.

Garvin Facts. The Garvin Machine Co., New York, N. Y. An interesting pamphlet presenting some valuable suggestions in the matter of purchasing second-hand machinery. It is addressed to purchasing agents, superintendents, foremen, managers and financial officers. To each one of these executives is devoted a page in which facts concerning the purchase of second-hand machine tools are presented. It concludes with a message to prospective buyers that "your wisdom will be determined by results, not price."

"Twistest." J. S. Imlach, Ottawa, Canada. A six-page folder describing and illustrating a tool that tests connecting rods both ways at the same time, and which magnifies any error that exists. The illustrations show the operation of the device in its various positions.

Turret Machines. The Warner & Swasey Co., Cleveland, Ohio. A well prepared 36-page catalog illustrating and describing a complete line of accurate, durable machines for bar and chucking work. The contents include turret lathes, universal hollow-hexagon turret lathes for heavy operations, and plain and universal turret lathes for brass work. Each type is fully illustrated and described with tables of operations showing capacity of work which each machine is capable of performing. Three pages are devoted to codes which make it easy for the purchaser to order machines or equipment.

Whitney Coupling. Kay Manufacturing Co., Norwalk, Conn. Circular 1922 describing the Whitney free-floating coupling for transmitting power from one shaft to another, which shafts are not in alignment. A table of dimensions and a price list are included.

Small Tools. Alfred Herbert, 13 British Indian St., Calcutta, India. Alfred Herbert, Ltd. has issued a quarterly stock list including prices of the small tools handled by the company. The booklet might offer interesting comparisons to American dealers.

Simplex Jacks. Templeton, Kenly & Co., Ltd., 4020 South Central Ave., Chicago, Ill. A. 24-page catalog describing a line of Simplex jacks manufactured by the above company for railroads, contractors, mining and oil producing industries, public service utilities, automobiles and trucks. It presents an interesting study of the principles that govern the capacities of jacks and presents detailed drawings of the construction of Simplex jacks so as to conform to the principles as outlined.

Jacobs Chucks. The Jacobs Manufacturing Co., 984 Park St, Hartford, Conn. A new catalog, No. 817, illustrating and describing a complete line of both Jacobs improved drill chucks and the new Jacobs super-chucks. Complete price lists of all sizes and types are included.

Rego "Little Six." The Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill. A small folder describing the "Little Six" outfit which gets its trade name from the fact that it is made to perform six operations as follows: Welding, cutting, brazing, lead burning or welding, radiator repair, and decarbonizing. It is intended for the garage or repair shop.

Gear Grinders. The Garrison Gear Grinder Co., Dayton, Ohio. A small booklet describing the Garrison gear grinder which automatically generates perfect tooth contours of any pressure angle. The construction of the machine is described minutely.

Power King. Jones, MacNeal & Camp, Warsaw, Ind. A four-page folder describing a line of Power King electric drills embodying the special features of full ball bearings, oversize motors and two speeds. The drill is described in detail by means of an illustration with the special features numbered and described in the margin.

Handbook of Conveyor Practice. Robins Conveying Belt Co., 13 Park Row, New York, N. Y. A 96-page handbook prepared by the Robbins company as an aid to engineers and draftsmen having to do with the planning or designing of conveyor installations. It contains a group of new and useful tables concerning capacities, power requirements, speeds of conveyors and similar matters; dimensions of the various conveyor parts, together with general data on conveyor practice. There is a section devoted to the description and illustration of installations of various kinds designed and erected by this company. There are also charts for determining steam and horsepower of transmission pulleys and belts, shaft diameters, horsepower of gears, and for finding the slopes of valleys in chutes and hoppers. The book is well prepared on heavy coated stock with excellent binding and covers.

Norton Alundum Safety Tile. The Norton Company, Worcester, Mass. A twenty-page booklet giving specifications for the proper installation of Norton Alundum safety tile. This information should be invaluable to architects and engineers who use Norton tile in their construction work. A series of excellent drawings are included which show clearly the various types of construction in which this safety tile is used.

Micarta Gears and Pinions. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. Circular No. 1579-B of the Westinghouse company, describing and illustrating this latest development in the field of silent gearing. Micarta is a non-metallic material developed by the Westinghouse company for gear and pinion application. It can be advantageously substituted for untreated steel, cast iron, bronze and all non-metallic materials commonly employed for gearing. The bulletin gives the distinctive features and the physical and mechanical properties of micarta in detail. A table of drawings showing designs of micarta gears and two pages of gear data and horsepower rating make the catalog most complete.

Magnetic Chucks. O. S. Walker Co., Inc., Worcester, Mass. Circular W2. 16 pages describing the Walker magnetic chucks of the rectangular, swiveling and vertical face types, in all of which the single coil or single magnet type of construction is a prevailing feature of the design. The illustrations show the parts which go into the making of a Walker chuck, and give the reader an excellent idea of the operation of a complete chuck. Other illustrations show the chuck in use on grinding machines. Another section gives tables of dimensions for chucks of the rectangular type, and also specifications. Two pages of the bulletin are devoted to a description of the Walker demagnetizer.

Sandblast Machines. Hoevel Manufacturing Corporation (controlled by the L. O. Koven & Bros. Co., 154 Ogden Ave., Jersey City, N. J.). The 1922 catalog of the Hoevel concern, illustrating and describing all the latest types of sand blasting machines for industrial purposes. The book shows machines for removing scale, rust, dirt and grease from castings before nickel plating, galvanizing or painting, and for other cleaning or polishing purposes.

Worthington Diesel Engines. The Worthington Pump and Machinery Corporation, 115 Broadway, New York, N. Y. Bulletin VK-1851-A, illustrating and describing the new Worthington Diesel engine of the two-cycle, solid injection type. A large cross-sectional photograph of the engine with the parts numbered and described in the margin is a feature of the catalog.

Hammered Crucible Tool Steel. McInnes Steel Co., Ltd., Corry, Pa. A small booklet describing the line of high-grade hammered crucible tool steel products manufactured by this company. Some of the items mentioned are vanadium, cello vanadium, clear point, superior, misco, special chrome, chrome nickel, tool steel forgings, gear blanks, forgings, weldless rings, hammered spindles, axle forgings, connecting rods and McInnes special tool steel. Each one of these types is briefly described, and the proper method for hardening and tempering is given.

Monitor Thermaload Starter. Monitor Controller Co., Baltimore, Md. A circular entitled "Keep Your Machines Running," briefly describes this thermaload starter, which is suited to any kind of machinery driven by alternating current motors.

Milliken Machine Tool Specialties. Milliken Machine Co., West Newton, Mass. Small circular describing the line of standard cast-iron surface plates, bench plates, angle plates, ball turret heads and slide-rests.

Forthcoming Meetings

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Reamer Driving Machine

George H. Blettner Co., 1841 W. Jackson Blvd., Chicago, Ill.

"American Machinist," March 9, 1922



The machine furnishes power for reaming operations ordinarily done by hand. It will drive hand, expansion, adjustable or special reamers up to 1½ in. in diameter. The spindle speeds are 10, 20 and 30 r.p.m. The spindle is fitted with a 5-in. Cushman geared scroll chuck. The motor has ¼ hp. and can be supplied for either a.c. or d.c. of 32, 110 or 220 volts. Height, 42 in. Floor space, 18 x 18 in. Weight, 145 pounds.

Micrometer, Inside, Extension

Reed Small Tool Works, Cherry and Vine Sts., Worcester, Mass.

"American Machinist," March 9, 1922

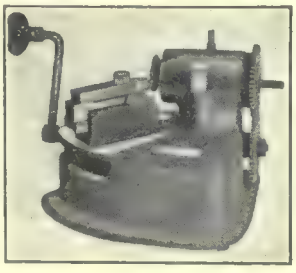


The micrometer is used to obtain internal measurements of cylinders and rings, but is useful as well in linear measurements, testing parallel surfaces, comparing gages and setting calipers. The detachable handle can be changed for right- or left-hand work. Extra rods, screwing on the threaded stud at the end of the barrel, give a change of length. The standard set consists of the inside micrometer, an adjusting wrench and five rods, giving a range from 3 to 8 in. Additional rods for measuring greater lengths, also a handle for gaging to greater depths in cylinders, can be furnished.

Lathe, Valve, Hand-Operated, "Peerless"

Steiner Brothers, Lima, Ohio

"American Machinist," March 9, 1922



The valve is held in place in the hollow spindle by means of a special self-centering chuck. Valves having stems from ¼ to $\frac{9}{16}$ in. in diameter and heads up to 3 in. in diameter can be held. The valve is rotated by a lever. A high-speed removable cutting tool is used, mounted in a slide that can be swung through an angle of over 30 deg. As the driving handle is turned, the toolslide is automatically fed inward. The worm wheel can be disengaged by the knurled knob at the side of the spindle housing, so that the toolslide can be moved by hand.

Planer, High-Speed

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

"American Machinist," March 16, 1922



The planer table operates at a speed of 150 ft. per minute on both the cutting and return strokes. Brass screen plates about 13 x 30 in. in size are planed. The shaft carrying the tight and loose pulleys passes entirely through the bed, and carries a pulley driving the second belt. The table contains T-slots, but no holes. The steel rack extends for the full length of the table. Two heads are mounted on the crossrail, both running on the lower screw. The capacity is 26 x 32 x 18 in. Minimum distance between tools, 12 in.

Reamer, Expanding, Cylinder

Campbell Auto Works, 238 N. El Dorado St., Stockton, Cal.

"American Machinist," March 9, 1922

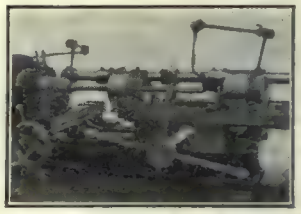


The tool is used for re-boring and finishing automobile cylinders. The head screws on a boring bar that can be fitted to any type of cylinder boring machine, and it may also be used for turret machines. It has an expansion of ⅜ in., adjusted by means of a screwdriver and a micrometer. The adjusting mechanism is concealed inside the head, and by turning the large central adjusting screw, the blades may be forced outward or inward. After adjustment, the eight screws are tightened into place and the blades thus locked in position. The tool is made in several sizes, the largest of which is 4⅛ in. in diameter.

Threading Machine, Staybolt

Warner & Swasey Co., Cleveland, Ohio

"American Machinist," March 9, 1922

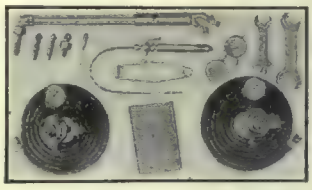


The machine is made up of the standard No. 4 turret lathe with a special attachment instead of the regular turret slide and saddle, and it may be used for the production of the studs and bolts, as well as staybolts. The machine handles crown stays, button-head stays and swivel stays up to 40 in. in length, and cuts any size of thread, using self-opening die heads. After the staybolt is chucked in position, the staybolt carriage is fed forward. The head is then formed by a forming cutter on the cross-slide, the staybolt carriage is fed forward, and the die heads close automatically and cut the threads.

Welding Outfit, "Little Six," Rego

Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill.

"American Machinist," March 9, 1922

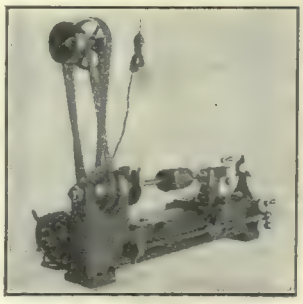


The outfit, made up of standard units of Rego equipment, is primarily for use in general garage repair work. The welding torch, equipped with three copper one-piece welding tips, will weld steel up to 1 in. in thickness, or with a cutting tip will cut steel up to 1 in. in thickness. Special tips are provided for brazing, lead burning or welding, and repairing radiators; and a decarbonizing torch for removing carbon from the combustion chambers of automobile cylinders. The other apparatus furnished consists of the oxygen and acetylene regulators, hose, wrenches, spectacles, spark lighter, and an instruction book.

Lathe, Bench, Motor-Driven

A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio

"American Machinist," March 16, 1922



The lathe countershaft is mounted on a 1¼-in. steel bar fitting in an extension support cast on the bed. The spindle has a ⅝-in. hole. The carriage, gibbed to the bed, is traversed by a long screw at the front. Feeds are operated by hand, and the driving motor can be operated from an ordinary lamp socket. Voltage and current should be specified. Equipment: motor, cord and plug, faceplate, centers, center rest and wrenches. Swing, 10 in. Distance between centers, 24 inches.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Cal., Los Angeles—R. Neul, 1334 East 63rd St.—one power lathe for machine shop.

Ill., Chicago—Chicago Pump Co., 2336 Wolfram St.—one 24 in. Ingersoll cutter grinder (used).

Ill., Chicago — E. Edtbauer & Co., 224 North Desplaines St.—one plain milling machine (No. 2 or 3).

Kan., Wichita—G. P. Cain, 1518 Poince St.—power drill press and emery wheel, for machine shop.

Kan., Wichita—J. O. Coleman, 106 North 3rd St.—power drills and grinders for machine shop.

Kan., Wichita—Day & Night Repair Shop, 222½ North Market St.—one power lathe.

Kan., Wichita—W. Gunning, 120 North St. Paul St.—power lathe for garage.

Kan., Wichita — H. Hoopper, Forum Garage—one power drill press and lathe.

Kan., Wichita—Palace Garage, 136 North St. Paul St.—emery wheel, drill press, lathe and cylinder grinder for power equipment.

Kan., Wichita—J. Ryan, Park Place—one power lathe.

Kan., Wichita—The Smith Machine Shop, 132 North Lawrence St., O. G. Smith, Purch. Agt.—power lathe and automobile cylinder grinder.

Kan., Wichita—Standard Cutlery Co., 154 North Market St., F. Mercier, Purch. Agt.—one power grinder for sharpening cutlery.

Kan., Wichita — Wichita Desicating Co., 911 Bentley Ave., J. R. Johnson, Purch. Agt.—one power lathe and one drill press.

Mich., Detroit—The F. J. Lamb Co., 928 Franklin St.—Numbers 1 and 2 Warner and Swasey hand screw machines.

Mich., Saginaw—I. L. Gunther, 128 North Franklin St.—one 10 x 30 in. Norton grinder.

Neb., Lincoln—J. H. Markel Motor Co., 1726 O St., W. F. Boys, Purch. Agt.—one 20 in. drill press, one 18 in. lathe, 7 or 8 ft. bed, both with motor attached; one air hammer, one air hose and attachments for 12 openings; one motor cleaning machine; blacksmith shop equipment including anvil, forge, and small tools; one bench grinder; one chain hoist and machine; one electric test stand.

Neb., Lincoln — Reliable Auto Tinners, 238 South 10th St., H. Fattig, Purch. Agt.—one power emery wheel and grinder, combined.

N. Y., Lewiston—F. Seick—machinery and tools for garage and repair shop now under construction.

N. J., Newark—W. H. Hall, 583 18th Ave.—50 lb. trip hammer.

N. Y., New York—The Cornell Iron Wks., 601 West 26th St.—one power punch press.

N. Y., Rochester—Brockway oMtor Truck Co., Cortland—machinery and equipment for service station and shop.

N. C., Asheville — Asheville Supply & Fdry. Co., H. J. Sutton, Secy.-Pres.—one 24 or 36 in. punch and shear, belt or electrically driven.

O., Cleveland—The Bd. of Educ., East 6th and Rockwell Sts., H. E. Boppel, Purch. Agt.—four saw benches, one cabinet planer, one hollow chisel mortiser, one block sander, four band saws, four hand jointers, four oil stone grinders, four lathes, four 10 in. bench drill presses, four 2 wheel grinders, four squaring machines, four bar folding machines, four punch and shear machines, four forming rollers, four burring machines, four turning machines, four wiring machines, four hand forges, for use in Audubon, Patrick Henry and Rawlings Junior high school.

O., Columbus — Modern System Grocery Co., 178 North 4th St., J. W. Baker, Pres.—equipment for proposed garage, on Lazell and Hickory Sts., capacity, 30 grocery trucks.

O., Columbus—The Sterns Lubricator Co., 395 East Broad St., C. H. Neil, Pres.—boring machines, grinders, polishers, etc., for new plant, at Cleveland Ave. and Colfax St.

O., Logan—Logan Fdry. & Machine Shop—machinery and equipment for large addition.

Pa., Frankford — Fidelity Machine Co., 4015 Paul St.—additional machinery for new factory.

Pa., Phila. — Rochlis Iron Wks., 1518 North 5th St.—shearing machinery, punch presses and bending machines for ornamental iron work.

Va., Waynesboro — Service, Gas and Supply Co., K. P. Wright, Mgr.—small tools and equipment for garage.

Wis., Milwaukee — The Economy Sheet Metal Wks., 305 Grove St., H. Rumpel, Purch. Agt.—30 in. square shears.

Wis., Milwaukee—Nash Motors Corp., Clement and Oklahoma Ave., (address Purch. Dept. Plant No. 4)—punch presses, boring machines, and other machinery and equiment for new plant now under construction, (body plant and sheet plant).

Wis., Milwaukee—J. Zapf, 1341 40th St.—one saw table, 1 sticker, and electric motors.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St.—equipment and tools for the manufacture of pressed steel and brass products for the plumbing trade, and specialties for hardware, shoe and furniture trades.

Ont., Peterborough—Motors & Machines, Ltd., A. E. Adams, Pres. & Mgr.—equipment for machine shop.

Ont., St. Williams—McCall & Co.—one 12 in. 4 sided planer, one 24 and one 26 in. 1 sided planer, one re saw, one swing saw 6 in. frame and two r.i.p. saws, one variety saw and one 36 in. band saw, one high speed shaper, one sash sticker, one 2 spindle boring and one 4 spindle verticle boring, one 16 in. and one 12 in. jointers, one elbow sander and one 2 drive sander, one turning lathe, one band saw filer, one blower side face, one chain mortiser.

Que., Montreal—H. J. Bowen, 293 Notre Dame St. W.—one small lathe and complete equipment for garage and repair shop.

Que., Montreal—I. P. Choquette, 900 St. Denis St.—one grinder, small machinery and tools for garage and auto repair shop.

Machinery Wanted

Cal., Los Angeles—Bittleston Shop, 335 South Los Angeles St.—tinners machinery.

Fla., Jacksonville—H. W. Dexter, 16th St.—one 20 ton sidewheel, M. C. B. equipped locomotive crane; one 30 h.p. single driven hoisting engine; two 30 h.p. double driven hoists with boilers; one 650 kw. 240 volt D.C. generator, belt driven.

Fla., Lakeland—Non-Acid Fertilizer and Chemical Co., H. E. Memminger, Mgr.—machinery and equipment for proposed fertilizer plant, incl. engines, boilers, dryers, tanks, etc.

Fla., Leesburg—The Municipal Ice Plant, W. E. Rogers, Mgr.—additional machinery for ice plant.

Fla., Milligan—J. L. and C. Wilkinson Mfg. Co., C. Wilkinson, Secy.—additional machinery for the manufacture of crates and boxes at woodworking plant.

Ga., Atlanta — The Western Newspaper Union, 127 Central Ave., brokers,—Meihle or Premier press, automatic feeder for cylinder press for power equipment.

Ill., Chicago — The Western Newspaper Union, 210 South Desplaines St., brokers—8 page double driven angle bar Duplex press power equipment.

Ill., Sycamore—Chicago Wire & Mfg. Co.—one cement mixer, 1 or 2 yd. capacity.

Kan., Girard—W. H. Wayland—automatic air outfit, tank, pump belt and motor.

Kan., Wichita—J. Coss, 716 North Market St.—woodworking machinery, combination saw, planer and cutting off equipment for power.

Kan., Wichita—The Brooks Letter & Addressing Co., 144 North Market St., H. O. Brooks, Purch. Agt.—power paper cutter and job press with Miller feeder.

Kan., Wichita—West Side Planing Mill Co., West Side—one power sander for wood working.

Mo., Kansas City—Midwest Auto Supply Co., 416 East 15th St.—automatic air outfit pump and motor air tank.

Mo., Kansas City—E. N. Wright, 707 Sharp Bldg.—stereotype machinery, incl. 1 moulding machine; 1 full page shaving machine; one 8 column flat casting box for both thin plate and type high; 1 saw trimmer and 1 steam table.

Mo., Valley Park—Barbour Boat Co.—tinsmith tools, furring machine and turning machine.

N. Y., Addison—Dairymen's Co-operative League Assn., H. E. Austin, Mgr. Cheese Factory—machinery and complete equipment for the manufacture of cheese.

N. Y., Binghamton—Tichener Iron Wks., L. E. Barnes, Secy.—machinery and equipment for proposed addition to architectural and ornamental iron works.

N. Y., Buffalo—J. Brand, 502 Swan St.—equipment for proposed bakery, at 369 East Genesee St.

N. Y., Buffalo—H. R. Conners and A. McClerie, Military Rd. and Hertel Ave.—one gasoline pump, 1 gas tank, 2,000 gal. capacity, and other minor equipment for proposed service station.

N. Y., Buffalo—Harvey Laundry Co., Inc.—extractors, revolving tubs, and other machinery and equipment for proposed laundry.

N. Y., Dansville—Newfield Gas & Oil Co., Inc.—pumps, pipe, machinery and equipment for gasoline extraction plant.

N. Y., Niagara Falls—Kimberly-Clark Paper Co., Packard Rd.—grinders (paper), machinery for pulphouse, also machinery and equipment for screen room, etc., for proposed factory.

N. Y., Painted Post—S. Miles, R. D. 1—large power grain binding machine.

N. Y., Patchogue—Advance, J. A. Canfield, Purch. Agt.—newspaper folder, power saw trimmer and router.

N. Y., Rochester—J. C. Haag, Fernwood Ave.—gas pump, air compressor, tank and general machinery and equipment for large commercial garage now under construction.

N. Y., Syracuse—Cloverland Ice Cream Co., 533 South Ave.—equipment and machinery for ice cream plant now under construction.

N. Y., Vestal—Universal Instruments & Metal Co., R. Mulliner, Pres.—special machinery and equipment for the manufacture of patented clothes line fasteners.

N. C., Brevard — H. C. Brevard — machinery for proposed ice and cold storage plant.

N. C., Washington—R. R. Zoeller, Cotton Mill—cotton gin, also blower and power pump to be used with cotton presses (used).

N. C., Wilmington—The Lingo City Metal Wks., T. D. Love, Purch. Agt.—veneer and slat making machines for veneer crates.

O., Cleveland—E. F. Hauserman Co., 1729 East 22nd St.—one draw bench for cold drawn steel shapes, chain beam and gearing 15 tons, length of beam 50 ft., head to have 8 openings and adjustable side gauges.

O., Cleveland—The Hunting Constr. Co., 823 Cleveland Discount Bldg.—one ¾ yd. grab bucket locomotive crane.

O., Columbus—Dept. Pub. Welfare, 9th and Oak Sts., H. S. MacAyeal, Dir.—bakery and mixing machines, ovens etc., laundry equipment, extractors, mangles and washing machines all for laundry and bake shop to be erected at Institution for Feeble Minded.

O., Marion—The Harding High School Students, H. R. McVey, Supt.—complete printing establishment. Estimated cost $1,000.

O., South Euclid—Random Shots, H. E. Burdett, Purch. Agt.—newspaper press and power paper cutter.

The Weekly Price Guide

Rise and Fall of Market

Advances.—Rise in coke prices forces No. 2 foundry iron up $1 per gross ton in New York, Birmingham, Pittsburgh and Chicago. Pittsburgh price of $1.60 per 100 lb., for structural shapes, plates and bars, giving way to quotations of $1.70@$1.75; steel bars principally affected. Blue annealed sheets up 15c in New York; Chicago quotes rise of 25c on blue annealed, 20c. on black and 15c. per 100 lb. on galvanized sheets. New York warehouses advance openhearth spring steel, ¼c.; bands and hoop steel 25c.; tank and floor plates, shapes and bars, 10c. per lb. Chicago advances coppered bessemer rods and hoop steel, 35c.; floor plates, cold drawn shafting, squares, flats, hexagons, etc., 10c.; shapes and bars, 30c. per lb.

Zinc quoted at 6¼c. as against 6c. per lb., New York; markets weaker in electrolytic copper, lead and tin. Wrought brass and copper ¼c. higher in New York and Cleveland. Solder up 2c. in New York; babbitt metal up ½c. per lb. in Cleveland.

Declines.—Raw linseed oil down 2c. per gal. in New York and Chicago. Machine oil reduced 10c. and lard cutting oil 5c. per gal. in New York.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	25.02
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.82
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern, sil 2.25@2.75	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No. 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4.20	3.60	4.30
Nos. 25 and 26.	3.10	4.25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.30	4.35	3.75	4.45
Nos. 12 and 14.	3.40	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¾ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¾ to 1¼	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	2.58
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.00		12@13
1/8	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.65; New York	6.50
Zinc (up to carlots), St. Louis, 5.42½; New York	6.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	20@21½	23.00
Copper wire (carlots)	16.00	16.50	16.25
Copper rods (ton lots)	19.00	21.50	19.50
Copper tubing (100-lb. lots)	22.75	23.00	23.00
Brass sheets (100-lb. lots)	16.75	17.50	18.75
Brass tubing (100-lb. lots)	20.00	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	15.50	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	25.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.50	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	....	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	....
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13¼x13½	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.86	1.00	.96
White lead, dry or in oil	100 lb. kegs.	New York,	12.50
Red lead, dry	100 lb. kegs.	New York,	12.50
Red lead, in oil	100 lb. kegs.	New York,	14.00
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$7.00
Coke, prompt foundry, Connellsville	per net ton		$7.50

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1½ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60–5%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50–5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, (h. h. plus std. extra of 10%)	15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.60	$3.25	$3 10
Cone heads, ditto (net)	3.70	3.35	3.20
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	55–5%	50%	50-10%
Copper burs	35%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.40	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50–5%	60–10%
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40-10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Okla., Tulsa—G. S. Henry, 311 Kennedy Bldg.—one National machine (number 2) for oil drilling.

Pa., Franklin—Galena Signal Oil Co., C. A. Miller, Supt.—equipment and machinery for proposed refinery at Point Richmond, Cal.

Pa., Franklin—Lakeside Refining Co.—large cracking stills for refinery.

Pa., Pittsfield—M. E. Barton, Route 1—machinery and equipment for shoe repair shop.

Pa., Ridgway—H. R. Smith & Co.—machinery and equipment for proposed tannery, at West Hickory.

Pa., Sharon—Sharon Furniture Co., Inc., J. Canteloupe, Pres.—Machinery for the manufacture of furniture.

Pa., Sharon—The Valley Packing Co.—machinery and equipment for proposed fruit packing plant addition.

Pa., York—F. A. Burrows Mfg. Co., J. J. Mace, Purch. Agt.—machinery and equipment for the manufacture of steam appliances.

S. C., Saluda—R. H. Etheridge, Woodworking mill—four side planer and masher, for use with blower system (used).

S. D., Florence—J. O'Neil—complete printing outfit, presses, paper cutter.

Tenn., Nashville—Hermitage Portland Cement Co., 3rd Ave. N., R. T. Miller, Secy. & Mgr.—receiving bids until July 1, on cement mill machinery and equipment for plant under construction.

Va., Cedarbluff—Clinch Valley Blanket Mill—equipment (for the manufacture of blankets and similar cotton and woolen goods) incl. engines, boilers, spoolers, extractors, looms, rag-pickers, etc.

Va., Norton—Norton Mattress Co., C. M. Bandy, Pres.—additional machinery and equipment for plant.

Va., Stuart—Stuart Cold Storage Co., J. F. Reynolds, Secy.—cold storage machinery and equipment.

Va., West Point—J. W. Marshall, flour mill—geared air conveyor equipment for sucking wheat from holds of vessels, (new or used).

W. Va., New Martinsville—Bd. of Educ., S. Bruce Hall, Pres.—equipment for vocational department of proposed high school.

Wis., Cudahy—Cudahy Brown Co., 626 Whitaker Ave., J. Lewanowsky, Purch. Agt.—special machinery for the manufacture of brooms.

Wis., Janesville—The City of Janesville c/o Clerk—machinery and equipment, including bucket conveyors, for gravel pit.

Wis., Mellon—Universal Toy & Novelty Co.—woodworking mchy. for proposed toy factory.

Wis., Milwaukee—Barg & Foster, 171 Bway; W. H. Barg, Purch. Agt.—machinery for the manufacture of candy, incl. gas furnace.

Wis., Milwaukee—N. J. Bertha, 1094 Newhall St.—one electric charging machine for garage.

Wis., Milwaukee—H. J. Esser, 82 Wisconsin St., Archt. and Engr., for Claybourn Process Corp.—one 3 ton and one 10 ton cranes for proposed plant.

Wis., Milwaukee—M. Feldman, 1513 Cherry St.—complete equipment and machinery for laundry.

Wis., Milwaukee—The Kidwell Boiler & Engine Co., 288 East Water St.—boiler shop equipment.

Wis., Omro—Omro Co-operative Butter & Cheese Co.—equipment for proposed modern creamery and cheese factory.

Wis., Racine—Belle City Incubator Co., 15th St.—one monorail crane.

Wis., Slinger—E. C. Kohl—machinery for laundry.

Wis., Wautoma—L. Chaimson—seed grinding machinery to be used with gas engine power.

Ont., Huntsville—Muskoko Wood Mfg. Co.—special machinery and equipment for the manufacture of wood products for proposed plant.

Ont., London—Carling Brewery Co.—equipment for the manufacture of near beer.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St.—woodworking machinery for proposed wagon factory.

Ont., Toronto—The Wilson-McGovern Co., Ltd., Lumsden Bldg.—one 15 ton, four wheel, narrow gage locomotive crane (used).

Ont., Welland—Universal Casket Co., E. A. Basque, Pres.—special machinery for the manufacture of caskets for proposed plant.

Que., Montreal—S. Meer, 1618 Bordeaux St.—equipment for blacksmith shop and foundry.

Metal Working Shops

Cal., Bakersfield—Atchison, Topeka & Santa Fe R. R., Ry. Exch., Chicago, Ill., is having plans prepared for the construction of machine shops, etc., on a 20 acre site, here. Estimated cost $400,000. R. B. Ball, c/o Atchison, Topeka and Santa Fe R. R., 221 South Bway, Los Angeles, Ch. Engr. Coast Line Div.

California—Hurley Machine Co., West 22nd and South 54th Aves., Cicero, Ill., plans to build an electrical manufacturing plant, on the Pacific Coast, here. Site not yet purchased. Estimated cost $1,000,000.

Ill., Chicago—Mundie & Jensen, Archts., 139 South La Salle St., are receiving bids for the construction of a 1 and 2 story 30 x 299 and 157 x 299 ft. storage and garage buildings, on Lawrence St. near Western St., for The Fair Department Store, State and Adams Sts. Estimated cost $230,000.

Mich., Detroit—Fisher Body Co., Genl. Motors Bldg., had plans prepared for the construction of a 6 story, 102 x 979 ft. factory addition for the manufacture of automobile bodies, on Fort St. A. Kahn, 1,000 Marquette Bldg., Archt.

Mich., Grand Rapids—Hayes-Iona Co., Inc., Muskegon St., N. W., plans to build a factory addition for the manufacture of auto bodies. Private plans. Engineer not announced.

N. J., Mt. Holly—Folsom & Stanton, Archts., 10 South 18th St., Phila., are receiving bids for the construction of a 1 story, 40 x 100 ft. garage, here, for W. D. Marren, Mt. Holly. Estimated cost $40,000.

N. J., Perth Amboy—Standard Underground Cable Co., 50 Church St., New York City, is receiving bids for the construction of a 3 story, 50 x 150 ft. factory on Washington St., here. H. J. Lewis, 336 4th Ave., Pittsburgh, Pa., Engr.

N. Y., Brooklyn—Studebaker Co. of Amer., 1700 Bway, New York, has awarded the contract for the construction of a 3 story, 190 x 220 ft. service building, on Dean St., here. Estimated cost $275,000.

N. Y., Buffalo—H. N. Kraft, (representing owner) 26 Summit Ave., plans to build an 8 story garage, on Main and Elmwood Sts. Owner's name withheld. Architect not announced.

N. Y., New York—O. Sinauer, c/o N. Langer, Engr and Archt., 81 East 125th St., will build a 1 story garage, at 234 West 154th St., by day labor. Estimated cost $50,000.

N. Y., Rochester—Brockway Motor Truck Co., Cortland, is receiving bids for the construction of a 49 x 176 ft. service station, 18 ft. high, on South Ave., here. Estimated cost $20,000. Architect not announced.

O., Canton—Pearl Motor Car Co., plans to build a 2 story garage, and will have 18,000 sq.ft. of floor space exclusively for sales, at 6th and Market Sts. Estimated cost $175,000.

O., Cleveland—Ferro Machine and Fdry. Co., 3166 East 66th St., has awarded the contract for the construction of a 1 story, 66 x 160 ft. warehouse and machine shop. Estimated cost $50,000. Private plans.

O., Cleveland—The York Ohio Ice Machine Co., 1106 Woodland Ave., has awarded the contract for the construction of a 2 story, 100 x 132 ft. factory, office and warehouse, at West 28th St. and Washington Ave. Estimated cost $60,000. E. McGeorge, 1900 Euclid Ave., Archt.

Pa., Charleroi—G. Woodward, plans to build a 3 story, 88 x 100 ft. service and repair shop. Estimated cost $45,000. Private plans.

Pa., Phila.—Fidelity Machine Co., 4015 Paul St., has awarded the contract for the construction of a 1 story, 86 x 160 ft. and a 2 story, 40 x 86 ft. machine shop, at Pike St. and Frankford Ave. Private plans.

Pa., Phila.—Osman & Holman, 121 West Wyoming St., are receiving bids for the construction of a 2 story, 89 x 125 ft. garage, on Green St. and Queen Lane. Estimated cost $60,000. Private plans.

Pa., Phila.—Supplee-Wills-Jones Co., 26th and Jefferson Sts., has awarded the contract for a 2 story, 80 x 90 ft. garage and service building, at 1520 North Stillman St. Estimated cost $55,000. Private plans.

Pa., Pittsburgh—J. D. McIlroy & Sons, 508 2nd Ave., is having plans prepared for the construction of a 1 story factory for the manufacture of sheet metal products. Estimated cost $40,000. Private plans.

R. I., Providence—Power & Mayer Mfg. Co., 150 Chestnut St., are having plans prepared for the construction of a 2 story, 90 x 90 ft. factory addition, for the manufacture of jewelry, on Chestnut and Elm Sts. Estimated cost $50,000. Perry & Whipple, Rhode Island Hospital Trust Bldg., Engrs. and Archts.

W. Va., Parkersburg—Seward Wire Co., 17 West 42d St., New York, has awarded the contract for the construction of a 1 story, 60 x 80 x 200 ft. manufacturing plant, here. Estimated cost $200,000.

W. Va., Sisterville—Grant Automatic Flowing Valve Co. plans to build a 1 story, 80 x 100 ft. manufacturing plant. Estimated cost $40,000. F. J. McCoy, Secy. Architect not selected.

Wis., Appleton—Scolding Lock Hair Pin Co., 844 College Ave., has awarded the contract for the construction of a 1 story, 40 x 200 ft. factory. Estimated cost $50,000.

Wis., Madison—Madison Gas & Electric Co., 120 East Main St., has awarded the contract for the construction of a 1 story, 50 x 75 ft. garage on Blount St. Estimated cost $40,000.

Wis., Madison—J. Peterson, 102 South Orchard St., has awarded the contract for the construction of a 1 story, 114 x 117 ft. garage, on Monroe St. Estimated cost $50,000.

Wis., Milwaukee—M. Tullgren & Sons, Archts., 425 East Water St., will soon award the contract for the construction of a 5 story, 100 x 150 ft. garage, for the Sixth St. Garage Co., c/o Architects. Estimated cost $200,000.

Wis., Pittsville—P. A. Hagen, Marshfield, plans to build a 1 and 2 story, 75 x 80 ft. garage. Estimated cost $50,000. Architect not selected.

Wis., Wausau—D. J. Murray Mfg. Co., has awarded the contract for the construction of a 1 story, 60 x 228 ft. machine shop addition. Noted May 18.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St., plans to build a specialties plant for the manufacture of pressed steel and brass products for the plumbing, hardware, shoe and furniture trades.

General Manufacturing

Cal., Alameda—H. Hirschbeck, 2143 Alameda Ave., has awarded the contract for the construction of a 1 story dyeing and cleaning plant, at 2309 Encinal Ave. Estimated cost $5,850.

Pa., Phila—Barrie & Sons, 1312 Walnut St., has awarded the contract for the construction of a 3 story, 22 x 106 ft. printing building. Estimated cost $80,000. Private plans.

Va., Suffolk—Parker Buggy Co. plans to rebuild its plant which was recently destroyed by fire. Loss $150,000. D. E. Parker, Pres.

Wis., Cudahy—Bd. of Vocational Educ. plans to build a 2 story vocational school. Estimated cost $75,000 to $100,000. J. P. Beuscher, Secy. Rosman & Wierdsma, 424 Jefferson St., Milwaukee, Archts.

Wis., Milwaukee—H. E. Krueger, 1014 Holton St., has awarded the contract for the construction of a 2 story, 30 x 50 ft. bakery on Holton St.

Wis., New London—Hamilton & Sons Cannery Co., has awarded the contract for the construction of a 2 story, 50 x 75 ft. cannery factory. Estimated cost $45,000.

Ont., Bowmanville—Thomson Knitting Co. has awarded the contract for the construction of a 2 story, 50 x 150 ft. knitting mill. Estimated cost $100,000. A. Wilson, Mgr.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St., has awarded the contract for the construction of a factory for the manufacture of wagons.

Ont., Owen Sound—Bd. of Educ. plans to build a technical school, including manual training department, physics and chemistry laboratories, etc. Estimated cost $200,000. F. H. Rutherford, Secy.

Ont., Toronto—Coca-Cola Co., 65 Bellwoods Ave., plans to build a 2 story, 100 x 260 ft. coca-cola plant. Estimated cost $200,000. G. A. Porter, Mgr.

Ont., Toronto—J. Kronick, c/o L. Coldoff, 313 Grace St., has awarded the contract for the construction of a 3 story, 50 x 118 ft. steam laundry on Bloor and Grace Sts. Estimated cost $25,000.

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The Making of Radio Apparatus

Some of the Methods Used in Making the Various Metal Parts in the Winding of Coils and in the Assembling of the Complete Apparatus

By FRED H. COLVIN
Editor, *American Machinist*

THE use of radio, due to the fascination of taking things out of the air and the broadcasting of interesting news and music to be picked up, has become phenomenal. Factories are taxed to their utmost to supply radio apparatus and new ones are springing up almost overnight. The American Radio and Research Corporation, Medford Hillside, Mass., while not a newcomer in the field, has a very interesting and modern factory that has been in operation several years. Its experience in making radio apparatus for the Navy during the war put it in an excellent position to take up and develop what we may call amateur apparatus.

The illustrations that follow will show some of the ingenious methods devised by production manager M. P. Stevens, and others for producing interchangeable parts such as is necessary in quantity production. Back of this production, however, is the design of the various "Amrad" units, to standard outside dimensions so they can be readily assembled either as separate units or combined into more complete apparatus at will.



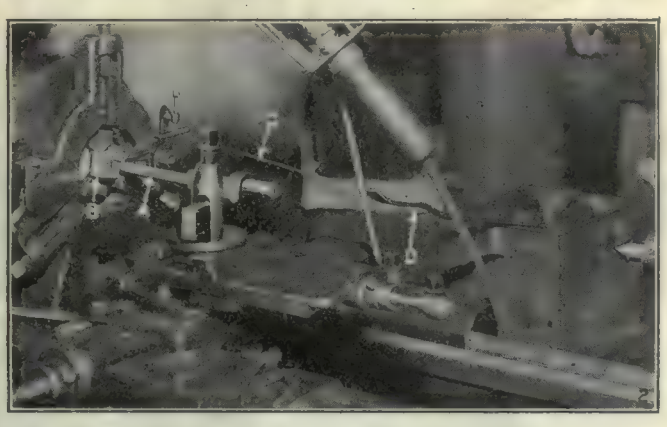


FIG. 1. BENDING ALUMINUM FRAMES. FIG. 2. WINDING COILS FOR RHEOSTATS



FIG. 3. BENDING THE VARIOUS WIRE CONNECTIONS

As will be seen in later illustrations, the large number of frames, such as shown at *A* in Fig. 1, are bent up from aluminum alloy strips. These strips are first punched with the three holes shown and are then placed in the bending fixture, being located by a pin in

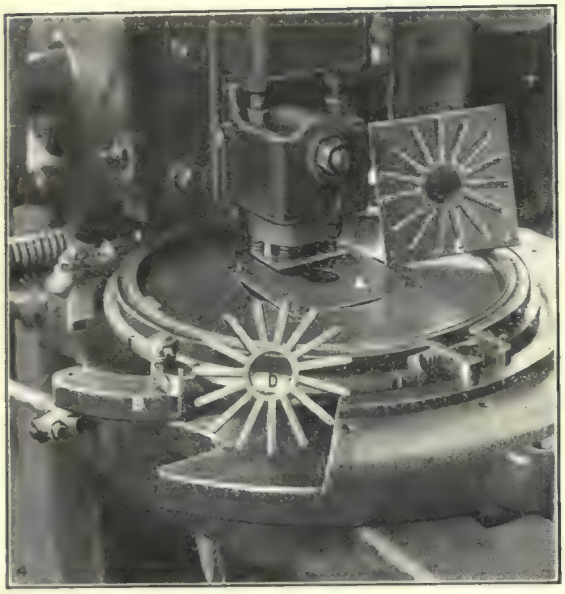


FIG. 4. PUNCHING SPIDERS FOR THE VARIOMETERS.



FIG. 5. WINDING THE BASKETBALL VARIOMETERS



FIG. 6. ASSEMBLING THE VARIOMETERS AND SOLDERING CONNECTIONS

the block *B* which fits into the large central hole. This block is then moved rearward by the cam handle *C* and clamps the strip against the stationary block at the back of the fixture. Bending arms *D* and *E* are then swung around by means of the handles shown, bending both ends of the strip at right-angles.

The shape and direction of the bend at the lower end are easily controlled. The handles are hinged to the backs of the bending arms and are provided with pins as at *F*. With these pins locked in the holes *G*, the ends of the strips can be bent in or out by the projecting blocks *H*. These blocks, each controlled by handles as at *I*, are normally below the surface of the bending fixture, but have been raised so as to show their shape and purpose. With the side strip firmly clamped between the bending arms and the stationary block it it is an easy matter to bend the ends in either direction by simply raising the blocks *H* on each side of the strip and then swinging the handles in the desired direction.

A simple winding fixture for resistance coils or rheostats is shown in Fig. 2. Here the flat fiber strip *A* which forms the core is slipped into the block *B* with just enough projecting to fit into the rotating holder shown in the toolpost. The wire *C* comes from the reel at the back, being threaded through the strip of belt *D*, which acts both as a straightener and a brake, passes through the friction guide shown clamped to the steadyrest and is wound around the core at the proper pitch by having the lathe carriage geared to the lead desired. As the coil is wound, the core pulls out of the block *B*, the number of turns being controlled by the length of the core and the lead of the coil. The wire is then cut off and another core inserted in much less time than it takes to describe it.

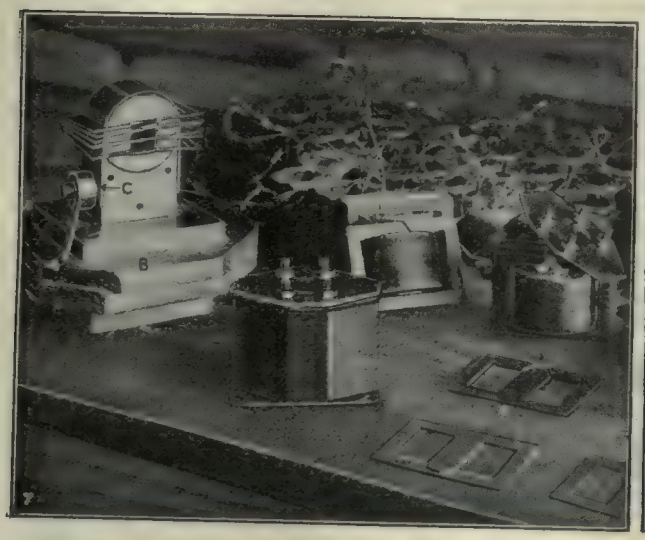
In addition to the rheostat and other coils, there are a large number of connecting wires necessary, some of which may be seen in Fig. 3. This illustration also shows some of the methods of bending loops and of locating them in the right place. The fixtures are very simple, the one at *A* making right-angle bends at any desired distance from the end, the location of the bend being controlled by a stop block. A sample board shows exactly the kind of bends desired and an experienced girl can turn them out very rapidly. The little fixture

B simply puts a kink in the end of the wire, at the desired point. At *C*, *D* and *E* are small, easily worked fixtures for bending loops in the ends of the wires.

Going from the rheostats and connecting wires to the making of the so-called basketball variometer, we find some extremely interesting methods. The basketball frame is made in halves from a sheet of thin fiber in which four holes have been punched in the corners for locating and carrying them under the punching machine as shown at *A* in Fig. 4. This machine has an indexing table of the usual type and the indexing mechanism is shown at *B*, *C* being a brake to prevent the rotating table from being carried beyond the proper point. The completed spider or half frame is shown at *D*, while *E* shows the sheet just before separating the spider from it.

The frames or spiders then go to the winding machines shown in Fig. 5, where they are clamped by large washers as at *A*, that fit over the spherical forms and shape the arms of the spiders to conform with them. The spiders are then wound with insulated wire with a rapidity that is almost unbelievable when it is considered that the wire must go under one prong and over the next as the spiders revolve. The winding spindles are driven by small electric motors each controlled by a foot operated clutch and the girls become so expert that the winding is practically continuous. The wire comes up over the pulleys as at *B* and runs between the fingers of the girl's right hand as she guides it over and under alternate prongs. At the same time the finger of the left hand raises every second prong so as to have the wire slip under it easily. This is one of the best examples of what efficiency experts call "automaticity" that the writer has ever seen. The stacks of completed halves on the bench give an idea of their appearance.

The assembling of the halves into the complete sphere or basketball requires very careful riveting. Tubular rivets are used in the small machine shown at *A* in Fig. 6. Here it is necessary to insert the rivet, place the prongs over the anvil and bring down the plunger for each prong. As with winding, the girls become very



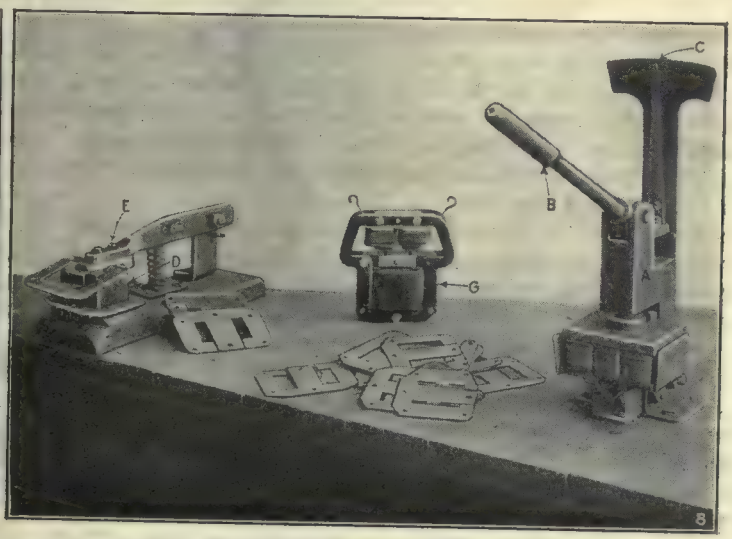


FIG. 7. ASSEMBLING A TRANSFORMER CORE. FIG. 8. ANOTHER ASSEMBLY FIXTURE

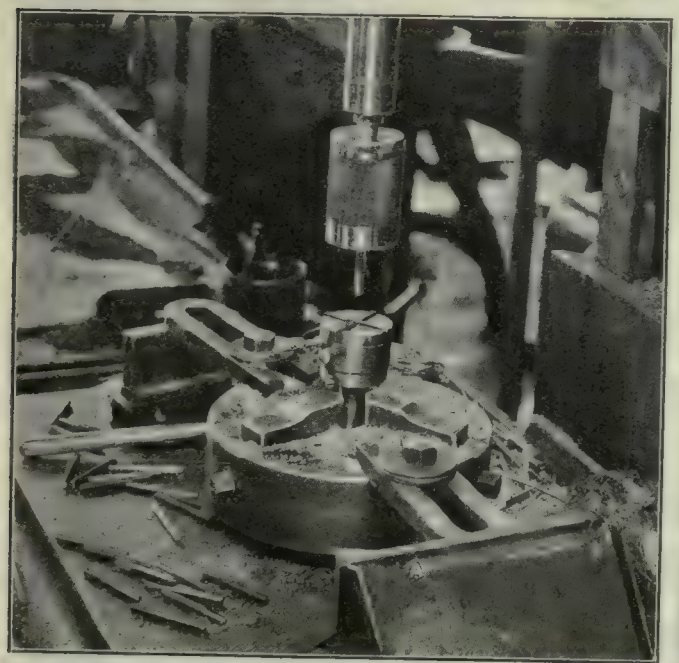


FIG. 9. THREADING STUDS IN A DRILLING MACHINE

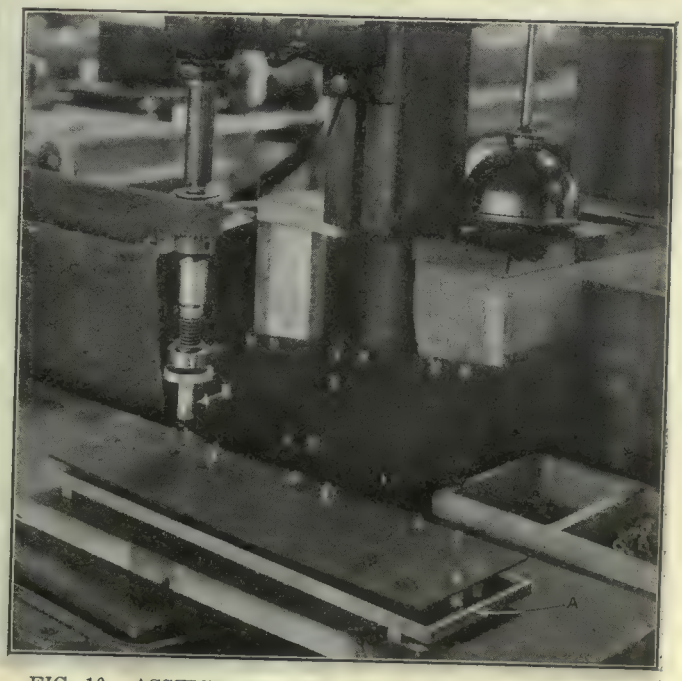


FIG. 10. ASSEMBLING AND STAKING BINDING POSTS

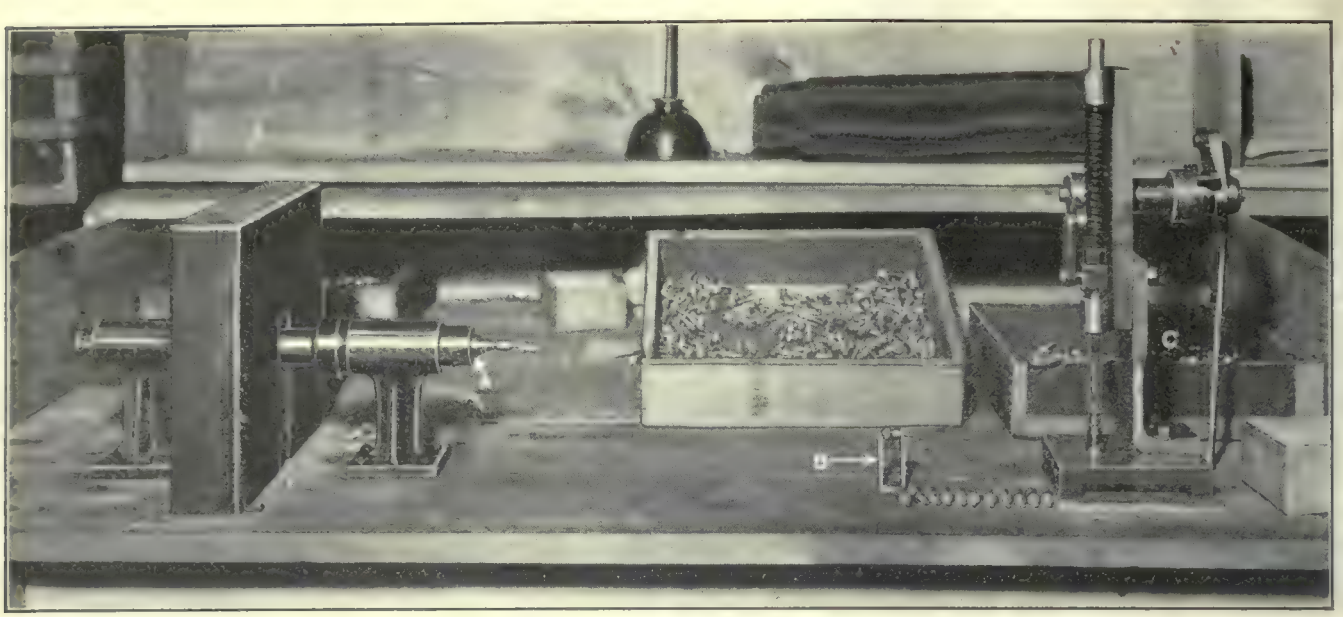


FIG. 11. ASSEMBLING STUDS BY POWER

expert and the work proceeds very rapidly. The most difficult part of the riveting operation is to join and rivet the outer basketball over the small one which goes inside, great care being necessary in avoiding the arms of the inner ball when placing the outer arms on the anvil for riveting.

At the left is shown one of the numerous soldering operations. In this operation all metal connections are soldered to various parts of the coils and also the connecting wires which lead to the various connections and controls. The electric soldering iron is particularly useful in delicate work of this kind. Several completed coils are shown on the bench and can be seen more in detail as the instruments progress toward final assembling.

A small transformer plays an important part in radio work and Figs. 7 and 8 show how the transformer cores are assembled inside the windings or coils. The shape of the stampings can be seen at *A*, Fig. 7, the assembling operation being to insert the central tongue through the opening in the coil. The coil is mounted on the revolving table *B* and held in place by a thin sheet-metal strap over the top and clamped at *C*. The girls bring the central tongue of a stamping so that it can be entered through the opening, and push it over until it surrounds the coil as shown. The table is then turned halfway round and the next stamping put in from the opposite side. The stampings are alternately placed until the required number have been put in.

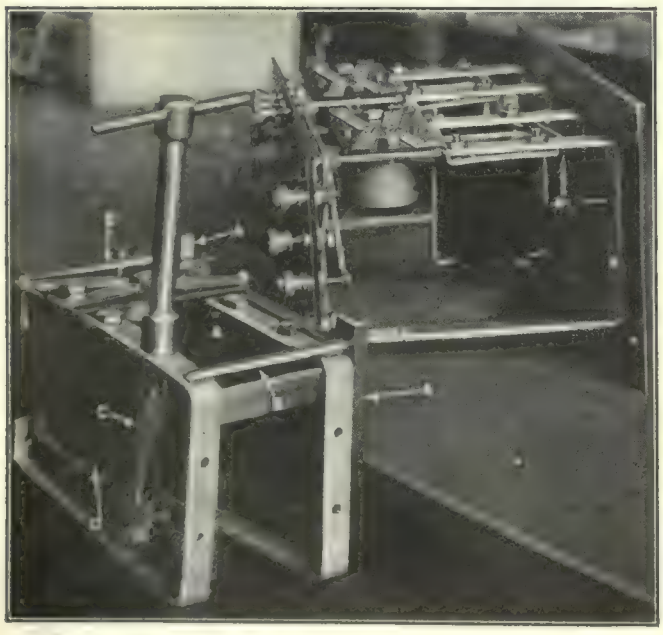


FIG. 12. AN ASSEMBLING FIXTURE FOR UNIT FRAMES

Another form of transformer is shown in Fig. 8, the stampings which form the core being very similar in both this and the previous case. This view shows a measuring or counting device at *A*, which enables the operator to select the correct number of stampings without counting them. She simply gathers a small bunch, puts them in place as shown and brings down the lever *B*. The pointer *C* indicates when the correct amount has been secured. There are two lines which give the upper and lower limits permissible in each core.

When the correct number of stampings have been selected, they are threaded into the core in a very simple manner as explained in connection with Fig. 7, except that they are all inserted in the same direction, which obviates the necessity for the revolving table. The core *D*, Fig. 8 is clamped in position by the lever *E*, which is operated by foot pressure and locked in position by suitable notches. With the core held firmly in position, the stampings are threaded through, the upper ends sliding over the sheet-metal protector attached to the clamping device. In this way the core is readily put in place inside the coil and is ready to be connected in the frame shown at *G*.

Work of this kind requires a larger number of studs and in order to prevent tying up an automatic screw machine, they are being made very successfully in the single-spindle drilling machine shown in Fig. 9. Here a Gronkvist chuck is put in the drilling machine spindle and a Geometric self-opening diehead is held in a three-jawed chuck, which in turn is clamped to the drilling machine table. The operation is practically continuous as the brass rods can be inserted and removed from the chuck without stopping the spindle and the self-opening diehead obviates the necessity for



FIG. 13. ASSEMBLING OPERATIONS ON THE COMPLETE UNITS

reversing the spindle. The studs are threaded very quickly in this way and by placing them on the chute *A* they fall directly into a box which prevents fu ther handling until they are ready to be taken to the next operation.

The assembling of small parts can easily consume an inordinate amount of time. It also affords opportunity for many ingenious devices, one of which is shown in Fig. 10, where connections are being fastened to an insulated panel that belongs in front of a combination of three separate units. The screw connections that have previously been assembled are placed in bushings in the plate *A*. Each bushing has a c ossbar which engages a slot in the end of the stud and holds it from turning. The panel is then put in position over the studs, a nut is slipped in the friction chuck *B* and the panel moved to bring it in the proper position. Each nut is driven home with the same tension, the clutch slipping as soon as it has been put in place.

In Fig. 11 is shown the way the studs, which are really binding posts, are made ready for assembling. The thumbnut and washer are screwed on by means of the power-driven head at *A*. The head of the stud is held by friction and the two parts screwed into place very rapidly. The gage for measuring the proper location of the threaded washer is shown at *B*. When the washer is correctly located, it is staked in position against turning by means of the little machine at *C*. This machine is in reality a large automatic center punch in which the staking is done by a hollow punch with four prongs that surround the stud and rest on the underside of the threaded washer. The pressure on the pedal compresses a spring and, at the proper point, releases a trip so that the spring drives

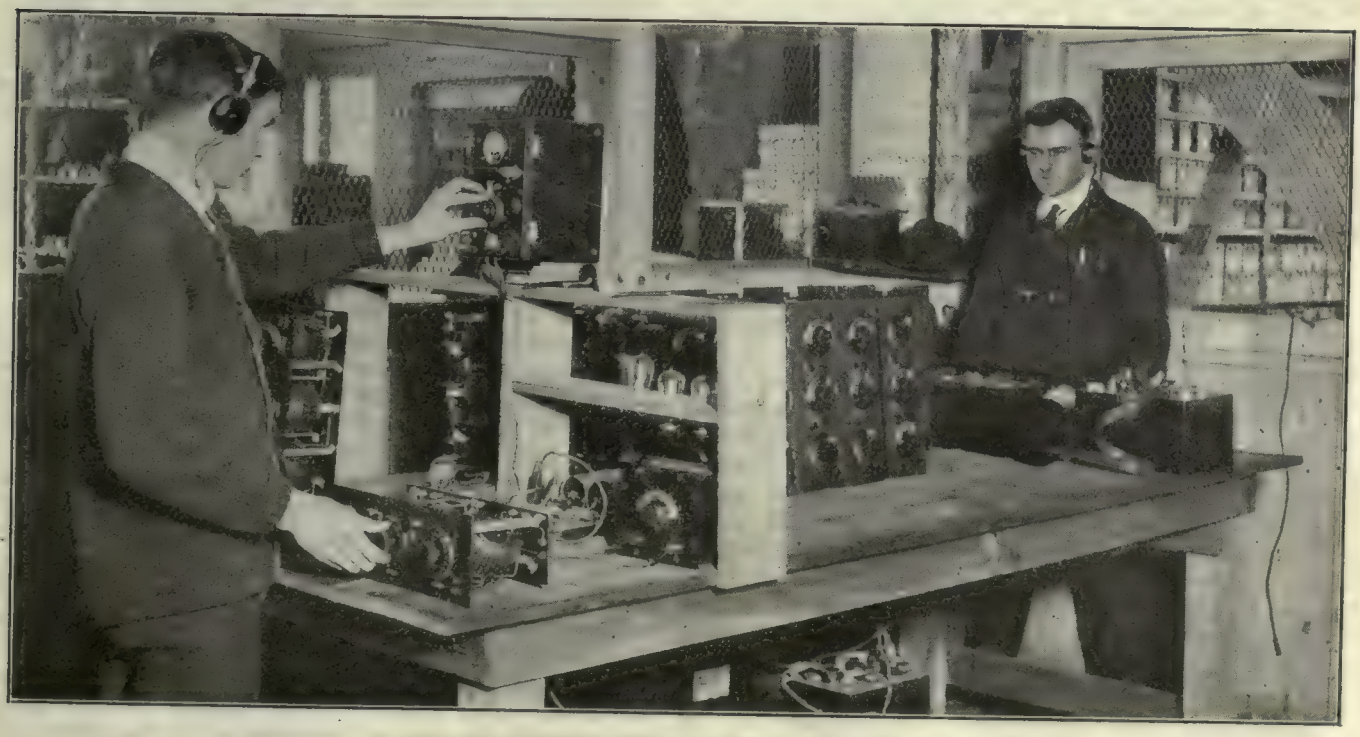


FIG. 14. GIVING EVERY UNIT ITS FINAL TEST

the punch into the washer with a sharp blow. The four prongs already mentioned stake the metal so as to grip the binding post stud firmly and prevent them from turning.

In Fig. 12 is to be seen the assembling of one of the units consisting primarily of a frame of two aluminum strips somewhat similar to the one shown in Fig. 1. This strip happens to be for a vacuum tube detector, the lamp socket being shown in the unit on the bench. The assembling frame is illustrated at *AAA* and includes two rods *BB* under which the framework is slipped. The screwdriver *C* fits into any one of the slots of the fixture at *D* and holds the screws against turning while the nuts are being tightened in place by the socket wrench shown. This screwdriver is easily moved from place to place and affords a convenient method of assembling work of this kind.

In Fig. 13 the units are shown approaching completion at one of the assembly benches. The basketball variometers are much in evidence here, as are the aluminum frames shown in Fig. 1 and the branch wires previously referred to.

After the complete assembly every unit is thoroughly tested, some of the tests being shown in Fig. 14. These tests check up all the work previously done, and insure the apparatus being in working condition when it leaves the plant. Many new developments are on the way, and improvements are to be expected from time to time. But with the units designed and constructed as illustrated herewith, changes and additions can be readily made to keep pace with future developments.

Use After Rejection Constitutes Acceptance by the Buyer

By Leslie Childs

Purchasers of machinery, under sales contracts in which provision is made for a definite trial period, will do well to bear in mind a decision recently handed down by the Wisconsin Supreme Court in the case of Fox vs. Wilkinson, 133 Wis. 337.

Fox, the plaintiff and buyer in the case, entered into a contract with Wilkinson, the defendant and seller, to purchase from the latter a traction engine. Wilkinson agreed to take $400 and an old horsepower drive for the engine. The contract provided, among other things, that Fox was to have ten days in which to test the engine. Upon delivery, Fox used the engine on some six or seven different days; decided, finally, that it was defective; that he would not accept it, and served notice upon Wilkinson to that effect. After notifying Wilkinson, however, it appears that Fox continued to use the engine for about a day and a half. Wilkinson declined to accept the rejection, claiming that the continued use of the engine by Fox, after rejection, constituted an acceptance. Wilkinson, in the meantime, it so appears, had been given possession of the old horsepower drive. Upon the refusal of Wilkinson to accept the rejection by Fox, Fox immediately brought action against Wilkinson to recover the horsepower drive.

This action on the part of Fox brought into issue, at the outset, the question of his right to rescind the contract in the light of his use of the engine after having formally rejected it. The case reached the Supreme Court on appeal, and that body, laying down the general rule governing cases of this kind, said in part:

When a purchaser has the right to subject the article to trial, the mere use is, of course, ambiguous, for it may be for the purpose of trial; but, when the test is complete so that the purchaser has, to his satisfaction, ascertained all that trial can teach him, and determined that the article does not satisfy the contract, then that element of ambiguity is eliminated in the construction of any subsequent acts of dominion or use. After that certainly any unnecessary application of the article to his advantage and benefit would in honesty be consistent only with a decision to become or continue owner. . . .

Reviewing the facts in the case and applying the general rule thereto, the court said:

Applying these rules of law to the instant case, we find it established as fact that, about noon of Aug. 27, the plaintiffs (Fox) had so completed the trial to which they were entitled, that they had ascertained that the engine would not work as guaranteed, and had determined not to accept it as satisfying the contract of sale, and had forwarded notice of such defect and determination to the seller. . . .

The trial being complete, and the inadequacy of the article to fully satisfy the calls of the contract being established, the plaintiffs (Fox) had the election to reject it altogether and rescind the sale, or, in certain business exigencies, to retain it as of some value, and pay such sum as might be proper after due allowance for its defects. . . .

In this situation, and with this right of choice, they made use of the engine for their own benefit for the remainder of the 27th and until noon of the 28th of August. There is no proof of any special exigency rendering such use unavoidable. Under authority of our decisions, such acts can have but one construction. They must be deemed to unambiguously declare plaintiff's (Fox) election to become owners. . . .

The court concluded by affirming the judgment rendered in the lower court in favor of the sellers (Wilkinson), holding that the use of the engine after its rejection by Fox constituted, in effect, an acceptance.

This decision should serve as a warning to the prospective purchaser of equipment. If a purchase contract be entered into, its terms and provisions must be respected to the letter by both parties. If the article or piece of equipment purchased prove unsatisfactory during a definite trial period, formal written notice of rejection should be served upon the seller by the buyer. Failure to observe this important point may be held to constitute an acceptance, as has been shown in the case here cited. If, for any reason the trial period agreed upon be found of insufficient length, and extension of time be desired, such extension should be taken care of in a separate agreement in writing between the contracting parties. Failure to observe this commonsense rule has been, too often, the cause of unwarranted expense and disagreeable litigation.

Orders vs. Instructions

By C. E. Jenson

It is one thing to issue an order to do a certain job in a certain way, another to show how to perform the stated operation with the proverbial skill and despatch, or "to the Queen's taste" as the saying still goes. In fact, if some orders were unaccompanied by instructions they might appear impossible to carry out. (Some are.) That method is best which instead of just emitting an order in general terms, like "make six to sketch and dimensions," dictates just what machines and appliances are to be used, and to what degree of accuracy and finish, which if it does not obviate the possibility of wrong work, at least lessens it and (if instructions are followed to the letter) places the responsibility for total or partial failure just where it undoubtedly belongs—on the one issuing the order.

Distortion Produced in Casehardening

Consistent Minimum Warpage in Manganese Steel—Large Holes Decrease, Small Holes Increase when Carbonized—Greater Wall Thickness Produces Greater Effect

By A. A. BLUE
Metallurgist, Duff Manufacturing Co.

IN THE manufacture of casehardened gears, ratchet wheels and bushings, which involves comparatively small center holes that must be subsequently ground to fine tolerances, it was a difficult matter to predict the size the holes should be made before carbonizing and hardening so as to properly allow for the grinding. The following experiments were undertaken, therefore, to arrive, if possible, at some generalization in this regard.

It was felt that the most significant variables to be considered were: The grade of steel used; the size of the opening as compared with the diameter of the entire piece, i.e., the wall thickness; and the nature of the opening, as round, square, hexagon.

The steels met with in the manufacture under consideration were S. A. E. 1,020, S. A. E. 1,114 and a low-carbon, high-manganese steel, all, of course, being carbonized. The analyses of the samples used in the present tests were as follows:

	Carbon	Manganese	Phosphorus	Sulphur	Chromium
S.A.E. 1,020.....	0.26	0.54	0.015	0.044	....
S.A.E. 1,114.....	0.18	0.67	0.068	0.084	....
Manganese steel...	0.21	1.14	0.020	0.039	0.22

Disks 1 in. thick by 2½ in. in diameter were prepared from each of these steels, and openings cut in them as follows: 2-in. round, 1½-in. round, 1-in. round, ½-in. round; and 1½-in. hexagon, 1-in. hexagon, ½-in. hexagon. Thus a variety of wall thicknesses and two shapes of holes were given. The openings were then carefully measured by means of a micrometer and the results noted in the accompanying hole dimension table. The location of each measurement was marked by punch marks, so that all later measurements could be made at the same point, thus eliminating any variation in the piece itself.

Casehardening the Samples

All pieces were well packed in carbonizing boxes, heated throughout to 1,650 deg. F. and held at this temperature for 4 hr. After this, the pots were removed from the furnace and allowed to cool on the floor. The disks were taken out when cold and the openings were again measured at the same location as the measurements made before carbonizing.

The disks were then reheated to 1,600 deg. F. in a lead pot, to prevent scaling, and quenched in oil, after which they were cleaned and measured as before. Finally, they were reheated in the lead pot, the manganese steel to 1,375 deg. F. and the others to 1,425 deg. F. and quenched in water, once more cleaned and measured. The figures obtained by the measurements in these three operations are given in the hole dimension table.

The outstanding feature of the results was the marked and consistent minimum warpage found to occur with the manganese steel. Practical work in carbonizing a steel of this manganese content has shown it to deform in treatment to a markedly less degree than ordinary carbon steel. The present experiments indicated that S. A. E. 1,114 steel, or ordinary screw stock, came close to the manganese steel in this respect, although, of course, its high sulphur and phosphorus contents render it unfit for good carbonizing practice. This effect, in the case of the S. A. E. 1,114 grade may have been due to the fact that the steel was dead as a result of these large amounts of impurities, so that it had less strength than the purer S. A. E. 1,020 steel, and, therefore, it had less power for distortion. Such an explanation, however, will not apply in the case of the manganese steel, where the tensile properties are greater than those of the ordinary carbon steels.

HOLE DIMENSIONS PRODUCED IN CASEHARDENING

Sample	Machined	Carbonized	Oil-quenched Center	Oil-quenched Edge	Water-quenched Center	Water-quenched Edge
Round hole, 2 in. dia.,						
1,020.....	2.001	2.000	2.000	2.004	1.998	2.000
1,114.....	2.002	2.001	2.000	2.001	1.999	2.001
Manganese	2.001	2.000	1.996	1.999	1.997	1.999
Round hole, 1½ in. dia.,						
1,020.....	1.502	1.501	1.494	1.502	1.495	1.500
1,114.....	1.503	1.502	1.500	1.502	1.501	1.502
Manganese	1.501	1.500	1.500	1.501	1.498	1.500
Round hole, 1 in. dia.,						
1,020.....	1.001	1.001	0.998	1.004	0.991	0.998
1,114.....	1.000	1.000	1.000	1.002	0.997	1.003
Manganese	1.001	1.001	0.998	1.002	0.999	1.001
Round hole, ½ in. dia.,						
1,020.....	0.499	0.500	0.492	0.497	0.487	0.498
1,114.....	0.499	0.500	0.496	0.500	0.496	0.500
Manganese	0.499	0.500	0.499	0.500	0.500	0.501
Hexagon hole, 1½ in.,						
1,020.....	1.503	1.502	1.499	1.505	1.498	1.503
1,114.....	1.503	1.502	1.502	1.504	1.503	1.503
Manganese	1.503	1.502	1.502	1.504	1.500	1.501
Hexagon hole, 1 in.,						
1,020.....	1.002	1.002	0.993	1.001	0.994	1.003
1,114.....	1.001	1.001	0.999	1.002	0.998	1.002
Manganese	1.001	1.002	1.001	1.003	1.002	1.005
Hexagon hole, ½ in.						
1,020.....	0.564	0.564	0.556	0.564	0.556	0.566
1,114.....	0.563	0.564	0.562	0.565	0.560	0.564
Manganese	0.564	0.564	0.564	0.567	0.563	0.566

The changes in the diameter of the openings for the various steels as a result of carbonizing only are given in one column of the hole dimension table. It appears to be consistently brought out that the larger holes got smaller, while the smaller ones got larger, although the change in any case was small. This may have been due to the greater expansive forces present in the thicker walled pieces, or it may have been because the smaller holes offered poorer conditions for the absorption of carbon, and hence showed no growth in thickness. This effect is apparently independent of the grade of steel or the character of the opening.

Generally speaking, the greatest change came after the second hardening and although the differences in the effects of the two hardenings were small in the case of hexagons, they were quite large for the round holes. The S. A. E. 1,020 steel showed the greatest changes, the S. A. E. 1,114 grade the next and the manganese steel the least, although these latter two were frequently very close together, as noted above.

It was seen that the changes got smaller as the size of the opening increased, or, in other words, as the wall thickness decreased, and it was apparent that the thinner sections had less distorting power than the thicker ones. This effect was found to be true both for round and hexagonal shaped openings.

In measuring the openings in the samples after hard-

ening, it was found that the interior of the holes were smaller than the outer edges. These two sets of figures are given in the hole dimension table under the headings "Center" and "Edge" respectively for each hardening operation. The difference between these two figures, or the "bulge" was greater with the smaller holes, that is, the greater the wall thickness the greater was the distortion, due, no doubt, to the greater forces exerted by the larger mass of metal. The distortion in this connection was also greatest with the S. A. E. 1,020 steel, the S. A. E. 1,114 grade being second, and the manganese steel again showing the least deformation. All of the specimens showed a scleroscope hardness of from 80 to 85 after water quenching.

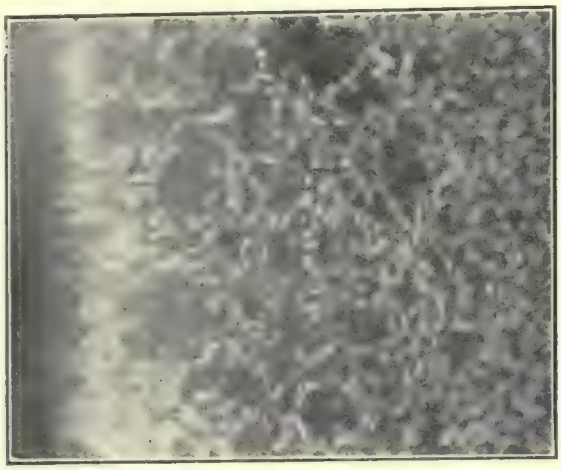


FIG. 1. MICROPHOTOGRAPH, S. A. E. 1,020 STEEL

At 100 diameters, 5 per cent HNO_3 etch. Shows case with good penetration. Separation of ferrite in case is due to annealing for machining. Core has fine grain.

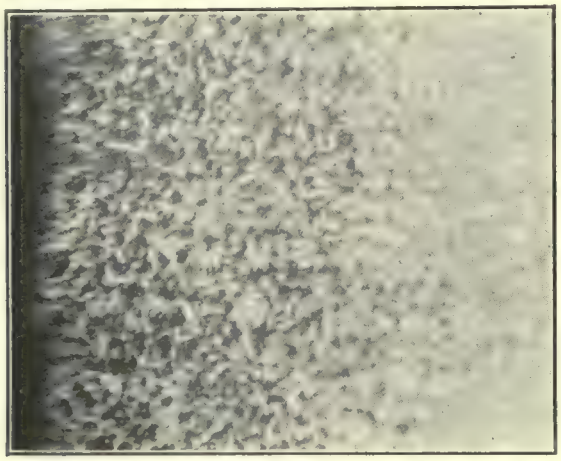


FIG. 2. MICROPHOTOGRAPH, S. A. E. 1,114 STEEL

At 100 diameters 5 per cent HNO_3 etch. Shows case with rather light penetration and marked evidences remaining of segregation in streaks, even after having received four heats. The light case obtained with this grade of steel may have some bearing on the small amount of deformation produced in hardening.



FIG. 3. MICROPHOTOGRAPH, MANGANESE STEEL

At 100 diameters, 5 per cent HNO_3 etch. Shows outer portion of case. The remaining inner portions of the case extend considerably beyond the range of the lens of the microscope and could not be included in a single photograph. Note great density of case even after annealing operation. In spite of much greater depth and density of case, this grade of steel was found to show the least distortion upon hardening.

After the final measurements had been taken, one sample of each grade of steel was annealed, cut so as to show the case, polished, etched with alcoholic nitric acid, and photographed at 100 diameters. The results are shown in Figs. 1, 2 and 3, and are the representation of the S. A. E. 1,020, S. A. E. 1,114, and manganese steels. In all of these photographs, the carbonized case is shown at right-angles to the direction of rolling in the original bar. The difference in penetration of carbon into the various steels is marked and well worth noting. It should also be observed how the segregation and streaks in the S. A. E. 1,114, or screw stock, persist even after the four treatments the steel has had up to this point. These streaks run out into the case and frequently tend to form soft spots in carbonized material made from this grade of steel.

The conclusions formed from these tests are that:

The character of the steel plays the greatest part in determining the amount of distortion to be expected after final hardening in the casehardening operations. The addition of manganese up to approximately 1.25 per cent to ordinary S. A. E. 1,020 steel reduces the deformation to a very marked degree. Where its other properties are not objectionable, screw stock will be found to show only a small amount of warpage.

The wall thickness of the piece under consideration plays an important part in the deformation after treatment, the greater wall thickness producing the greater effect.

The shape of the opening in the piece, judging from the comparisons made of round and hexagonal-shaped openings has no marked effect.

Understanding Shop Terms

By Robert Grimshaw

In many lines of industry, terms are used that are almost or entirely unknown in other branches. On the other hand some expressions mean one thing in one line and something entirely different in another. I was 23 years old before I met up with the word "shim," which is New Englandese for a thin wedge or packing-out piece. In Wilmington and Chester and Philadelphia, we had (very properly) called it a "Dutchman"—because that was its right name.

In some shops "chucking" is merely putting work pieces into and holding them in a chuck, while in others it implies processing in a turrent lathe or its equivalent. The "universal wood worker" of Cincinnati becomes a "general jointer" when transported to London, where our monkey wrench is known as a "universal spanner." What the New York clothing manufacturers know as a "mark" the Baltimorean terms a "spread."

It is evident that the foreman must know the local trade terms—and then some—and see to it that his workmen, many of whom come from parts more or less unknown, know them, too.

Second-Story Planer Foundations

How the American Tool Works Supports Its Planer Department Upstairs—Concrete Slabs for Foundations—Methods of Leveling and Straightening Long Planer Beds

By A. E. ROBINSON
General Superintendent, American Tool Works Co.

WHILE many machine shops are in multi-storied buildings and consequently have machine tools of various kinds on floors above the street, it is not often that we find the whole planer department of a large plant, including some large machines, located on the second floor.

The installation of the twenty-five planers in the planer department of the American Tool Works Co., Cincinnati, Ohio, is unique from several standpoints, the principal feature being the fact that the machines

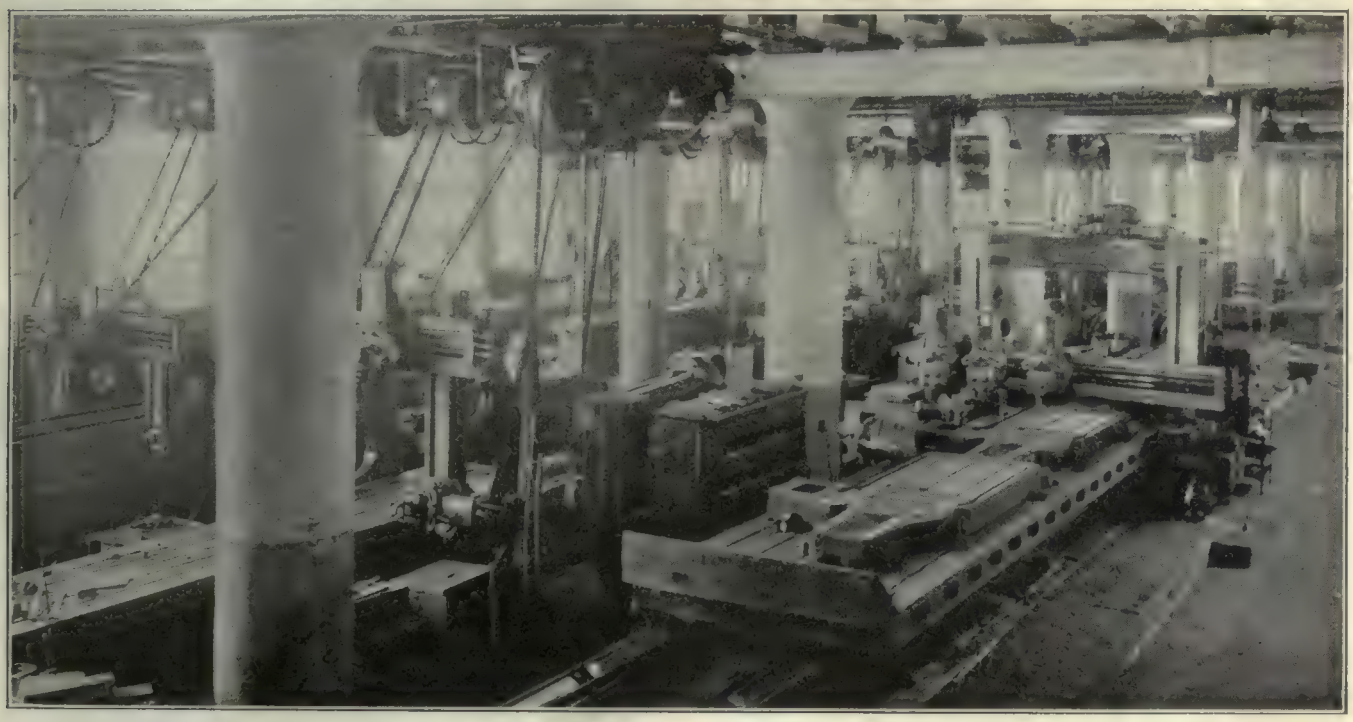


FIG. 1. SECOND-STORY PLANER DEPARTMENT

are installed on the second floor of a reinforced-concrete building, and within a space approximately 80 x 220 ft. A partial view of the planer department is shown in Fig. 1. Five rows of machines are placed with ample aisle space between the rows and storage space between the machines. Special cranes with electric hoists are mounted on the ceiling over the loading ends of the tables and permit of loading any planer without disturbing the others.

Many of the machines are provided with variable speeds for cutting, with a constant return speed. All the planers except one are belt-driven from line shafts driven by motors through silent chains. On machines having variable cutting speeds, a single belt from the line shaft is used to drive the return pulley on the countershaft, while a variable-speed motor on the ceiling is used to drive the cutting pulley through a silent chain, the speeds being controlled through a rheostat on the bed near the tumbler lever. The remainder of the machines have two-speed countershafts driven by belt from the line shafts.

The largest planer is 72 in. x 60 in. x 40 ft. and is arranged for reversing motor drive. This planer is equipped with three rail heads and two side heads, and will plane eighteen small lathe beds at one setting.

The installation of this machine and the other smaller machines on the second floor was a problem that required study and differed materially from the customary installations on ground floors or solid foundations.

It was found that the use of a raised concrete foundation on top of the 10-in. floor slab would provide the necessary beam construction to stiffen the floor and prevent vibrations in the machines. But on account of the excessive weight of the 72-in. x 40-ft. planer, together with its table loads, it was deemed advisable to place an auxiliary supporting column directly under the center of the planer near the housings. The form for this column was placed in position and the reinforcing rods and concrete were introduced through a hole in the floor above.

The same type of foundation was used under all the planers, but the 72-in. machine, being so much larger than the others, makes its foundation construction of greater interest and it will therefore be described in detail. The first thing to be considered was the exact location of the machine with reference to the adjacent columns, and to obtain the maximum rigidity of floor by keeping it close to the columns, which have mushroom tops 8 ft. square. These columns are spaced 20 ft. apart in each direction and a liberal use of reinforcing steel in the columns and floor slab effectively ties the parts together in a very rigid mass.

The plan and elevation of the foundation and a section through the building at this point are shown by Fig. 2.

The floor was carefully cleaned and all oil or other foreign substances removed, then the surface was roughened to hold the concrete of the foundation. The wooden form for the foundation was built on the spot, carefully located from chalk lines laid out on the floor, and firmly anchored in place by braces from adjacent columns and machines. Heavy castings were laid on the form at intervals.

The use of jacks for leveling planers is universal in this plant, and the principal consideration in this instance was the number and location of these devices. The depressions for them were cast in the foundation by inserting a frame across the form at their locations and the omission of concrete inside these frames. The concrete was, however, firmly tamped under these frames.

The concrete projected outside of the planer bed about 4 in. all around, with some additional width at the ends and with housing seats to accommodate a special combined jack and locating device of the double-screw type.

The jacks consist of a main baseplate ribbed on the bottom so as not to slip. Upon the baseplate slides a wedge block controlled by a heavy screw at the outer end. The special fixtures include another heavy screw in an upturned flange to bear against the bed and prevent any side or longitudinal motion. The two special fixtures at each end of the bed were placed crosswise, while the four used at the housings were placed longitudinally, holding the machine firmly and preventing any movement on the wedge blocks.

After the concrete form was in place a number of twisted reinforcing rods were suspended in it to tie the members of the foundation together firmly. Then thin concrete was poured into the form and carefully tamped and settled at all points, and a trowel used all around the outside to bring the cement to the outer surface. Slicing the trowel up and down inside of the form to force away the gravel insured a smooth surface.

The form was allowed to remain on the foundation for about a week, then it was removed and the outer surface "pointed up" where necessary.

After the main foundation was firmly set the leveling jacks were carefully located and leveled, then a thin cement grout was poured around each jack base to anchor it securely in the depression of foundation. After the cement around the jacks had hardened the planer bed was placed upon the jack blocks and carefully aligned and leveled by the process to be described.

The leveling and aligning are two separate processes, although each is somewhat related to the other. The leveling was done first, then the alignments were made and, after that, a final check-up of the leveling.

To level the bed the table was run to the extreme

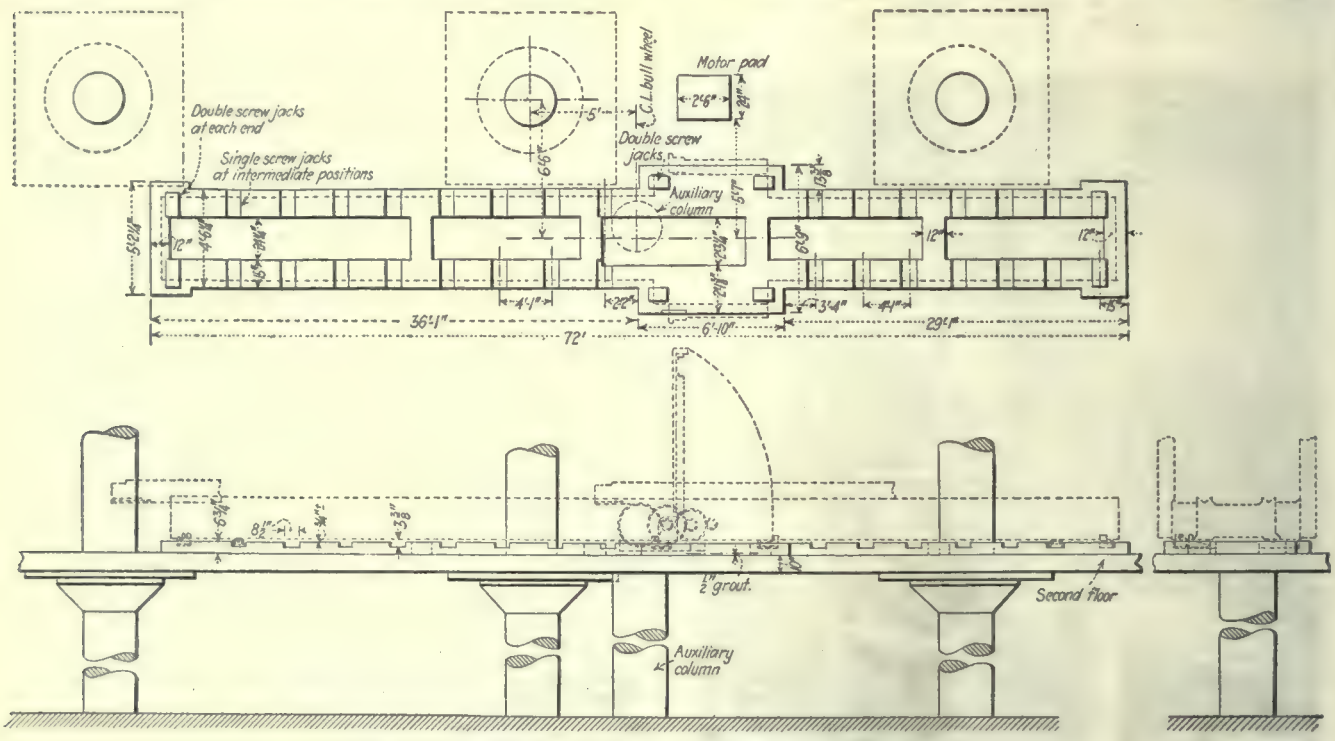


FIG. 2. FOUNDATION AND SUPPORTING COLUMNS

end of the bed, and six ground cylinders all of the same diameter laid in the V's. Across the cylinders were laid three tested parallel bars of the same thickness and then another parallel bar laid longitudinally on these parallels to hold a graduated level and a straight-edge.

The leveling was started at one end and the wedges of the leveling jacks set up or down as required, adjusting them at both sides of the bed. Then the first parallel was removed and placed in front of the third parallel, and the level bar and straight-edge moved forward, using the two previously leveled parallels as a gaging point. The jacks under this portion were then carefully set and the process repeated until the opposite end of the bed was reached. The straight-edge and level were also used in a diagonal direction, and the level used crosswise on the lower parallels.

After the first leveling was completed the bed was checked for alignment, the method and apparatus being as follows:

The aligning was performed by the use of a tight piano wire and an indicator. The wire was stretched between two uprights, one at each end of the bed. The

uprights were mounted on duplicate V-blocks which fit the bed V's. The indicator was mounted upon a third V-block which slides along the V of the bed. The indicator was used to take a reading between its end and the wire to determine the amount of mis-alignment at all points of the bed.

A piece of white paper was laid under the wire and

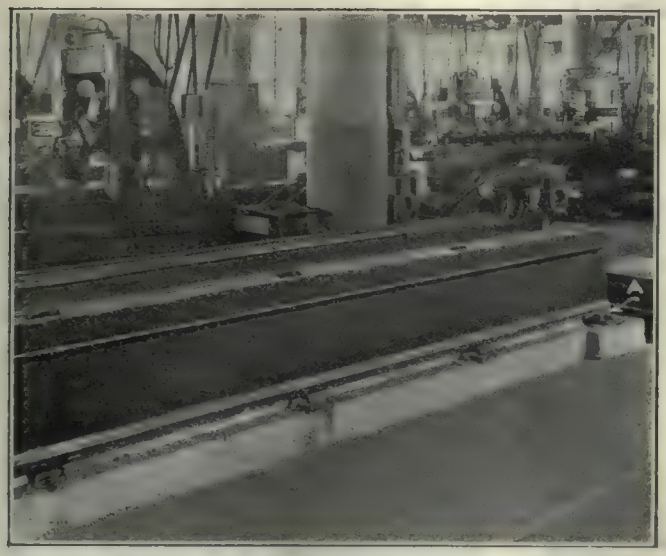


FIG. 3. LARGE PLANER FOUNDATION AND ALIGNING JACKS

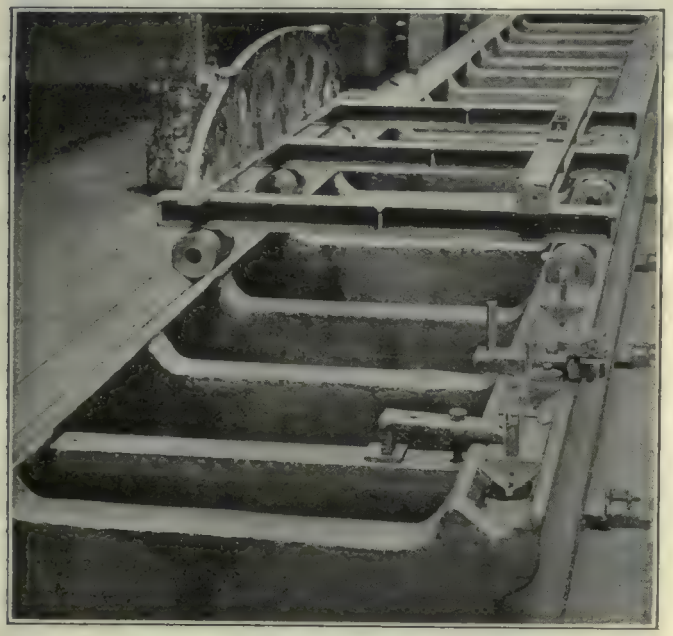


FIG. 4. LINING UP AND LEVELING THE PLANER BED

an electric light with a shade on it used to illuminate the paper, thus permitting the light space between the wire and the indicator to be clearly seen.

Forcing the Bed Into Line

The alignment began at the housings and worked both ways, as the ends of the bed could be easily moved with a crowbar, while the housing section was too heavy to move and formed a good starting point. In place of a crowbar, however, a special device *A*, Fig. 3, with a screw in the side to move the bed sideways, was used.

The indicator was set up to the wire at the middle point of the bed, then it was moved to each end and the reading at the middle duplicated by shifting the ends of the bed to suit. Then all the intermediate points were checked and after the entire length had been covered in this manner a final check up was made to insure against errors.

After the alignment, a final level reading was made, the table placed on the bed and a very light cut taken over the table top.

Finally a narrow board was secured all around the inner and outer edges of the bed and the space between the under face of bed and foundation was filled with a cement grout. After all settling and drying out of cement had ceased, the small pockets cast near each jack were filled with melted sulphur. These sulphur pads assist in supporting the bed and relieve the strains from the jacks somewhat, and because sulphur sets without shrinking it maintains a solid bearing between bed and foundations.

Leveling and Aligning the Planer Bed By Well-known Method

The illustration, Fig. 4, shows in a preliminary way the method used in leveling and aligning the planer bed. This method has been in use for about 20 years by the American Tool Works, the photograph having been taken many years ago.

As concrete requires quite a length of time to harden, it is necessary to check up the leveling of the bed at frequent intervals until no movement is detected, then an occasional check up is all that is necessary to insure accuracy at all times.

This planer installation has now been in use constantly for about five years, and has proved entirely satisfactory and free from the chatter annoyances which we might expect to find in an installation of this nature.

Does Forced Lubrication Score Bearings?

By Frank C. Hudson

MANY of the best automobile motors have forced lubrication for the crankshaft bearings and we have always supposed that this was the way to secure the surest and best lubrication of bearings. It certainly sounds reasonable, but there's another side to the story.

A friend of mine runs a real service station where he re-turns and sometimes re-grinds crankshafts. He tells me that his crankshaft man would starve to death if it were not for the motor with forced feed. Journals in such motors are almost always scored opposite the oil hole in the bearing. Crankshafts with splash feed are rarely found to be scored and a little polishing is all they need unless they have worn out of round.

If this is so, and I've no reason to suppose my friend is incorrect, it seems to indicate that the forced lubrication system pumps grit of some kind, as well as oil, into the bearings. With the splash bearing the grit evidently does not get in between the bearing surfaces.

The scoring can only be caused by dirt which gets into the oil and stays there. It shows that it pays to change the oil in the crankcase frequently so as to keep the oil clean. A few quarts of oil are cheaper than a motor overhaul. New oil every 500 miles is a good investment.

Automotive Service Methods and Equipment

XII. Service Operations on the World's Largest Motor Car Fleet—Tools for Assembling and Disassembling—Straightening the Frame

By HOWARD CAMPBELL
Western Editor, *American Machinist*

THE Yellow Cab Co., of Chicago, Ill., owns and operates nearly 1,500 taxicabs—probably the largest single fleet of motor vehicles in the world. These cabs were designed especially for this service by the Yellow Cab Co.'s engineers, working in conjunction with the engineers of the Continental Motors Co., the Timken Axle Co., the Brown-Lipe Gear Co., and the several other companies that manufacture the major parts of the assembly. One of the main features of the design is that of accessibility for service. Some of the service tools used are described herewith.

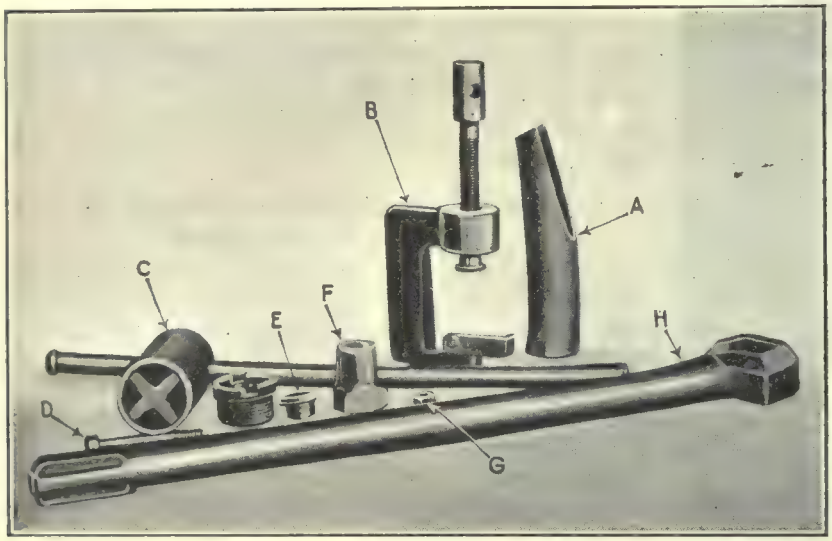


FIG. 1. A FEW HANDY SERVICE TOOLS.

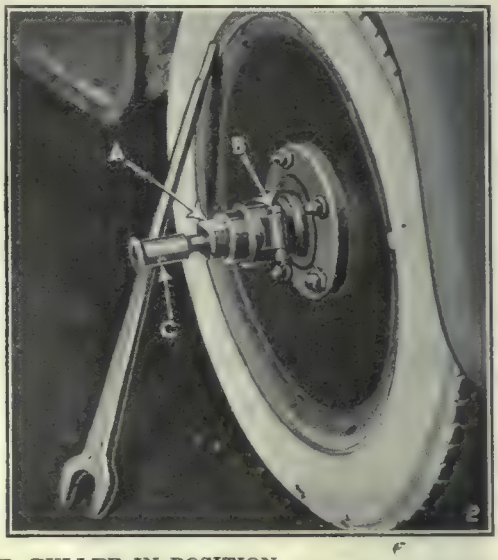


FIG. 2. WHEEL PULLER IN POSITION

The tool shown at *A* in Fig. 1 is a 9-in. section of 1½-in. pipe that has been milled or ground at an angle across the end and down the side, the two surfaces thus machined forming a right-angle. This pipe is used as a punch with which the steering wheel is driven off the end of the shaft. The upper end of the pipe is placed against the shaft just under the wheel, so that the pipe partly envelops the shaft and with the upper end of the pipe bearing half way round the under side of the hub of the wheel. Then the wheel can be driven off as a rule with little, if any, injury resulting.

The section of pipe just described can be used for driving off wheels that have cast-iron spiders, but is hardly practicable for use on wheels with aluminum spiders. For removing the latter from their shafts, the puller shown at *B*, Fig. 1, is used. The operation of the tool is obvious.

The wrench shown at *C* is used for removing valve plugs from cylinders. A spider-shaped section is welded into the bottom of the section of pipe that serves as the body of the wrench, the four arms of this spider being of the correct width to fit into the four slots in the valve plug.

Occasionally, however, a valve plug is found so firmly seated in the cylinder that the wrench just described cannot be used. In that case the several pieces *D*, *E*, *F* and *G* are used. If the valve plug is tapped for a petcock, the bolt *D*, which is ⅜ in. in diameter and about 4 in. long, is put through the hole with the head end of the bolt downward. If the plug is tapped for a spark plug, the piece *E*, which is threaded outside

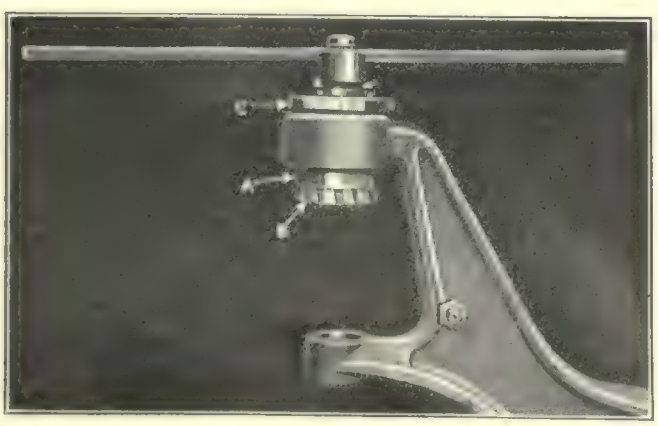


FIG. 3. FRONT AXLE BEARING CUP ASSEMBLING.

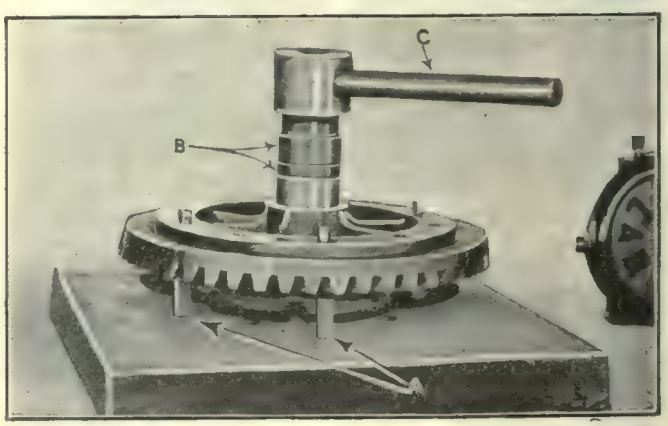


FIG. 4. RIVETING FIXTURE FOR DRIVE GEAR

and has a $\frac{7}{16}$-in. hole through it, is screwed into the plug and the bolt is inserted through this piece. Then part *F*, which also has a hole drilled through it, is placed in the plug with the lugs fitting into the four slots and with the bolt protruding from the upper end. Then the nut *G* is screwed down on the bolt so as to hold the piece *F* firmly in place. Part *F* is milled to a hexagon on the upper end, and the wrench *H* is made to fit it. With this outfit any valve plug can be removed.

Each rear wheel of a Yellow taxicab fits on to a long taper bearing, being held in place by means of a key. When it becomes necessary to remove a wheel from the shaft, the puller shown in Fig. 2 is used. This puller is bored and threaded inside the same as a hub cap, so that when the hub cap is removed, the puller can be screwed on to the hub in place of the cap. This is done with the wrench shown, which fits the flat spots shown at *A*. When the puller is tightly on, it is locked in place by means of the bolt *B*. Then the tapered end of the wrench handle is inserted in the hole in the stud *C* and the stud is screwed against the end of the axle shaft. The operation is slow, but sure.

While it is a comparatively simple manner to knock a bearing cup out of an axle, it is not always so easy to put one in again. In Fig. 3 is shown what is called a front axle bearing-cup puller, but in this case the puller is

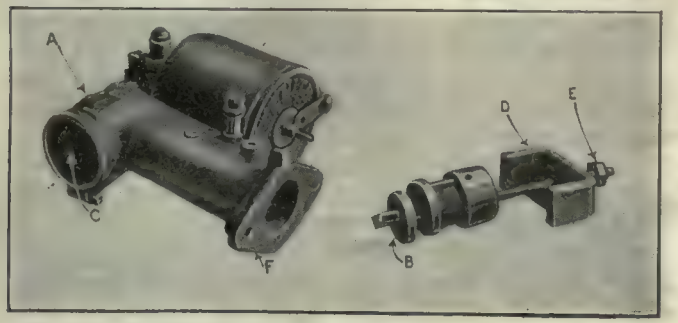


FIG. 5. TOOL FOR REMOVING VENTURI TUBE FROM CARBURETOR

used for assembling instead of disassembling. The cup *A* is held in place and the piece *B*, which resembles a stud with a large disk-shaped head is inserted from the bottom as shown. Then the part *C* to which is attached the handle, is screwed on to the stud. The stud can be seen sticking up past the handle.

Part *C* is a flat piece in which a hole is drilled for the stud, and which acts as a thrust bearing for the handle. The hole in the center is just large enough for the stud to pass through, and the piece holds three capscrews which serve to hold this piece and the handle together, without interfering with the operation of the handle. This is accomplished by having the studs set so close to the handle that the inner side of each capscrew head fits into the groove in the hub of the handle, as shown. The stud is $\frac{3}{4}$ in.–10 thd., and the capscrews are $\frac{1}{4}$ in.

The fixture shown in Fig. 4 is for the purpose of holding a differential flange and a drive gear together while they are being riveted. The studs *A*, of which there are five, are spaced so that every other rivet hole comes over a stud. Five rivets are put in place, and the assembly is set on the fixture with the head of each rivet resting on the stud as shown. An air hammer is used to head the rivets over and then the other five rivets are placed in and the operation is repeated. The two parts indicated at *B* are washers, the thickness

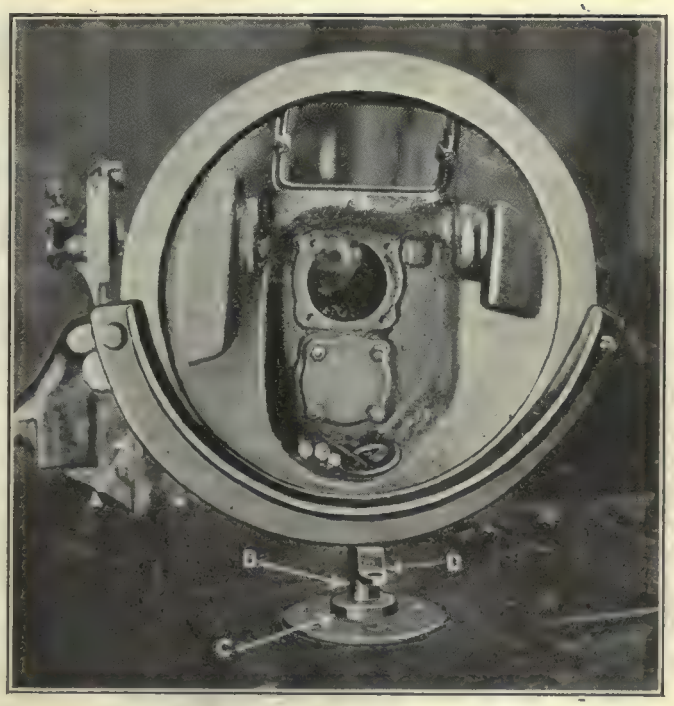


FIG. 6. TRANSMISSION CASE STAND

of which varies with the difference in the design of the flanges. The assembly is clamped and held in place by the handle *C*.

It is claimed that one of the most difficult of service operations is that of removing the Venturi tube from a carburetor. The device used for this operation in this plant is shown in Fig. 5. The stud, which is $\frac{1}{4}$ in., 20 thd. by 6 in. long, is inserted in the carburetor through a hole at the back end which cannot be seen in the picture but is indicated at *A*. The washer *B* is put into the carburetor through the hole *C* and placed on the stud, then the brace *D* and the nut *E* are put on to the stud, the brace resting on the face of the carburetor flange at *F*. Drawing down the nut *E* will then pull the tube from the carburetor.

A device for holding transmission cases while they are being worked on is shown in Fig. 6. The frame *A* was forged to shape in the blacksmith shop and

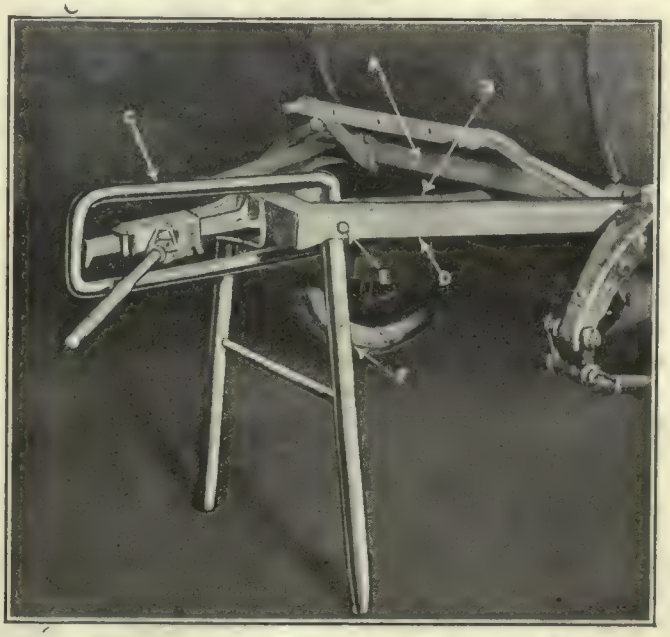


FIG. 7. DEVICE FOR STRAIGHTENING FRAME REAR CROSS MEMBER

welded to the stud *B*. This stud is 1¼ in. in diameter, and the collar *C* of the flange is 2½ in. in diameter. The small brace *D* was welded on to keep the frame from tipping, although if the collar were high enough it does not seem that this should be necessary.

It has happened several times that vehicles have run into the back end of the taxicabs in such a manner as to bend the rear frame cross member *A*, Fig. 7. Considerable difficulty was experienced in straightening these members until the apparatus shown was devised. The piece indicated at *B* is a 1½-in. shaft hinged to the large link, *C*, at one end, and with a hook on the other end which hooks around the frame cross member. When the jack is operated in the position shown, sufficient pull is exerted on the cross member to straighten it without preheating. The framework of the device *D* is of heavy angle steel hinged by the rod *E* to the legs *F*. These legs are of 1½-in. pipe. The rod goes clear through the frame, acting as a hinge for both legs. The link *C* is made of 1⅛-in. round stock. The ends of the frame *D* are cut so that so that they will fit into the angle formed by the rear cross member and the spring hangers.

The Machine Shop Superintendent

By F. P. Terry
Belfast, Ireland

Much has been written about new tools, jigs and fixtures, high-speed steels and many other things which enter into the running of a modern machine shop, but very little about the most important item of all—the machine shop superintendent, and I am quite sure the lucky or unlucky individual who is in this position often wonders why he is left alone.

The machine shop superintendent is very much in the same position as the regimental sergeant-major, except that the latter is all right so long as he obeys orders while the superintendent very often has to make his own orders and then be brought up against a court-martial if they don't come out as expected, while every foreman under his control considers what a soft job he has and would give anything to get it. There are also directors and general managers who occasionally wonder if the superintendent is filling any useful purpose, seeing that every department is well looked after by capable foremen, forgetting, of course, that most of them have been put there by the superintendent, often after opposition by those above him.

Of course, many superintendents are a great deal to blame for the troubles and trials of their positions, one of the greatest faults being the desire to retain every item of authority in their own hands, making the foremen mere puppets, consequently adding to their own difficulties a hundredfold as no one takes any responsibility but themselves.

What are the qualifications necessary to become a successful machine shop superintendent is a question that can be answered in many ways according to the circumstances of the case. The class of shop and the work to be done must be considered, but whatever the conditions it is absolutely necessary for the superintendent to have a thorough knowledge of his work, an excellent memory, a temper under control and the means to lose his personality whenever necessary.

Two of the most successful superintendents known to me possessed the above qualifications, but in many ways were as wide apart as the poles. One was the dryest old Scotsman I ever met, but as far as the machine shop was concerned he was the youngest machinist in enthusiasm. Every new type of machine tool or jig must be tried out as quickly as possible. Turret lathes were as much to him as a toy motor car to a youngster. If any foreman or workman could suggest anything to save time he was delighted, but I don't think I ever saw him smile. He was a very strict disciplinarian without being offensive, as everyone knew an order was an order and there was the end of it. I remember being in his office one morning. We were both busy over some new jigs, when an office boy came in to tell him that there was a lady in the waiting room who wanted to see him. "Tell her I dinna see ladies in the morning," he blurted out, and the boy left. I afterwards found out that the caller was his wife and had brought an important letter for him, but she had to take it back again. When the boy returned with his message the lady explained that she was the superintendent's wife. "I cannot help it, ma'am. I am not going back as I want to keep my job," he said.

Another Type of Superintendent

The other superintendent, a Yorkshireman, was a born humorist, and I often thought it a great pity he was so successful at his work because the stage lost a great comedian. But notwithstanding, he kept perfect control of the whole shop, and foremen and men would do anything for him. During the time I was in the shop a thorough re-organization was taking place and many new jigs and fixtures were being made. In connection with the suggestion scheme, the superintendent adopted an idea that is well worth copying. When a suggestion was received from a workman, he immediately got the man's foreman to bring the suggester along to his office and everything was gone over. If considered suitable, the draftsman started in with instructions to consult the workman as much as necessary. Many times only the bare idea was forthcoming from the workman who often had only a vague idea of drawing, and the complete article frequently had the suggestions of the superintendent, foreman, toolroom foreman and draftsman, but when the drawing was finished and the name given to the jig, there always appeared the words "Suggested by John Blank" with the date. This, of course, appeared on all blueprints that came into the shop, and when the device was made and tested the whole business came before the suggestion committee and whatever the award the name on the blueprint was the more highly valued. It was my pleasure when quite a young man to see my name put forward in this manner, although the actual idea was advanced beyond any dream of mine by the superintendent, who never claimed anything.

Both the superintendents referred to have passed away, but their methods can be copied today. They feared no man, but never forgot that the man who pays the piper has some choice in selecting the tune. Both read the American Machinist from cover to cover and anything new or interesting in advertising or news was put before foremen and men. They were accessible to the floor sweeper, but never interfered with the foremen's authority. They made mistakes and were not afraid to admit it. They required responsible foremen, storekeepers, etc., believing in everyone carrying their own share.

Methods of Machine Tool Design

Continuing the Fourth Article—Analysis of Belt Drive for Planer—Reasons for Stalling, Slipping and Squealing Belts—Energy and Acceleration Diagrams

By A. L. DeLEEUW

A BELTED planer drive presents certain problems which merit careful analysis. The main features of a planer drive are that it must run the planer alternately in opposite directions, it must run at frequent intervals, and it must do this act of reversing quickly. The problem is made more complicated by the fact that the planer must run faster one way than the other.

The general construction is too well known to be described here, and we will mention at once certain facts which must be kept in mind when designing a planer.

(1) Belts must not run slower than 1,000 ft. per minute in order that they may be shifted.

(2) Belts must not run faster than 4,500 ft. Higher speeds are apt to diminish the arc of contact, due to centrifugal force, which may also cause an air cushion to be formed between belt and pulley.

(3) Supposing the pulleys to be of cast iron, their circumferential speed should not be more than 5,200 feet.

(4) The pulleys should run as fast as possible in order to use belts of a minimum width.

Drive for an Imaginary Planer

Keeping these requirements before us, we can now analyze the drive for some imaginary planer. Suppose the planer is to transmit 12 hp. on the cutting stroke, then the question is: What shall be the belt width and what the belt speed? We will use a double belt, which in an ordinary drive can transmit a pull of 60 lb. per inch width, but which we will load with 45 lb. because a planer belt should shift freely and should be, therefore, under light tension only—

12 hp. = 12 × 33,000 lb.-ft. per minute. This amount divided by 45 will give us the product of belt speed and width. The product is $\frac{12 \times 33{,}000}{45} = 8{,}800$. We might use a 2-in. belt running at 4,400 ft. per minute or a 3-in. belt at 2,933 ft., or a 4-in. belt at 2,200 ft., etc. At first glance it would seem that a 2-in. belt is the proper size to use. It shifts easily, requires light bearings, does not pull hard on the shaft, and the belt speed, though high, is still within the limits.

We will further suppose that the return speed of the planer must be 2½ times the cutting speed and we will see to what this requirement leads us. We can obtain this increased return speed by making the counter pulleys of even size and making the driving pulley on the machine in ratio of 2½ to 1, but we see immediately that this would not do. If we did, the return belt working on a small pulley would have to start up the big driving pulley, and this would mean a great deal of slippage. We will be compelled to keep the machine pulleys of nearly even size. A ratio of 4 to 3 is about the limit. We might make the machine pulleys of even size, but then one counter pulley would be 2½ times as large in diameter as the other and that would mean that the cutting belt would have a low speed even when we use the highest permissible speed for the return belt. We see then, that we must compromise and that, in order not to have too much difference in belt speeds, we must make the difference between the machine pulleys as great as possible. We will try pulleys of 40 in. and 30 in. in diameter. If the corresponding counter pulleys are y and x, then $\frac{x}{30} = 2\frac{1}{2} \times \frac{y}{40}$, so that $\frac{x}{y} = \frac{75}{40} = \frac{15}{8}$

If the return belt speed is V, then the rim of the cutting pulley will have a speed of $\frac{40}{30} \times V$. If we further suppose that the pulleys will be cast iron, then we must take care that at no time shall the circumferential speed of any pulley exceed 5,200 ft. per minute, so that $\frac{40}{30} V = 5{,}200$ ft. or less, and therefore $V = 3{,}900$ ft. or less. Accepting for the present $V = 3{,}900$ ft., we find that the large counter pulley has that speed and therefore the small pulley has a speed of $\frac{8}{15} \times 3{,}900$ ft. = 2,080 ft., which is the speed of the cutting belt.

We found the product of belt width and speed to be 8,800. The belt width is therefore $\frac{8{,}800}{2{,}080} = 4.23$ in. As this is not a commercial size we will select 4 in. for the width. This being less than the theoretical amount, we will check up, and see if the pull per inch width has become too much. The pull is $\frac{4.23}{4} \times 45 = 47.5$ lb. This is close enough to the desired amount to be acceptable.

Selecting the Countershaft Speed

Next we select a countershaft speed which will give us the desired belt speed. Of course, any speed would do, provided we selected the proper sizes of pulleys. The large pulley must have a speed of 3,900 ft. This pulley would have to be 149 in. in diameter if the countershaft speed were 100 r.p.m. and proportionally less for higher speeds. The diameter of the small pulley would be $\frac{8}{15} \times 149$ in. = 80 in. We do not need to hesitate to go up with the countershaft speed to 400 r.p.m., we should merely see to it that the large pulley does not become too large nor the small pulley too small. At 400 r.p.m. the diameters would be 37½ in. and 20 in. As 37½ in. is not a commercial size we must take either 36 in. or 38 in. We will select 38 in. and that for two reasons: In the first place, we have paid no attention to the fact that there is necessarily some slip of the belt, so that if we have a pulley of 37½ in. diameter we would have *less* than 3,900 ft. belt

speed. In the second place, we have neglected to take the thickness of the belt into consideration. This is a quite common error. We will find that it amounts to very little *in this particular case*. However, it may amount to more when small pulleys are used and, in any case, though small variations from the theoretical values may be tolerated in machine design, they should be noted so as to avoid *piling error upon error*.

What we have to consider now is this: We will get the proper return speed when the lower pulley, which is 30 in. in diameter, is driven by an upper pulley of $37\frac{1}{4}$ in., which is a ratio of $\frac{37\frac{1}{4}}{30} = 1.241$. As a matter of fact, however, we should have figured the diameter of the pulleys at the neutral axis of the belt. The thickness of belt used for our drive may be estimated to be $\frac{5}{16}$ in. so that we should take $30 + \frac{5}{16}$ in. and $37\frac{1}{4} + \frac{5}{16}$ in. for the diameters of the lower and upper pulleys respectively. The ratio between such pulleys would be $\frac{37\frac{9}{16}}{30\frac{5}{16}} = 1.238$. We see then, that the lower pulley runs a little too slow; very little, it is true, but this little and the belt slip justify us in selecting the next higher rather than the next lower size. And so we will make the upper pulley 38 in. This makes the small countershaft pulley $\frac{8}{15} \times 37\frac{1}{4}$ in. $= 20$ in. Here again we find that the diameter should be somewhat less than 20 in., but we make it 20 inches.

We now have a set of conditions as shown in Fig. 53. We know that one of the belts must be open and the other crossed, and the question is: Which belt should be crossed? As a rule the crossed belt is put on the cutting pulley and this is sometimes correct, but not always. If the planer is designed to take very heavy cuts and to have a moderate or low return speed, the crossed belt should be on the cutting pulley; but if the cuts to be taken are rather light and the return speed is high, the crossed belt should be on the return pulley. Quite often the conditions we have to deal with are not so clean-cut and the conclusion not so obvious. We should analyze the problem more fully.

It is often believed that we cannot give the planer as high a return speed as we might wish because it takes too much power to give the heavy table and its load the momentum or rather *energy* which it possesses when running at high speed. The following analysis will show what is fairly well known nowadays—that it is not the momentum of the table but that of the pulleys, which sets the limit on the return speed. The pulleys are supposed to be of the sizes as shown in Fig. 53, the table is supposed to weigh 25,000 lb., and a load of another 25,000 lb. is supposed to rest on the table. The belt is supposed to go on the return driving pulley. In so doing it must give the table and its load the energy due to a speed of 100 ft. per minute and to the pulleys an amount of energy depending on their weight and velocity. In the accompanying calculation no rotating parts are considered except the rims of the pulleys—no arms, hubs nor beads, and no gears. Neither is friction considered though it is plain that

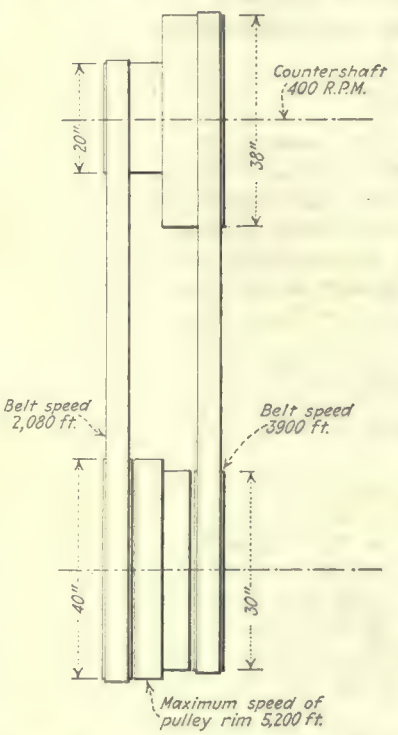


FIG. 53. PLANER PULLEYS AND BELTS

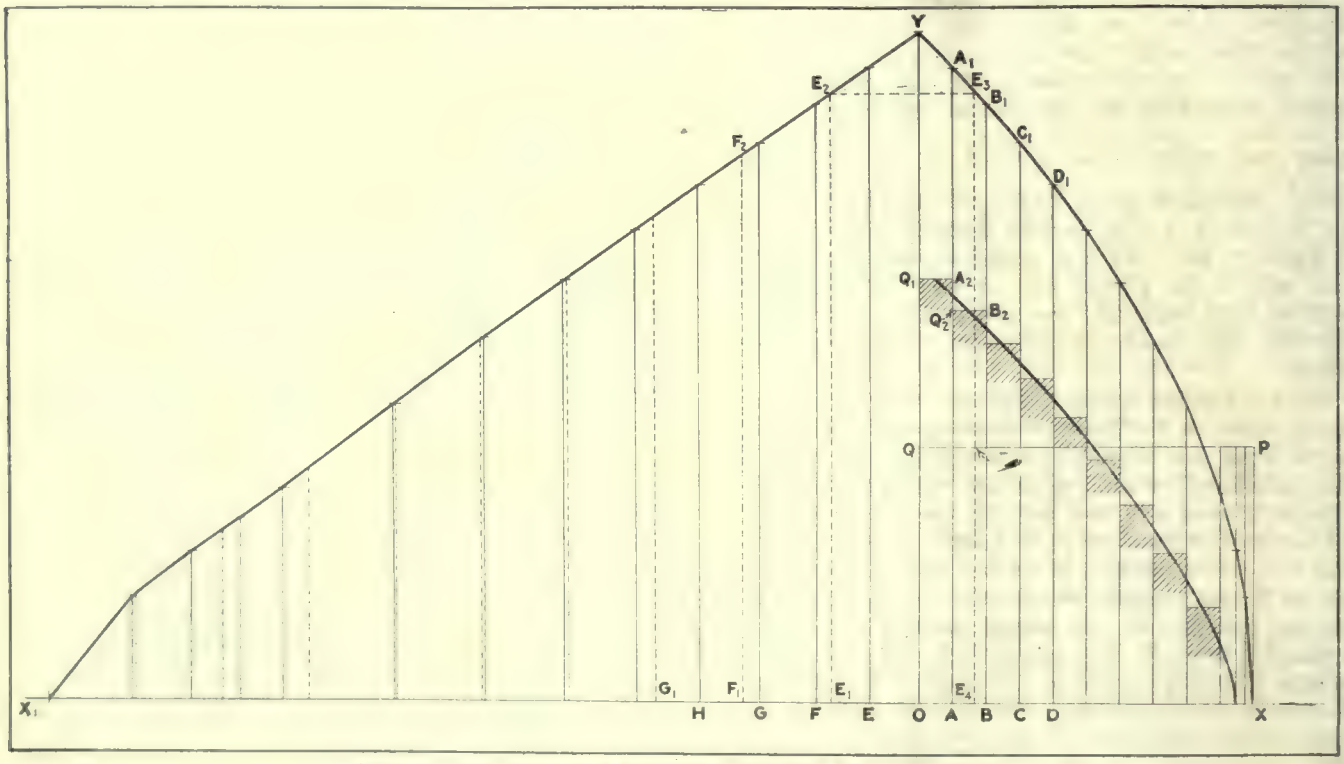


FIG. 54. DIAGRAM OF FRICTION FORCES IN A PLANER

the friction will add considerably to the work the return belt must perform.

Width of pulley = 4½ in.
Diameter small pulley = 30 in.
Diameter large pulley = 40 in.
Surface speed small pulley = 3,900 ft. per minute.
Surface speed large pulley = 5,200 ft. per minute.
Thickness of pulley rim ⅜ in.
Energy of double pulley $E = \frac{1}{2} MV^2$.

$$E = \frac{1}{2} \times \frac{30}{1} \times \frac{22}{7} \times \frac{9}{2} \times \frac{3}{8} \times \frac{26}{100} \times \frac{1}{32} \times \frac{3,900}{60} \times \frac{3,900}{60} + \frac{1}{2} \times \frac{40}{1} \times \frac{22}{7} \times \frac{9}{2} \times \frac{3}{8} \times \frac{26}{100} \times \frac{1}{32} \times \frac{5,200}{60} \times \frac{5,200}{60} = 9,204 \text{ lb.-ft.}$$

Weight of table 25,000 lb.
Weight of work 25,000 lb.
Speed of table 100 ft. per minute.
Energy of table

$$E = \frac{1}{2} \times \frac{50,000}{1} \times \frac{1}{32} \times \frac{100}{60} \times \frac{100}{60} = 2170 \text{ lb.-ft.}$$

Energy of pulley and table = 11,374 lb.-ft.

This shows that less than one-fifth of the work done is spent on the table and its load, and more than four-fifths on the rims of the pulleys.

When the belt has been shifted onto the return pulley it will ultimately give the table its full speed of 100 ft. per minute, provided that it is capable of doing somewhat more than overcoming the friction of the various parts. However, we would not be satisfied if the table did not attain this speed in a very short time, that is, before it has traveled many inches. If we assume that the table will have reached its full speed at the end of 12 in. travel, then we know that the belt must have delivered 11,374 lb.-ft. of energy in $\frac{1}{100}$ minute (this being the time in which the table travels 12 in). However, when we consider that the table was not always traveling at a speed of 100 ft. per minute, but started with a speed zero, we see that it took the table $2 \times \frac{1}{100} = \frac{1}{50}$ minute to travel the 12 in. between no speed and full speed. In $\frac{1}{50}$ minute then, the belt delivered 11,374 lb.-ft. or at the rate of $50 \times 11,374$ lb.-ft. = 56,870 lb.-ft. per minute. This is about 18 horsepower.

This belt runs 3,900 ft. per minute, so that the belt pull is $\frac{18 \times 33,000}{3,900} = 152$ lb. Using a 4-in. belt, the pull per inch of width will be 38 lb., which is less than the pull on the cutting belt. For that reason we put the cross belt on the cutting pulley and the open belt on the return pulley.

The belt shifter for a planer is generally a cast-iron eye attached to a pivoted arm. There are two such arms, one for each belt. Like other shifters, they act on the slack side of the belt. As a rule they are operated by a cam which first removes the belt from one pulley and then leads the other belt onto the other pulley. Let us suppose that the cutting belt has been moved from its tight pulley and that the return belt is being led onto its pulley. This operation is accomplished by a dog on the table striking the tappet which, in its turn, moves the shifter levers through certain connections and a cam. When the dog first touches the tappet the planer table is still going at the full cutting speed. Shortly after, the tappet has moved far enough to take the cutting belt off its pulley. For a very short period of time the planer must run by the momentum of its parts. However, almost immediately after the cutting belt has left its pulley, the return belt moves onto its tight pulley. This latter pulley is running in the direction opposite to that of the entering belt, so that this belt will have a braking effect as soon as it gets into contact with its pulley. As a consequence the planer slows down and, as a further consequence, the tappet moves at a slower rate and so does the entering belt. Gradually the planer table comes to a standstill which means that the tappet and therefore the entering belt ceases to move. The entering belt is only partly on its pulley. As the pulley has come to a standstill, but the entering belt is, of course, still moving, this belt will now begin to give the pulley a movement in the opposite direction.

At this point various things may happen. It may be that a sufficient width of the return belt has come on the return pulley to enable it to start the planer in the return direction. Or it may be that the proportions of tappets, connections and cams were such that the belt had moved very swiftly onto the pulley, so that a much greater part of the width of the belt is on the pulley than what is necessary for the mere stopping of the planer. In that case there will be a very quick stop and a very quick picking up of the return speed. A third possibility is that the belt has moved onto its pulley at a very slow rate, that there is but a very small portion of the width of the belt on the pulley, but that it has taken such a long time that the loss of momentum by friction combined with the braking effect of this small portion of the belt has brought the planer to a standstill, and yet that there is so little of the belt on the return pulley that it does not have the necessary power to overcome the friction and give the planer the necessary acceleration in the opposite direction. A great many troubles which one may experience with belt-driven planers are due to the lack of consideration given to this process of shifting.

The first action of the belt when it enters the driving pulley is to stop the planer, in which action it is assisted by friction. After the planer has come to a standstill the same belt proceeds to give the planer a movement in the opposite direction, which action is opposed by friction. In either case the end to be accomplished is to give the moving parts of the planer a certain amount of energy. In order to see how the action of the belt and the friction of the parts affect the operation of the planer we will consider these two items separately.

In Fig. 54 is shown a diagram indicating the manner in which a planer would be brought to a standstill by friction only. *OA, AB, BC, CD,* etc., are equal distances representing the distances traveled by the planer table, beginning at full speed and ending with the planer table brought to rest. There are a great number of parts in the planer which moves as long as the table moves. The weights of all these parts are fixed, and their speeds are all in a certain fixed relation to one another so that, instead of considering all these items separately, we may imagine that there is a single part of a certain weight moving at a certain speed and that this single part possesses as much energy as all the various moving parts of the planer possess. This part will give up its energy by friction, and as the amount of work done against friction is the

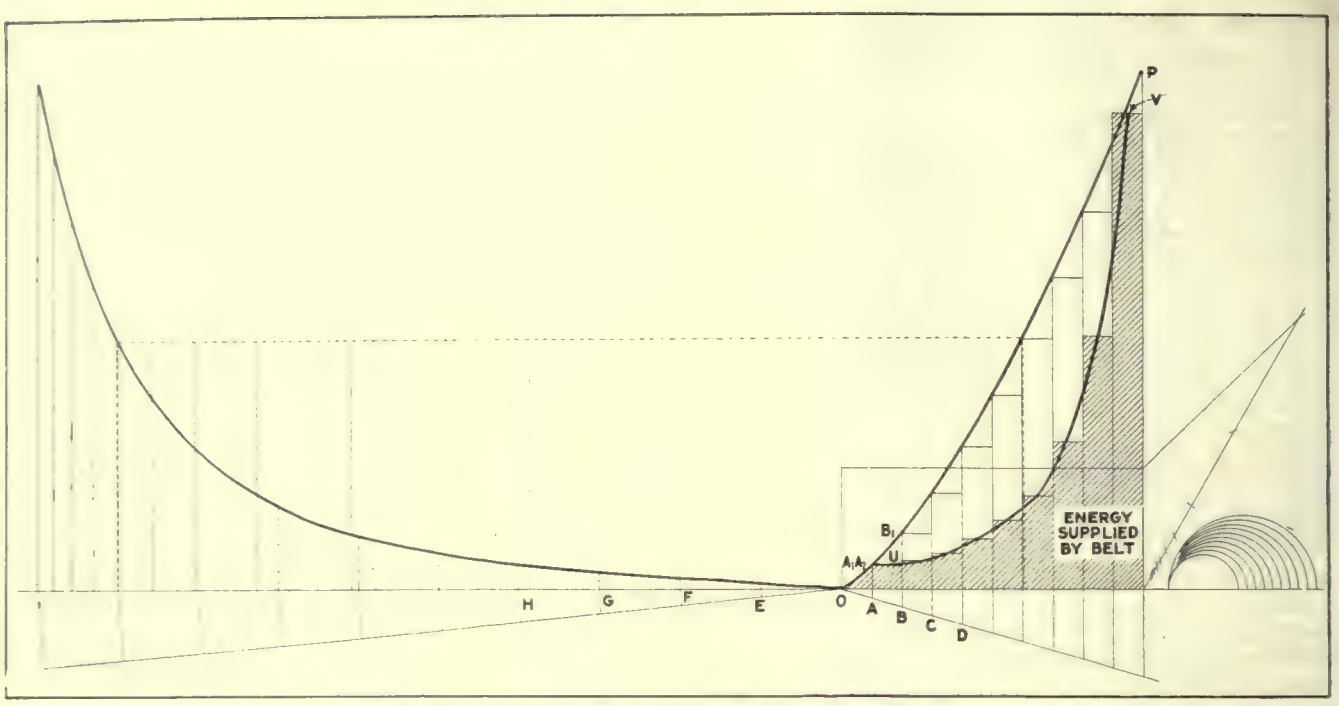


FIG. 55. DIAGRAM OF ACTION OF DRIVING PULLEY

product of the weight, the coefficient of friction and the distance traveled, equal amounts of energy are given up when equal amounts of distance are traversed.

When the planer has traversed a distance OA, it has lost a certain amount of energy as a result of which the speed has been reduced from OY to AA_1. This length AA_1 can be found by considering that the amount of remaining energy has been reduced in proportion of OX to AA_1 and that the speed therefore must have been reduced in the proportion of $\sqrt{OX}:\sqrt{AA_1}$. Similarly we can find the length of the lines BB_1, CC_1 and DD_1, and the curved line XY will show how the speed of the planer varies between full speed and a complete standstill if the parts are affected by friction only. Of course, it will be recognized that, in order to get the correct diagram, a larger number of points should be laid out than shown here.

It would also be interesting to know how the speeds vary when we consider equal time elements, and it would further be interesting to see how the energy of the planer is absorbed by friction.

In order to find the relation between time and speed we lay out on OX_1 the times required to traverse the distances OA, AB, BC, CD, etc. We find the distance OE as follows: We imagine that the speed has not changed while the planer has traveled from O to A, and we make the time required for that amount of movement our unit and lay it out as the line OE. We further imagine that the speed does not change between A and B and that this speed is AA_1. The question then is to find the line EF. As the times required for equal stretches are in inverse ratio as the speeds we find that: $OE:EF = AA_1:OY$. Similarly we find that $FG:EF = AA_1:BB_1$, etc. In this manner we find the times OE, EF, FG, GH, required to travel equal distances, and we obtain the diagram X_1Y as the curve for speed in relation to time.

In order to find the manner in which the energy of the planer is absorbed by friction we will use the same diagram in which we consider the area $OXPQ$ to represent the total amount of energy to be absorbed. We divide the line OX_1, which represents the total time required to bring the planer to a standstill, in as many parts as we had laid off on the line OX. These parts, then, represent equal times and are indicated by the lines OE_1, E_1F_1, F_1G_1, etc. The perpendicular E_1E_2 indicates the speed at that moment. We draw E_2E_3 and the perpendicular E_3E_4. This line E_2E_4 also indicates the speed of the planer at the moment indicated by the point E_1. During this period of time the speed of the planer has been reduced from OY to E_2E_4, so that the amount of energy absorbed during that time is OE_4E_5Q. In a similar way we can find the amounts of energy absorbed during the time E_1F_1, F_1G_1, etc. And as these times are all alike we will plot the result on the right side of the diagram by placing on the base line equal distances. We already have such equal distances, namely OA, AB, BC, etc., and we will therefore use them as the measures for equal times. We should remember that heretofore we have been using these distances as a measure for equal distances traveled by the planer and we obtained in that manner the curve XY; now we will use these same distances as measured for equal times and try to obtain the curve indicating the absorption of energy.

The energy absorbed during the first element of time was OE_4E_5Q. The area of this rectangle must be represented on the base OA. The new rectangle will be OAA_2Q_1. In similar manner we find points F_1, F_2, F_3, F_4, F_5 and the rectangle ABB_3Q_2. The curve thus obtained shows the manner in which the energy is absorbed by friction only.

The diagram of Fig. 55 shows how the belt shifting onto the driving pulley gradually gives the planer energy in the direction opposite to the one in which it is running. As the belt moves onto the pulley the force with which it grips the pulley gradually becomes greater and the negative acceleration it gives to the pulley becomes greater in proportion to the width of belt. We must further remember that the width of belt on the pulley is proportional to the distance traveled by the planer after the belt has entered the pulley. These distances traveled by the planer are in-

dicated by OA, AB, BC, CD, etc. The acceleration (negative) given to the planer parts is indicated by AA_1, BB_1, CC_1, etc. If we consider the acceleration constant during the very short time the planer moves from O to A, or from A to B, or from B to C, we will be able to construct our diagram for speeds. The speed AA_2 equals $\sqrt{2aD}$, in which D is the distance traveled and a is the acceleration. The speed BB_2 is found in the following manner: This speed consists of the initial speed AA_2 plus an increment due to the acceleration. This acceleration is not a but $2a$, so that B_2B_3 equals $\sqrt{4aD}$. Similarly we would find that the distance C_3C_4 would equal $\sqrt{6aD}$. In this manner we find the curve OP for the speeds when equal distances are traversed, and we must remember that these speeds are negative speeds.

To construct the diagram for speeds in relation to time, we lay out the distances OE, EF, FG, etc., each one of these distances representing the time in which the unit of distance OA is traversed by the planer. Again we treat this diagram as we treated the diagram of Fig. 54 in order to find how the energy is absorbed by the entering belt, and we find curve UV.

In the diagram of Fig. 56 the two energy absorption curves of Figs. 54 and 55 are laid together. The lower part shows how the energy is absorbed by the belt. The energy diagrams of Figs. 54 and 55 are shown here on the same scale. This energy is represented by rectangle $ABCD$. The planer will be brought to a complete standstill when the sum of the areas covered by the two diagrams is equal to the area $ABCD$. This happens at the line PQ. As it happens in the illustration the two diagrams are almost each other's complement. This is the ideal condition. If there should be a large opening between the two diagrams it would indicate that there is less energy absorbed during part of the time than what might have been, *i.e.*, that it will take an unnecessarily long time to stop the planer. In other words, there is too much overrun. If, on the other hand, the diagrams overlap each other we have the condition that the belt is brought on the driving pulley at too fast a rate. The belt is called upon to do too much work because no advantage was taken of the friction. In that case we will have too much slip with resultant squealing of the belt.

The dog on the table ceases to act on the tappet as soon as the planer has come to a stop. From that moment on, the table moves in the opposite direction and there is, therefore, no way of shifting the belt further. The shifting mechanism should be so proportioned that the full belt width is on the pulley when the table has traversed the distance AP. If the action of the shifting mechanism is too slow, the planer will stop before the full width of the belt is on the pulley. The result may be that there is not enough power for the cut or reverse (stalling) or there may be a general slowing down of the machine (continued slippage and squealing). If the action is too fast there will be excessive slippage for a short period of time with a possible burning of the surface of the belt and uncertainty as to the point of reversal.

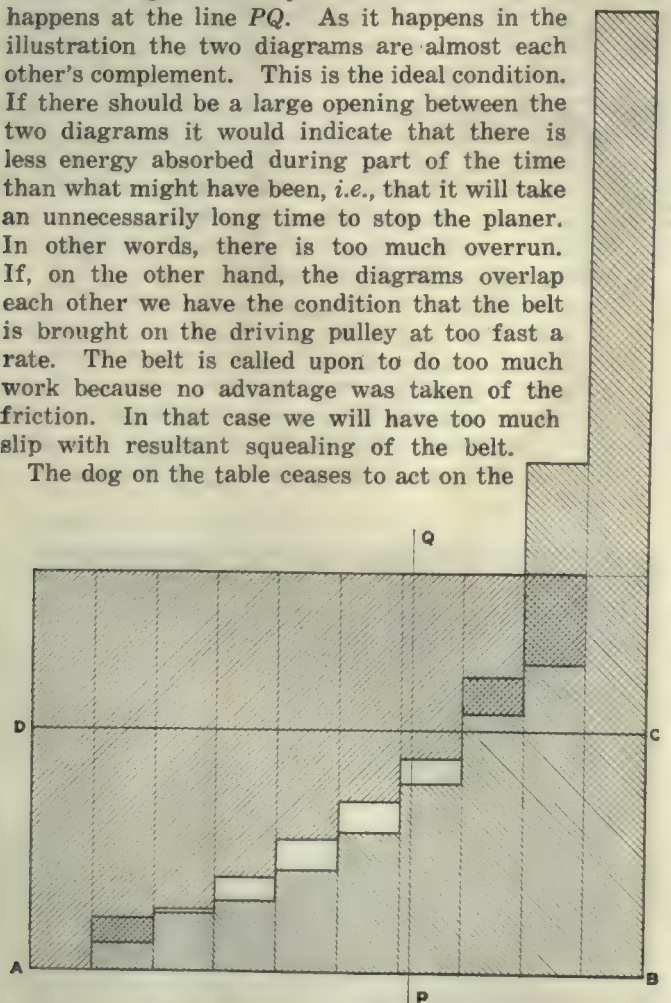


FIG. 56. COMBINATION OF ENERGY ABSORPTION CURVES OF FIGS. 54 AND 55

Why Some Tools Are High in Price

By John R. Godfrey

"A hundred and fifty dollars for that tool? Why I could make one for less than fifty if it wasn't patented. You fellows want to make too much money all at once. Come in next time you're around this way." This was the remark which greeted a friend of mine who tried to sell a new tool for use in repairing motors to a garage man. So he had to tell him a few wholesome truths.

"You're right about the cost," he said, "only you've got it too high." But that's only the beginning. Next we have to spend good money for space in the *American Machinist* and other papers to let you know that such a tool can be had. You look at the ad and tell Bill here that it looks pretty good, but you don't send us an order, even when we offer to send it on approval for 30 days. After a few weeks or months you get up ambition enough to write for a circular but even then you don't order. You don't even answer the letters we write you about it.

Procrastination Costs Money

"Circulars and letters cost money and unfortunately we have to eat while you're thinking it over. Now you want to put it off till next time I come around this way. You forget that it costs us real, hard dollars for carfare, food and hotel bills beside the other expenses I've mentioned.

"I know the price is high. But it's because you customers make it cost so much money to sell you. If a hundred men a month who really need this tool would send us their orders without my traveling all over the map to get 'em, we'd be glad to knock an even fifty dollars off the price you kick about. But as long as you make it hard for us to sell you this tool, we've simply got to pass the cost of this selling along to you. There's no other way. If you have to spend a day getting to a day's job, you've got to charge for two days somehow, no matter how it appears on the bill."

A Possible Remedy

These birds who boast about being hard to sell, who waste your time and hang off as long as possible before buying don't seem to realize that they are the ones who make it necessary for manufacturers to charge high prices. If we had some way of making each customer pay for the cost of selling him what he eventually buys, he'd wake up and save money as well as save us time and trouble.

Another Method of Machining Pistons

A Special Machine for Rough-Drilling Two Pistons at Once—Heat-treating to Prevent Distortion Later—The Final Reaming of the Piston-pin Hole

SPECIAL CORRESPONDENCE

THE Wills Sainte Claire motor uses cast-iron pistons of light construction and has some interesting methods of machining them. After cleaning and preliminary inspection, the open end is bored and faced, leaving $\frac{1}{32}$ in. in the bore and $\frac{1}{64}$ in. on the end for finish. The holes are then drilled in a special Reed-Prentice four-spindle drilling machine as in Fig. 1. This carries four pistons, and drills two of

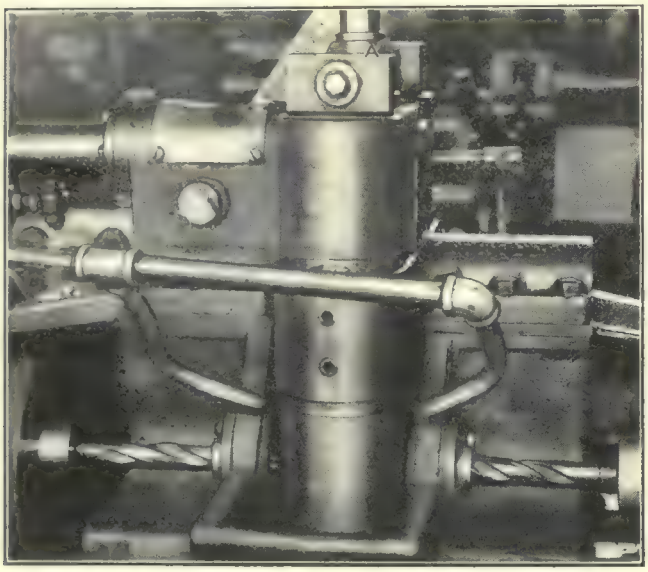


FIG. 1. ROUGH-DRILLING THE PIN HOLES

them at each feeding of the drills, the other pair of spindles being on the opposite side of the machine. The pistons are clamped by the bolt *A*, the two upper stations being loaded while the lower pistons are being bored.

The workhead carrying the pistons is supported on trunnions which bear in the bed of the machine. This arrangement supports the work rigidly and makes accurate indexing possible. The drills are guided as close to the pistons as possible to prevent the tendency of "running" on a round surface. These precautions in the rough-drilling make it easier to secure finished pistons which are accurate, and accurate pistons are a necessity in all high-grade motors. The general solidity and stiffness of the machine are indicated by the portion shown in Fig. 1. The twin branch pipes supply flooded lubrication which flows down into the base of the machine.

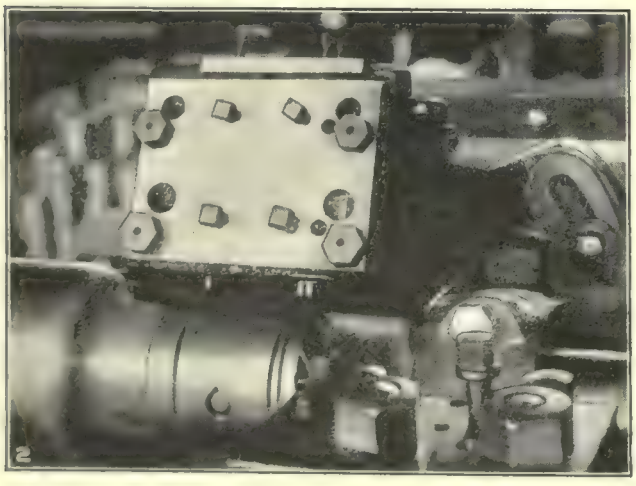
The pistons are next rough-turned on another Reed-Prentice machine as in Fig. 2. This machine also roughs the grooves with the tools in the back arm attachment, and leaves $\frac{1}{32}$ in. for finish on the outside. Heat-treating or annealing comes next, followed by another inspection. Then a slot is milled for the piston-pin cap, the end is rebored and the head is faced.

The piston-pin holes are line reamed in the fixture shown in Fig. 3. This fixture forms part of a chuck which goes on the lathe spindle and guides the reamers on both sides of the piston. A simple clamping device, not shown, makes it easy to handle the pistons in and out of the fixture.

This final reaming requires extreme care, both on the part of the workman and in the tools and fixtures used. Although the rough-drilling is from each side, it will be noted that through reaming is required for the final finish. The reamers are piloted inside the special chuck and also supported in an outer bushing to insure the desired accuracy of alignment.

The outside is next finished including the ring grooves; the relief is cut on the sides; the piston-pin hole is hand reamed; the open end is countersunk; the head is polished and the piston finally inspected before going to the assembly department.

These details of piston machining and finish give a good idea of the great care which is taken with this important part of the motor. It is in marked contrast with much of the practice of a few years ago when comparatively little attention was paid to such refinements as polishing the head and sundry other little details which make for satisfactory performance of the motor.



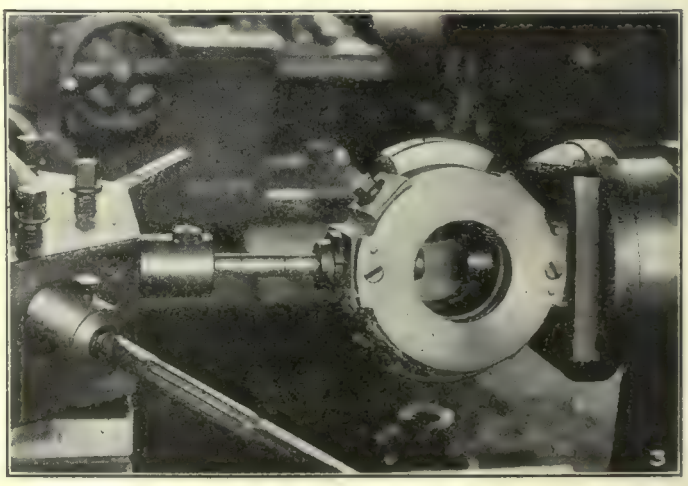


FIG. 2. ROUGH-TURNING AND GROOVING. FIG. 3. REAMING PISTON-PIN HOLES

Oxy-Acetylene Cutting Machine

Mechanically Guided Torch Cuts Intricate Shapes at Great Speed—Gas Pressure and Rate of Torch-Travel Regulated to Suit the Work

By I. WILLIAM CHUBB
Editor European Edition, *American Machinist*

WHILE the process of metal-cutting by means of the oxy-acetylene blowpipe is by no means uncommon, the results obtained do not usually compare in any way as regards finish with ordinary machining processes. In this respect, and also as to operating cost, advantages can certainly be claimed on behalf of the Godfrey oxy-acetylene jet machine made by the Godfrey Engineering Works, Wood Green, London, N. The machine itself (see Figs. 1 to 3) is fairly simple, having a double-jointed swinging frame bearing the blowpipe, etc. Two independent screw-operated slides are carried by the machine frame, and by hand or power, will give either or both of two cross movements to the cutting-jet over the work. By means of an index head these slides can be set so that cuts can be made at any angle to the axis of the machine. A circular attachment is also provided comprising a graduated revolving arm, by means of which the jet can be caused to rotate horizontally, thereby cutting a hole of any radius up to the length of the arm itself. Trepanning operations necessary for large holes are avoided and the finish resulting is ready for the reamer. In this case the work is stationary.

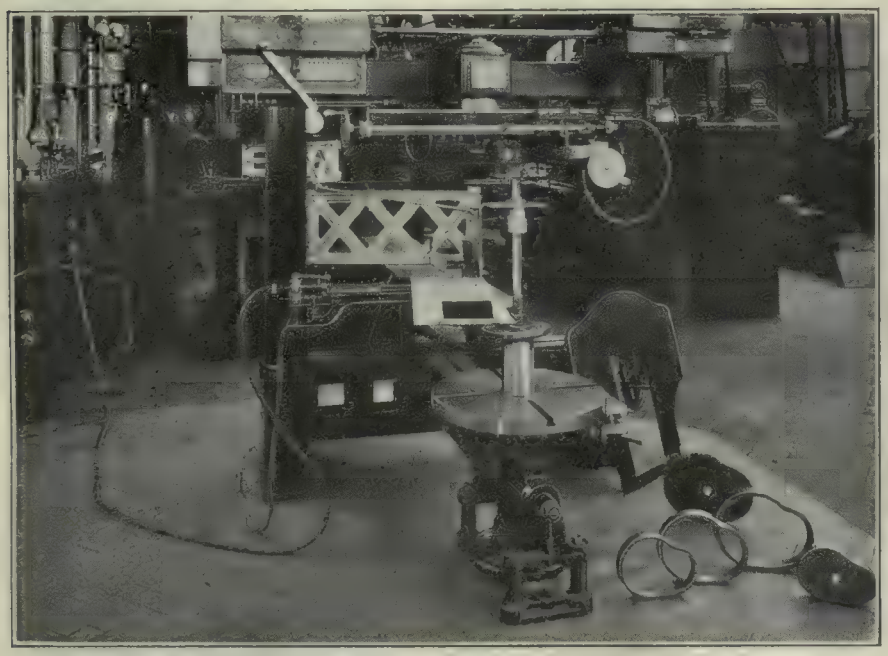


FIG. 1. THE GODFREY OXY-ACETYLENE JET MACHINE

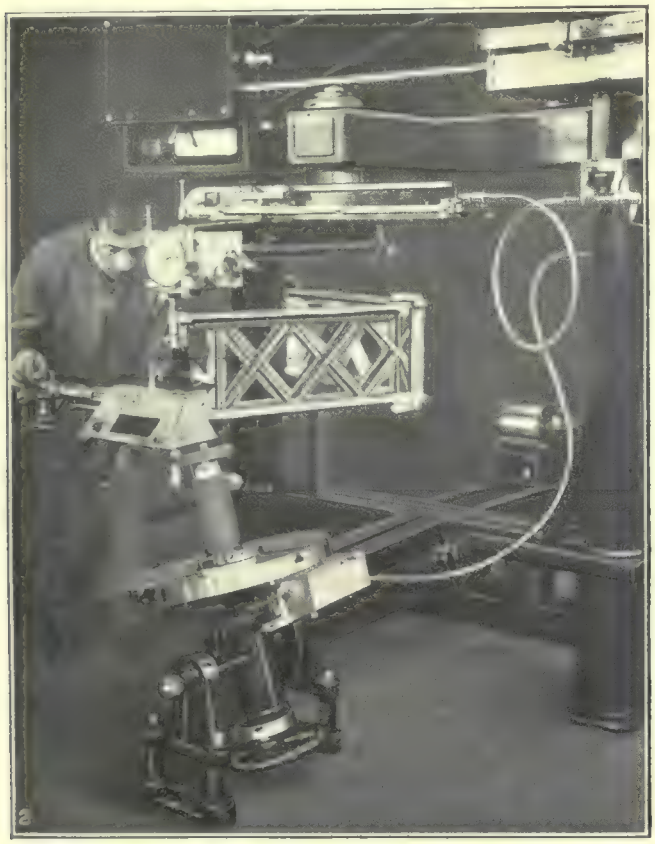
For holes beyond the range of the arm and up to 6 ft. in diameter the work is placed on a revolving faceplate or table in front of the machine. From this table a central spindle may project upward and for shapes that are other than circular the spindle will carry at the top a templet of metal, wood or fiber, against which a pin immediately above the jet on the jointed arm is kept in contact by a spring. As the table rotates the jet itself moves and thus reproduces the shape desired, the size being that of the templet when the pin is of the same diameter as the jet. Cams and other shapes larger than the templet may be cut by using a roller in place of the pin, the maximum size of the roller depending, of course, on the radius of the smallest curve on the templet. The drive of the machine is by a ¼-hp. motor and belt, friction gearing and flexible shafting being employed for the main slides and rotary movements.

The drive is by belt to a friction disk at the top of the machine and across this disk a small drum or pulley, kept in contact by a weighted lever, can be moved radially. Two of these friction drives are employed, one on each side of the machine, and the disks are calibrated for speed, the drive being by a belt on a two-speed cone and by the flexible shafts to the revolving faceplate and the two rectangular motions. Cutting speeds ranging from ½ to 20 in. per minute are obtainable, adjustments being effected by a lever within reach of the operator's left hand. The table in front of the machine is mounted on trunnions and may be raised or lowered by a screw. For cutting bevels transversely, the roller at the back of the machine can be raised so that the work can be made to lie at any angle to the horizontal. For bevel cutting longitudinally the work is fastened to the table at the front and the table is slewed to the right or left as necessary.

Besides cutting rapidly, the machine produces a particularly good finish, and this is in a large measure due to the constant feed resulting from the mechanism employed. In addition, the flame used is of a somewhat exceptional character as the gas pressure employed is low, especially for finishing purposes. The jet is small, a whirling motion being given to the mixture by rifling and other features in the blowpipe. The length of the white cone is barely $\frac{1}{16}$ in., and as the cone does not touch the work the edges of the material are not melted, the surface being left smooth. The heating flame, which is tubular, is but $\frac{1}{16}$ in. in diameter and the distance of the nozzle of the blowpipe from the work is $\frac{1}{16}$ in. The oxygen pressure employed ranges from 5 lb. per square inch upwards, mild steel plates ½ in. thick for example being best cut with a pressure of from 10 to 15 lb. The cost of oxygen per foot of a ½-in. plate, cut at 12 in. per minute is less than 1d. Finishing or washing cuts may be taken at pressures of 2½ lb. or even lower. Owing to the small area of the heating flame the acetylene consumption is less than usual.

Regulator valves are provided and a master gas tap on the blowpipe cuts off all gas without affecting these

valves, so that if the correct mixture has been determined it is at once available when the appliance is next used. The valves for oxygen and acetylene have calibrated dials and pointers. The oxygen is preheated to about 60 deg. F. above the normal temperature, the exact amount depending on atmospheric conditions. An electric resistance is used for preheating the oxygen supply pipe, the pipe being formed into a coil by a couple of turns. Preheating disperses any water that may be carried by the oxygen. Pressure in the oxygen



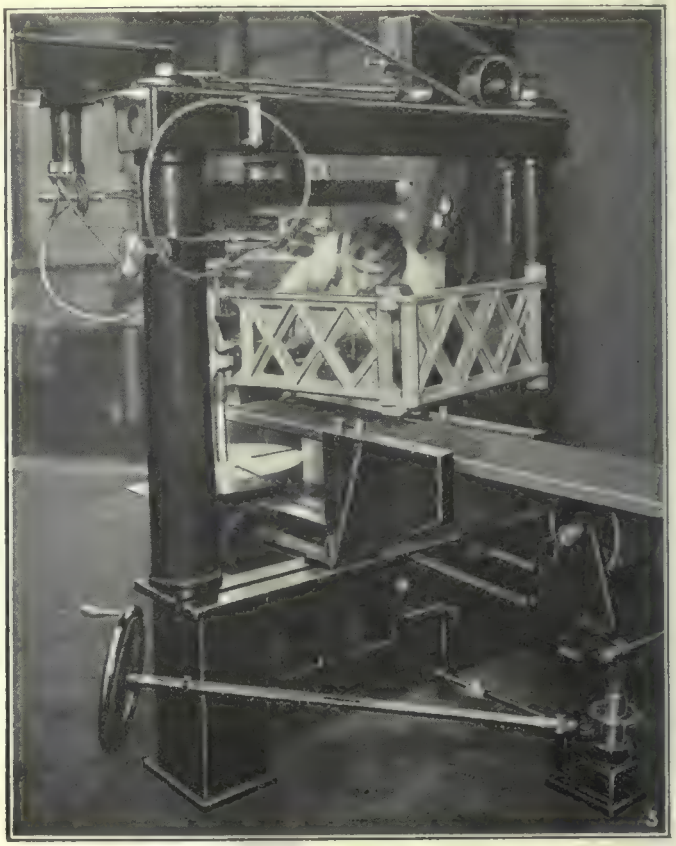


FIG. 2. GODFREY JET MACHINE CUTTING ON A PLANE. FIG. 3. GODFREY JET MACHINE CUTTING FROM A TEMPLET

cylinders is reduced from 1,800 lb. to the required value in two stages, first down to 40 or 50 lb. by one reduction valve and the balance by another reduction valve, the purpose being to avoid pressure fluctuation. Electric ignition is employed by means of an accumulator and coil, one end of which is grounded, a lever on the blowpipe bringing the sparking point to within the required distance of the nozzle. Saving of both time and gas is claimed for this device.

Cuts $\frac{1}{16}$ and even $\frac{1}{20}$ in. wide have been made with a blowpipe orifice of 0.047 in. The smallest orifice employed is 0.035 in. in diameter. Examples of work done are shown in Fig. 4, where a cam form and three cam rings are shown as cut from a 12 in. square plate $\frac{5}{8}$ in. thick, the inner cuts being 0.06 in. wide. The hole in this example was drilled, but if it is necessary to start in the middle of a plate the hole can be blown through first, preferably by a simple hand blowpipe, to prevent plugging the nozzle of the machine blowpipes by return of the oxide.

The view at the left shows five rings and a central core cut in a ½-in. plate, the diameters ranging from 1 to 9 in. The total time occupied for the six cuts was 9 min. 32 sec., the 9-in. ring taking 2 min. 46 sec., the 7-in. ring 2 min. 20 sec., and so on down to the 2-in. ring taking 48 sec. and 1-in. center 32 sec. This example suggests the use of the machine for the production, without waste, of printers' chases in a series of sizes from plates of suitable thickness, the chases being flat and without welds at the joints. Above the right-hand view in Fig. 4 will be seen a small piece of metal with dogtooth cuts, 0.055 in. wide. These cuts were made with a nozzle 0.047 in. in the bore.

At *A* in Fig. 5 is a reversing link for a steam engine commercially produced from metal 1¼ in. thick, the link measuring 12 in. across its longest dimension and the complete outline being produced in 6 min. The cam at *B*, measuring 11 x 9 x 1¼ in. thick, was produced by automatic operation in 6 min., and the hole in the middle piece *C* was cut for demonstration purposes in 2½-in. metal in 6½ min. A higher pressure is necessary for holes than for exteriors, the flame being diverted as it cuts down. For instance, a 4-in. hole in 3½-in., 35-ton tensile steel, requires a pressure of about 35 lb., whereas a cut on the exterior will call for a pressure of about 20 lb. The pressure is increased to prevent distortion of the flame. A slower flame travel is used for holes, because in going round the flame tends to trail. The maximum thickness that can be cut is about 5 in. The thicker the material the higher the pressure needed and the larger the orifice. The flame will cut material down to ¼ in. thick, but below this is apt to produce distortion.

About the other examples shown in Fig. 5 it may perhaps be sufficient to say that the ring *D* was cut from a plate 1 in. thick. The hole is 5 in. and the outside diameter 6 in. It took 30 min. 30 sec. for both cuts, while the hexagon nut *E*, 5 in. wide across the flats and 2½ in. thick, took 5 min. for the exterior and 4 min. 50 sec. for the 3¾-in. hole. Examples of work

seen by the writer included a 7-in. disk of ¾-in. metal mounted on a vertical spindle on the revolving faceplate. With the flame cone about ⅛ in. long, two cuts were taken, the first at 15 lb., the second, for finishing, at 10 lb. The time occupied was 2 min. 15 sec., giving a feed of about 10 in. per minute. The cut was square and the finish good.

Horn plates for railway cars have been cut complete in 17 min. in ¾-in. plate, the perimeter, including that of the hole, being about 12 ft. and the pressure employed 15 lb. A trimming made from a templet, different sized rollers being used for the outside and inside, produced the frame shown around the examples in Fig. 5. The metal is ⅛ x ¾ in. The cut is square and parallel all around, sharp corners being produced as shown, and no subsequent machining is necessary. It is usual to leave a small fin at the end of the cut to be removed by a file, otherwise a groove results owing to the absence of metal for the dissipation of heat.

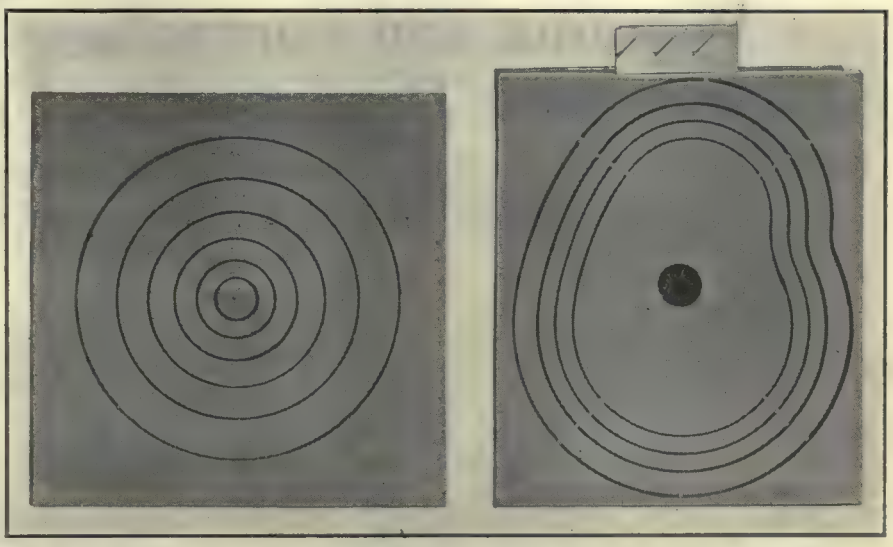


FIG. 4. CAMS AND RINGS CUT BY GODFREY MACHINE

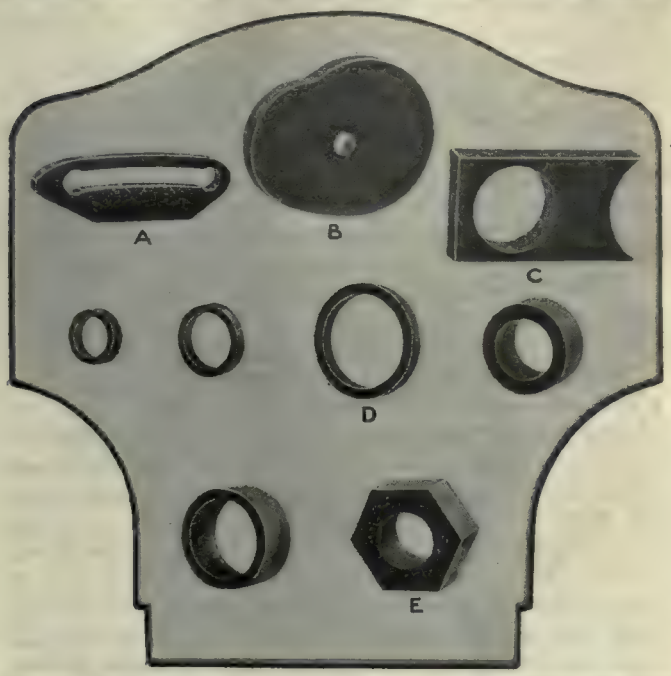


FIG. 5. EXAMPLES OF WORK CUT BY GODFREY MACHINE

By way of demonstration, gearing has been produced with from 0.002 to 0.005 in. left on the teeth for finish. Thus gears of 2-in. circular pitch mesh together and run properly, 16 teeth being cut in 16 min. in ½-in. plate. The templet used was in the form of a single tooth, the piece being indexed round. Rack teeth have been cut, and any odd shapes required may be produced either by combination of the movements of the machine or from a templet. Holes for tubes in superheater plates have been cut, the practice being to leave say ⅛ in. and then take a washing cut at a lower pressure.

The machine is adaptable to toolroom work, roughing out dies, etc., and profiling operations where the finish obtained has been found in a number of cases to eliminate further machining. It is used in the blacksmith shop, avoiding the cost of several heats on heavy masses. In shipyards heavy plates have been cut, avoiding the need for drilling and chipping and the use of power shears with their inevitable distortion of the plate and the destruction of its physical properties in the vicinity of the sheared edge. Reference has been made to the use of the machine in connection with the production of superheaters, 4-in. holes in 1⅛-in. header plates being cut in 2 min. each, the holes then being ready for reaming. Circular ends of cylindrical boilers have been cut automatically without marking out, this applying also to the welding bevel of drum tanks, produced in one cut. Where the material has been cut by the Godfrey process, the British Board of Trade investigation confirms as unnecessary the machining operations essential to remove the stressed edges as would be required in *sheared* ship and boiler plates.

For bogie frames, locomotive side frames and for similar purposes on material from ½ to 3 in. and upwards, a specially adapted form of the machine will shortly be available. The machine is of service to ship breakers for cutting old plate with a form and finish that will enhance the value of the scrap material.

The Foreman and "Labor"

By A. W. Brown

The word "labor" I put in quotation marks when I write it, because as generally used it is misapplied. It implies what is not the case, that manual workers are the only ones who labor and that no unorganized manual worker has the right to consider himself or herself in the laboring class. He or she may be in the laboring class, but is not of "labor."

The foreman occupies a peculiar position in regard to his workers. He is not of them, because he has been engaged by the management and not by them. In fact he may be more or less actively and violently opposed by some one from his shop, or from some other shop or by some one from no shop at all, who claims to represent the workers.

At the same time, he is of their stock and breeding, and can better understand them than can a member of the management. Even if the latter has been a worker of some kind, the chances are that he cannot understand the problems of any other kind; and further, probably much water has flowed under the bridges since his days as a worker and, still further, he may not be at the strategical point.

Planning and Controlling Work in the Assembling Department of a French Shop

Work Plotted on Revolving Calendar and Always Under Control of Planning Department—Forms Used for Assembly Specifications and Piece-Work Tickets

BY E. JULLIEN

A COMPLETE description of the planning system in use at the works of Messrs. Savy Jeanjean et Cie., Courbevoie, France, was published on page 889, Vol. 54, of AMERICAN MACHINIST. In that article the organization of the machine shop was fully described. The system has since been extended with very good results to the assembling floor. The manner in

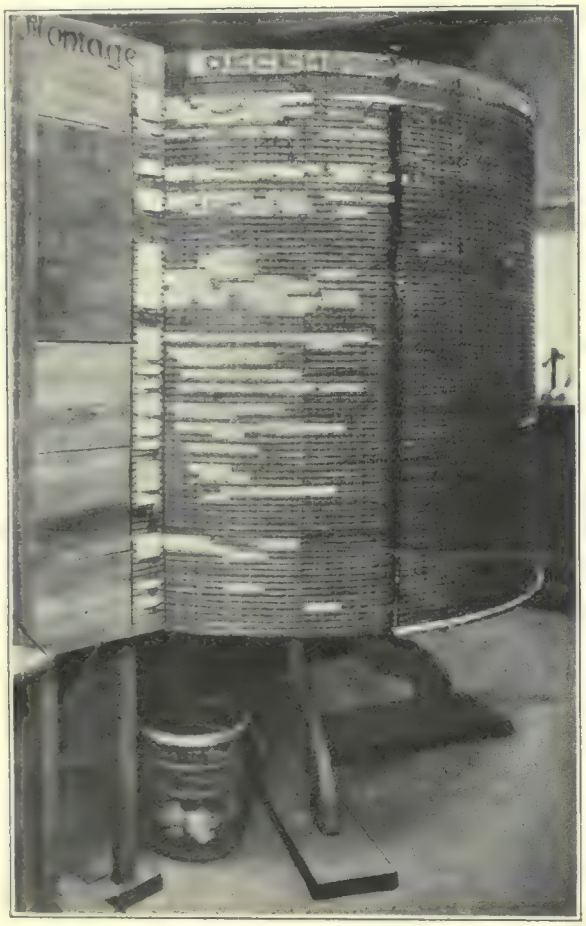


FIG. 1. THE REVOLVING CALENDAR

which the work is planned and followed out in the machine shop was fully explained in the above-mentioned article, where the use of the revolving calendar, the routing cards, the progress sheets and the calculagraph were described.

Near the revolving calendar, shown in Fig. 1, is a chart in which the following information is entered for each machine, or each lot of machines started: Order number, description of machines and date on which the machining is started, as well as the scheduled finishing date.

The assembling-shop planning department keeps in constant touch with the machine-shop planning department and follows the progress of the machining from the chart referred to above, the progress sheets and the routing cards. When the machining of one part, or a lot of parts is completed, the part or parts are delivered to the foreman who will be responsible for assembling the machine or machines for which the parts are made. The name of the foreman is written in one of the two blank spaces on the routing card and the card returned to the progress clerk to enable him to keep the progress sheets up to date. The routing card is then passed to the assembling-shop planning department where it is filed in a cabinet with all the other routing cards belonging to the same job. When the cards representing all the parts necessary to assemble a machine are in the file, all the parts have been delivered to the foreman whose name is written on the cards, and the machines can be assembled without having to wait for one or more parts which have not yet been machined.

In order to have all the assembling specifications and instructions ready in time, the planning department is always informed of the date at which the machining will be completed on any order number, so the assembling specifications and piece-work cards can be prepared in time. One of the assembling specifications is shown in Fig. 2 and a piece-work ticket in Fig. 3. The size of the assembling specification sheets are such that when folded in two they are exactly the same size as the piece-work cards.

All the assembling work prepared in the above-mentioned manner is plotted on the revolving calendar, which was described in the previous article. One half is used for plotting the machining work, the other half for the assembling work. The fixed vertical board placed in front of the drum contains the names of all the workmen employed on actual assembling. One name is placed opposite each circular strip on the drum. A plan of the revolving calendar is shown in Fig. 4. The workmen's names are grouped on the board in the same way as the men are grouped in the assembling shop, that is to say, in gangs, each foreman having charge of one gang.

The assembling work is plotted on the calendar in the following manner: Each assembling specification corresponds to a well-defined part of the work for which a certain number of hours has been allowed, say 30 hours for example. A strip of plotting paper as shown in Fig. 5 is cut to a length corresponding to 30 hours, and on that strip the following information is given: Order number, description of machine, operation, number, symbol of group workman's name and check number.

The strip is then placed on the calendar opposite the workman's name either in continuation or advance of the work he may already have in hand, the starting date corresponding to one end of the strip and the finishing date to the other. The starting date is written on the back of the workman's card as a guide to enable the clerk in the distributing office to place each card

on the distributing board, according to urgency, in such a way that the work is always given out in the same order as it has been plotted on the calendar.

When a workman finishes his work, he advises his foreman and the foreman advises the inspector who inspects the work. If all is correct, the inspector initials the workman's ticket and his copy of the assembling specification. The workman takes his specification and piece-work ticket to the distributing office where the distributing clerk looks on the piece-work card and specification to see if the work has been inspected, and if so, prints on the card the finishing date and time as well as the total time spent on the

SHEET NO. 1 — ASSEMBLING SPECIFICATION — NO. 1

DESCRIPTION OF THE MACHINE 3 Rolls refiner type 40×80 — ORDER NO. 358

NAME OF THE GROUP First motion shaft complete (2 sets) — SYMBOL 2315-6-A

OPERATION NO.	DETAIL OF WORK TO BE DONE	CONSULT DRAWING NO.	TIME ALLOWED	TIME PASSED	TIME GAINED	RECORD	REMARKS
1	Assemble friction clutch complete and fit it upon main shaft. Fit driving pinion at other end of shaft for correct position of pinion on shaft. Ream holes in pinion to drawing No. 2315. Fit key must fit tight both	2315	3" per set	2.65" per set	0.35" per set		

SIGNATURE OF CHIEF PLANNER H.L. — TOTAL TIME 5.3" 0.7" — DATE Nov 9 1921 — WORK PASSED BY ASSEMBLING FLOOR FOREMAN

FIG. 2. ASSEMBLING SPECIFICATION



ASSEMBLING

PIECE WORK CARD NO. 6532
ORDER NO. 358
SHOP No. 3
DEPARTMENT Union

OPERATION NO.	1
NUMBER OF OPERATIONS NECESSARY TO ASSEMBLE MACH.	12

PLANNING DEPARTMENT

DESIGNATION OF MACHINE 3 Rolls refiner type 40×80

GROUP SYMBOL 2315-6-A — DESCRIPTION OF WORK TO BE PERFORMED Assembling friction clutch and driving pinion on first motion shaft (2 machines)

SIGNATURE OF PREPARATOR A.F.

INSPECTING DEPARTMENT

NUMBER OF GROUPS ACCEPTED 2 — REMARKS O.K.

NUMBER OF MACHINES ACCEPTED

SIGNATURE OF INSPECTOR R.O.

TIME KEEPING AND COSTING DEPARTMENT

WORKMANS NAME Collins — WORKMANS CHECK NUMBER 54 — HOUR RATE 2.50

NUMBER OF GROUPS OF MACHINES TO BE PAID — PRICE PER UNIT 9.00 — AMOUNT TO BE PAID 18.00

TIME PASSED 6 HOURS 3 TENTHS — SALARY 13.25

TIME KEEPERS SIGNATURE M.S. — BONUS 4.75

FIG. 3. PIECE-WORK CARD

job. This being done, the clerk gives the workman the specification and drawings for his next job, as well as the piece-work card with the starting date and time printed on it. The duplicate copy of the assembling specification can now be placed in the next pocket, marked work in hand.

The finished work cards are handed over to the progress clerk who keeps the progress sheets up to date; afterwards they are sent to the time-keeping department which finds thereon the necessary information to prepare the pay card of each assembler. From the time-keeping department the cards are sent to the prime-costing department, where is provided all the necessary information to work out the cost of assembling each machine manufactured in the works. The assembling specifications are returned to the head of the planning department, filed in a special filing cabinet, and when all the assembling specifications for

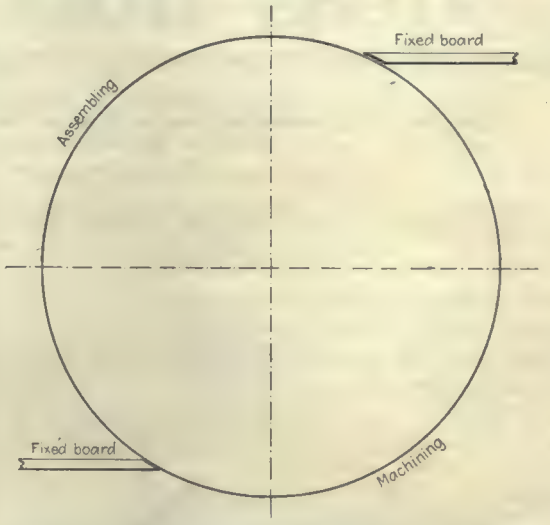


FIG. 4. PLAN OF REVOLVING CALENDAR

one machine have been filed, a summary giving the time taken for assembling the complete machine is made up on a special form, a copy of which is shown in Fig. 6.

This summary is made up duplicate, one copy is kept as a record in the planning department, the other

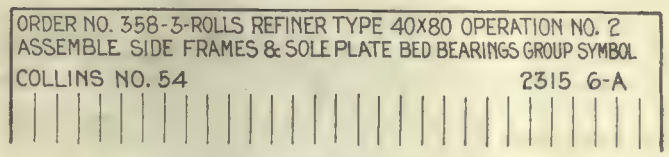


FIG. 5. THE PLOTTING STRIP

is sent to the prime-costing department and helps the cost clerk to collect all the piece-work cards which have been used to assemble any given machine and work out the cost of assembling. The system described has been in use for several months with the result that a

SHEET NO. ____ — ASSEMBLING SPECIFICATION — NO. ____

SUMMARY — ORDER NO. ____

DESCRIPTION OF THE MACHINE ____

OPERATION NO.	DESIGNATION OF THE OPERATION AND SYMBOL OF GROUP	TIME ALLOWED H	TIME ALLOWED M	MAXIMUM TIME H	MAXIMUM TIME M	MINIMUM TIME H	MINIMUM TIME M	AVERAGE TIME H	AVERAGE TIME M	LOT NO.	REMARKS
	BROUGHT FORWARD										
	TOTAL TO CARRY OVER							SIGNATURE OF CHIEF OF PLANNING DEPT.			

FIG. 6. ASSEMBLING SPECIFICATION (SUMMARY)

considerable amount of time and money has been saved on every machine assembled. It has also been found very easy to follow the progress and to give at any time the date on which any machine going through the assembling shop can be completed.

Ideas from Practical Men

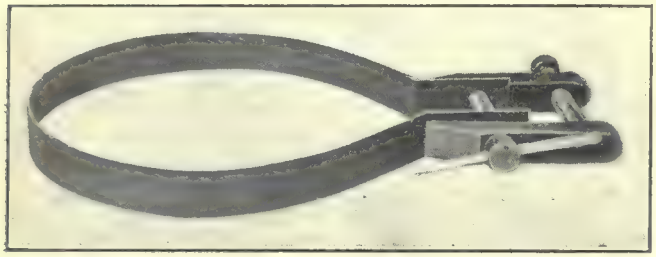
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

A Device for Contracting Piston Rings

By Harry Moore

The illustration shows how a pair of ordinary toolmakers' clamps, together with a piece of thin flat steel or strap iron, can be utilized to form a very good device for contracting piston rings.

The piece of steel is drilled near each end so as to pass over the inner screw of the clamp. In order to



A PISTON RING CONTRACTOR

facilitate the working of the tool, a short piece of wire is driven through the hole in the head of the screw. Pressure is applied with the outer screw only, the inner one being used merely to keep the jaws in line and being adjusted for that purpose only.

The tool shown was one that I made for the purpose of squeezing a number of rings together while they were tightened in a special chuck preparatory to turning the periphery.

Jigs for Accurate Drilling and Reaming

By R. Grant

The castings illustrated in Fig. 1 are quite frail and in drilling holes through the bosses, are apt to spring so that the holes will not line up accurately. The jigs for drilling the holes, while of the conventional box form, had the bushings set and clamped in V-blocks, instead of being driven in holes. The V-blocks were hardened and

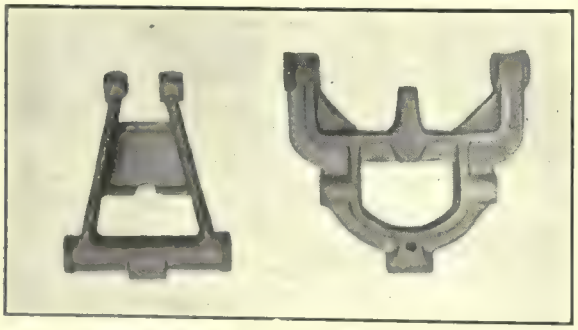
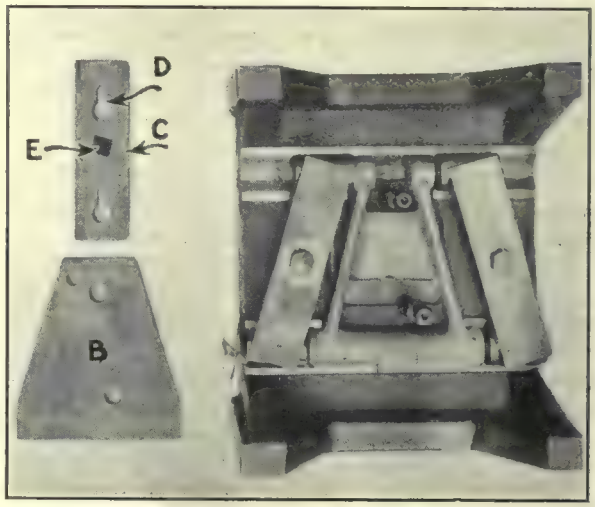
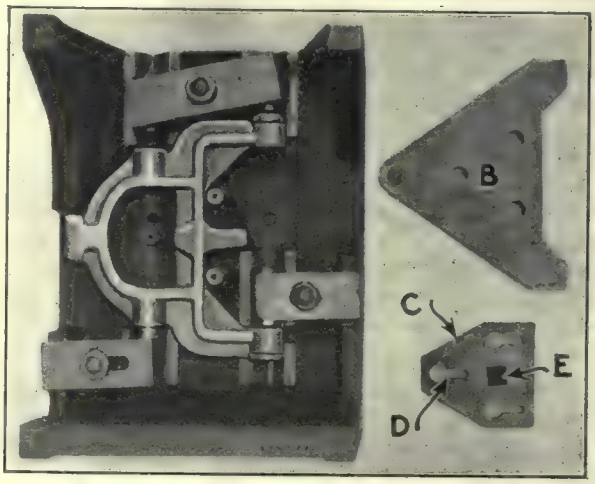


FIG. 1. THE WORK TO BE DRILLED AND REAMED

ground and clamped in grooves planed in the jig bodies. Drill bushings were readily distinguished from reamer bushings by a small groove ground around the middle. All bushings were interchangeably used in a number of jigs of similar design, thus reducing the quantity of bushings needed to the minimum.

The method of clamping the bushings in the jigs is shown in Figs. 2 and 3, which also show the work in position but not clamped. For clamping the work, the equalizers *B* and clamp plates *C* were used in the following manner: The equalizers were placed over the work on which they bore at points directly over the work-support points, being located by studs in the jig base. The clamp plates *C* were provided with keyholes as at *D*,





FIGS. 2 AND 3. METHOD OF CLAMPING THE BUSHINGS AND WORK

and were set over the equalizers, the studs passing through the round parts of the keyholes. Flats on the sides of the studs below the ends permitted the clamp plates to slide on the studs, the flats engaging with the elongated part of the keyhole and holding them in position against pressure in line with the studs. When in this position, tightening the central screws *E* clamped the work through the equalizers.

In some cases the holes were drilled through from one side of the casting, while in others the drilling was done from opposite sides. In operation the jigs rested on sub plates provided with leveling screws and were trammed up from the drilling machine spindle until practically dead true, so that a satisfactory degree of accuracy was attained.

A Shop Man's Method of Figuring Change Gears

By George Heald

On page 678 of American Machinist, W. G. Andrews submits a method of figuring compound gearing which is, as he says, "simplicity itself," but I am impelled to make the same criticism of it as he aims at the method outlined by J. Crommel in an earlier issue—that it does not go far enough.

His method is applicable to all lathes that are geared even; that is, when the gears on the main spindle and on the inner end of the stud have the same number of teeth. If these two gears have different numbers of teeth then the pitch of the leadscrew cannot be used as the numerator of the fraction.

On an even-geared lathe, equal gears on the stud and leadscrew will cut a thread of the same lead as the leadscrew. If, on the other hand, the fixed gear on the stud should have twice as many teeth as the corresponding gear on the main spindle, equal change gears placed on stud and leadscrew will produce a thread that has twice as many turns per inch as the leadscrew.

On an uneven-geared lathe the proportion would be as follows: *As the lead of the thread that will be cut with even gears, is to the lead desired to be cut, so will be the number of teeth in the change gear upon the stud to the number of teeth in the corresponding gear upon the leadscrew.*

There is still another complication. On a lathe that carries two gears upon the intermediate stud in a ratio of 2 to 1, 3 to 1, etc., the factoring must be done so that one of the fractions obtained will be of the same ratio.

Take the first example cited by Mr. Andrews; ratio 2 to 1, leadscrew 4, thread to be cut 40. Factoring, we have $\frac{4}{40} = \frac{1 \times 4}{5 \times 8}$. Since the fraction $\frac{4}{8}$ is of the ratio 2 to 1, the same as that of the intermediate gears, it need not be carried further. Multiplying $\frac{1}{5}$ by 20 we have $\frac{20}{100}$ as the gears required.

Formula for Tap Drill Size

By J. R. Owens

Most formulas for determining the tap drill sizes for threaded holes are difficult to remember. Here is one that is easy, both to keep in mind and to apply. Though it may be old, I have never seen it in print and it may serve to help some of the younger members of the fraternity. It applies to the U. S. F. thread and is recommended only for the ordinary run of work that does not require exact figuring.

Subtract the fraction represented by the pitch from the nominal size of the tap.

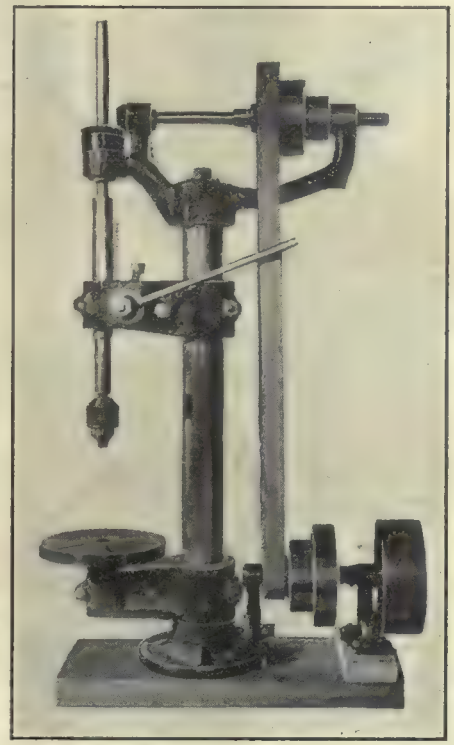
Example: Tap, $\frac{1}{2}$ in., 13 pitch: $\frac{1}{2} - \frac{1}{13} = 0.500 - 0.077 = 0.423$ = size of tap drill.

Home-made Drill Press

By M. Shutt

Having need for a small drill press for my shop and having more time than cash at my disposal last winter, I decided to capitalize some of the surplus time by building the machine. The result, as the accompanying cut will show, is a good, serviceable machine at a nominal cost.

Only four patterns were required. One is represented in the top casting that carries the bearings for the upper horizontal shaft and upper end of spindle; one for the two brackets, alike, that support the quill and the work table respectively; one for the base of the machine; and one for the two pedestals, also alike, in which the lower horizontal shaft runs. The column is a piece of 3-in. cold-rolled shafting; the bevel gears were from the differential of a wrecked automobile and needed but little machining to fit them for their new duties; the cone pulleys were built up from thin sections of hard wood and provided with steel collars setscrewed to the shafts; and the table was the faceplate of a 12-in. lathe, fitted to a hollow stud that screws into the plate and is turned to fit the hole bored in the end of the bracket. One advantage of this construction is that any chuck that fits the lathe will also fit the drill press and may be put in position as readily upon the one as upon the other.



A HOME-MADE DRILL PRESS

Both ends of each bracket are split and provided with clamping screws, so that either may be moved up or down on the column, or the table turned around or swung to one side. The pattern for these brackets was provided with suitable bosses so that a power feed could be added whenever I have the time and ambition.

A $1\frac{3}{4}$-in. plank forms the foundation of the machine, to which the base and the outboard pedestal are lagged. The driving pulleys and the feed rack were the only other castings used, and these were found in the accumulation of odds and ends that represent no negligible part of the assets of the small repair shop. All other parts were made from bar stock and most of them required little machining.

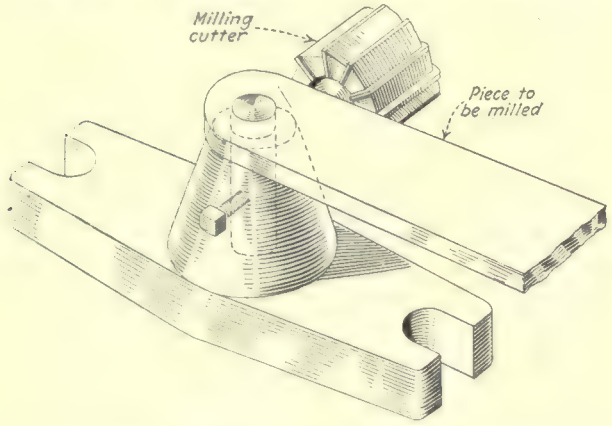
The spindle has a No. 2 Morse taper hole and is fitted with a chuck to hold drills up to $\frac{1}{2}$ in. Above that size standard taper shank drills up to 29/32 in. are accommodated. The machine will drill to the center of a 15-in. circle and the maximum distance from the table to the lower end of the spindle is about 12 inches.

Simple Radius Milling Device

By Joseph J. Sanders

The sketch shows a simple milling fixture that has been in use in our factory for some time for milling the radius on the ends of small links.

The links are set over the stud as shown and swung



RADIUS MILLING DEVICE

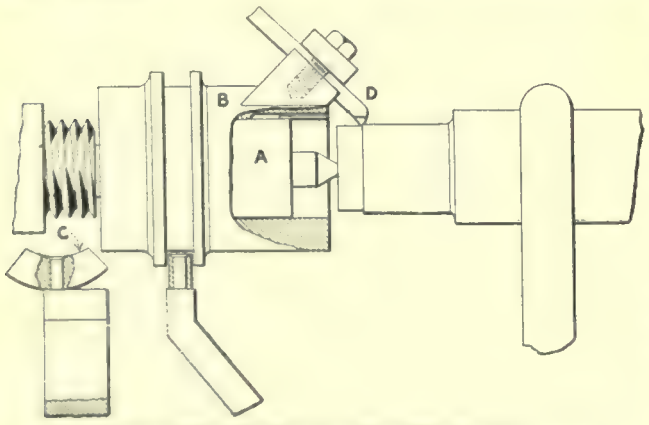
around by hand. We have milled as many as 180 pieces an hour with this device.

Tool for Re-turning End Journals of Lift Shafts

By F. M. A'Hearn

In repairing the valve gear of locomotives one of the jobs that is often slighted by reason of the difficulty in handling it, is the re-turning of the journals at the ends of a lift, or tumbling shaft. Because of the arm to which is connected the reach rod, this shaft will not swing in a lathe unless that machine is so large as to be out of all proportion to the work to be done. A not uncommon practice is to heat and bend the reach rod arm parallel to the shaft, so that the latter will swing in a comparatively small lathe; then to straighten it again after the turning is completed.

Many times this work is neglected entirely. The renewal of the bearings in the lift-shaft stands are considered sufficient, regardless of the slack that soon develops, resulting in needless vibration and hammering at this point. This is particularly liable to occur in valve motions of the Stephenson type, in which the lift shaft is swung upon rather short bearings supported by the main frames, with no means of adjustment other than renewal.



TURNING END JOURNALS OF LIFT SHAFT ARMS

The tool shown in the sketch has been in service for some 15 years and the writer is often asked for sketches or drawings from which it may be duplicated in other shops.

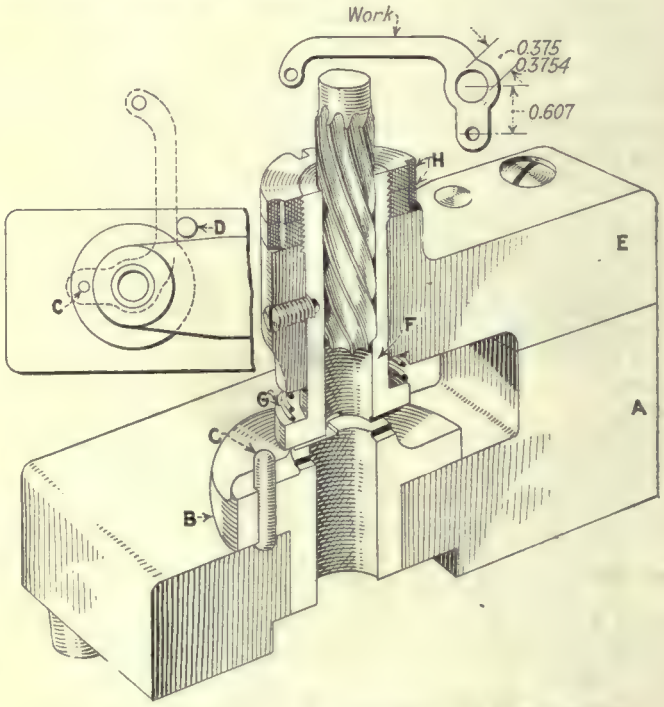
The arbor *A* may be bored and threaded to fit the spindle nose or, as is probably more convenient, provided with a taper shank to fit the center hole. The sleeve *B* slides freely upon the arbor and is driven from it by means of a feather. A stud, driven in the end of a tool shank and fitted with a short swiveling block *C*, to enter the groove in the sleeve, provides for the feed movement.

The lift shaft is placed upon centers with the reach rod arm resting upon a block of wood on the lathe shears, the tool shank fastened in the toolpost of the carriage, and the toolbit *D* adjusted to the cut. The operation should be quite obvious from the sketch.

Jig for Reaming Small Parts of Sheet Metal

By C. Stevens

The jig in the accompanying drawing is used to ream a hole 0.375 in. in diameter in a small lever made of cold rolled steel of 0.078 in. thickness. It is necessary that this hole be square with the surface, round,



JIG FOR THE ACCURATE REAMING OF THIN PARTS

smooth, and to size within a tolerance of — 0, + 0.0004 inch.

A standard spiral fluted reamer is used, the flutes running parallel to the axis of the reamer for a distance of $\frac{1}{8}$ in. at the entering end. As many as 50,000 holes have been reamed with one reamer, all being within the 0.0004 in. limit and as smooth as glass.

The body of the jig *A* is made of machine steel. It is bored to receive the hollow plug *B*, in which is the locating pin *C*. This plug is of tool steel, hardened, and with its upper surface ground parallel to the base of the jig. Another locating pin *D* in the body of the jig serves to prevent the work from turning with the reamer.

The bracket *E* is of tool steel and is fastened to the body by means of fillister head screws and dowels.

A guide bushing *F*, hardened, ground, and lapped, is a sliding fit in the bracket, and its internal diameter is as close a fit to the reamer as is practical.

The under side of the bracket is counterbored to form a cell for the spring *G*, which bears against the shoulder of the bushing *F* and thus exerts a pressure upon the work as the latter is pushed under it. The height of the bushing is determined by the position of the lock collars *H* so that the opening between the bushing and the hollow plug *B* is a trifle less than the thickness of the work.

The jig is clamped to the table of a drilling machine with the reamer bushing in line with the spindle. A small pump added to the equipment of the machine keeps a stream of oil on the reamer and washes away the chips.

Repairs by Electroplating

By F. H. Sweet

In reference to the discussion in American Machinist as to the practical value of electrical depositions of metal to compensate for wear, I would say that in many cases worn parts can be restored to their original dimensions by this method. Nickel is good for this purpose because of its hardness.

The part should be thoroughly cleaned and dipped in melted wax. When the film of wax has cooled it is scraped away from the surfaces which require treatment, and the part immersed in the plating bath. As the metal is deposited very slowly it is easy to work to very close limits; yet, if sufficient time be allowed, the deposit may attain a thickness of $\frac{1}{32}$ in. or more.

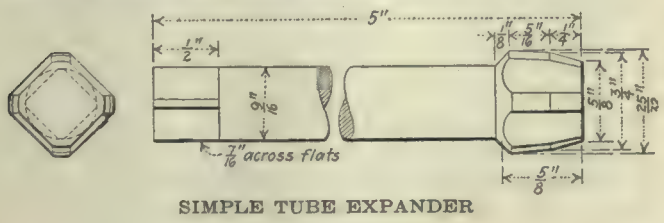
If the operation be properly carried out the nickel adheres to its foundation very tenaciously and is quite continuous and of even thickness throughout. In this way expensive and heavy pieces, such as crankshafts, cylinders and pistons can be made serviceable again at a cost far smaller than that of a new part. At the other end of the scale very slight wear in delicate machinery, in which close adjustment is essential, may be put right by the deposition of a film of the exact thickness required.

Simple Tube Expander

By J. Greig

The accompanying sketch illustrates a tube expander which was successfully employed where brazing or sweating were prohibitive, metal to metal joints being the requirements, and no other form of tube expander at hand. Apart from its usefulness, its simplicity and cheapness will appeal to most readers. The tubes to be expanded were $\frac{3}{4}$-in. internal diameter.

At first the expander was driven by hand, but progress was very slow and the work laborious, so it was decided to use it in a vertical drilling machine with the assistance of a tap driver. This was successfully accomplished and after experiment with various lubricants, wagon grease was finally adopted.

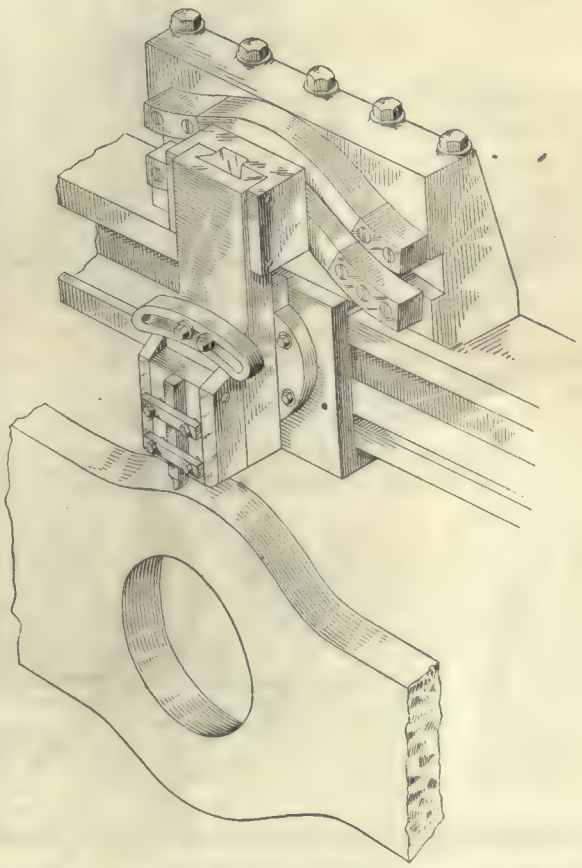


SIMPLE TUBE EXPANDER

Radius Planing Device for Stern Posts of Ships

By Alonzo G. Collins

When the cry from Uncle Sam was for "ships" and "more ships," a planer hand was making bad weather of the job of manipulating two feed screws on a 7-ft.



METHOD OF PLANING CURVES WITH CAM DEVICE ATTACHED TO PLANER

planer in an endeavor to coax the point of the cutting tool to follow the designer's curves around the propeller shaft bearing-hub of a cast-steel stern post; and as the handles of said feed screws were at times nearly 7 ft. apart, the planer hand was in a fair way to qualify as a mountain climber, even if he did have the longest reach of any man in the shop.

It soon developed that this method was not getting the production desired, and the writer was called upon for help. The device shown in accompanying drawing was the result, and when it was installed the effect on the planer hand was such that he was enabled to catch up on the baseball news in his favorite paper.

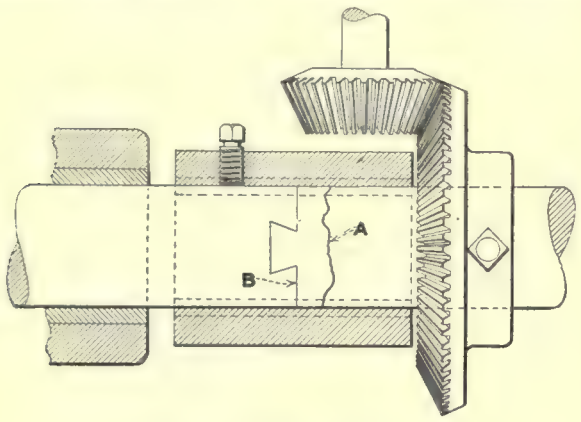
The drawing is almost self-explanatory, but I will add that the cam bracket was attached to the cross-rail of the planer by five 1½-in. screws, and the cam roller bracket was attached to the upper end of the toolslide with eight $\frac{7}{8}$-in. screws. The down-feed screw in the saddle was removed, leaving the toolslide supported and controlled by the cam roller in the cam slot as the saddle was fed across the work by the regular cross-feed screw.

Owing to the difference in shape of the stern post on opposite sides of the center, it was necessary to make two cams, as when the work was turned over the relative positions of the curves were reversed.

Repairs to Crankshaft of Motor Boat

By C. M. May

The crankshaft of a four-cylinder, two-cycle engine, used on a motorboat broke at point *A* shown in the accompanying sketch, and because of the position of



JOINING A BROKEN CRANKSHAFT

the miter gears (which drove the magneto) a flange coupling could not be placed at this point to join the broken ends.

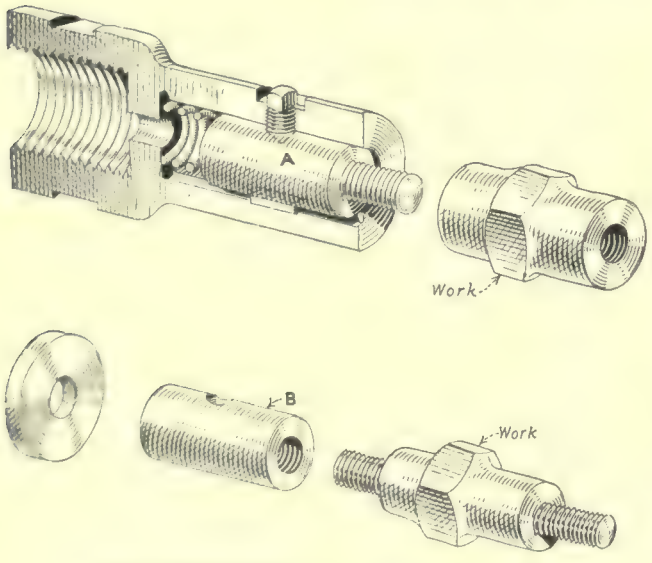
I sawed off the shaft at the point *B*, squared it up and cut the dovetail as shown. A new piece of 2-in. shaft was correspondingly dovetailed to fit and a cast-iron bushing bored to drive over the joint. Two keys, shown by dotted lines in the sketch, assisted in the driving and the bushing was prevented from moving endwise by two small setscrews.

The boat has been in daily service for six months and the shaft has given no further trouble at the joint.

Second Operation Chuck for Brass Turners

By Thomas W. Airey
Gainsborough, England

A very handy and easily made chuck to hold small threaded parts for second operations is shown in the accompanying illustration. It is especially serviceable to brass turners. The feature of the chuck is the ease with which the work can be released after it is finished.



BRASS TURNINGS FOR USE IN SECOND OPERATION CHUCK

The shell of the chuck is threaded to screw on the spindle nose of the lathe in the usual way. The outer end of the shell is bored and finished true and smooth to take the stud pin *A*, which should be hardened. A feather in the stud pin engages with a spline in the shell, so that both parts must rotate together.

A somewhat sharp pointed setscrew through the shell enters a corresponding depression or countersink in the stud pin and should be set up tightly before placing work on the chuck.

After the work on a piece has been completed, instead of getting a wrench to release it just loosen the setscrew slightly. The spring back of the stud pin will push the shoulder of the work away from the end of the shell and the work may be spun off the thread with the fingers.

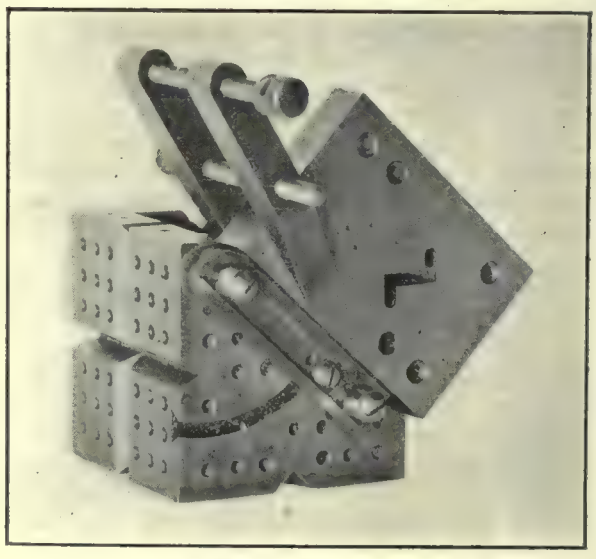
Stud pins of various sizes and threads may be made to adapt the chuck to a variety of work. A bushing with a threaded hole instead of the stud pin, but having otherwise the same characteristics, as at *B*, accommodates work having a male thread. If the shoulder of the work is smaller than the hole in the end of the shell, a carefully faced steel washer may be used between them.

A Handy Sine Bar Block

By Joran Kyn

A block for use on the surface plate in connection with a sine bar and on the usual laying out tools contained in a toolmaker's kit, is a very convenient article.

Such a block is illustrated herewith and it will be



HANDY SINE BAR BLOCK

seen that numbers of tapped holes are provided for the attachment of a sine bar in all sorts of positions. Accurate V-grooves in all faces afford an opportunity for holding punches and other tools with round shanks while laying off other parts to give lines for machining.

With the sine bar pivoted by a screw at the upper end and provided with a clamping bolt to engage in the circular dovetailed slot, as shown in the illustration, the bar can be swung and clamped at angles not provided for by any of the tapped holes. The block shown herewith is in use in the shops of the Phono Parts Corporation, 124 Pearl St., Brooklyn, N. Y.

Editorial

Keep On Coming Back

"IF THINGS keep up the way they were last month we'll begin to feel as though we were in the machinery business again." This remark from a machine tool builder who dropped in the office this morning is typical of the sentiment in many directions these days.

The automobile industry, probably the biggest machinery buyer of all, had its banner month in May when it turned out over 250,000 cars. A good deal of the material that went into those cars was purchased recently and at the bottom of the market, and as a result balance sheets at the end of June, 1922, are going to be far more cheerful than those of June a year ago.

Manufacturers of motor cars know better than to expect the early season rush on touring cars to continue, but they also know that the average car owner has set his heart on having a closed car "next time" and they are getting ready for the fall weather when glass windows and a solid roof look pretty good even to the most confirmed dust eater.

Other branches of the machinery industry have not been so fortunate as the transportation suppliers but they have also felt the revival of trade and are becoming busier. They may not have the closed car trade to look to and produce for next fall but there is likely to be something in their particular field that corresponds if they are wise enough to recognize and go after it.

Summer is on us with the vacation season and the vacation spirit. By all means take the recreation and rest that you need to keep you in good trim, but don't let your business take a vacation just because it is summertime. It is a pretty poor organization that slows down when the boss is away. The scheme of having under-studies for every job is a pretty satisfactory one when the hot weather comes and key men need a little time off occasionally to keep them fit. Trained substitutes are anxious and able to make a showing.

We have started to come back, let's keep on coming in spite of the weather and the season.

Forced Lubrication and Scored Bearings

THE letter on another page of this issue on the observations of a service station mechanic as to the scoring of bearings of motors which have a forced oil feed, is worth the consideration of designers of all kinds of machinery. There is an undoubted tendency toward forced lubrication and there seems to be much in its favor. If, however, the experience of repair men is that such bearings score more frequently than bearings lubricated by the splash system, it is up to us to find the reason.

There seems to be but one remedy and that is a more careful attention to the purity of the oil used. The old idea of securing economy by saving in lubricating oil, seems to be severely jolted by this letter. There can be no question as to the value of lubrication obtained from a constant and copious supply of clean oil forced between the bearing surfaces. If this method of lubrication causes scored bearings it can only be because the lubricant carries with it impurities of such a nature as to cut the surfaces between which it is pumped.

The remedy does not seem to be in abandoning forced lubrication but in providing better methods of insuring that the oil forced to the bearings shall be free from abrasive substances. Better filter screens and a more frequent changing of the oil would seem to be the answer rather than a return to splash lubrication.

Those who have studied this question carefully can testify to the rapid accumulation of fine particles in the oil. This is readily seen as a discoloration and felt between the fingers as a sort of sludge. While it does not feel especially gritty, it is certainly not a lubricant and its effect in motor bearings indicates that it has a cutting action which scores both crankshafts and bearings.

Useless Patents

THERE are two arguments for monopoly patents—to prevent a competitor using a device which may be vital to your business, or to enable you to manufacture and market it at a profit. The reason for the first is apparent, but the only justification for the latter is the existence of a sufficient market to make it a profitable undertaking. And in too many cases this is not carefully considered.

There are many instances where a mechanic devises a new tool or machine which aids greatly in getting out production. Considering only the returns which a few inventors have secured, they spend their good money for a patent without stopping to canvas the probable sales and the cost of getting it into the hands of the user. This seems to be particularly true of the men in railroad shops, although it may be that more such cases have come to our attention.

There are two serious objections to these ill advised patents. They waste the money of the inventor and they prevent the use of tools which would be of considerable benefit to the country at large, could they be used in even the comparatively few shops for which they are fitted. This is a case where the payment of a small royalty by whoever cared to use the device would benefit all concerned.

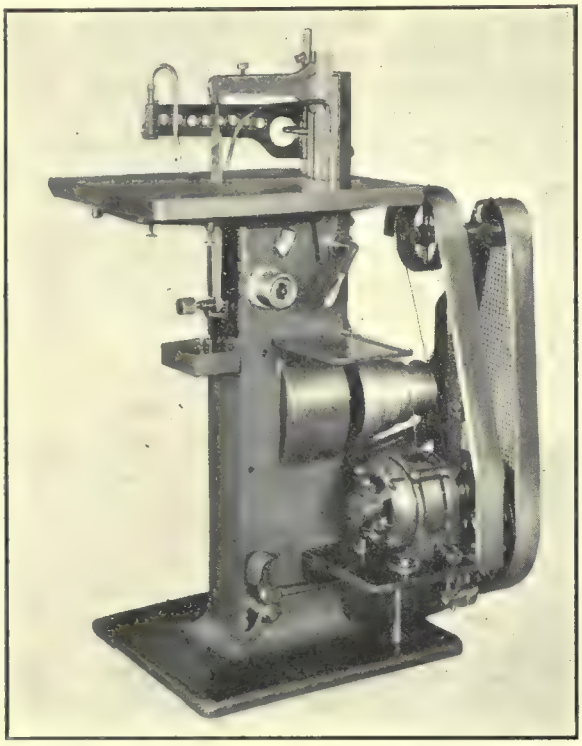
Anyone who contemplates spending money on a patent with a view to profiting thereby, should first carefully consider the possible market and then the percentage of this which can probably be secured. He should count carefully the cost of selling which is very frequently much more than the actual cost of manufacture. This will in most cases be sufficient to deter him from spending the money for a patent, especially if he has secured the advice of a good salesman as to the cost of marketing.

Eliminating evèn ten per cent of the patents which cannot possibly pay a suitable return would save the inventors thousands of dollars and greatly relieve the congestion of the patent office.

Shop Equipment News

Oliver High-Power Filing Machine

The Oliver Machinery Co., Grand Rapids, Mich., has recently brought out the large-capacity high-power filing machine that is herewith illustrated equipped



OLIVER HIGH-POWER FILING MACHINE

with a motor drive. The main column is a casting having a wide flange to form the base. A large tool shelf is fastened to the column, as well as a removable box for catching filings.

The length of the stroke is adjustable by means of an eccentric inside the column that is easily accessible. This eccentric is connected to the vertical sliding mechanism by means of a telescoping connecting rod, which permits the use of files from 3 to 14 in. long. The four-step cone pulley is directly connected to the eccentric shaft. The moving parts are balanced by a counterweight so as to give smooth operation.

The table measures 20 x 24 in. and is provided with diagonal grooves for filings. It tilts for draft or clearance in all four directions. The work-clamping arm swings over the table and the pressure with which it holds the work down on the table can be regulated. The work may easily be forced against the file by the operator without danger of it being lifted with the file and thus injuring the operator's fingers.

The head has an arrangement of a cam inside of the cone pulley to relieve the file $\frac{1}{32}$ in. on the up stroke, thus lengthening the life of the file. A pump having a swinging nozzle blows the filings from the point of contact of the file and work.

The slide is 18 in. long and is made of machine steel, with the lower arm of cast steel welded to it. Provision is made for adjusting the lower arm, so as to line up the file to make the cutting edge parallel with the finished surface desired on the work. The slide is driven by means of a four-step cone pulley that gives speeds from 80 to 320 strokes per minute. The length of the stroke is adjustable from $\frac{1}{2}$ to 7 inches.

The machine can hold and drive files from a 3-in. needle size to a 14-in. bastard, either standard or special. Although work up to 9 in. high may be filed, for constant filing 6 in. should be taken as the maximum work height.

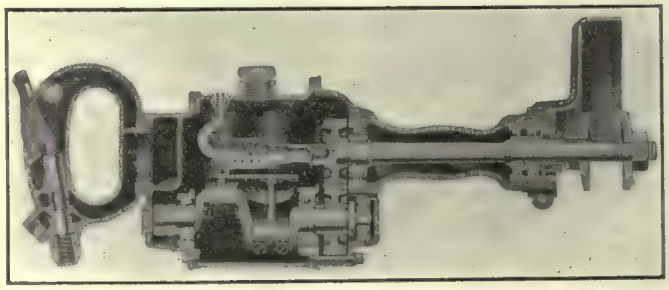
An overhead support arm for filing closed-bottom dies can be furnished, and also a lower support clamp for use in filing closed-top dies. A sawing attachment consisting of upper and lower arms for holding hacksaws can be fitted. By means of a toting truck the machine can be made portable.

The motor required has $\frac{1}{2}$ hp. at 1,800 r.p.m. It can be mounted as shown and belted to the speed-reducing jackshaft that has a yoke support. Thus the outfit is self-contained. The floor space required is about 22 x 38 in. and the weight about 700 pounds.

Developments in Chicago Pneumatic Grinder

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has recently made some changes in the design of its pnuematically operated portable grinder. A wire brush for use in place of a grinding wheel has been developed. The brush makes the equipment applicable to such work as removing rust, paint and scale from steel and iron surfaces. It consists of a $\frac{1}{8}$-in. steel back plate dished so as to better retain the wires, and a $\frac{1}{8}$-in. front plate having a series of slots through which the wires extend. The wires are grouped in thirty renewable units of heat-treated crucible steel.

Particularly when used with the wire brush, the air motor is required to deliver continuous service. In



CHICAGO PNEUMATIC GRINDER WITH OIL SEPARATOR

order that the bearings may be better lubricated and need oiling only occasionally, an oil separator has been fitted to the grinder. The device enables continuous service for 48 hours, or even longer, without replenishing the supply of lubricant.

As can be seen in the accompanying sectional view

of the grinder, the oil separator consists of a perforated cylindrical steel shell attached to the inner end of the grinding spindle. This shell revolves around the vent tube, and the oil-laden air leaving the motor passes through the holes in the shell. The centrifugal action causes the oil to be separated from the air and thrown back into the mechanism. The air then escapes free from oil. The separator is applicable to the larger sizes of the "Little Giant" grinders.

Ettco High-Speed Tapping Attachment

The Eastern Tube and Tool Co., 594 Johnson Ave., Brooklyn, N. Y., has recently placed on the market the sensitive, high-speed tapping attachment that is shown in Fig. 1. The device has a capacity of $\frac{1}{16}$ in. in steel and $\frac{1}{4}$ in. in cast iron or brass. Its extreme light weight should be noted, as the complete unit weighs only $3\frac{3}{4}$ pounds.

The tapping spindle is driven through friction clutches on both the forward and the reverse motion. The friction drive on the reverse motion is of especial importance, because of the fact that taps are frequently broken when backing out of the hole.

The arrangement of the mechanism can be seen in Fig. 2. The shank in the spindle of the drilling machine drives directly the upper cast-iron cone. This cone carries a gear that drives the train of gears operating the lower cone. Thus, both cones are driven at the same time, although in opposite directions. Between the upper and lower cones is a third conical member faced with leather on both sides. This cone is mounted on the spindle driving the tap by means of an Oldham coupling, so that it is free to center itself on the two other cones and does not tend to throw the spindle out of alignment when driving.

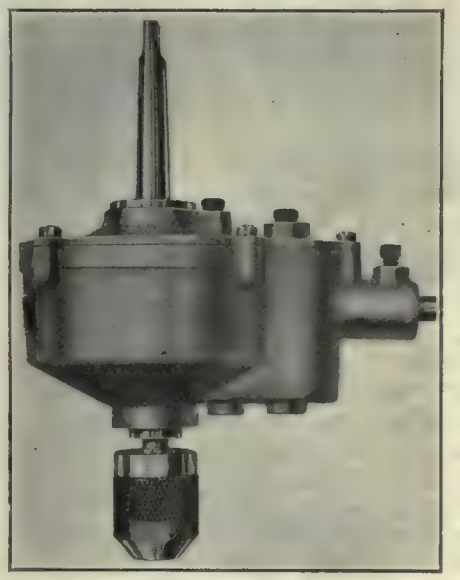


FIG. 1—ETTCO HIGH-SPEED TAPPING ATTACHMENT

The tapping spindle is fitted over a projection on the shank for most of its length, so that it is held in alignment. In addition, it is carried and supported in a bearing in the lower half of the aluminum housing. Both the upper and the lower bearings can be easily oiled, and the oil cannot reach the leather friction surfaces. The journals are hardened and ground, and run in phosphor-bronze bearings. It should be noted that the thrust of the cut is transmitted directly back to the spindle of the drilling machine, without being carried by the housing of the attachment.

When the drilling machine is running idle, the tap is naturally rotated in the reverse direction, since the driven friction cone rests on the bottom driving cone. As soon as the tap is brought to the work, a movement of $\frac{1}{16}$ in. upward brings the driven cone in contact with the upper driving cone, which drives the tap while it is cutting the thread.

The speed of the tap can be easily regulated by the pressure placed on the drilling machine spindle. As soon as the tap encounters an obstruction, the clutch slips and prevents breakage. When the bottom of the hole has been reached and the drilling machine spindle is raised, the driven cone comes in contact with the lower driving cone, and is caused to run in the reverse direction at a speed twice that of the forward speed.

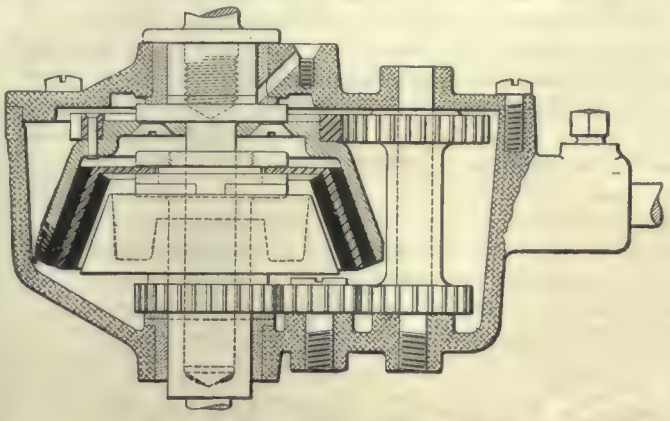


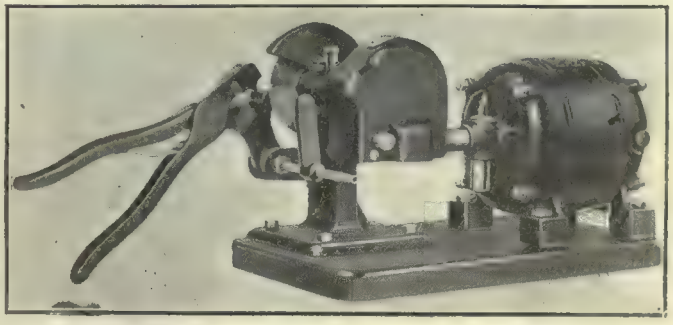
FIG. 2—SECTIONAL VIEW OF ETTCO TAPPING ATTACHMENT

A rod in the housing prevents the device from rotating with the spindle of the drilling machine. A special type of tap-holding chuck that provides a slight play for the tap is provided. This chuck gives additional protection against breakage, as it permits the tap to follow the drilled hole, in case the spindle is not in exact alignment with that hole. The entire unit is only $5\frac{1}{4}$ in. in height from the nose of the chuck to the spindle of the drilling machine. The smoothness of operation is stressed by the maker, as well as the speed and the safety with which the holes can be tapped.

Triangle "Rapid" Bench Saw

The portable bench saw shown in the accompanying illustration for cutting small metal stock has recently been developed by the Triangle Metal Products Corporation, 31 Dartmouth St., Rochester, N. Y. The saw is made in two sizes, the No. 1 machine being intended to cut metal from $\frac{1}{8}$ to $\frac{1}{2}$ in. in diameter and the No. 2 from $\frac{1}{2}$ to 1 in. in diameter. The saws used are interchangeable.

A $\frac{1}{3}$-hp. 110-volt enclosed motor arranged for either a.c. or d.c. to suit the type of current available, drives the saw through a worm gearing. The speed of the saw is ordinarily 110 r.p.m., although it can be made



TRIANGLE "RAPID" BENCH SAW

greater for cutting soft material such as brass and copper. The circular saws are $\frac{1}{32}$ in. in thickness and $3\frac{1}{2}$ in. in diameter. They are hollow-ground, so as to provide clearance for the teeth. The saw is covered by a guard. Due to the thinness of the saws, very little stock is wasted in the cutting-off operation.

The work-holding device is equipped with handles that permit of very rapid operation and clamping. The device clamps and holds either round, square or hexagon stock without any change in the arrangement. A stop for adjusting the length of the piece cut is also provided.

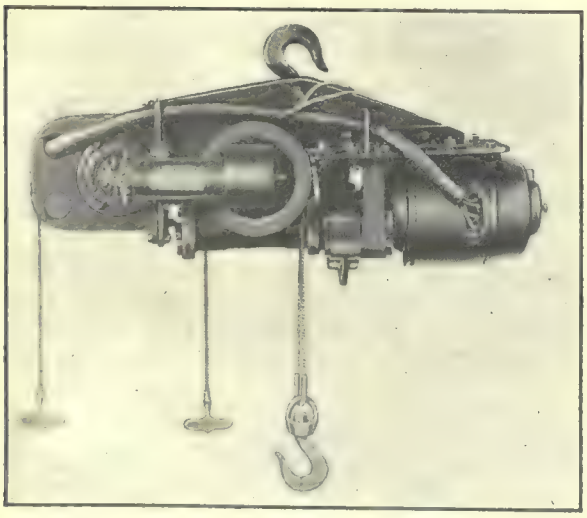
It is stated that $\frac{1}{2}$-in. round cold-rolled steel rod can be cut through in 30 sec. and $\frac{5}{8}$-in. round brass rod in 5 sec., and that brass rod $\frac{7}{16}$ in. in diameter has been cut at the rate of 18,000 pieces per hour. The weight of the machine complete is 40 pounds.

Reading Type-S "Everedy" Electric Hoist

In the accompanying illustration is shown the Type-S "Everedy" electric hoist that has recently been placed on the market by the Reading Chain and Block Corporation, Reading, Pa. The hoist is intended especially to replace hand-power chain hoists, and for this reason it is light in weight and runs at rather high speed. It is stated to be substantial and rugged enough to withstand continuous service, and it has a guaranteed over-load capacity of 50 per cent.

The hoist is very similar in construction to the other electric hoists made by the concern. It is equipped with a mechanical motor brake which operates in conjunction with the control lever. It has an automatic limit stop that acts at both the bottom and top limits of the movement and is adjustable for any desired height of lift.

The hoist is balanced, so that the lifting hook is always central with the point of suspension. The rope is guarded to prevent over-winding. The gears are packed in grease and the bearings are protected to

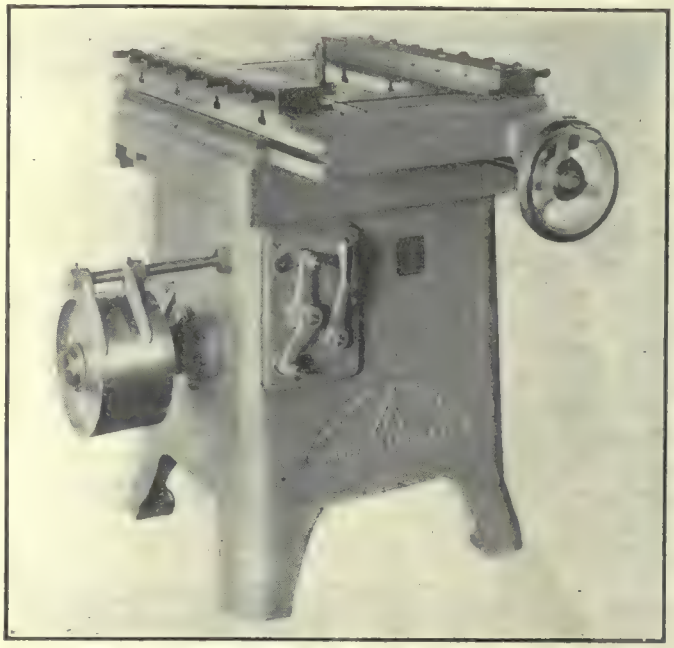


READING TYPE-S "EVEREDY" ELECTRIC HOIST

prevent loss of oil. The location of the motor may be observed in the accompanying illustration. The hoist may be controlled by pendant cords or by a push-button switch. It is made in sizes for lifting loads from 500 to 4,000 lb. at high speed. It should be noted that the hoist requires very little head room.

Billings & Spencer Die-Milling Machine

The Billings & Spencer Co., Hartford, Conn., has developed a machine for milling dies and similar kinds of work of irregular outline. Though the machine em-



BILLINGS & SPENCER DIE-MILLING MACHINE

bodies the principles of the older and well-known type of machines for this purpose, it contains many features that have hitherto been applied only to other classes of machinery.

Power may be transmitted from the lineshaft to the tight and loose pulleys of the constant-speed drive shaft of the machine, which should run at approximately 300 r.p.m. A speed-change gear box provides four changes of spindle speed ranging from 281 to 926 r.p.m., the change being accomplished by the movement of two conveniently placed levers.

The spindle is provided with a lever-operated collet that grips the cutters firmly and yet releases quickly and easily. This lever is located upon the side of the machine within easy reach of the operator. Special collets are provided with each machine to hold cutters with shanks $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1 in. in diameter. Cutters may be so held as to permit any degree of draft.

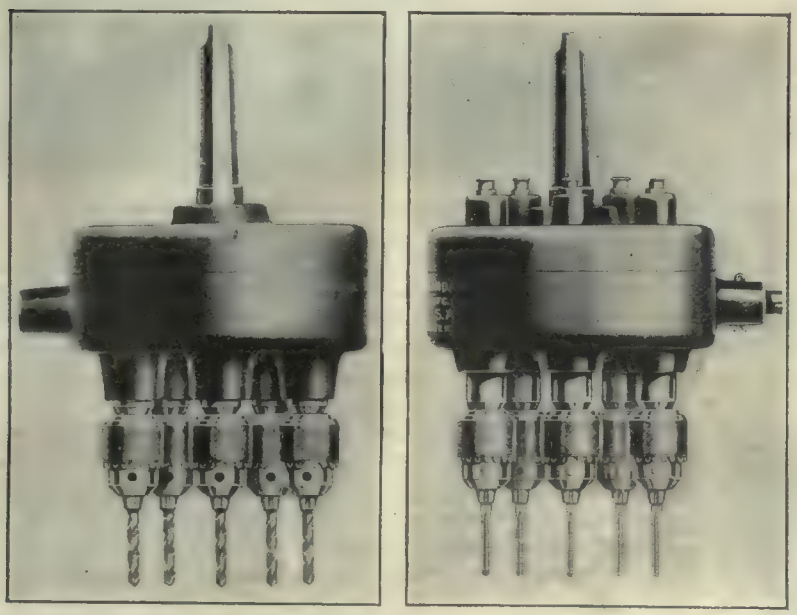
A double sliding carriage forms the upper part of the machine, upon which may be clamped dies or other work from $3\frac{1}{2}$ to $17\frac{1}{2}$ in. wide and of any length. This carriage permits a traverse movement of 12 in. and a cross movement of $4\frac{1}{4}$ in. Either movement may be operated independently or in conjunction with the other, and the actuating screws are provided with graduated dials by means of which close measurements and adjustments may be obtained. The slides are of the square lock gib type, so that they cannot lift under pressure of the cut, and have ample bearing surfaces.

All rotating members of the machine are mounted upon well lubricated ball bearings, and a force-feed oiling system supplies ample lubrication to all moving parts. The upper part of the column is so designed as to carry away the chips from the cutter and is easily accessible for cleaning. The construction of the bearings and slides is such that chips or sediment cannot work in from the outside.

Because of the fact that the work lies in the carriage right side up and with the cutter entering from below, the operator's vision is unobstructed and the lay-out is at all times under his observance. The machine occupies a floor space of 49 by 58 in. and weighs approximately 2,000 pounds. It is driven directly from the line shaft by a 2½-in. belt without a countershaft.

Landau Multiple-Spindle Drilling and Tapping Heads

The Models E and F back-geared tapping chucks recently placed on the market by the Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y., were described on page 906 of *American Machinist*. A multiple-spindle head operating on the same principle and designated as the Model H is shown at the right of the accompanying illustration. The head is equipped with five tapping spindles equally spaced on the circumference of a circle. The distance from the center of the driving spindle to the centers of the tapping spindles is 2½ in. on the head shown.



LANDAU MODEL K DRILLING HEAD (AT LEFT), MODEL H TAPPING HEAD (AT RIGHT)

The main driving spindle is mounted on ball bearings. The speed of reversal is four times as fast as that of the forward speed. The device employs standard chucks to hold the tap, and the capacity is up to ¼ in. Clutches disengage when too great a strain is placed on the taps. The taps can be fed right down to the bottom of the hole, and they stop automatically without danger of breaking when an obstruction is encountered. The outside of the housing is smooth and there are no projecting screws on it.

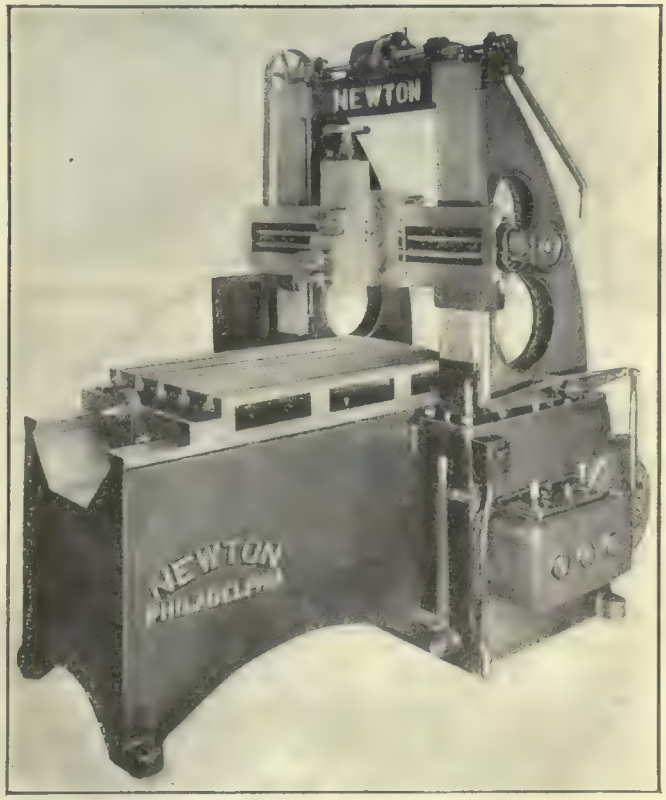
At the left of the illustration can be seen the Model K multiple-spindle head used for drilling the holes before the Model H head is employed. The head is similar in construction to the Model H, although it is not, of course, fitted with a reversing mechanism. The main drive has ball bearings, and the drilling spindles also are equipped with ball bearings and have standard taper shanks for carrying the drills. The two heads can be used in conjunction with each other to drill and tap a number of holes simultaneously and to give a high rate of production on such work.

Newton Crank Planer

In order to provide a heavy-duty tool for short-stroke work, the Newton Machine Tool Works, Inc., 23rd and Vine Sts., Philadelphia, Pa., has just placed on the market the crank planer shown in the accompanying illustration. The machine is made with either one or two heads on the crossrail, as may be required, and has a capacity of 32 in. in width and 32 in. in height, with a maximum stroke of 34 in. The base is a one-piece, box-type casting. The uprights are of box section, bolted and doweled to the base.

The motor is mounted on the off side of the planer and speed variation is controlled by the gear box shown in the illustration. The hardened steel gears in this box are of the sliding type and fully enclosed to run in oil. All driving bearings are bronze bushed. The main driving gear is of the helical type and has a 4½-in. face and is 37 in. in diameter. It drives the rocker arm and gives a relatively uniform cutting speed with the advantage of a slightly lower speed at the start of the cut. The quick return has a speed ratio to the forward speed of 1¾ to 1. The length of the stroke can be set from the operating side, an indicator being provided to show the length. Provision has been made for speeds of 6 to 35½ strokes per minute. Cuts ⅜ in. deep with from $\frac{1}{16}$ to ⅛ in. feed may be taken on forged steel.

The table is of double-plate construction. It is provided with an adjustment of 20 in. along the bed, which adjustment can be made while the machine is stroking. After the table has been positioned, the driving element can be clamped in position by the square-end shaft shown at the end of the table. Control of the table motion is through a clutch



NEWTON CRANK PLANER

and a brake operated by the lever at the operating point. Provision is made for locking this lever out of position, so that the machine cannot start and possibly injure the operator.

The feed motion is of the double-cycle type, operating on the return stroke of the table. It is transmitted to the crossrail through a rack and pinion, giving cross, down and angular feeds. The crossrail is raised and lowered by power derived from the belt shown in the illustration. The planer is especially suitable for machining die blocks, forming dies, locomotive crossheads, shoes, wedges, or other short-stroke work.

Madison-Kipp Automatic Force-Feed Machine Tool Lubricator

An automatic force-feed machine-tool lubricator that has recently been developed by the Madison-Kipp Corporation, of Madison, Wis., is illustrated in Fig. 1. The lubricator is in principle similar to those formerly made by the concern. A grooved plunger is operated from a double eccentric, so that it rotates on its upward and downward strokes and causes a registration of the inlet and outlet ports with the grooves in the plunger. No ball and spring valves are employed. The lubricator can be made for lubricating any number of positions, and can be installed on large automatic machines or simple bench grinders and single-spindle drilling machines.

Either four or eight positions can be lubricated from

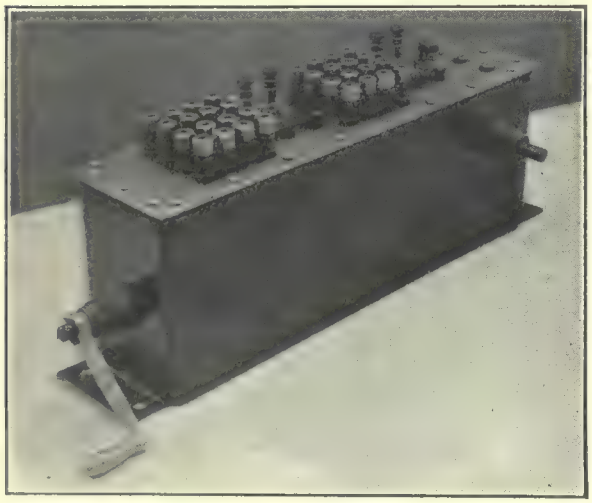


FIG. 1—MADISON-KIPP MACHINE-TOOL LUBRICATOR

each pumping unit. An eight-feed lubricator need be no larger than the standard two-feed lubricator, although it may have a large reservoir if required. The lubricator is driven by the machine it lubricates, and therefore starts and stops with the machine and delivers oil only while the machine is running. The time of the operator is saved, as it is necessary merely to replenish the oil in the reservoir, instead of oiling all oil holes on the machine.

The lubricator consists of a reservoir and cover. Fixed to the cover and working in the oil are the pumping units for measuring and forcing the oil to the feed outlets and bearings. There is no pressure tank with choke-valve outlets.

The amount of oil delivered can be regulated from as little as one drop up to ten drops per eight revolutions of the pump drive shaft. The adjustment for each set of eight feeds is made by means of one slotted-

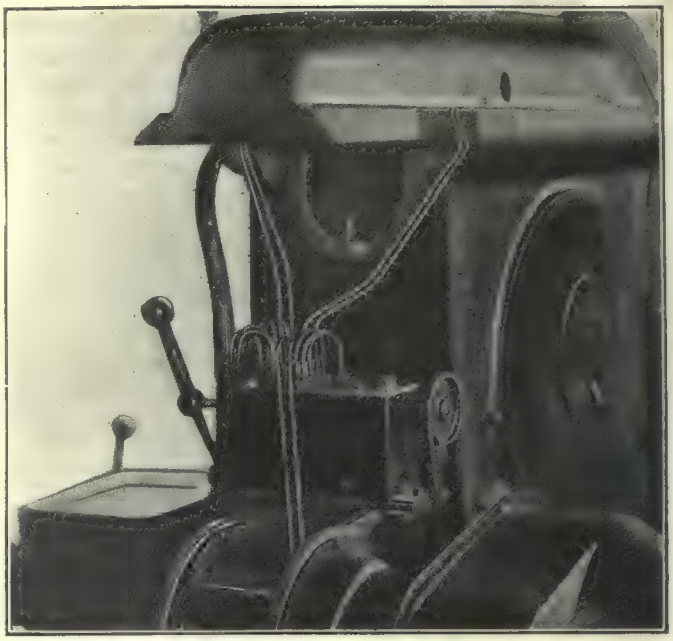


FIG. 2—LUBRICATOR ATTACHED TO SHAPER

head screw shown on top of the lubricator. The other slotted-head screws mounted on the test connectors are employed when it is desired to observe the amount of oil being delivered by each unit. Changing the speed of the lubricator drive shaft makes possible a further regulation of the amount of oil delivered.

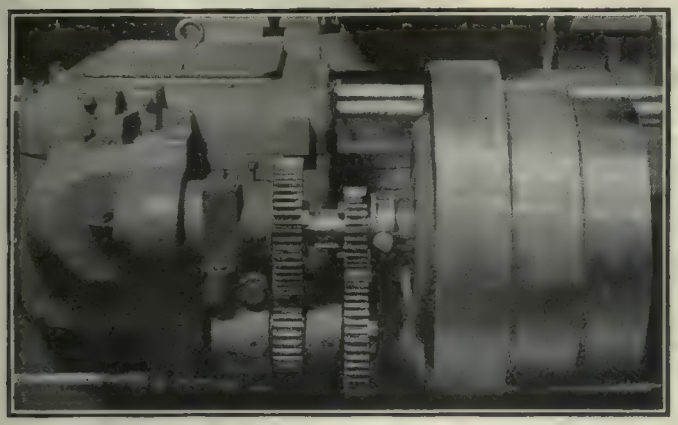
The 32-feed lubricator illustrated is arranged for belt drive with the driving shaft located on the side of the reservoir. The drive of the lubricator may be of the ratchet type requiring a reciprocating motion, or it may be arranged for pulley drive from a rotating shaft of the machine. The device can deliver oil against high pressure.

Each reservoir is provided with an oil-level indicator and a large filler cap and strainer. The lubricator illustrated with a pipe plug instead of filler cap is for use in a large system where oil is filtered and re-used. The drive shaft may be placed on either the side, end or top of the lubricator. Since the pumping, measuring, and driving mechanisms are all attached to the cover of the lubricator, the reservoir can be made a part of the casting of a machine, so that the lubricator becomes an integral part of the machine. When desirable the lubricator may be had with two compartments, allowing the use of two different grades of oil.

In Fig. 2 is illustrated a 16-feed lubricator attached to a 26-in. motor-driven shaper. The lubricator is belt driven from the clutch shaft. All points originally provided with oil hole covers are connected to the lubricator, and each way of the ram is provided with two oil leads. The oil consumption is stated to be one pint to fifty hours of machine operating time.

Slow-Speed Drive for Cincinnati Boring Mill

The Cincinnati Planer Co., Cincinnati, Ohio, has recently developed a mechanism for its boring mill to provide slow speed, as well as the ordinary range of speed of the table. This mechanism is shown incorporated in the drive in the accompanying illustration. The machine on which the device is here fitted is a 7-ft. boring mill that is arranged for speeds about 30 per cent in excess of the standard speeds, so that it can work effectively on locomotive driving boxes and



SLOW-SPEED DRIVE ON CINCINNATI BORING MILL

other brass parts. The addition of the slow-speed device enables the turning of tires on the same machine, a speed as slow as ⅔ r.p.m. being obtainable.

In the position shown the reducing gears are operating, and the table would move at low speed. By sliding the small upper gear into the clutch of the larger gear, direct drive can be obtained so as to utilize the regular speeds of the boring mill.

A special cover serves to protect all of the gearing, and also the shifter rod for sliding the gear into engagement. The arrangement makes the machine capable of both very high and very low speed, and the device does not interfere with the operation in either range.

Stow Radial Flexible Shaft Outfit

A mechanism for driving a large flexible shaft from a lineshaft without the use of an individual motor is illustrated herewith. The device has recently been developed by the Stow Manufacturing Co., Inc., of Binghamton, N. Y. The chief feature is the pivoted horizontal arm, which enables the operator to work



STOW RADIAL FLEXIBLE SHAFT OUTFIT

over a large area. The arrangement of the counterweight for the arm, and of the driving belt, can be easily seen.

The radial flexible shaft outfit is adapted particularly to use in garages, repair shops and vulcanizing plants. Besides being used for grinding and buffing, it can be employed for drilling, or operating a screwdriver. The mechanism can be supplied in various sizes to suit different classes of work.

B. & S. "Rex" Micrometer

The "Rex" micrometer has just been brought out by the Brown & Sharpe Manufacturing Co., Providence, R. I. to afford a high-grade precision tool at a low price. This line of micrometers is furnished for either English or metric measure and includes twenty-four sizes of micrometers to take measurements up to 24 in.,

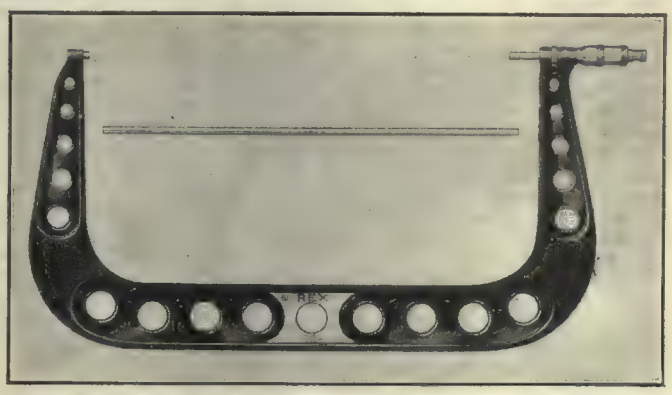


FIG. 1. B. & S. "REX" LARGE MICROMETER

or 600 mm. The micrometer is regularly provided with a clamping ring to clamp the spindle and preserve the setting.

A feature is the rectangular shape of the frame, a construction that gives greater measuring capacity than



FIG. 2. REX 1-IN. MICROMETER

frames of the circular type. Hole are used in the larger sizes to lighten the frames, as can be seen in Fig. 1. The anvil, spindle and other parts of the tool are similar to the parts of the regular Brown & Sharpe micrometer and means are provided for adjustment for wear of the measuring surfaces and screw.

In Fig. 2 is shown the No. 11, 1-in. micrometer without a clamping ring or ratchet stop. It is the smallest and simplest tool for the line, and hence the most reasonably priced. The frame is of I-section. In larger sizes the bends in the frame are reinforced, so as to increase the rigidity. There are holes in the web on the largest frames.

It is claimed that, while the price of these micrometers is low, their accuracy is held to the Brown & Sharpe standard. In the larger sizes, the micrometers can be provided with finished wooden cases. The tools can be furnished singly or in sets.

and a brake operated by the lever at the operating point. Provision is made for locking this lever out of position, so that the machine cannot start and possibly injure the operator.

The feed motion is of the double-cycle type, operating on the return stroke of the table. It is transmitted to the crossrail through a rack and pinion, giving cross, down and angular feeds. The crossrail is raised and lowered by power derived from the belt shown in the illustration. The planer is especially suitable for machining die blocks, forming dies, locomotive crossheads. shoes, wedges, or other short-stroke work.

Madison-Kipp Automatic Force-Feed Machine Tool Lubricator

An automatic force-feed machine-tool lubricator that has recently been developed by the Madison-Kipp Corporation, of Madison, Wis., is illustrated in Fig. 1. The lubricator is in principle similar to those formerly made by the concern. A grooved plunger is operated from a double eccentric, so that it rotates on its upward and downward strokes and causes a registration of the inlet and outlet ports with the grooves in the plunger. No ball and spring valves are employed. The lubricator can be made for lubricating any number of positions, and can be installed on large automatic machines or simple bench grinders and single-spindle drilling machines.

Either four or eight positions can be lubricated from

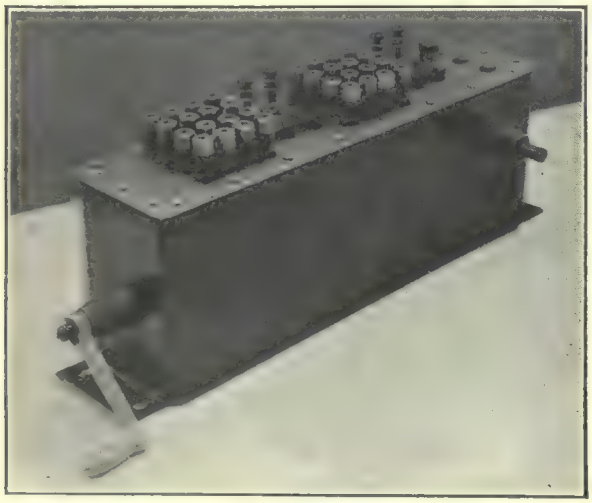


FIG. 1—MADISON-KIPP MACHINE-TOOL LUBRICATOR

each pumping unit. An eight-feed lubricator need be no larger than the standard two-feed lubricator, although it may have a large reservoir if required. The lubricator is driven by the machine it lubricates, and therefore starts and stops with the machine and delivers oil only while the machine is running. The time of the operator is saved, as it is necessary merely to replenish the oil in the reservoir, instead of oiling all oil holes on the machine.

The lubricator consists of a reservoir and cover. Fixed to the cover and working in the oil are the pumping units for measuring and forcing the oil to the feed outlets and bearings. There is no pressure tank with choke-valve outlets.

The amount of oil delivered can be regulated from as little as one drop up to ten drops per eight revolutions of the pump drive shaft. The adjustment for each set of eight feeds is made by means of one slotted-head screw shown on top of the lubricator. The other slotted-head screws mounted on the test connectors are employed when it is desired to observe the amount of oil being delivered by each unit. Changing the speed of the lubricator drive shaft makes possible a further regulation of the amount of oil delivered.

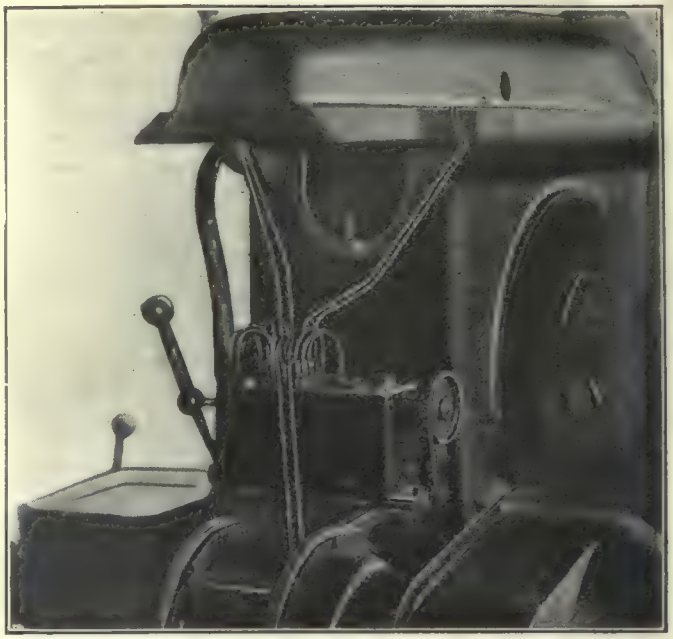


FIG. 2—LUBRICATOR ATTACHED TO SHAPER

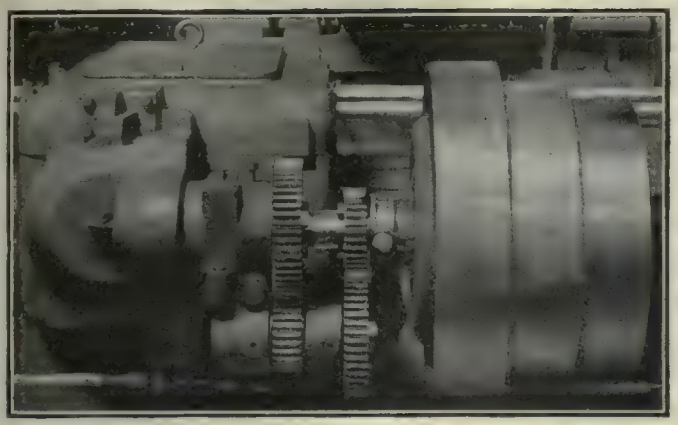
The 32-feed lubricator illustrated is arranged for belt drive with the driving shaft located on the side of the reservoir. The drive of the lubricator may be of the ratchet type requiring a reciprocating motion, or it may be arranged for pulley drive from a rotating shaft of the machine. The device can deliver oil against high pressure.

Each reservoir is provided with an oil-level indicator and a large filler cap and strainer. The lubricator illustrated with a pipe plug instead of filler cap is for use in a large system where oil is filtered and re-used. The drive shaft may be placed on either the side, end or top of the lubricator. Since the pumping, measuring, and driving mechanisms are all attached to the cover of the lubricator, the reservoir can be made a part of the casting of a machine, so that the lubricator becomes an integral part of the machine. When desirable the lubricator may be had with two compartments, allowing the use of two different grades of oil.

In Fig. 2 is illustrated a 16-feed lubricator attached to a 26-in. motor-driven shaper. The lubricator is belt driven from the clutch shaft. All points originally provided with oil hole covers are connected to the lubricator, and each way of the ram is provided with two oil leads. The oil consumption is stated to be one pint to fifty hours of machine operating time.

Slow-Speed Drive for Cincinnati Boring Mill

The Cincinnati Planer Co., Cincinnati, Ohio, has recently developed a mechanism for its boring mill to provide slow speed, as well as the ordinary range of speed of the table. This mechanism is shown incorporated in the drive in the accompanying illustration. The machine on which the device is here fitted is a 7-ft. boring mill that is arranged for speeds about 30 per cent in excess of the standard speeds, so that it can work effectively on locomotive driving boxes and



SLOW-SPEED DRIVE ON CINCINNATI BORING MILL

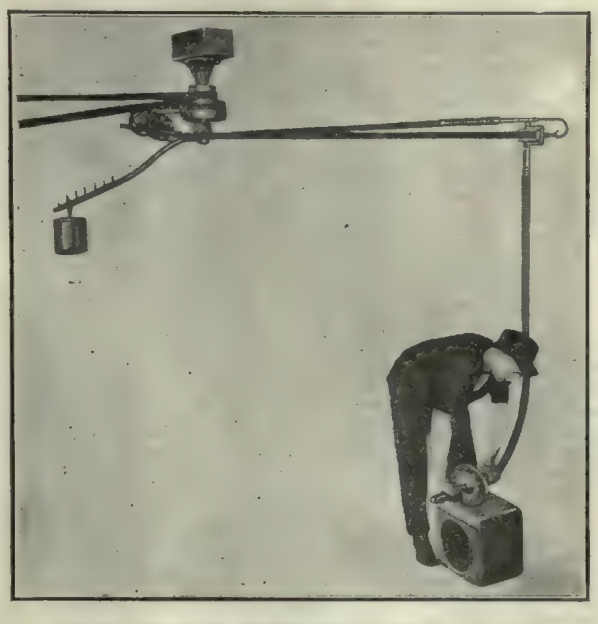
other brass parts. The addition of the slow-speed device enables the turning of tires on the same machine, a speed as slow as ⅜ r.p.m. being obtainable.

In the position shown the reducing gears are operating, and the table would move at low speed. By sliding the small upper gear into the clutch of the larger gear, direct drive can be obtained so as to utilize the regular speeds of the boring mill.

A special cover serves to protect all of the gearing, and also the shifter rod for sliding the gear into engagement. The arrangement makes the machine capable of both very high and very low speed, and the device does not interfere with the operation in either range.

Stow Radial Flexible Shaft Outfit

A mechanism for driving a large flexible shaft from a lineshaft without the use of an individual motor is ilustrated herewith. The device has recently been developed by the Stow Manufacturing Co., Inc., of Binghamton, N. Y. The chief feature is the pivoted horizontal arm, which enables the operator to work



STOW RADIAL FLEXIBLE SHAFT OUTFIT

over a large area. The arrangement of the counterweight for the arm, and of the driving belt, can be easily seen.

The radial flexible shaft outfit is adapted particularly to use in garages, repair shops and vulcanizing plants. Besides being used for grinding and buffing, it can be employed for drilling, or operating a screwdriver. The mechanism can be supplied in various sizes to suit different classes of work.

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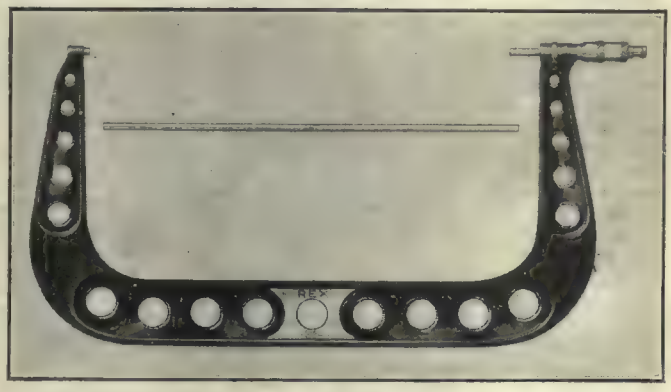


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News Section

Locomotive Works Plans Great Expansion

Completion of a program of enlargements and additions to cost approximately $1,500,000, to give an increased capacity of 50 per cent, is being pushed by the Lima Locomotive Works, Inc., according to a recent report issued by J. S. Coffin, chairman of the board. The board also proposes to redeem the $1,393,000 first mortgage bonds now outstanding, as the interest demands amount to $170,000 annually, and to this end urges that the certificates of incorporation be amended so as to change the existing common stock into 309,000 shares without par value. A special meeting of the stockholders has been called for July 14, in Richmond, Va., the principal office of the company.

The company has had its enlargement program in progress during the last three years and is desirous of completing it as soon as possible because of the opinion that "an increased demand for locomotives is to be expected next year, and perhaps for several years, in view of the known needs of the railroads of the country."

British Engineering Lockout Ended by Vote

A recent cable dispatch from London states that by 76,478 votes against 39,423, the Amalgamated Engineering Union has voted for acceptance of the employers' proposals for the settlement of the lockout in the engineering industry.

This acceptance needs only the ratification of the employers' federation, which is expected speedily, to end the impasse which has existed for fourteen weeks in the engineering trades. The lockout originally affected some three-quarters of a million workers.

An official announcement says arrangements have been made for resumption of work immediately and employment will be given to members of the union as quickly as factory arrangements allow.

American Machines Exhibited at Brussels Fair

Among the machine tools exhibited at the recent Brussels Fair were the following American makes: Pratt & Whitney Co., Hartford, Conn.; R. K. LeBlond Machine Tool Co., Cincinnati, Ohio; Dauber-Kratsch Co., Oshkosh, Wis.; Chas. G. Allen Co., Barre, Mass.; Norton Co., Worcester, Mass.; Heald Machine Co., Worcester, Mass.; Stockbridge Machine Co., Worcester, Mass. These tools were shown under belt by Henri Benedictus, a Brussels dealer, who reports considerable interest and satisfactory results.

He also exhibited Norton abrasive wheels, Pratt & Whitney small tools and Disston files.

Finance Committee Still Debates Tariff Rates

Yielding to objections voiced by Senator Jones of New Mexico, the Senate Finance Committee has acceded to a demand to reduce the duty on steam engines and steam locomotives from 20 to 15 per cent. Senator Jones referred to this duty as a "colossal" mistake, because of the size of the articles and the extent of the industry. He referred to the stupendous production of steam engines and locomotives in this country.

Senator Jones and others also criticised the duty on sewing machines. Senator McCumber admitted that sewing machines did not need protective duties, but pointed out that without the duty the articles could be manufactured abroad and shipped and sold in this country cheaper than the cost of American manufacture.

Senator Simmons opposed the 25 per cent duty on sewing machines, and favored their free importation. Senator Underwood also opposed the duty, declaring that the Singer Sewing Machine Co. and the National Cash Register Co., are trusts controlling the markets here and abroad.

Senator Stanley referred to the failure of Congress to pass his bill to amend the patent laws to protect American patent rights growing out of resumption of the patent treaty with Germany. He said the bill was not passed because it would endanger rights of American patentees in Germany. He said the Singer Sewing Machine had opposed the bill because it had millions of capital in American patents in Germany and if the treaty were not revived Germany would control these patents. He charged that Germans are making sewing machines under American patents by American capital and enterprise in Germany.

An amendment by Senator Jones eliminating the duty on sewing machines was rejected, 23 to 31. Another amendment by the Senator confining the 40 per cent duty to sewing machines valued at more than $75 was rejected, 24 to 31.

An amendment by Senator Walsh to eliminate the duty of 25 per cent on cash registers was debated but action deferred.

Senator Stanley said that with the exception of steam engines, and various electrical devices, nothing had contributed more to making this country the industrial master of the world than the perfection of the open-hearth furnace. This furnace had permitted the use of all ores. He opposed the duty on fire brick on the ground that it would add to the cost of steel production.

The duty of 25 per cent ad valorem on automobiles, automobile bodies, chassis, motorcycles and parts, not including tires, as recommended by the committee, was adopted in the debate. The matter of countervailing duties to meet higher duties imposed on American automobiles was passed over for later consideration.

Adjustment Board for Navy Yard Wages

Representative Hull, of Iowa, has introduced a bill in Congress to create a board of adjustment which shall constitute a wage board and board of appeals for employees of Navy Yards and Arsenals. The board would consist of twelve members, three appointed by the Secretary of War, three by the Secretary of Navy, and six to be chosen by the civilian employees. It would establish wages annually on the first day of January based on maintenance of a standard of living, the relation between wages and cost of living, training and skill, responsibility, and the average change in per capita productivity of manufacturing industries over the preceding ten years.

Germany's Auto Exports Decrease 40 Per Cent

The February exports of automotive products from Germany, totaling 684 passenger cars, motor trucks, and chassis, decreased nearly 40 per cent, as compared with exports during January, according to unofficial reports received by the automotive division of the Department of Commerce. The total exports of cars and chassis for the first two months of 1922 amounted to 1,775. Of the February shipments, the Netherlands took 30 per cent, Belgium 14 per cent, Spain 8 per cent, Switzerland 4 per cent, Denmark 4 per cent, Sweden 4 per cent, France 2 per cent, Great Britain 2 per cent, and Austria 2 per cent.

Fabricated Steel Sales Fall in May

Sales of fabricated structural steel during May amounted to 82 per cent of fabricating capacity, according to reports made to the Department of Commerce by firms comprising 70 per cent of the fabricating capacity of the United States. The May business reported by eighty-two firms, having a capacity of 130,600 tons, totaled 106,620 tons, as against April sales of these same firms amounting to 121,211 tons, or 93 per cent of capacity.

Total sales throughout the United States, based on the reported percentage and a total capacity of 180,000 tons, amounted to 146,900 tons in May, while revised figures for April give a total of 165,900 tons. The April figures are based on reports from eighty-seven firms, having a total capacity of 132,600 tons, whose sales amounted to 122,198 tons, or at the rate of 92 per cent of capacity.

War Surplus Sales

The War Department reports that up to May 15 a total of $228,397,352 of surplus supplies of the Ordnance Department were sold or transferred to other Government departments, which was 33 per cent of the original cost.

Business Conditions in Germany

By OUR BERLIN CORRESPONDENT

The situation of the German industry presents no apparent difference to that of last month. Production continues with undiminished intensity, and the amount of orders in hand is sufficient to save most manufacturers from worry almost over the rest of the year. The unhealthy inside conditions are, however, becoming more and more pronounced. Moreover, a material change in the state of the market, the beginning of which could be noticed some time ago, is steadily gaining in dimensions. Although the demand along the chain of consumers shows no slackening in its middle stages, it has weakened considerably at the ends. The buying craze of the ultimate consumers has subsided, and the relations between them and sellers have become rather strained. People, inspired by the optimism of the daily press with regard to the great political problems pending, are of the opinion that the upward rush of prices has reached its climax and that even a reverse may be expected. Such expectations are chiefly based upon hopes for a large international loan to Germany, with a decided improvement of the mark to follow. Kindred hopes were entertained with regard to the Genoa Conference.

Prices Out of Reach

Of the expected break in the movement of prices nothing can be seen yet. The rise in prices of the basic products has not had time to take effect upon finished products. The finished article has, of course, to bear the price increments which its component parts accumulate during the course of production, and for this reason it seems rather idle to speculate on a stoppage. The fact remains that present prices have surpassed the purchasing power of the great mass of consumers, which alone is sufficient to cause a strong reaction upon the market. Coal, for instance, has reached a price level which makes it almost impossible for the salaried population to pay for the house fuel. Relations between the income of the population and prices are already seriously disturbed. Balance can only be restored by raising the income, which remedy would be of a transitory character only, as it would add new impetus to the movement of prices. Wholesale prices have now, according to index figures, arrived at 50 times the pre-war level, whereas the income has only increased by about 30 times in the case of manual laborers, and 20 times in that of clerical workers. Living costs have risen from 20 to 30 times above pre-war level, which appears to conform to the level of wages, whereby it has to be considered that these figures are drawn up in a rather doubtful way, evidently founded upon a much lower standard of living than in pre-war times. The other alternative for restoring the economic balance is a further drop of the exchange rate, which is at present kept in check by some unseen forces, helped by the hopes already mentioned.

These hopes, although pronounced in the upper classes, are insufficient to keep in check the discontent of the working population. The strike fever is growing perceptibly. It would probably have accumulated greater force if wages in all groups of workmen were on the same level. The disparity prevailing prevents concerted action, thereby depriving the latent conflict of its kneenness.

While in North Germany the 48-hour week is in force universally, the working time in South Germany is restricted to 46 hours per week. The South German manufacturers, being somewhat handicapped by this disparity, have tried to persuade the workmen to conform with conditions in North Germany. This is strictly within the demobilizing ordinances limiting the working time to 8 hours per day. Still the workmen are opposing any increase of their working time as a matter of principle, on the ground that it would prejudice their position and declaring that one concession on their side would lead to further attempts on the side of the employers. In this contention they are not quite sincere, as they are open to agree if wages are increased. The extent of the increase demanded, 100 per cent, puts such a solution of the difficulty out of the question, and makes it clear that the workmen have no wish to accommodate the manufacturers. A compromise by the latter of 47 hours a week was refused.

The arbitration courts, which took the matter in hand after direct negotiations between employers and workmen arrived at a deadlock, decided in favor of the 48-hour week. Their finding was, however, not accepted by the workmen, whereupon they went on strike in most cases, followed by lockouts in others. All persuasion used upon the workmen, appealing to their commonsense and public spirit, was wasted. The large metal industry of South Germany laid idle for many weeks. The whole South German machine building and motor car industry which is manufacturing for export to a large degree, and therefore is a factor of national importance, was affected. The loss resulting therefrom to the country as a whole was very large.

Labor Will Not Concede

Much more alarming than this direct loss is the aspect the strike opens upon the labor problem. If the workmen are not amenable to reason in a trifling case like this, it is clear what attitude they would take if they were required to make serious concessions in the direction of the old order of things. They are making it quite evident that they are determined not to retreat a single step from the strongholds of their present position no matter how the country fares. The South German strike which ended in a retreat of the manufacturers, barely veiled behind a very lame compromise, may well be considered as a test piece of the great labor battle which is ever looming up darkly on the horizon. The gulf between the workmen and manufacturers is indeed not over the question of wages but over the conflict between socialism and the exigencies of production. The two are at present strongly opposed, with no hope in view of reconcilement. At no other time since the revolution is the necessity of higher efficiency and increased production more clearly put in relief than at the present time, which shows how far the productive capacity of Germany is reduced. Expansion can only come from an increase of manual labor and a higher efficiency of mechanical labor. The great dilemma of the country is that the one is withheld on the ground of socialistic theories, and the other cannot be supplied for lack of means.

In the latter respect the present time also is an eye-opener. In the business reports coming in from all parts of the country the most prominent feature has lately become the lack of working capital. The changed attitude of the money market towards the calls of industry has become strongly marked. New capital issues which only a few months ago were readily absorbed are falling flat, and the investors show disinclination to take up any more stock, even at or near par value.

Capital Tied Up

The population has for some time been groping in the dark for a solution of this unexpected development which is strongly reflected by the attitude of the stock exchange, even toward the most favorable stock. The explanation is now outlining itself more clearly. In the course of the present boom, with the enormous rise in prices accompanying it, an ever increasing part of the national capital has become tied up in manufacturing deals. It was estimated some time last year that the capital actually "working" in industry, and therefore out of circulation, is 50 billion paper marks. When considering that prices since then have more than doubled, and at the same time the speed of turnover has become delayed in almost the same proportions by the clogging of the economic machinery, it is clear what a large increase of tied up capital has taken place, which probably has assumed a size forming the larger part of the whole floating debt of the country. It is rumored that potential forces are at work to stem the inflation of German currency, but inflation is still going on.

The German industry has now commenced to realize how poor it has become in spite of appearances. In foreign countries this is not realized yet, rumors of enterprises like those of Stinnes still upholding the belief of untold riches. It is an open secret that many business men, who kept funds in foreign countries, have had to withdraw them. In place of a flight of capital out of the country, the reverse is now taking place. If German industry were called upon today to supply the billion gold marks proudly offered only six months ago as a loan to the government, it could truthfully point to empty pockets.

As an illustration to what extent even the largest firms have had to make concessions in order to obtain fresh capital may be mentioned the case of the leading incandescent lamp manufacturer, the Osram Company, a combine of the foremost electrical firms in Germany. This firm recently floated an issue of a new type of bond which, besides the

fixed interest, carries a dividend to a certain limit.

The natural result of such conditions is that the industry is running dangerously short of raw materials, especially of the more expensive kinds. Even the supply of iron is entirely insufficient at the present rate of consumption. The high-handed action of one of the largest German dealers in iron and steel products, who canceled all orders placed at lower than present prices, is an illustration of this fact, especially as it is known that the dealer is the selling agent of several of the leading German steel works, and closely linked with them financially. Such offences against good faith are entirely unsupported by law, and have indeed been condemned often in courts and by public opinion.

With regard to the situation in the iron, steel and machinery building industries, the following can be said: Complaints from all sides with regard to insufficient coal supply have become more and more virulent. The steel works are handicapped by the scarcity of the grades required, and the foundries are complaining of lack of foundry coke. The situation is greatly strained, but the difficulty is chiefly caused by the dwindled reserves of pig iron and scrap. In spite of the lately improved output of coal and coke, the blast furnaces are unable to produce the increased quantity of pig iron required. The consequence is that considerable quantities have to be imported. Manufacturers declare that these imports necessarily tend to increase the cost, which is a strong exaggeration of facts.

From the small tool industry it is reported that although new orders are still freely given, the business boom seems to have passed its climax. The prices of files, saws, drills and other tools have in many cases already reached the world market level, and for this reason the export business has slackened perceptibly.

A Decline Expected

Employment in the machine building industry continues to be satisfactory, but a decline of business is soon expected. In certain parts of the country, chiefly Rhineland, an actual decline had already set in by the end of April, which is evidenced by considerable shortening of delivery times. Cost of production is still increasing in an alarming degree with no stoppage in sight. The recent increase of prices of castings is nearly one-third, and further rises are expected.

Locomotive and railroad car works have now received state orders which, although only half of last year's size, are sufficient to keep them well employed for the rest of the year. The Railroad Administration has in this case, for the first time in its history, had to concede sliding prices. The foreign business of this industry is visibly declining. The times when it could draw profits with full hands out of the disparity between the value of the mark abroad and in Germany are past. In several cases tenders have lately been underbid by foreign competitors, chiefly English and Belgian.

Business in the machine tool industry is brisk, although a considerable break in the upward curve of employment can be noticed. The machine tool trade, which is as a rule in a better position to feel the pulse of the market, is exercising again considerable caution with regard to placing new orders. The leading works, which in the majority sell to consumers direct, notice little difference, but manufacturers selling chiefly to the trade complain of a perceptible slackening of business. Standard tools, which for a time have enjoyed a demand no less brisk than that for single purpose machines, are again losing ground steadily. A change in the demand for specialized tools is not noticeable yet, but it is felt that the attitude of the buyers has changed in this respect also. The buyers, who quite recently have hardly looked upon prices—quick delivery being the first consideration, are now commencing to haggle, exhibiting strong objection to sliding prices. Inquiries are still received in even increased numbers but the percentage of orders realized therefrom is diminishing.

Prices of tools are still rising. The Association of German Machine Tool Builders gives for each month directions for the fixation of prices, which may be seen from the following figures indicating the percentage of increases over the November prices for each consecutive month:

December	34 per cent
January	40 per cent
February	54 per cent
March	70½ per cent
April	100½ per cent
May	120 per cent

The prices in force in November were from 15 to 30 times pre-war level, according to size and quality. At present the actual sale prices vary from 35 to 70 times the pre-war prices. The margin between export and domestic prices has almost disappeared, and a number of tools have at the present rate of exchange already reached pre-war level. There is not the least likelihood of a stoppage. Information received coincides in the belief that further increases of at least 20 per cent will be required during the coming months, as the recent increase in the prices of coal, material, freight and wages, which cannot yet be gaged in all its consequences, is not being taken care of by the present sale prices. If the exchange rate were arrested even at the present stage, times for imports would not seem to be far away, and a number of dealers are already figuring on American machinery.

The upward movement of prices can of course not fail to exercise a strong influence on the export business of the machine building industry. Cancellations of foreign orders are already received in alarming numbers. It appears that many foreign buyers are trying to scramble out of contracts wherever they offer a loophole. The decrease of the machine tool exports from 7,336 tons in February to 6,852 tons in March is in all probability already an indication of changed conditions. It is peculiar to note that while the returns in paper marks for the March exports show an increase of six million over those of February in spite of their diminished quantity, their equivalent in gold marks at the average exchange rate of March constitutes a further drop, the prices only averaging 400 gold marks to the ton, or 40 per cent of the pre-war average. The exports of the chief lines of the machine building industry during the first three months of the year are given here:

	Metric Tons		Value in Million Marks		Ratio to Pre-war Standard
	1922	1913	1922	1913	
Railroad engines	19,002	10,932	731	11	38
Power engines (stationary and portable)	11,094	15,545	333	16	29
Textile machinery	9,298	18,793	502	27	37.5
Machine tools	21,085	17,852	537	21	22
Agricultural machinery	8,242	8,340	150	7	19.2

As can be seen, the machine tool exports are considerably higher than in 1913. This may in some measure be due to different calculation, wood working machinery evidently being included in machine tools.

The total of the machinery exports from January to March in 1922 was 112,190 metric tons, which compares favorably with that of the same period of 1913, the latter being 129,624 tons.

While the boom is apparently still in full swing, the leaders of industry have lately commenced to foreshadow serious times ahead. A gloomy view to this effect formed the keynote of a speech recently made by Stinnes, supported by the speakers at the annual meeting of the National Association of German Industry, and that of the Machine Building Industry. On what ground that view was based was pronounced in no case, leaving it open for each individual to speculate upon. Sinister events are darkly hinted at, adding to the spirit of uncertainty already prevailing. Whatever they are, one thing is clear, that prices have broken all bounds, and that the carefully preserved control of prices is failing for the first time since the revolution. The upward rush of prices has carried business already to the threshhold of the alternative, either of a speedy collapse or a further downslide of the mark. If the latter is stemmed, which the country is led to believe is possible, a reverse will set in, leading straightway to great labor disputes.

In leading quarters there is hardly any illusion left with regard to the seriousness of the present situation, and it can be said that the hopes at first based upon Russia as a probable saviour of the situation have by sober reflection diminished into insignificance. Considering the stringency of money already dwelt upon, there is no chance of Russian business developing to a degree which could offer any compensation for losses in other markets. Efforts are made to further this business, and an exhibition of German products—chiefly machinery—in Russia may be mentioned in this connection. The question of financing, over which so much hopeful looking business has already broken down, is a drawback to all such endeavors. German agents are traveling all over Russia in the hope of picking up business or concessions, but the attitude of the business world as a whole towards Russia is very skeptical, to say the least, and unless Russia finds an outlet herself out of her difficulties, it cannot be seen how the two countries could profit mutually from the economic relations they have now entered into.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The New York Stock market had a fainting spell last week. The other speculative markets broke slightly in sympathy. Cotton, grain, hog products, sugar and coffee all declined more or less but the losses were partially or entirely recovered when it came to be understood that there was nothing seriously wrong with the security markets and that the slight derangement there was probably due to a mild attack of indigestion induced by over eating. But when a reaction is overdue it only needs a trifle, real or imagined, to precipitate it, and now that the nausea and vomiting are over with, a recovery of strength and confidence is definitely indicated.

This statement is based not only upon a careful investigation of the record but upon what I saw and heard as I visited some of the more important cities of the Middle-west last week. Almost everywhere the demand from the agricultural regions is excellent. The sales of the mail order houses are increasing rapidly and the jobbers report an excellent trade. Bank clearings are increasing almost everywhere and constant buying is necessary to replenish the depleted stocks. Dry goods, shoes and staple goods of nearly every description are readily salable and there is a distinct and significant improvement in the inquiry for farm implements and machinery.

A shortage of labor, especially farm hands, is generally reported. Some employers attribute it to the law restricting emigration, but it is fundamentally due to the abundant credit which has made it possible to float the large bond issues whose proceeds are now being spent in improvements that employ thousands of men. In Cleveland, for instance, work has just been started upon the long promised railway station. It will cost $58,000,000, most of which will be paid out in wages. The railways are planning much other work that will cost millions, and hundreds of millions will be spent in roads and municipal improvements, the money for which has been provided through bond sales.

These disbursements are at the bottom of the country-wide prosperity that is obvious, and while it may be slightly affected if wheat does not recover some of the recent decline, I was surprised to hear some large farmers admit that with a good crop they could make money on "dollar wheat."

Prices for iron and steel are tending upward. Zinc and lead are also higher, but the demand for copper is still freely suplied at between 13¾ and 14 cents. Optimism and activity are still reported in the motor industry.

The slight decline in sugar that occurred while the stock market was breaking has been entirely recovered and the indications still favor much higher prices.

Silk is steady. Wool and woolen goods are firmer and the cotton trade was supplied with a very bullish argument in the consumption report for May, which shows that the American mills took 495,674 bales in that month and that the total of consumption and exports for the year ending July 31 will probably exceed 12,000,000 bales.

Rubber is firmer upon a cable from Java saying that the Dutch growers will probably agree to limit the output, and a further advance in both hard and softwood lumber is another significant straw in the current of prices.

The New England textile strike is practically ended as the operatives are rapidly returning to work.

Our foreign trade figures for May show exports valued at $308,000,000 and imports worth $254,000,000. As compared with last year there is a decrease of $21,000,000 in exports and an increase of $50,000,000 in imports, which have probably been accelerated by the pending tariff bill. The figures are not especially significant otherwise.

The money market continues easy. The New York banks have reduced the rates paid on balances and bankers acceptances have sold as low as 2½ per cent, while the going rate on commercial paper is 4 per cent. The weekly statement of the Federal Reserve System shows no important changes. The Bank of England has reduced its rate to 3½ per cent and call money in London is lending at from 1 to 2 per cent.

Lloyd George and J. P. Morgan have had a conference about the abandoned German loan, and unless the former has lost his persuasiveness and the latter his influence the issue of a loan that will work the financial rehabilitation of Europe is a question of only a few months. The first meeting of the Hague conference was held last Thursday. Nothing being expected of it, something may be accomplished.

The market for sterling and francs has recovered the decline which followed the adjournment of the bankers' conference, and even marks are slightly higher despite a report which puts the outstanding circulation on June 7 at 154,914,880,000 marks.

Other foreign developments are generally encouraging. France has averted the complete bankruptcy of Austria by lending that distressed government 55,000,000 francs. Lenin is either dead or paralyzed and with his passing the peaceful penetration of Russia by Western civilization is brought nearer.

The lockout in the British engineering trades has been settled and 600,000 men have returned to work on the employers' terms. An East India bond issue for £12,500,000 has been successfully underwritten in London, and Jugo-Slavia has negotiated a loan of $25,000,000 in New York. The bonds run for forty years and go to the public on a basis which yields 8.4 per cent. Trade throughout the British Empire seems to be on the mend and a boom is reported from far off Australia.

Mexico appears to have agreed upon a settlement with her creditors as represented by the bankers in conference with her finance minister, Señor de la Huerta, in New York, and Mexican securities have advanced sharply. Cuban finances are being rapidly straightened out under the wise direction of General Crowder and travelers recently arriving from Spain tell of a great industrial transformation in that romantic country. To top all this 10,000 travelers left New York for Europe on the steamers sailing June 10, and it is now estimated that our tourists will spend at least $500,000,000 on the other side the Atlantic during the present summer.

Coal Strike Dangerous

The only shadows which darken this bright outlook are the unsettled coal strike, the assininity of Congress in attempting with procrastination to foster an absurd tariff bill on the country and the predicted return of the 17 year locusts due this summer. These things are mentioned in the order of their importance. With the assistance of the newspapers the menace of the tariff bill and the locust will probably disappear, but the coal strike may result in real trouble next winter unless it is soon ended. A cargo of Welsh coal is on its way from Cardiff to New Bedford, but we cannot of course rely upon imported coal for our requirements and some way to start up the American mines must speedily be found.

Carborundum Takes Leading Role in Film Production

An eight-reel moving picture of the production and use of carborundum has been produced by the Rothacker Film Manufacturing Co., of Chicago, for the Carborundum Company, of Niagara Falls. The picture has been given the appropriate title of "The Jewels of Industry." The picture shows how carborundum is produced at a temperature of 4,000 deg. F. and visualizes step by step the various processes by which the crude carborundum is converted into grinding wheels and other forms of abrasives to meet the needs of industry.

The picture is more than a story of carborundum; it is virtually a survey of American industry. In producing the picture the film company sent cameramen to fifty-eight different industries to obtain scenes picturing carborundum on the job in its various uses. The picture in its entirety is eight reels but it has been broken up into units to fit various lengths of programs, and to present features that would prove most interesting to different audiences. Copies will be placed at the disposal of the Government for use in the campaign started by Secretary of Commerce Hoover to use movies to create foreign markets for American products.

American Railway Association Conventions at Atlantic City

With everything their own way on the Million Dollar Pier, and with apparently few counter attractions, the Mechanical Division and the Purchases and Stores Division of the American Railway Association held successful conventions at Atlantic City, June 14 to 21. The attendance was large and representative of a majority of the membership. More than four hundred members of the Railway Supply Manufacturers' Association had exhibits, approximately eighty of them being exhibits of machine tools and small tools.

The following is a list of the exhibitors of machine tools, small tools and machine shop appliances:

Air Reduction Sales Co., New York City.
Ajax Manufacturing Co., Cleveland, Ohio.
American Tool Works Co., Cincinnati, Ohio.
E. C. Atkins & Co., Indianapolis, Ind.
Beaudry & Co., Inc., Boston, Mass.
Chas. H. Besly & Co., Chicago, Ill.
Baker R. & L. Co., Cleveland, Ohio.
Black & Decker Manufacturing Co., Towson, Baltimore, Md.
S. F. Bowser & Co., Fort Wayne, Ind.
W. L. Brubaker & Bros. Co., New York City.
Carborundum Co., Niagara Falls, N. Y.
Celfor Tool Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York City.
Clark Tool Works, Belmont, N. Y.
Clark Tructractor Co., Chicago, Ill.
Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Steel Tool Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland, Ohio.
Cochrane-Bly Co., Rochester, N. Y.
Covington Machine Co., Inc., Covington, Va.
Dale Machinery Co., Inc., New York City, representing
  Betts Machine Co., Rochester, N. Y.
  Colburn Machine Tool Co., Cleveland, Ohio.
  Milholland Machine Tool Co., Indianapolis, Ind.
Davis Boring Tool Co., St. Louis, Mo.
Davis-Bournonville Co., New York City.
Dayton Pneumatic Tool Co., Dayton, Ohio.
Detroit Twist Drill Co., Detroit, Mich.
Diamond Machine Co., Providence, R. I.
Henry Disston & Son, Inc., Phila., Pa.
Horton Chuck Co., Windsor Locks, Conn.
Electric Arc Cutting and Welding Co., Newark, N. J.
Elwell-Parker Electric Co., New York City.
Walter H. Foster Co., New York City, representing
  Ingersoll Milling Machine Co., Rockford, Ill.
  Electric Controller & Manufacturing Co., New York City.
General Electric Co., Schenectady, N. Y.
G. A. Gray Co., Cincinnati, Ohio.
Edwin Harrington, Son & Co., Inc., Phila., Pa.
Hartford Tap and Gauge Co., Hartford, Conn.
Heald Machine Co., Worcester, Mass.
Hendey Machine Co., Torrington, Conn.
Hoggson & Pettis Manufacturing Co., New Haven, Conn.
E. Horton & Son Co., Windsor Locks, Conn.
Hyatt Roller Bearing Co., New York City.
Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York City.
Wm. H. Keller Inc., Grand Haven, Mich.
King Pneumatic Tool Co., Chicago, Ill.
Landis Machine Co., Waynesboro, Pa.
Lehman Machine Co., St. Louis, Mo.
Lunkenheimer Co., Cincinnati, Ohio.
Mahr Manufacturing Co., Minneapolis, Minn.
Main Belting Co., Phila., Pa.
Manning, Maxwell & Moore Inc., New York City, representing
  Columbia Machine and Tool Co., Hamilton, Ohio.
  Cone Automatic Machine Co., Windsor, Vt.
  National Machinery Co., Tiffin, Ohio.
  Putnam Machine Co., Fitchburg, Mass.
  J. E. Snyder & Son, Worcester, Mass.
  Woodward & Powell, Worcester, Mass.
Metal and Thermit Corporation, New York City.
Midvale Steel and Ordnance Co., Phila., Pa.
The Alexander Milburn Co., Baltimore, Md.
Miller & Crowningshield, Greenfield, Mass.
Morton Manufacturing Co., Muskegon Heights, Mich.
Nazel Engineering and Machine Works, Phila., Pa.
Newton Machine Tool Works, Inc., Phila., Pa.
Niles-Bement-Pond Co., New York City, representing
  R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.
  Pond Machine Tool Co., Plainfield, N. J.
  Stockbridge Shaper Co., Worcester, Mass.
R. D. Nuttall Co., Pittsburgh, Pa.
Oxweld Railroad Service Co., Chicago, Ill.
Peerless Machine Co., Racine, Wis.
Henry Pels & Co., Inc., New York City.
Porter-Richards Machinery Co., Philadelphia, Pa., representing
  Cincinnati Iron and Steel Co., Cincinnati, Ohio.
  Jas. Clark, Jr., Electric Co., Louisville, Ky.
  Willey Electric Tool Co., Jeffersonville, Ind.
Production Machine Co., Greenfield, Mass.
Racine Tool and Machine Co., Racine, Wis.
Reed-Prentice Co., Worcester, Mass.
Joseph T. Ryerson & Son Co., Chicago, Ill., representing
  Black Diamond Saw and Machine Works, Natick, Mass.
  Ryerson-Conradson Machine Co., Chicago, Ill.
S. K. F. Industries, Inc., New York City.
William Sellers & Co., Inc., Philadelphia, Pa.
Simonds Manufacturing Co., Fitchburg, Mass.
Southwark Foundry and Machine Co., Phila., Pa.
Standard Electric Crane and Hoist Co., Phila., Pa.
Swind Machinery Co., Philadelphia, Pa., representing
  Baker Bros., Toledo, Ohio.
  Bradford Machine Tool Co., Cincinnati, Ohio.
  Fosdick Machine Tool Co., Cincinnati, Ohio.
Torchweld Equipment Co., Chicago, Ill.
H. B. Underwood Corporation, Phila., Pa.
U. S. Light and Heat Corporation, Niagara Falls, N. Y.
Universal Boring Machine Co., Hudson, Mass.
Walworth Manufacturing Co., Boston, Mass.
Wayne Tool Manufacturing Co., Waynesboro, Pa.
F. O. Wells Co., Greenfield, Mass.
Williams Tool Corporation, Erie, Pa.
Wright Manufacturing Co., Lisbon, Ohio.
Yale & Towne Manufacturing Co., Stamford, Conn.

Business Items

The American Machine Products Co., Eighteenth and Howard Sts., Detroit, Mich., has been reorganized under the name of the Ampco Twist Drill and Tool Co. The officers of the company are: Earl A. Munger, president: E. A. Wilson, vice-president; Chester P. O'Hara, secretary-treasurer. The company is marketing a complete line of standard tools, including twist drills, reamers, cutters, gages, and similar tools.

The Cole Cylinder Grinding Co., South Bend, Ind., has been organized to manufacture cylinder grinding machinery. The company has a capital stock of $25,000 and is composed of George W. Cole, Fred A. Bryan and Hugh B. McVicker, all of South Bend.

The Kesselkalb Machine Co., Baltimore, Md., has opened a machine shop at 2,578 Hollins St., that city, to do boring and repair work on automobile engines.

The Harley-Davidson Motor Co., of Milwaukee, Wis., has won its case in the Supreme Court. That court directs the Circuit Court of Appeals for the Third District to decide the appeal presented in the suit for infringement of letters patent relating to clutches for motorcycles brought by the Eclipse Machine Co.

The Black & Decker Manufacturing Co., Baltimore, Md., has established a new Detroit office in the General Motors Bldg. C. G. Odell, assistant to president, will be in charge.

Edward Mills, of Midland, Mich., and Samuel Fair, of Saginaw, are organizing a company to operate the plant of the Cooley Castings Co. in Saginaw. New equipment will be installed and it is planned to commence production during July.

The Wilart Instrument Co., New Rochelle, N. Y., has arranged for an increase in capital from $100,000, to $1,000,000, for general expansion.

The Sharon Steel Hoop Co., Sharon, Pa., has called a meeting of stockholders to approve an increase in capital stock from $15,000,000 to $20,000,000, a portion of the proceeds to be used for expansion.

The Powell Iron Works, 270 Sutter Ave., Brooklyn, now operating a local plant, has incorporated with a nominal capital of $10,000, for proposed general increase in operations. The new company is headed by S. Powell and A. Farber.

The Murphy Iron Works, foot of Walker St., Detroit, Mich., has arranged for an increase in capital to $400,000 for increased operations.

The Reo Motor Car Co., Lansing, Mich., has adopted a ten-hour day, five-day week schedule at its plant in the nature of an experiment, and four weeks operation has brought very satisfactory results. A daily production of 130 automobiles is being maintained.

The Blackman Talking Machine Co., Hornell, N. Y., manufacturer of talking machines and parts, has filed notice of increase in capital from $200,000 to $1,000,000 for general expansion.

The Hudson Machinery Corporation, 515 Greenwich St., New York, will operate in the future under the name of Ferguson & Haas, Inc.

The H. O. King Co., 1,145 Diversey St., Chicago, Ill., machinist, has arranged for a change of company name to the King Pneumatic Tool Co.

The Southwest Metals Co., 15 Broad St., New York, has arranged for an increase in capital from $10,000,000 to $12,000,000, for proposed expansion.

The Fleming Machine Co. has been incorporated in Springfield, Mass., to manufacture a set of machines for automotive repair work. Details concerning these machines are to be announced soon. The products will be made in Springfield, the capitalization is $30,000 and the incorporators are George W. Fleming, 38 Virginia St., Springfield, and John G. Perman and F. Julius Quist, of Worcester, Mass.

The Keating Valve Co., Springfield, Mass., has purchased the Robert M. Keating Co., reorganized the business, and has resumed the production of the Keating flush valve. The new concern has Henry L. Bowles as president, and Charles S. Vining as treasurer and manager.

The Lee Rule and Level Co. is being established in Greenfield, Mass., to manufacture a combination tool embracing a rule, level, square and straightedge, under patents it controls. It will occupy the old factory of the Waltham Watch Co. in that town. H. E. Lee, the inventor, is president, F. Anderson is vice-president and

treasurer, and H. H. Hawkins is mechanical engineer.

The American Electric Service and Maintenance Co. has occupied its new building in Springfield, Mass., where it is equipped for rewinding transformers, redesigning motors and other repair work for electric power and manufacturing concerns. Many contracts have been booked, insuring a heavy business throughout the summer.

Avery & Saul, dealers in sheet metals, iron, steel, etc., 207 Congress St., Boston, Mass., has recently incorporated the business under the laws of Massachusetts, and under the name of Avery & Saul Co. The capital stock is $175,000, and the incorporators are: Fred L. Avery and Paul F. Avery, of Winchester, Mass.; Arthur D. Saul, of Arlington, Mass.

Personals

STANLEY H. BULLARD, vice-president of the Bullard Machine Tool Co., Bridgeport, Conn., has been appointed by Governor Lake, of Connecticut, as one of the members of the commission from that state which will study a proposed consolidation of the six New England railroads into one system.

JOHN D. CARMODY has joined the sales force of the Weaver Manufacturing Co., Springfield, Ill. He will have charge of a Middlewestern district.

HARRY M. WEY has been appointed manager of the Chicago district of the Pittsburgh Testing Laboratory with offices at 1,560 Monadnock Bldg.

ROBERT R. JENKS, president of Fales & Jenks Machine Co., manufacturer of cotton machinery, etc., Pawtucket, R. I., has been chosen on the board of managers of the new branch bank in that city, of the Rhode Island Hospital Trust Company, of Providence.

J. MILTON PAYNE, assistant treasurer of the Woonsocket Machine and Press Co., manufacturer of textile machinery, Woonsocket, R. I., has recently been elected chairman of the new board of managers of the new branch in Pawtucket, R. I., of the Rhode Island Hospital Trust Co., of Providence.

HENRY J. MILLER has been elected president of the Lake Torpedo Boat Company, submarine boat builders, Bridgeport, Conn. Mr. Miller comes from Elizabeth, N. J., and is a brother of the late Herbert S. Miller, who was president of the company up until his death a short time ago. Mr. Miller is also a member of the board of directors of the company.

FREDERICK D. HARGER has resigned as vice-president and general manager of the Mono Corporation of America, manufacturers of gas apparatus, with offices in New York City. He has joined the staff of the Chas. J. Tagliabue Manufacturing Co., of Brooklyn, which will take over the manufacture and sale of Mono products.

W. P. CLARK, president of the Clark Tool Works, Inc., Belmont, N. Y., has returned from a five-months' business trip in the Philippine Islands.

CHARLES R. PRICE has resigned the position of superintendent for the Ames Sword Co., Chicopee, Mass., which he had filled for 30 years. He will become general manager of the sword department of the V. H. Blackington Co., Attleboro, Mass.

C. A. SHERMAN, formerly vice-president of the Badger-Packard Machinery Co., of Milwaukee, Wis., has severed his connections with that company. Mr. Sherman has not announced his plans for the future.

C. C. ZIEGLER, St. Louis district manager for the Greenfield Tap and Die Corporation, Greenfield, Mass., has been appointed Western sales manager of that company, with headquarters at Chicago. Mr. Ziegler succeeds Frank Oliver, who resigned to accept the position of Eastern sales manager at New York for the Whitman & Barnes Manufacturing Co., of Akron, Ohio.

P. J. O'CONNOR has left the sales force of the E. L. Essley Machinery Co., of Chicago, and has joined the staff of the Haynes-Stellite Co., also of Chicago.

LINCOLN B. SMITH has been elected treasurer of the Holyoke Foundry Co., Holyoke, Mass.

Obituary

JOHN WARDLE SEEKINGS, secretary and treasurer of the Bridgeport Screw Co., Bridgeport, Conn., died on June 14 at his home in Bridgeport. Mr. Seekings was born in England 56 years ago. He was prominent in manufacturing circles throughout New England and the East.

Trade Catalogs

Sprague Panel Boards. The Sprague Electric Works, New York City. A four-page circular No. 67,900, describing the new narrow-unit panel board, safety type, which is only 10 in. wide outside the barriers. It was designed with a view to conserving space and to market at a reasonable price.

Melting Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Circular No. 243, describing a line of stationary and tilting crucible melting furnaces for aluminum, brass, bronze, copper and other non-ferrous metals. These furnaces are designed to operate with oil or gas fuel. Several types are shown in operation, and detailed drawings are furnished, as well as tables of sizes and specifications.

Filtering Systems. The Wayne Oil Tank and Pump Co., Fort Wayne, Ind. Bulletin No. 6,600, describing the new Wayne Type E circulating oil filtration system. The operation of this filter is thoroughly explained and illustrated by photographs and drawings.

Welding Rods and Electrodes. The Page Steel and Wire Co., Monessen, Pa. Catalog No. 500, a handbook of Page-Armco welding rods and electrodes for oxy-acetylene and electric welding. The book contains a list and description of the various products of this company, including welding materials, steel ingots, wire rods, spring rods and wire strand. Chemical analyses of each type are given, as well as descriptions of heat-treating methods. Among the chapters included in the book are comparison tables on wire gages, conversion tables, decimal equivalents, American Welding Society's specifications, tables of weights and measures, tables of deposited metals, metal composition, metallurgy of iron and steel, oxy-acetylene welding rods, specifications for welding wire, temperatures, tests for welding material, and a wealth of other valuable material for the welding man in the shop.

Drills and Reamers. Gledhill Manufacturing Co., 107 Friendship St., Providence, R. I. A small four-page circular listing a number of types of semi-high speed steel combination center drills, center reamers and counter-sinks. Tables of sizes and price lists are included.

Kingsbury Thrust Bearings. Kingsbury Machine Works, 4320 Tackawanna St., Philadelphia, Pa. A well prepared catalog containing, besides a list and description of Kingsbury thrust bearings, a wealth of material of considerable value to engineers and to users of thrust bearings. Some of the features include dimensions, power loss guarantee, combined vertical thrust and general bearings, Queenston development, propeller thrust bearings, actual power loss determination and standardization of power losses.

Uehling Recording Equipment. The Uehling Instrument Co., Paterson, N. J. Bulletin No. 112, illustrating and describing the CO_2 recording equipment for guiding the engineer and fireman in reducing the waste of fuel up the chimney. Special features included in the bulletin are the "Pyro-Porus" filter for keeping gas sampling lines clean, and the separate recorder for the engineer's office and indicator for the boiler front.

Special Washers. Kales Stamping Co., 1659 West Lafayette Blvd., Detroit, Mich. A small folder giving a list of special washers of all gages and materials, manufactured by this company. The list contains over a thousand different sizes of washer dies which are maintained in stock for making up washers of any material that can be punched.

Industrial Furnaces. The Surface Combustion Company, 366 Gerard Ave., New York, N. Y. A series of eight bulletins on industrial furnaces and attachments of various kinds, as follows: No. 3G, surface combustion low pressure air gas inspirators; No. 5, type A oven furnaces; No. 6, type B, pot-hardening furnaces; No. 7, type C and type D, soft metal melting furnaces; No. 8, galvanizing baths; No. 17, rivet heaters, No. 24, laboratory furnaces for high temperatures. All of these furnaces and attachments are fully described and illustrated with specifications and performance records.

Hydraulic Turbines. S. Morgan Smith Co., York, Pa. Bulletin No. 112, illustrating and describing a line of Smith hydraulic turbines embodying design and construction features developed over a period of almost fifty years. Steam power tables included have been prepared from tests made at the Holyoke Testing Flume. There are also several tables showing the velocity of water, areas and circumferences of circles, and the loss in head in each 100 ft. length of pipe at different velocities. The illustrations show various power plants and installations of Smith turbines.

Universal Card Holders. Detroit Stamping Co., 3405 W. Fort St., Detroit, Mich. A small folder describing the universal card holder, spacers for milling machine arbors, dies and various types of metal stamping and punching work.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A business man in Spain is interested in the purchase of black iron gas pipe, with fittings; iron-working machinery, such as lathes, drills, planes, punches, and cutters. complete outfit of machinery and tools for making chains, particularly railroad coupling chains, with hooks; machinery of all kinds for machine shops, foundries, forges, dry docks, port works, and railways. Quotations are desired c.i.f. Spanish port. Reference No. 2459.

Firm in the Netherlands wishes to purchase or secure an agency for electric motors, pneumatic tools, all kinds of small oil motors and small steam turbines. Quotations desired c.i.f. Netherlands port. Terms: Cash against documents. Reference No. 2443.

Forthcoming Meetings

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

The Weekly Price Guide

RISE AND FALL OF MARKET

Advances.—No. 2 foundry pig iron up 50c. and Northern basic, $1.48 per gross ton, Cincinnati; scarcity of basic and bessemer iron. Tin quoted at 32¼c. as against 32⅛c. per lb., New York warehouses. Copper rods and wire and brass rods and sheets up ¼c.; copper sheets and tubing up 1c. and brass tubing up 2c. per lb. in Cleveland. Mill price of steel bars, $1.70; structural shapes and plates nearing that figure. Quotations, however, on shapes, plates and bars range between $1.60@$1.75 per 100 lb., f.o.b. Pittsburgh.

Declines.—Lead quoted at 6¼c. as against 6⅜c. per lb., New York. Zinc market easier in tone, prices unchanged; copper dull.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	26.50
Southern Ohio No. 2	25.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.82
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern, sil 2.25@2.75	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	7.0	4.5	3.0
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2 6
Chicago	5.0	4.5	3.5
Cincinnati	6.0	5.0	4.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4 20	3.60	4.30
Nos. 25 and 26.	3.10	4 25	3.65	4.35
No. 28	3.15	4 35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.45
Nos. 12 and 14.	3.25	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¼ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	2.58
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅝	8.00		12@13
¼	6.50		11@12
5/16 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			14.62½
Tin, 5-ton lots, New York			32.25
Lead (up to carlots), St. Louis, 5.65; New York			6.25
Zinc (up to carlots), St. Louis, 5.42½; New York			6.25
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	21.00	23.00
Copper wire (carlots)	16.00	17.00	16.25
Copper rods (ton lots)	19.00	22.00	19.50
Copper tubing (100-lb. lots)	22.75	24.00	23.00
Brass sheets (100-lb. lots)	16.75	18.00	18.75
Brass tubing (100-lb lots)	20.00	21.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	..
Solder (⅛ and ¼), (caselots)	25.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.50	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	....	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	....
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.86	1.00	.96
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$7.00	
Coke, prompt foundry, Connellsville	per net ton	$7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60–10%	60–10%	60%
1⅛ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60–5%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, (h.h. plus std. extra of 10%)	15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75–5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net)	$3.60	$3.25	$3 10
Cone heads, ditto (net)	3.70	3.35	3.20
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	55–5%	50%	50-10%
Copper burs	35%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.40	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls). List price, New York, per ply, 12-in. wide, per lin.ft., $2.88.			
Leather:			
Medium grade	40–5%	40–10–2½%	50%
Heavy grade	35%	40%	40–5%
Rubber and duck:			
First grade	60–5%	50–10%	40 10%
Second grade	60–10–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Conn., Stratford—J. G. Robson, 2180 Elm St.—one No. 2 cutter and creaser (used).

Ill., Aurora—The Blanchard Co., 692 Benton St.—one 42 in. Sheridan die cutting machine and roughing machine.

Kan., Wichita—B. F. Croney, Wichita Pattern Wks., 117 West English St.—power lathe and emery stand.

Kan., Wichita—Fouts Motor Service, 306 South Main St., W. B. Fouts, Purch. Agt.—drill press for power equipment.

Kan., Wichita—C. Hamilton, 144 North Water St.—one drill press for garage.

Kan., Wichita—Kansas Gas & Electric Co., 2336 South Main St., W. Peters, Purch. Wgt.—power lathe and drill press.

Kan., Wichita—W. F. Peters, 233-6 South Main St.—power emery wheel.

Kan., Wichita—South Main Garage Co., 315 South Main St., H. Cummings, Purch. Agt.—power emery wheel and stand.

Kan., Wichita—Taylor Electric Co., 124 North Market St.—power lathe.

Kan., Wichita—C. A. Whitney, 222 East Douglas St.—power drill press and lathe, belting and motor for the manufacture of jewelry.

Kan., Wichita—G. B. Wilson (machinist)—power lathe and drill press.

Md., Baltimore—Western Maryland R.R. Co., Hillen Sta., M. C. Byers, Pres.—machinery and equipment for proposed car shops at Pt. Covington.

Mich., Detroit—W. Eurham, 2964 Chalmer Ave.—three ⅜ in. and one 1¼ in. Cleveland milling machines.

Mich., Grand Rapids—Stalter Edge Tool Co., F. N. Statler, Supt.—one Jones and Lamson turret lathe and one heavy duty milling machine.

N. Y., Buffalo—Ellicott Motor Service Co., 19 Wells St.—machinery, tools and full equipment for gas station.

N. Y., Buffalo—E. R. Emig, 871 East Ferry St.—lathe, drills, presses and other equipment for proposed machine shop.

N. Y., Buffalo—C. J. Ernst, 1009 East Ferry St.—machinery and equipment for proposed shop and service station.

N. Y., Buffalo—D. Liberto, 167 Bway—complete equipment, tools, etc., for several garages.

N. Y., Buffalo—G. Schmidt, 58 Grote St.—machinery and equipment including gas tanks, pumps, etc., for proposed garage, repair shop and gas station on Genesee St.

N. Y., Jamestown—Probst Sheet Metal & Roofing Co., 220 East 2nd St.—machinery and equipment for sheet metal plant on 1st St.

N. Y., Ransomville—B. Frey—machinery, tools and equipment for proposed garage and machine shop.

N. Y., Rochester—P. Lettardy, East Ave.—machinery, tools and equipment for garage and repair shop on North Union St.

N. Y., Rochester—H. Sibley, 100 Sibley Blk.—tools and equipment for garage and repair shop on North St.

N. D., Grand Forks—The Union Transfer Co.—automatic screw machine to cut a ☆ spiral groove in ⅞ in. cold rolled shaft, spiral groove to make one full turn in 12 in.

O., Cleveland—The Armature Coil Equipment Co., 3202 Scranton Rd.—medium sized shaper.

O., Cleveland—The Weiss Heating and Plumbing Co., Cedar Ave. near East 55th St.—one 8 ft. Chicago steel bending brake for bending 16 gauge iron. One set Egra plain forming rolls. One 36 in. squaring shear for 18 gauge material. Small turning machine. One No. 10 revoving Whitney punch and other equipment for heating and plumbing trade (new or used).

Pa., Charleroi—G. Woodward—tools and equipment for 3 story addition to repair shop and service station.

Pa., Coraopolis—Standard Steel Spring Co.—shaper.

Pa., New Castle—Southside Garage, Mill and Phillips Sts., H. Gibson, Purch. Agt.—additional machinery, tools and equipment for addition to garage.

Pa., Phila.—Crawford & Co., 1539 Wood St., (pipe hangers and fittings)—machinery and machine tools for new shop, including drilling machines, lathes, belting, shafting, etc.

Pa., Phila.—Department of Transit, 1211 Chestnut St., W. S. Twining, Dir.—one drill press, 24 in.
One electric floor grinder.
One air compressor.
One oil forge.
Quantity of vises, small and large wrenches and other tools.

Pa., Phila.—Enterprise Mfg. Co., 3rd and Dauphin Sts.—equipment for machine shop addition now under construction.

Pa., Phila.—Hill Independent Mfg. Co., Adams and Emerald St.—drill presses, metal stamps and machinery, straightening and bending machinery.

Pa., Phila.—F. Romano, 819 Fitzwater St.—drop forge, lathe and planer.

Pa., Phila.—T. Savill's Sons Co., 1310 Wallace St., manufacturer of plumbing supplies—additional foundry and pipe threading machines, power.

Pa., Phila.—Wayne Mfg. Co., 2624 West Haggert St.—two medium size punch presses (used).

Pa., Pittsburgh—Pittsburgh Malleable Iron Co., 3rd and Summit Sts., J. P. Coates, Dir.—machinery and equipment.

Pa., Warren—Warren Steel Car Co., Inc., address B. Mathis, Mgr.—Modern machinery for the repair of steel tank cars.

Tex., San Antonio—Claussen Lock & Safe Co., 616 Market St., H. H. Claussen, Genl. Mgr.—elec. grinders, drill press and miscellaneous machinery and equipment.

W. Va., Holden—Island Creek Coal Co.—equipment for proposed machine shop.

W. Va., Princeton—Princeton Automobile Accessories Co., R. F. Forkner, Mgr.—lathe, drill press and smaller machine shop tools (new or used).

W. Va., West Union—West Union Machine & Supply Co., W. L. Lynn, Secy.—one 24 in. x 14 ft. lathe, one 20 in. shaper, power hack saw, electric light plant equipment 100 K.W. A.C. generator.

Wis., Beloit—J. H. Saris, 412 Broad St.—power machinery for proposed garage and repair shop.

Wis., Mercer—D. L. White—machinery and equipment for auto repairing.

Wis., Milwaukee—C. Schoebel, 1092 Richards St.—combination punch and shear for sheet metal.

Wis., New London—F. P. Zang—sander.

Wis., Oshkosh—Oshkosh Cylinder Grinder Co., c/o J. Robb, 126 Park Ave.—grinders.

Wis., Sheboygan—W. A. Knaak Motor Co., South 13th St. and Georgia Ave.—machinery for proposed auto repair shop.

Wis., Sheboygan—E. W. Tupper, 1328 North 7th St.—electric pumps for proposed garage and filling station on St. Clair St.

Ont., Toronto—F. Passmore, 925 Bathurst St.—repair equipment and gasoline supply stand and tank for proposed garage and repair shop.

Machinery Wanted

Ark., Little Rock—T. K. Falconer, 2313 West 13th St.—special machinery for the manufacture of chain protectors for automobile tires, for proposed plant at Texarkana.

Cal., Redlands—J. H. Strait & Co.—machinery and equipment for dehydrating and cider manufacturing plant.

Cal., Reedley—Union High School Trustees—equipment for proposed manual training school.

Cal., San Francisco—Western Newspaper Union, 32 Clay St.—Goss Comet or Duplex double drive model press.

Del., Wilmington—J. D. Sisler Co., 3rd and King Sts.—refrigerating machinery and equipment for proposed cold storage plant.

Fla., Jacksonville—Jacksonville products Co., F. Burkhart, Mgr.—additional machinery for fruit canning plant.

Fla., Leesburg—Municipal Ice Plant—additional machinery for ice plant.

Idaho, Nampa—Idaho Sash, Door & Glass Co.—saws, planers and other machinery and equipment for proposed factory.

Ind., Plymouth—Schlosser Bros.—refrigeration and ice cream making machinery.

La., New Orleans—W. W. Carre Co., Ltd., 814 Hibernian Bldg.—machinery for lumber and finish mill.

Mich., Grand Rapids—Adzet Printers Supply Co., 41 Ellsworth Ave.—one Miehle press.

Mich., Milford—T. S. Hubbell—caterpillar crane, 12 ton, 40 ft. boom, and 1 yard bucket.

Mich., Munising—Munising Fdry. Co.—foundry machinery and equipment for branch plant at Hibbing, Minn.

Mo., Kansas City—J. L. Zidson, 4507 Michigan Ave.—rock crusher and other power rock machinery, also belting.

N. Y., Albion—T. Page Canning Co.—machinery and equipment for medium size canning plant.

N. Y., Bolivar—Bolivar Fdry. Co., Inc., W. J. Brannen, Pres.—equipment for small foundry.

N. Y., Buffalo—Allan Mfg. & Welding Co., 163 Adams St., R. Siemer, Secy.—hand tools, drills, etc., for use in small welding shop.

N. Y., Buffalo—Drive Your Car Co., Inc., 280 Niagara St., G. H. Buhr, Pres.—one 500 gal., one 1,000 gal. tank, pumps and other equipment for gasoline and service station.

N. Y., Buffalo—C. A. Klocke, William St.—gas pump, oil pump, 500 gal. tank, and small tools and equipment for garage and service station.

N. Y., Buffalo—L. Kradel, 1909 Bway.—one 1,060 gal. gas tank and pump for auto livery service.

N. Y., Buffalo—Kutz Bros., c/o R. G. Kutz, Purch. Agt.—complete bakeshop equipment for proposed shop at 1750 Main St.

N. Y., Buffalo—T. Parisi, 1471 Jefferson Ave.—complete machinery and equipment, electrically operated, for shoe repair shop.

N. Y., Buffalo—G. Rath, 1644 Bailey Ave.—one 1,000 gal. tank and gasoline pump, also compressor for tire service.

N. Y., Buffalo—Ye Old Time Baking Co., Inc., 1361 Fillmore Ave., A. E. Robinson, Pres.—ovens and equipment for large bakery at 623 Williams St.

N. Y., Corning—Dairymen's League, O. Wolcott, Pres.—machinery and equipment for proposed milk plant and condensory.

N. Y., Dansville—Maloney Bros. & Wells—machinery and equipment for packing plant.

N. Y., Fredonia—Fredonia Seed Co., Inc., 28 South Water St., H. F. Lupean, Secy.—special additional machinery and equipment for proposed seed factory on Main St.

N. Y., Jamestown—Black Belt Corp., 15 East 15th St., F. E. Clark, Genl. Mgr.—machinery and equipment for proposed addition to plant.

N. Y., Jamestown—Rappole & Robbins, 303 Lafayette St.—air compressor for tire service station.

N. Y., Lockport—Hall & Carrey Weaving & Belting Co.—machinery and equipment for the manufacture of woven textiles, etc.

N. Y., New York—L. Mundet & Son, Inc., 461 8th Ave.—woodworking band saw with 5 to 6 in. blades.

N. Y., New York—Standard Cloth Co., Inc., 342 Madison Ave., (converters of cotton goods), A. Mannheimer, Secy.—cotton cloth cutting machine for cutting 4 to 6-ply cotton at a time.

N. Y., Phelps—A. S. Rathbun—machinery and equipment for flour mill.

N. Y., Red Creek—Central Packing House—machinery and equipment for proposed fruit packing plant.

N. Y., Rochester—Amer. Woodworking Mchy. Co., Lyell Ave.—machinery and equipment for proposed addition to factory.

N. Y., Rochester—Glare Control Headlight Co., Inc., c/o R. L. Curtis, Pres.—machinery for the manufacture of dirigible headlights.

N. Y., Rochester—J. C. Moore, 65 Stone St.—Miller press feeder 10 x 15 for Chandler & Price power press, new series.

N. Y., Rochester—Mt. Carmel Grape Juice Co., c/o E. H. Verhurst, 463 Augustine St.—machinery for the manufacture and bottling of grape juice.

N. Y., Rochester—Rochester Packing Co., 900 Maple St.—machinery and equipment for addition to packing house.

N. Y., Sodus—Sodus Fruit Farm, Inc.—large machines for pitting cherries, to be operated by motor power.

N. Y., Webster—W. Kittleberger, North Ave.—machinery and equipment for fruit canning plant at Walworth.

N. Y., Webster—Webster Basket Co.—machinery for basket manufacturing plant at Rochester.

N. C., Charlotte—F. Hayman, North Tryon St.—machinery and equipment for refrigeration and cold storage plant.

O., Cleveland—L. S. Apple, 617 Schofield Bldg., (stove plate enamel plant)—two large smelters; 10 furnaces (to be lined with carborundum brick); 20 spraying booths; 2 milling machines; electric pickling vats; racks and miscellaneous equipment for proposed plant.

O., Cleveland—C. S. Morgan, 1545 East 18th St.—machinery and equipment for proposed Ignition School.

O., Niles—Niles Tire & Rubber Co., F. E. Turrell, Dir.—machinery for the manufacture of tires and rubber products.

Pa., Bridgeport—J. Lees & Sons Co., Dyers, J. L. Eastwick, Purch. Agt., vats, tanks, agitators, drying machines, etc.

Pa., Chester—Nell-A-May Plush Mills, 6th and Madison Sts., F. Lees, Purch. Agt.—narrow looms and other machinery.

Pa., Coraopolis—Standard Steel Spring Co.—one 10 ton overhead crane, 60 ft. span.

Pa., New Castle—Bd. of Educ.—engine lathes, woodworking machinery, etc.

Pa., Norwood—Pennsylvania Equipment Co.—one 10-ton electric traveling crane, 25 to 35 ft. span.

Pa., Phila.—B. Bernstein & Sons, 1401 North 3rd St., M. Bernstein, Purch. Agt.—additional woodworking machinery for factory.

Pa., Phila.—Better Cake Co., 1034 South 57th St., c/o J. G. Patton—additional machinery for bakery, including dough mixer, conveyor, electric stoves, etc.

Pa., Phila.—C. B. Cochrane & Co., Kensington Ave. and Butler St.—additional narrow looms for carpet mills.

Pa., Phila.—Columbia Carpet Mills, 3rd and Huntingdon Sts.—additional electric looms.

Pa., Phila.—I. J. Horstman & Co., 18th and Washington Sts.—spindles, twisters and other machinery.

Pa., Phila.—F. P. Woll & Co., Tacony and Church Sts., manufacturers of curled hair)—machinery of various kinds and tools for machine shop.

Pa., Phila.—Womens Hospital, 2137 North College Ave., J. L. Maull, Purch. Agt.—Printing presses, 7 x 11 Chase motor driven, automatic feed.

Pa., Sharon—N. Polus—equipment for sand and gravel bank at New Castle.

Pa., Sharon—Valley Packing & Provision Co.—ice plant, coolers and other equipment for proposed addition to packing plant.

Pa., Slatedale—The Blue Mountain Slate Co.—machinery and equipment for slate factory now under construction.

Pa., Washington—Observer Publishing Co.—printing machinery and equipment for proposed plant on Main St.

Tenn., Nashville—Hercules Silica Asphalt Co., 207 Stahlman Bldg.—machinery for the development of rock asphalt including conveyors, air compressors, drills, dinky engines, relaying rail, etc.

Tex., Amarillo—Merchants Produce Co.—machinery and equipment for proposed 30 ton ice plant.

Va., Abingdon—Abingdon Lumber Corp., T. M. Clapp, Secy.—machinery for proposed addition to lumber mill.

Va., Farmville—Farmville Ice Cream Co., E. S. Martin, Secy. and Mgr.—machinery for making ice cream (new or used).

Va., Staunton—Staunton Coca-Cola Bottling Wks., W. L. Sams, Secy. and Mgr.—machinery and equipment for plants at Staunton and Charlottesville (new or used).

W. Va., Bluefield—C. L. Seyler Lumber Co., c/o C. L. Seyler—saw mill and logging equipment including dry kiln, band mill, planer mill, locomotive, rails, etc., for plant at Graham, Va. (used or new).

W. Va., Lansing—Shawner Constr. Co., J. A. Ellison, Mgr.—portable planer and matcher (used).

W. Va., Logan—Guyan Machinery Shops—power driven scroll saw, band wheel for 6 ft. Smith Myers & Schnur mill.

Wis., Athens—Braun Bros.—machinery for planing mill, belt driven.

Wis., Cudahy—H. M. Shoe Co.—shoe working machinery.

Wis., Eau Claire—Chippewa Valley Produce Co.—refrigerating machine and cooling apparatus for cold storage plant.

Wis., Fort Atkinson—Fort Atkinson Canning Co.—canning machinery and crating machine.

Wis., Merrill—Wisconsin Mfg. Co., c/o E. Chauvin—special machinery for proposed factory for the manufacture of sweeping compound.

Wis., Milwaukee—Nowiny Publishing Co., 618 Mitchell St.—paper cutting machine.

Wis., Neillsville—Neillsville Canned Food Co., A. G. Shedden, Purch. Agt.—canning machinery.

Wis., New London—Amer. Plywood Corp., F. P. Zang, Mgr.—sander, taping machine textile dryer and special machinery.

Wis., Racine—Clark Engineeering Co., 4th St. and Lake Ave.—loop winding machine for winding coils in motor repair shop.

Wis., Racine—Clark Eng. Co., Lakeview Bldg., 9th and Lake Ave.—loop winder for winding motor coils in motor repair shop (used).

Wis., Sheboygan—A. H. Ehrlich, 1123 North 8th St.—vulcanizing and power equipment.

Wis., South Kaukauna—H. J. Fassbender, R. F. D. No. 1—churns, mixers, dairy machinery and cooling apparatus.

Wis., Stevens Point—E. B. Schwohn, 215 Strong Ave.—machinery for shoe repair shop at Appelton.

Wis., Wausau—D. L. Bellinger, 1024—3rd St., Machinists—traveling crane.

Wis., Wausau—Gromwald & Co., c/o C. Westberg, Monuments—power saws and polishing mills.

N. B., Brockway—E. Vail—saw mill machinery and other equipment.

Ont., Lindsay—J. Hadley—machinery and equipment for proposed shingle factory.

Ont., Listowel—Pfeffer Milling Co.—equipment for flour mill.

Ont., London—The City Council, H. A. Brazier, City Hall, Engr.—equipment for a carrier system to carry cinders from the incinerator across the river about 1,000 ft.

Ont., Millbank—H. E. Ratz Co.—machinery, engine and general equipment for sawmill.

Ont., Niagara Falls—U. S. Light & Heat Co., manufacturer of batteries, auto starters, etc.—machinery and equipment for plant which is being remodeled.

Ont., Tillsonburg—W. Ruth—equipment for proposed bakery.

Ont., Welland—Welland Cotton Mills, manufacturers of fine and coarse yarns—machinery and equipment including looms, spinners, etc., for proposed million dollar cotton mills on Queen and Duncan Sts.

Que., Montreal—Empire Fdry., 128 Wellington St.—machinery and equipment for proposed brass foundry addition.

Metal Working Shops

Cal., Los Angeles—California Electric Heating Co., 517 Chapman Bldg., plans to build a factory, for the manufacture of combined electric heater and fan, in southeast part of city. Estimated cost $100,000. W. H. Vance, Vice-Pres. Engineer and architect not selected.

Ill., Chicago—W. F. Block & Co., 1845 Lamon Ave., is having plans prepared for the construction of a 1 and 2 story 180 x 200 ft. factory, for the manufacture of sheet metal products, at 1828 Lamon Ave. Estimated cost $100,000. H. H. Green, 304 South Wabash Ave., Archt.

Ill., Chicago—R. R. Cenek, Archt., 118 North La Salle St., will soon receive bids for the construction of a 1 story, 75 x 160 ft. factory on Cottage Grove Ave. and 48th St., for the Auto Truck Body Builders Co. Estimated cost $35,000.

Ill., Chicago—K. Kautman Bros., c/o Dubin & Eisenberg, Archts., 14 West Washington St., will soon award the contract for the construction of a 3 story, 62 x 125 ft. factory and garage, on Fillmore St. Estimated cost $60,000.

Mass., Middleton—The Middleton Motor Co., Danvers, plans to build a 2 story garage, service and repair shop here. Estimated cost $40,000. Private plans.

Mich., Detroit—Fisher Body Co., General Motors Bldg., has awarded the contract for the construction of a 6 story, 102 x 979 ft. factory addition, for the manufacture of automobile bodies. Estimated cost $2,000,000.

Minn., Minneapolis—Bd. of Park Commissioners, J. A. Ridgway, Secy., City Hall, will soon award the contract for the construction of 3 story, 43 x 144 ft. shops and warehouses, on Lyndale Farmstead. Estimated cost $75,000. Magney & Tusler, 126 South 9th St., Archts.

N. Y., Buffalo—C. J. Ernst, 1009 East Ferry St., plans to build a small shop and service station. Estimated cost $12,000. Architect not announced.

N. Y., New York—Commissioner of Plant & Structures, 18th floor, Municipal Bldg. will receive bids until June 23, for the construction of a repair shop, for the department of street cleaning, at 16th St. and Ave. C.

N. Y., New York—The Transit Commission, 49 Lafayette St., has awarded the contract for the construction of additional repair shops on Lenox Ave. and West 148th St. Estimated cost $300,000. Private plans.

O., Cleveland—E. Schimmelman, 17702 Lake Shore Blvd., has had plans prepared for the construction of a 1 story, 54 x 118 ft. garage and commercial building. Estimated cost $50,000. Private plans.

O., Cleveland—J. Struziak, 8126 Wade Park Ave., has completed plans for the construction of a 1 story, 17 x 43 ft. garage and boiler room. Estimated cost $40,000. Private plans.

O., Dayton—Dayton & Troy Auto Co., 2nd and St. Clair Sts. is having plans prepared for the construction of a 5 story, 85 x 200 ft. garage and auto sales building. Estimated cost $180,000. Architect not selected.

O., Lakewood (Cleveland P. O.)—W. C. Schultz, 11913 Detroit Ave., has awarded the contract for the construction of a 1 story, 70 x 90 ft. garage and commercial building on Detroit and Love Aves. Estimated cost $40,000. Noted June 8.

Pa., Coraopolis—Standard Steel Spring Co. is receiving bids for the construction of a 1 story, 64 x 141 ft. factory addition (crane building).

Pa., Erie—Union Iron Wks., 15th and Cascade Sts., is receiving bids for the construction of a 1 and a 3 story, 160 x 310 ft. addition to its plant. G. W. Bach, Mgr. Private plans.

Pa., Johnstown—J. Walling & Co., 518 Washington St., Plans to build a 3 story, 74 x 132 ft. garage, on Railroad St. Estimated cost $150,000.

Pa., Lancaster—Rowe-Stuart Motors Corp. will build a 120 x 271 x 327 ft. factory for the manufacture of Anderson truck tires, on Fountain Ave. between Rossmere and New Holland Aves.

Pa., New Brighton—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story, 100 x 203 ft. machine shop, here. Estimated cost $100,000. W. H. Garver, c/o owner, New Brighton Company, Engr.

Pa., Phila.—J. J. Greenberg Co., Morris Bldg., has awarded the contract for the construction of a 5 story, 55 x 150 ft. sales and service station at 1409-11 North Broad St. Estimated cost $125,000. Noted May 18, 1922.

Pa., Phila.—L. J. Kolb, 10th and Reed Sts., plans to build a 1 story, 60 x 71 ft. and a 1 story, 175 x 200 ft. garage at 1418-28 Mellon St. Estimated cost $80,000. C. B. Weldon, 10 South 18th St., Archt.

Pa., Phila.—H. P. Weldon, Archt., 10 South 18th St., is receiving bids for the construction of a 2 story, 42 x 60 ft. foundry, at 635 North Watts St., for T. Savills Sons, 1310 Wallace St. Estimated cost $10,000.

Pa., Pittsburgh—Fleishman Co., 701 Washington St., New York City, will soon award the contract for the construction of a 1 and 2 story, 75 x 175 ft. garage, warehouse and office building on Alley and Western Sts., here. Estimated cost $50,000. L. L. Teeman, c/o owner, Archt.

Pa., Pittsburgh—Haller Baking Co., 260 North Denniston Ave., has awarded the contract for the construction of a 2 story 86 x 92 ft. bakery addition and garage, on Shakespeare St. Estimated cost $50,000.

Pa., Warren—Warren Steel Car Co., Inc., plans to rebuild its plant which was destroyed by fire. Estimated cost $75,000. B. Mathis, Mgr. Architect not announced.

Va., Brattleboro—The Presby-Leland Co., Barre, has awarded the contract for the construction of a 1 story cutting shed, a 1 story machine shop, a 1 story office building, and storage sheds, here. Estimated cost $100,000. Private plans. Noted June 1, 1922.

Va., Norfolk—Johnson Motor Corp., 751 Granby St., has awarded the contract for the construction of a garage. Private plans.

Va., Norfolk — Lowenberg — Goodman Corp., 127 Granby St., has awarded the contract for the construction of a 91 x 305 ft. garage on Granby and 11th Sts. Estimated cost $194,000.

W. Va., Holden—Island Creek Coal Co. plans to build a machine shop to replace the one destroyed by fire. Estimated cost $75,000. Architect not announced.

Wis., Beloit—J. H. Saris, 412 Broad St., is receiving bids for the construction of a 2 story, 100 x 130 ft. garage. Estimated cost $50,000. J. F. Hetherington & Son, Goodwin Blk., Archts.

Wis., Sheboygan—W. A. Knaak Motor Co., South 13h St. and Georgia Ave., is having plans prepared for the construction of a 2 story, 50 x 95 ft. garage. Estimated cost $50,000. E. A. Stubenrauch, 629 North 8th St., Archt.

Wis., Sheboygan—E. W. Tupper, 1328 North 7th St., has awarded the contract for the construction of a 1 story, 50 x 60 ft. garage and filling station on St. Clair St. Estimated cost $40,000. Private plans.

Ont., Toronto—F. Passmore, 925 Bathurst St., plans to build a 2 story, 40 x 80 ft. garage and repair shop. Estimated cost $30,000.

General Manufacturing

Cal., Dinuba—Sun Maid Raisin Growers, Holland Bldg., Fresno, are having plans prepared for the construction of an 80 x 140 ft. packing plant, here. Trewhitt-Shields Co., Rowell Bldg., Fresno, Archts.

Cal., Eureka—Eureka Woolen Mills, Bway and Whipple Sts., has awarded the contract for the construction of a 2 story addition to its plant. Estimated cost $12,000. F. E. McGee, Vice-Pres.

Cal., Reedley—Union High School Trustees will receive bids until June 30 for the construction of 6 high school buildings, including administration, gymnasium, manual training, cafeteria, etc. Estimated cost for building and equipment, $450,000. Trewhitt & Shields, Rowell Bldg., Fresno, Archts.

Cal., San Francisco—O'Brien Bros., Inc., Archts., 240 Montgomery St., are receiving bids for the construction of a 2 story printing plant on Howard St., for L. Laurie, Mills Bldg. Building to be leased to Leighton Press, 516 Mission St. Estimated cost $25,000.

Cal., San Francisco—W. N. Brunt, 766 Mission St., has awarded the contract for the construction of a 2 story printing plant, on Minna and 7th Sts. Estimated cost $40,000.

Cal., San Francisco—Wayne Oil Tank and Pump Co., 4th and Harrison Sts., has awarded the contract for the construction of a 1 story shop and office building on 4th and Perry Sts. Estimated cost $10,000.

Fla., Lakeland—Non-Acid Fertilizer and Chemical Co. is having plans prepared for the construction of a fertilizer plant. H. D. Mendenhall, Lakeland, Archt.

Fla., Tampa—Tampa Gas Co., 201 Madison St., plans to build a gas plant extension. Estimated cost $50,000. R. Nettles, Chapin and Boulevard Sts., Engr.

Ga., La Grange—Dunson Mills has awarded the contract for the construction of a 1 story 111 x 132 ft. addition to their weave shed.

Ind., Kokomo—Kokomo Gas & Fuel Co., c/o C. A. Moore, Pres., is having plans prepared for the construction of a manufacturing plant. Estimated cost $500,000. The Kopper Co., Union Arcade Bldg., Pittsburgh, Pa., Engrs.

Me., Portland—Confederated Home Abattoir Corp., plans to build a meat packing and ice manufacturing and refrigeration plant. Estimated cost $500,000. Architect not announced.

Md., Baltimore—Kaufman Beef Co., Union Stock Yards, had plans prepared for the construction of a 3 story, 110 x 120 ft. packing plant. Estimated cost $125,000. Himmelsbach and Schlich, 136 Liberty St., New York, Engrs.

Mass., Boston—The Ginter Co., 369 Congress St., has awarded the contract for the construction of a 4 story, 40 x 80 ft. bakery on Shawmut St. Estimated cost $50,000.

Mass., Ipswich—Hayward Hosiery Co. has awarded the contract for the construction of a 1 story, 45 x 135 ft. hosiery mill. Estimated cost $15,000. Private plans. W. E. Hayward, Pres.

Mass., Lynn—A. M. Creighton, 27 Willow St., has awarded the contract for the construction of a 4 story, 50 x 225 x 255 ft. factory for the manufacture of shoes. Estimated cost $300,000.

Minn., Cloquet—The Northwest Paper Co. has awarded the contract for the construction of a 3 story paper mill. Estimated cost $500,000. Noted Feb. 9, 1922.

Minn., Cloquet—Northern Lumber Co. is building a 2 story, 75 x 185 ft. planing mill. Estimated cost $30,000.

N. Y., Buffalo—Harvey Laundry Co., Inc., 90 Chenango St., plans to build a laundry. Estimated cost $15,000. Private plans. Architect not announced.

N. Y., Lockport—A. W. Jack Corp. has awarded the contract for the construction of a paper mill, on Mill and Transit Rds.

N. Y., Niagara Falls—Kimberly-Clark Paper Co., Packard Rd., has awarded the contract for the construction of one 50 x 100 ft. and one 50 x 120 ft. factory building for the manufacture of paper. Estimated cost $60,000.

N. Y., Red Creek—Central Packing House has awarded the contract for the construction of a 50 x 100 ft. fruit packing plant.

N. C., Brevard—H. C. Brevard, plans to build an ice and cold storage plant. Estimated cost including machinery $12,000 to $15,000. Engineer not selected.

N. C., Winston-Salem—Bailey Bros., plan to build a 5 story, 63 x 154 ft. cigarette factory. Estimated cost $100,000. Lockwood, Green & Co., Charlotte, Archts.

O., Cleveland—A. Zicha, 3587 East 108th St., has awarded the contract for the construction of a 2 story, 42 x 66 ft. bakery and commercial building, at 4110 Memphis Ave. Estimated cost $40,000. Private plans.

O., Columbus—Department of Public Welfare, 9th and Oak Sts., will soon award the contract for the construction of a laundry and bakeshop on West Broad St. Estimated cost $50,000 and $30,000 respectively. R. S. Harst, Ohio-Hartman Bldg., Archt.

Pa., Phila.—Bayuk Bros., Inc., 3rd and Spruce Sts., will soon receive bids for the construction of a 4 story, 84 x 109 ft. factory, for the manufacture of cigars, at 10th and Bainbridge Sts. Estimated cost $250,000. E. A. Wilson, 1208 Chestnut St., Archt.

Pa., Phila.—Blumenthal Bros., Margaret and James Sts., has awarded the contract for the construction of a factory for the manufacture of cocoa products. Estimated cost $200,000. Ballinger Co., 12th and Chestnut Sts., Archts.

Pa., Phila.—C. B. Cochrane, Kensington Ave. and Butler St., plans to build a 3 story, 40 x 200 ft. rug factory. Estimated cost $50,000. W. Steele & Sons, 16th and Arch Sts., Engrs.

Pa., Phila.—Columbia Carpet Mills, 3rd and Huntington Sts., has awarded the contract for the construction of a 5 story, 40 x 114 x 146 ft. carpet mill, on 3rd and Cumberland Sts.

Pa., Phila.—Gill Glass Co., Amber and Venango Sts., has awarded the contract for the construction of a 2 story, 20 x 86 ft. factory. Estimated cost $25,000.

Pa., Phila.—W. F. Newberry Co., Otis Bldg., Engrs., are receiving bids for the construction of 1 story, 20 x 25 ft. and 1 story, 70 x 200 ft. factory buildings for the manufacture of silks, on Front and Olney Aves., for Heinz Mfg. Co., 2120 West Tioga St. Estimated cost $80,000.

Pa., Pittsburgh—Newspaper Printing Co., Gazette Sq., has awarded the contract for the construction of a 3 story, 81 x 84 x 107 ft. addition to their plant. Estimated cost $175,000. E. B. Lee, Chamber of Commerce Bldg., Archt.

Pa., Reading—Central Abattoir Co., Chestnut St., had plans prepared for the construction of a 3 story plant addition. Estimated cost $125,000. Himmelsbach and Schlich, 136 Liberty St., New York. Engrs.

Pa., Rochester—Amer. Borax Co., c/o Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, has awarded the contract for the construction of 3 story, 50 x 100 ft., 1 story, 50 x 100 ft., and 1 story, 30 x 50 ft. factory and power plant, here. Estimated cost $90,000. Private plans.

Pa., Shamokin—Croninger Packing Co. has awarded the contract for the construction of a 5 story, 28 x 52 ft. and 50 x 77 ft. packing house. Estimated cost $200,000. Noted April 13, 1922.

Pa., Sharon—Sharon Furniture Co. plans to rebuild a factory recently destroyed by fire, for the manufacture of furniture. Estimated cost $25,000. Architect not announced.

Pa., Williamsport—Peters Packing Co., has awarded the contract for the construction of a 4 story, 68 x 68 ft. packing house. Estimated cost $130,000. C. B. Comstock, 110 West 40th St., New York, Archt.

Tex., Grand Prairie—Prairie Refining Co., has awarded the contract for the construction of a refinery. Estimated cost $40,000. I. B. Walker, Pres.

Va., Buena Vista—United Chemical Products Co., 609 Chamber of Commerce Bldg., Pittsburgh, is receiving bids for the construction of a 1 story, 41 x 44 ft. plant here, for the manufacture of fertilizer. Estimated cost $45,000. F. B. Deane, c/o owner, Archt.

Va., Norfolk—The City Gas Co., has awarded the contract for the construction of gas holder, boiler works, and extension to gas mains at present plant, on Monticello Ave. Estimated cost $122,000.

W. Va., Huntington—Perry Norvell Shoe Co., has awarded the contract for the construction of a 6 story shoe factory, on Guyan and 25th Sts. Estimated cost $100,000.

Wis., Fair Water—Fair Water Co., has awarded the contract for the construction of a 2 story, 70 x 85 ft. dairy. Estimated cost $50,000.

Wis., Madison—The City of Madison, N. C. Buser, Clerk, plans to build a 20 ton auto scale for public use. E. E. Parker, Engr.

Wis., Madison—Northern Wisconsin Oil Co., De Pere St., Menasha, has awarded the contract for the construction of a 1 story, 50 x 110 ft. filling station on Gilman St., here. Estimated cost $45,000. Address G. Mayer, Menasha.

Wis., Milwaukee—Claybourn Process Corp., c/o H. J. Esser, 82 Wisconsin St., Archt. and Engr., will soon award the contract for the construction of a 1 story, 117 x 200 ft. building for the manufacture of a color printing process, on Humboldt Ave. Plans are also being prepared for the construction of a 1 story, 30 x 80 ft. boiler room and heat treating building, also a 1 story, 100 x 182 ft. administration building.

Wis., Omro—Omro Co-operative Butter & Cheese Co. has awarded the contract for the construction of a 1 story, 69 x 74 ft. creamery and cheese factory. Estimated cost $42,000.

Ont., Huntsville—Muskoko Wood Mfg. Co., plans to rebuild its plant partially destroyed by fire. Estimated cost including machinery, etc., $100,000.

Ont., Welland—Empire Cotton Mills, Ltd., has awarded the contract for the construction of an addition to its mills. Estimated cost $250,000. Noted March 23.

Ont., Welland—Welland Cotton Mills. Ltd., plans to build a cotton mill in two units, one for coarse yarns and the other for fine yarns, on Queen and Duncan Sts. Estimated cost $1,000,000. R. Cooper, Secy. Private plans.

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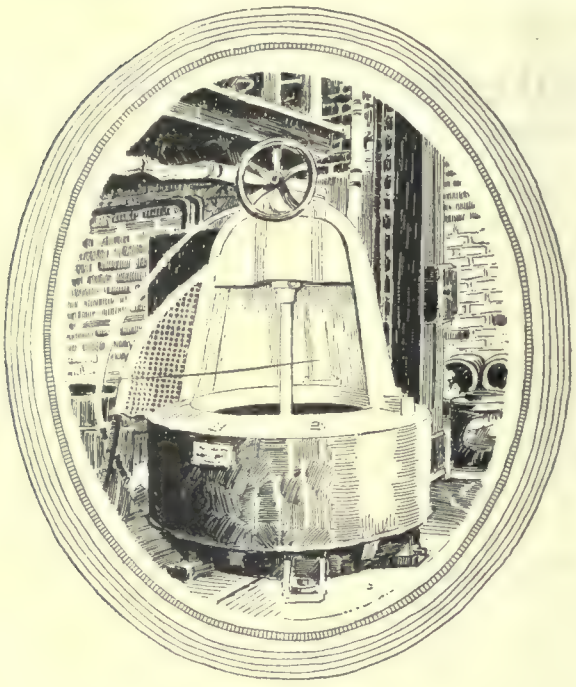
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Machines that Whirl the Water Out

Of course we mean centrifugal drying machines.

Such machines are made by several firms, some of whom have been in the business for many years and have built up a wonderful reputation for good machines and fair prices.

There's a lot of cast iron in them, but the basket for revolving the material to be dried is made of copper. Fairly large machine tools are required to work on the larger sizes, and an average or typical size is perhaps 48 inches inside the revolving basket.

Taking the 48 in. machine as a fair sample, one type weighs 4000 lbs. and another about 4600 lbs. The first sells for a trifle over $1400 and the other for about $1600. If they had worked the price out on a pound basis they couldn't have come nearer to a fixed rate per pound—and it's mighty close to 35 cents.

While the materials differ somewhat and there is a considerable difference in weight, the pound price may be likened to the vertical boring mill. The workmanship required on the dryer is certainly no more accurate than on the boring mill. Of course, there is more cast iron—but one of the highest price boring mills on the market sells for only 25 cents a lb. as against 35 cents for dryers.

But—

When you buy machine tools—you buy production—not pounds

American Machinist, New York

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Here are three Link-Belt Data Books which every user of power-transmission chains—every factory manager who is not now using chain drives—and everyone interested in the efficient and economical transmission of power, should read.

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780

Leaving a "mark"

Centuries before Columbus discovered America there lived in the western part of our country, the Cliff Dwellers. Near the Grand Canyon of the Arizona, particularly, can be seen what is left of the homes of these strange people.

Hewn out of solid rock in numerous cliffs which rise out of the desert waste, these places of habitation are almost inaccessible. Some crude pottery and hatchet heads of stone have been discovered, but beyond that we know comparatively nothing of these people.

They indeed are the foundlings of history. Their origin is almost as trackless as the sand which surrounds the ruins of their homes.

What they did, their characteristics; in fact, what became of them undoubtedly will always remain a mystery. They came, lived and vanished. Oblivion swept over them like a tidal wave, leaving only scattered fragments of their history.

What a contrast, what a difference compared with other peoples history tells us about. Even the ancient Egyptians who lived thousands and thousands of years ago left their "mark" behind them. They made inscriptions in stone telling of their deeds, mummified their dead, built tombs and statues that exist today!

The Lodge & Shipley

Cincinnati

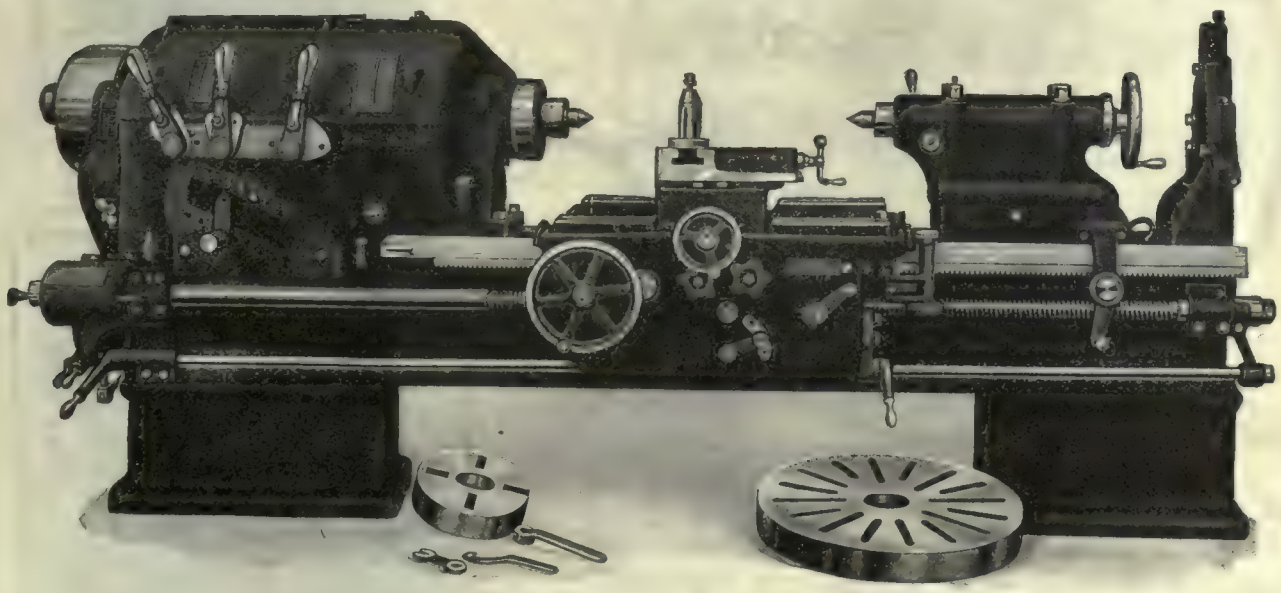
LATHES
Good Lathes Only

And that's what counts! Doing things out of the ordinary and better than the average will leave a "mark." This does not merely apply to people, but to anything—to machines.

There are countless machines that come and go and fail to leave their "mark."

When you are considering the addition of a lathe to your shop specify one that has established itself, one that will always be a real asset, one that will leave its "mark," such as

THE LODGE & SHIPLEY ENGINE LATHE

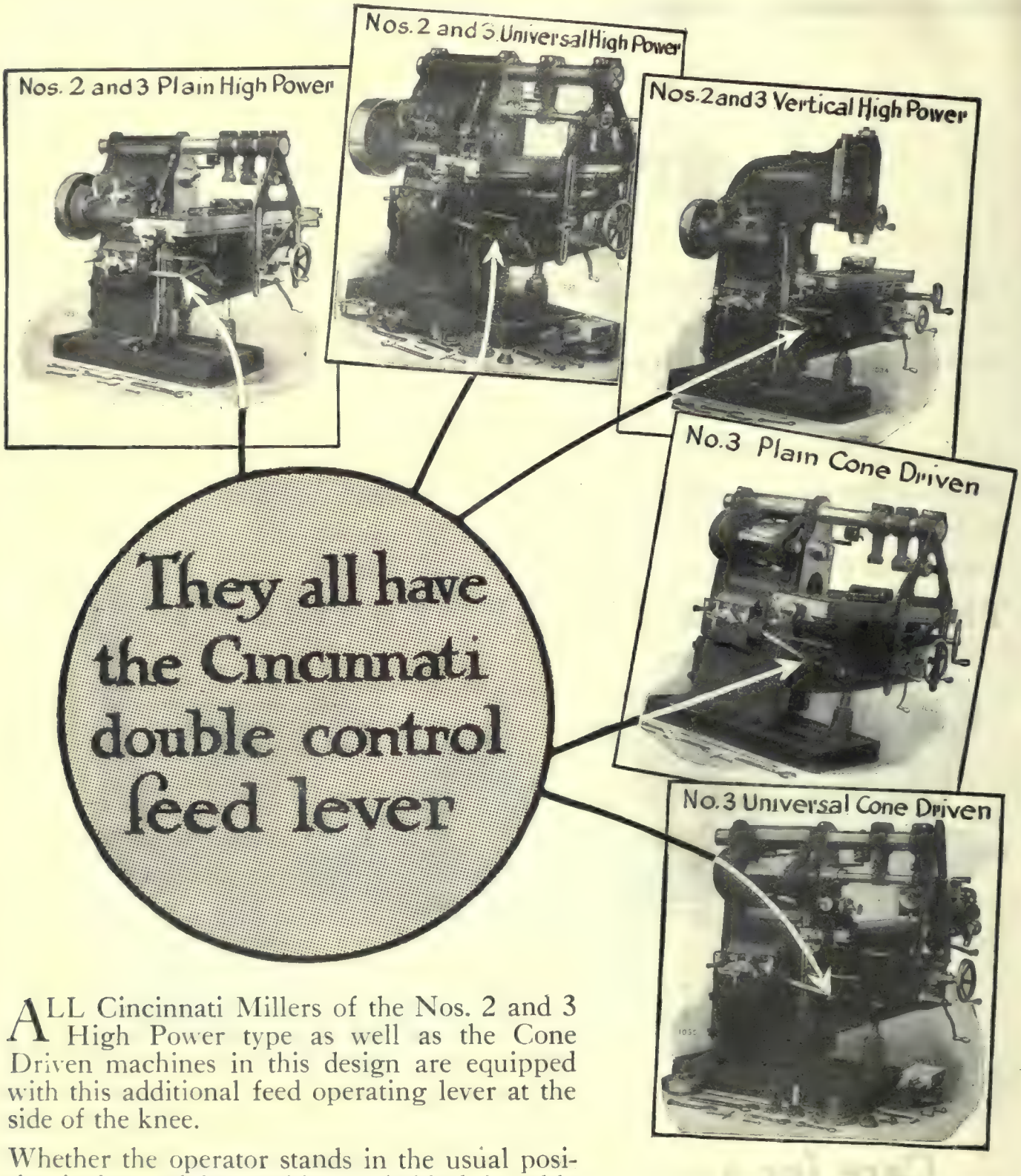


24-in. Selective Head Lodge & Shipley Engine Lathe
Made in sizes 14-in. to 60-in.

Care for a catalogue? No obligation.

Machine Tool Co.

Ohio



ALL Cincinnati Millers of the Nos. 2 and 3 High Power type as well as the Cone Driven machines in this design are equipped with this additional feed operating lever at the side of the knee.

Whether the operator stands in the usual position in front of the machine, or behind the table as the nature of the work sometimes requires, he still has instant control over feeds.

This is only one of their many features providing unusual convenience of control.

Cincinnati reputation is founded largely upon the performance of these machines. Their great power, with convenience of control, has made them famous. We are ready with the full details.

The Cincinnati Milling Machine Co., Cincinnati, O.

BAUSH METAL
DURALUMIN

A Few Advantages

MACHINING

Better than aluminum.
Cost greatly reduced when compared with iron or steel.
Taps and threads well.

RECIPROCATING PARTS

Weight reduced without loss of strength.
Acceleration increased.
Inertia decreased.

Polishes easily.
Resists atmospheric conditions.
No plating required.

Can be rolled, forged, drawn, heat treated and annealed.
Hot and cold worked.

A QUALITY METAL

Duralumin is an alloy produced after years of systematic endeavor to meet the demand for a metal which shall be as light as Aluminum and as strong as mild steel, yet without the many disadvantages of Aluminum in its pure state.

Duralumin is the only light metal that can replace steel in forgings. With a two-thirds saving in weight, heat treated Duralumin Forgings approximate mild steel forgings in strength.

Wherever weight is a deciding factor Duralumin is the most satisfactory metal for most articles made by hot working or forging. Naturally, Duralumin Forgings are especially desirable for reciprocating or moving parts where inertia, due to their own weight, forms a large part of the total stress.

Minimum Physical Properties of Rolled or Sheet Metal (heat treated) and of Forging Metal are:

Tensile	55,000 lbs. per sq. inch
Elastic Limit	30,000 lbs. per sq. inch
Elongation	18%

BAUSH MACHINE TOOL COMPANY

Metals Division

SPRINGFIELD, MASS., U.S.A.

Manufacturers of

BAUSH
DURALUMIN

BLOOMS—SLABS—BILLETS—SHEETS—FORGINGS

BAUSH CASTING METAL INGOTS

Aluminum Alloy of High Tensile Strength

Rolling Mill and Drop Forge Works
SPRINGFIELD, MASS.

Detroit Office:
1825 Dime Savings Bank Bldg.

Admiration



Also Makers of the Brubaker Staybolt Tap—The Tap with the Continuous Taper. Designed so you can't tell where the taper thread enters the straight which distributes the cutting strain.

Brubaker Tools Develop Enthusiastic Mechanics

A correctly designed tool works clean and free and thus takes the fatigue out of a day's work. Brubaker Tools are correctly designed from best grade materials and possess a temper that permits of highest motor speeds without danger of fracture.

Boiler makers insist on Brubaker Tools because they assure a bigger and better day's work with the minimum of fatigue.

Let us send you a Catalog covering the Brubaker Line.

W. L. BRUBAKER & BROS. CO.

50 CHURCH STREET, NEW YORK, N. Y.

FACTORY, MILLERSBURG, PA.

A New Betts Planer

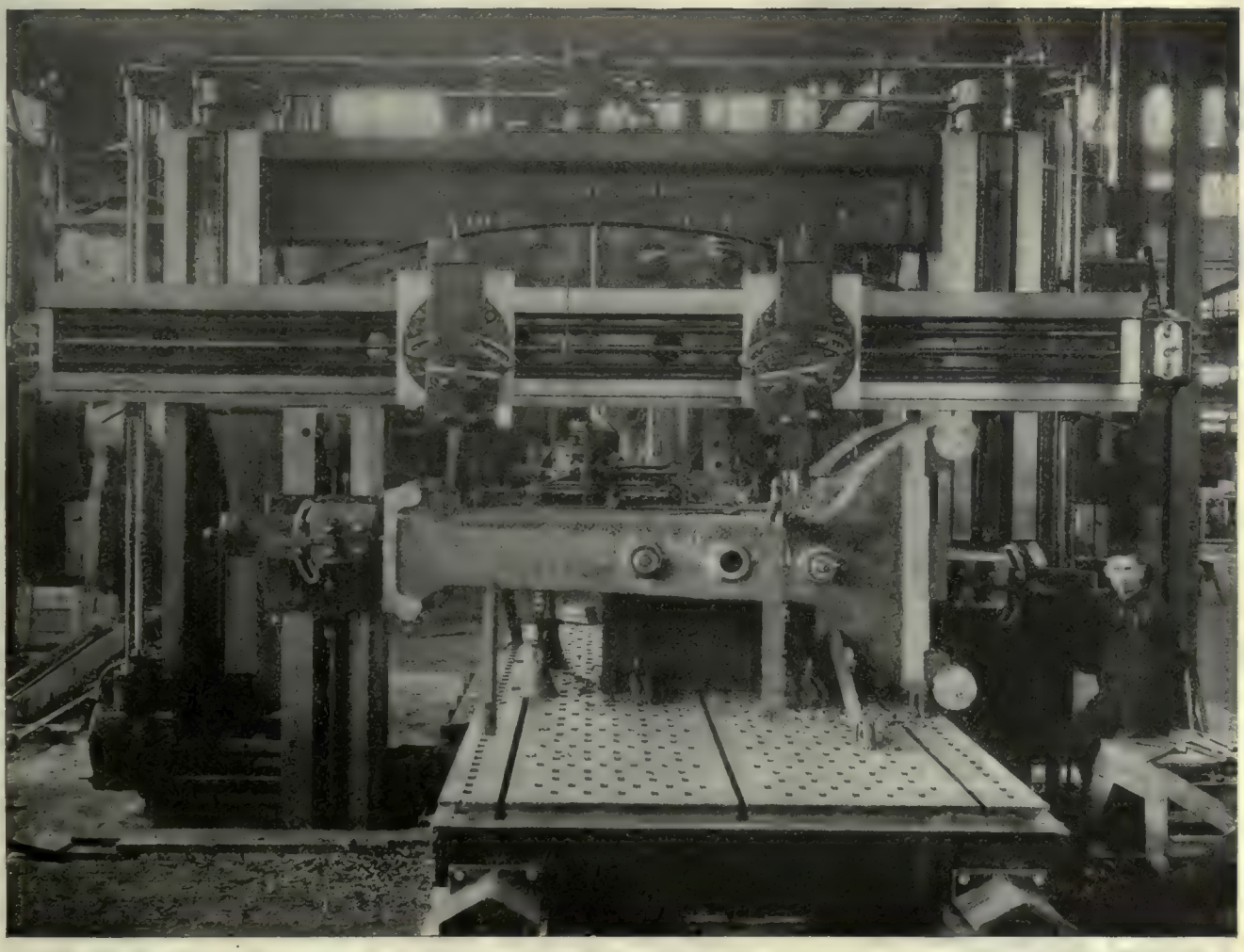
With Movable Side Rail

This machine is superior to an open side planer or an open side extension planer. It will handle work for which an open side planer is intended and at the same time has the rigidity of a standard planer.

The planer has two uprights which are keyed and bolted to the bed in the usual manner and in addition has a movable side rail which carries the left hand side head.

Note in the photograph that all four heads are working on this steel casting without over-hanging tool slides, thereby enabling a much heavier cut to be taken.

This planer was installed recently in the plant of the Erie Foundry Company, Erie, Pa.

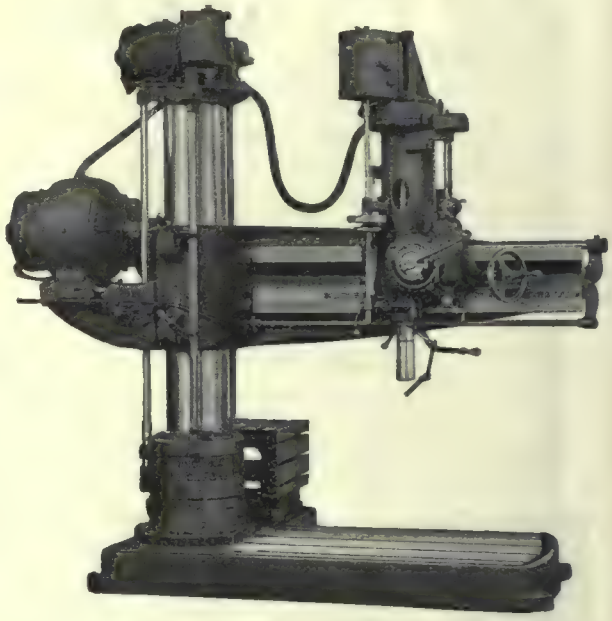


Betts Machine Company
402 Blossom Road, Rochester, N. Y.

BETTS MACHINE TOOLS

THE CINCINNATI BICKFORD

A Type of Drive That Some Prefer



There is a good deal to be said for this method of drive—mounting the motor on the arm.

It eliminates four shafts and seven gears, thereby obtaining direct power transmission to the spindle. This makes for simplicity, smooth operation and power economy.

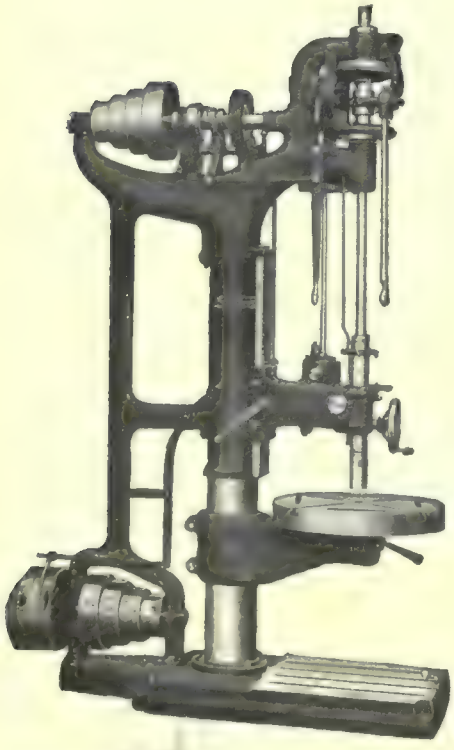
The motor at the top of the column renders the elevating mechanism entirely independent of the drive—the great advantage of which is explained in a new twelve-paged circular devoted exclusively to Motor Driven Radial Drills.

These drills are all that an experience of 48 years can make them—thoroughly up to date in design and reliable to the last degree in construction.

The Cincinnati Bickford Tool Co.

Oakley, Cincinnati, Ohio, U. S. A.

Founded 1874



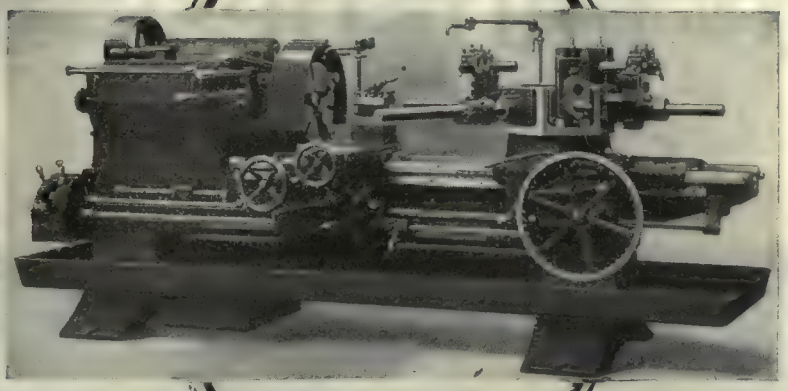
THE CINCINNATI

Economy of the Tapping Attachment

Besides eliminating the expense and inaccuracy of tapping by hand, the Tapping Attachment effects a great saving in taps by reducing the breakage, and prolonging the life of their cutting edges. It also provides a convenient means for starting and stopping the spindle when changing tools.

The Tapping Attachment acts through friction clutches and is hence operative at all speeds without shock or noise. It has unusual gripping power, is adjustable for wear, and may be disengaged when not required for tapping.

We make this type of drill in eight styles and five sizes, ranging from 24 to 42 inches.



The Highest Priced Turret Lathe

HOW many manufacturers are proud of the high price of their products. We are proud of it because it indicates how much more is built into each machine. Better workmanship, better material, better engineering thought.

Back in 1880, Mr. Warner and Mr. Swasey began making turret lathes at a time when there seemed to be ample larger makers of machinery to supply the needs.

In nearly every period in the 42 years since, buyers have paid more for W & S Turret Lathes than was asked for many other turret lathes obtainable during that time. They paid more, but they got more.

Those definite in-built characteristics made more money for the users of Warner & Swasey Turret Lathes, and so the higher price they paid became a lesser price.

W & S Turret Lathes are sound equipment investments which pay dividends over many years. Some shops have had W & S Turret Lathes not only out-produce several other types bought because of lower price, but outlast them many years.

Warner & Swasey Turret Lathes are sold at one fixed price, whether you are the buyer of one or many. You buy at any time with the same security whether you are a big or small buyer.

Take your production costs and length of profitable service. Compare them with that nearly forgotton price you paid for the machine, and you will find you bought your greatest bargain when you selected your Warner & Swasey Turret Lathes.

When seeking new equipment, investigate W & S Turret Lathes.

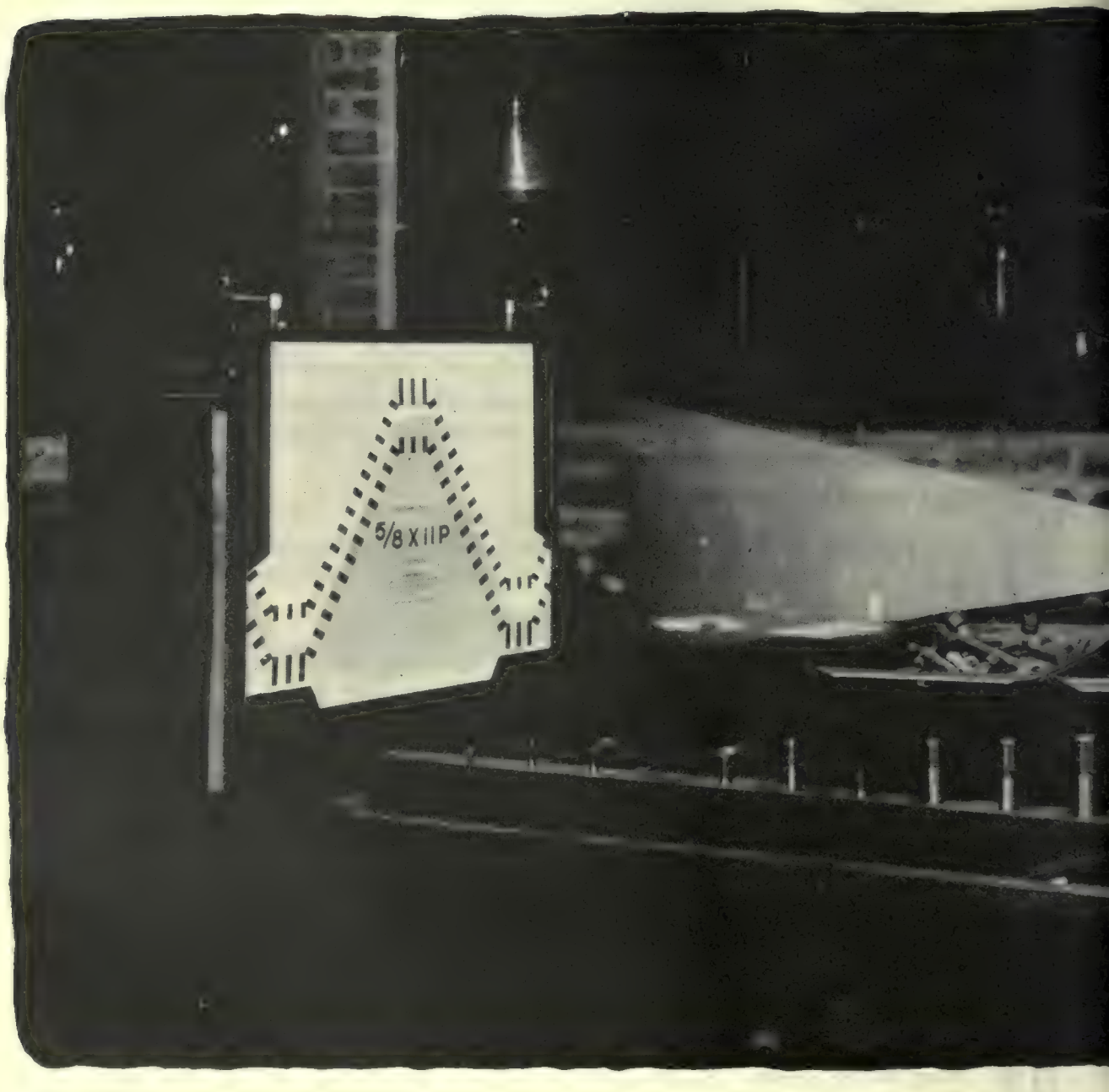
The Warner & Swasey Company

Cleveland, U. S. A.

NEW YORK: Singer Building
CHICAGO: 618-622 Washington Boulevard
MILWAUKEE: 209 Sycamore Building
BOSTON: Oliver Building
INDIANAPOLIS: 940 Lemcke Annex
BUFFALO: Iroquois Building
DETROIT: 5928 Second Boulevard
DAYTON: 518 Mutual Home Building

The Hartness Screw

Rapid



For Details

Jones & Lamson

Springfield,

9-10 Water Lane, Queen Victoria St., London, England

AGENTS:

France, Spain and Belgium—F. Auberty & Co., 182 Rue Lafayette, Paris; Holland—Spliethoff, Beeuwkes & Co., Leuvehaven, wz. Rotterdam; Japan, Korea, etc., Mitsui & Co., Ltd., Tokio; Australasia—McPherson's Pty., Ltd., 554 Collins St., Melbourne; Sweden—A. Bol. Oscar Lindbom, Stockholm—Post Box 420.

Thread Comparator

Reliable



Write Us

Machine Company

Vermont, U. S. A.

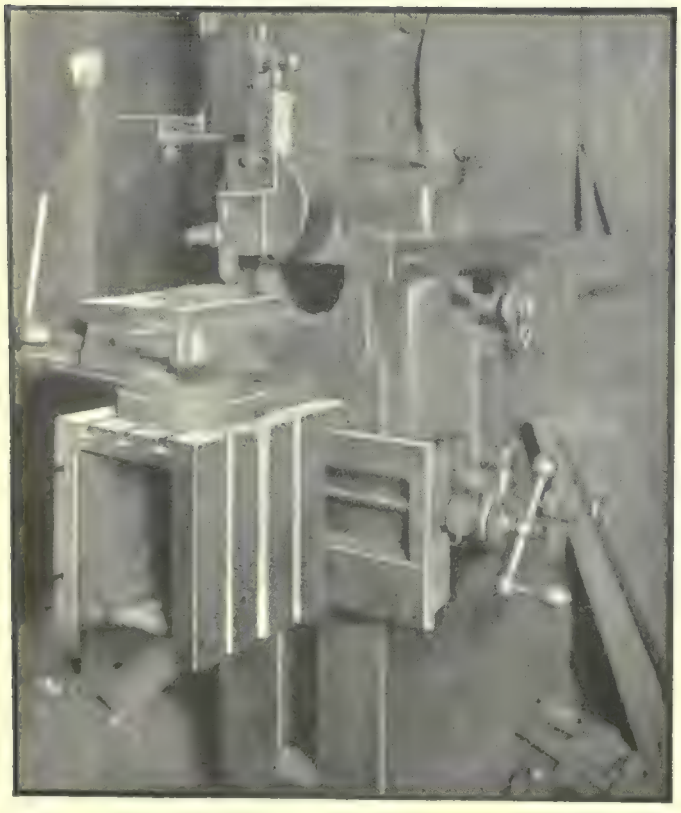
503 Market St., San Francisco, Cal.

AGENTS:

France, Spain and Belgium—F. Auberty & Co., 182 Rue Lafayette, Paris; Holland — Spliethoff, Beeuwkes & Co., Leuvehaven, wz. Rotterdam; Japan, Korea, etc., Mitsui & Co., Ltd., Tokio; Australasia —McPherson's Pty., Ltd., 554 Collins St., Melbourne; Sweden—A. Bol. Oscar Lindbom, Stockholm—Post Box 420.

AMER

To get away from "deadly mediocrity"



These are the days when it doesn't pay to be merely "one of the crowd"—the shop that really succeeds must be *above the crowd* in its general efficiency. There are too many plants equipped to do a job "almost as well" or "just as well"—and these plants will of necessity find the next few years hard years.

"It pays to get away from this deadly mediocrity" by installing machine tools which can do the job *better, faster* and *for less money!*

On the left is a 21-year old shaper, actually in use in a New York shop. It is of obsolete design, badly worn and inaccurate. When photographed it was taking a cut in steel 1/16 in. deep, with a .015 in. feed, 22 strokes per minute! *Do you call that economy?*

The American Tool Works

Lathes ***Planers***

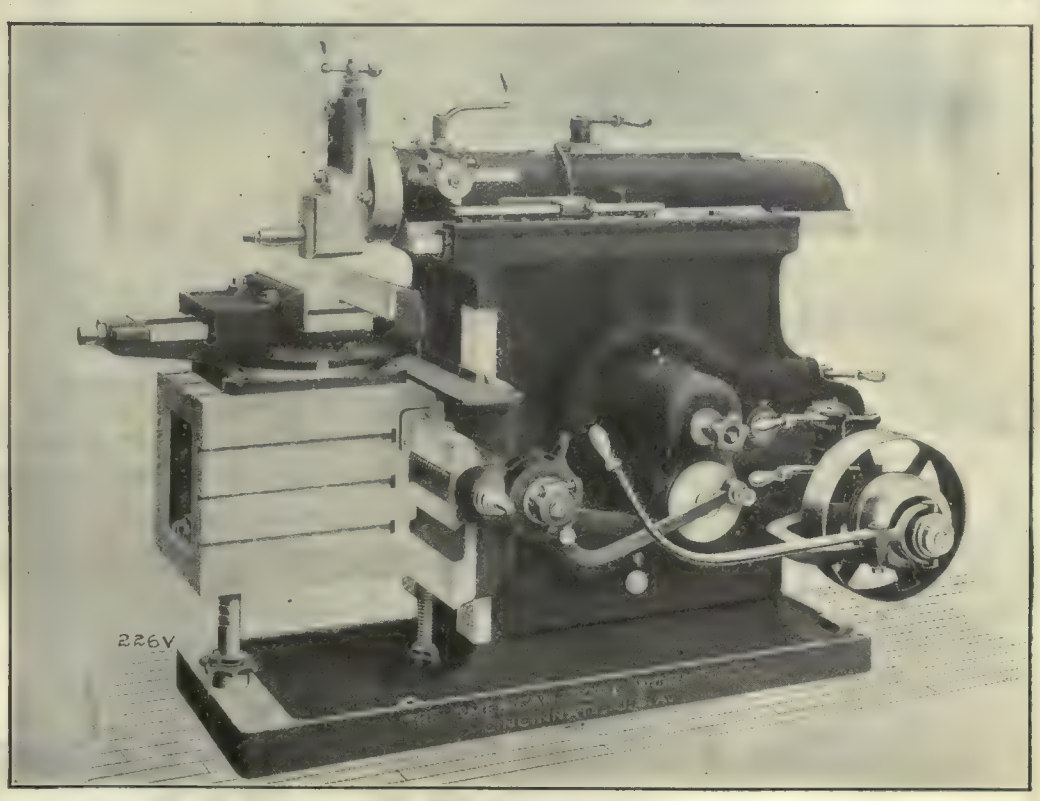
ICAN

INSTALL

AMERICAN SHAPERS

You probably have no equipment of such low efficiency as that shown on the opposite page, but you may have machines of so called "average" quality which are extremely costly to run. Have you a shaper which can compare with the production of this new "AMERICAN"?

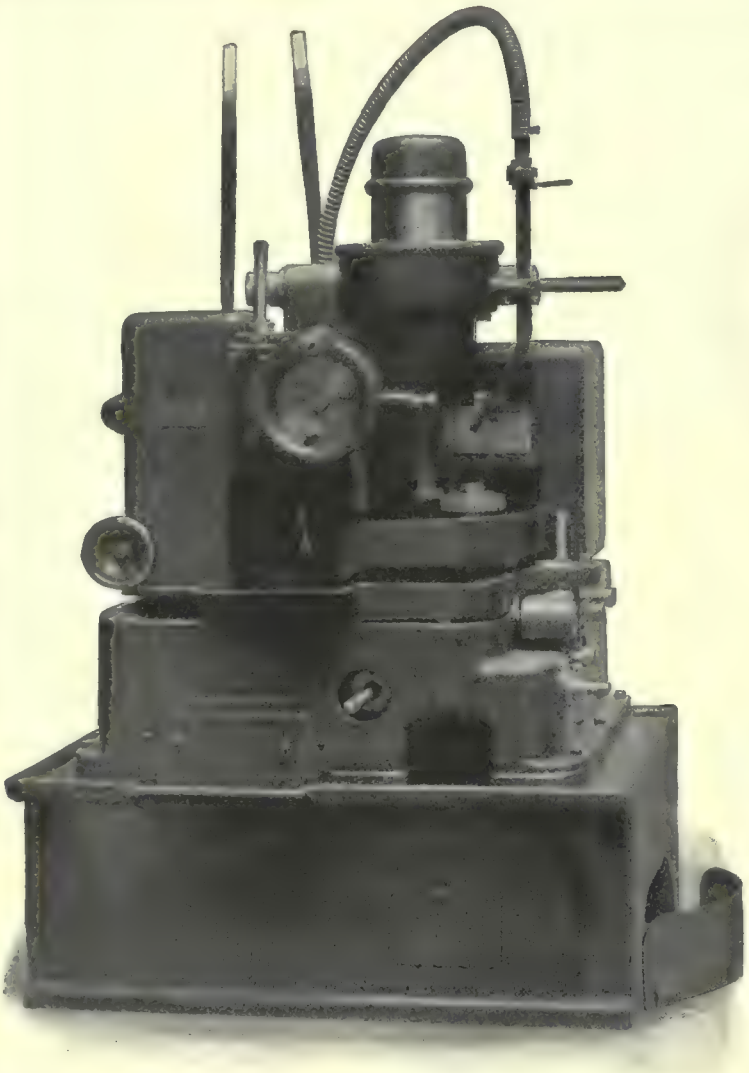
It is the same size (21-in. stroke) and does the same work at ½-in. depth of cut with a .093 in. feed, at 22 strokes per minute—an increase in output of over 48 times! Remember, too, that the work is *accurate*.



It's our job to change low efficiency and "average" efficiency to high efficiency. Let us help you check up your machine tools—we'll supply estimates that will be valuable to you.

Company, Cincinnati, U. S. A.

Shapers ***Radials***



This Machine Will Reduce Your Gear Costs

This new high-speed Gear Shaper is designed to operate at high reciprocating cutter speeds, and has a maximum cutting stroke of 1½ inch.

Cutter speeds of 600 strokes per minute and even higher are possible on alloy steel. Concentric and accurate gears in large quantities are possible due to the almost complete elimination of local heating of the work. The life of the cutter is also prolonged.

There are many other money-saving features embodied in the design of this machine.

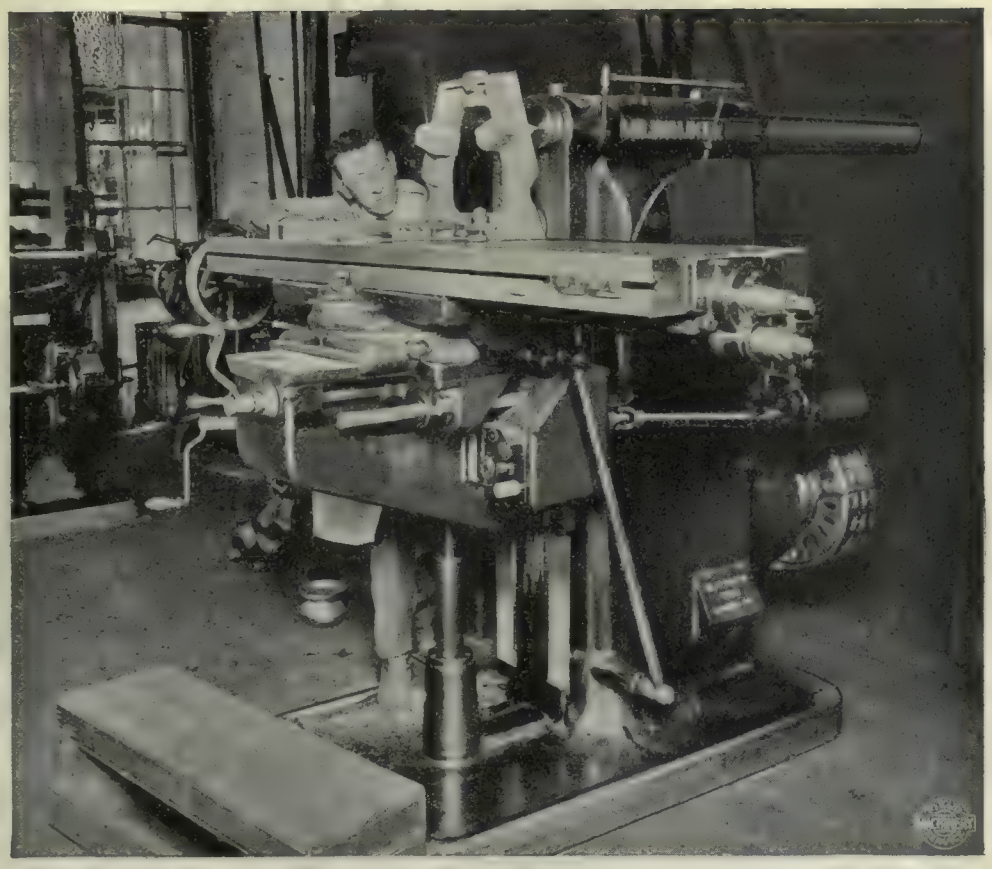
Give us an opportunity to explain them fully.

The Fellows Gear Shaper Company

Springfield, Vermont, U. S. A.

Foreign Agents—Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Parit, France; Societa Anonyma Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Ltd., Head Office, Calcutta, India. *Pacific Coast Representatives:* Eccles & Smith Company, Portland, Oregon; Seattle, Washington; San Francisco and Los Angeles, California.

MILWAUKEE MILLING MACHINES



"Only the Best Equipment" for This Contract Shop

The successful manufacture of special tools and machines—all the intricate, accurate work of the high grade contract shop—demands tools of the highest type.

This is realized by the Young & Franklin Co., Syracuse, N. Y.—as the superintendent says, "We use in our shop only the best equipment built." Every machine in the place is carefully chosen to meet a definite high standard.

We are proud of the fact that Milwaukee Milling Machines are the natural choice for a shop of this kind; that they get results that are satisfactory in every way to their owners and to us.

Wide range, accuracy, convenience—all make Milwaukee Milling Machines popular, enabling them to meet profitably the varied demands of every class of work, from contract or tool room operations to production manufacturing.

Send for literature.

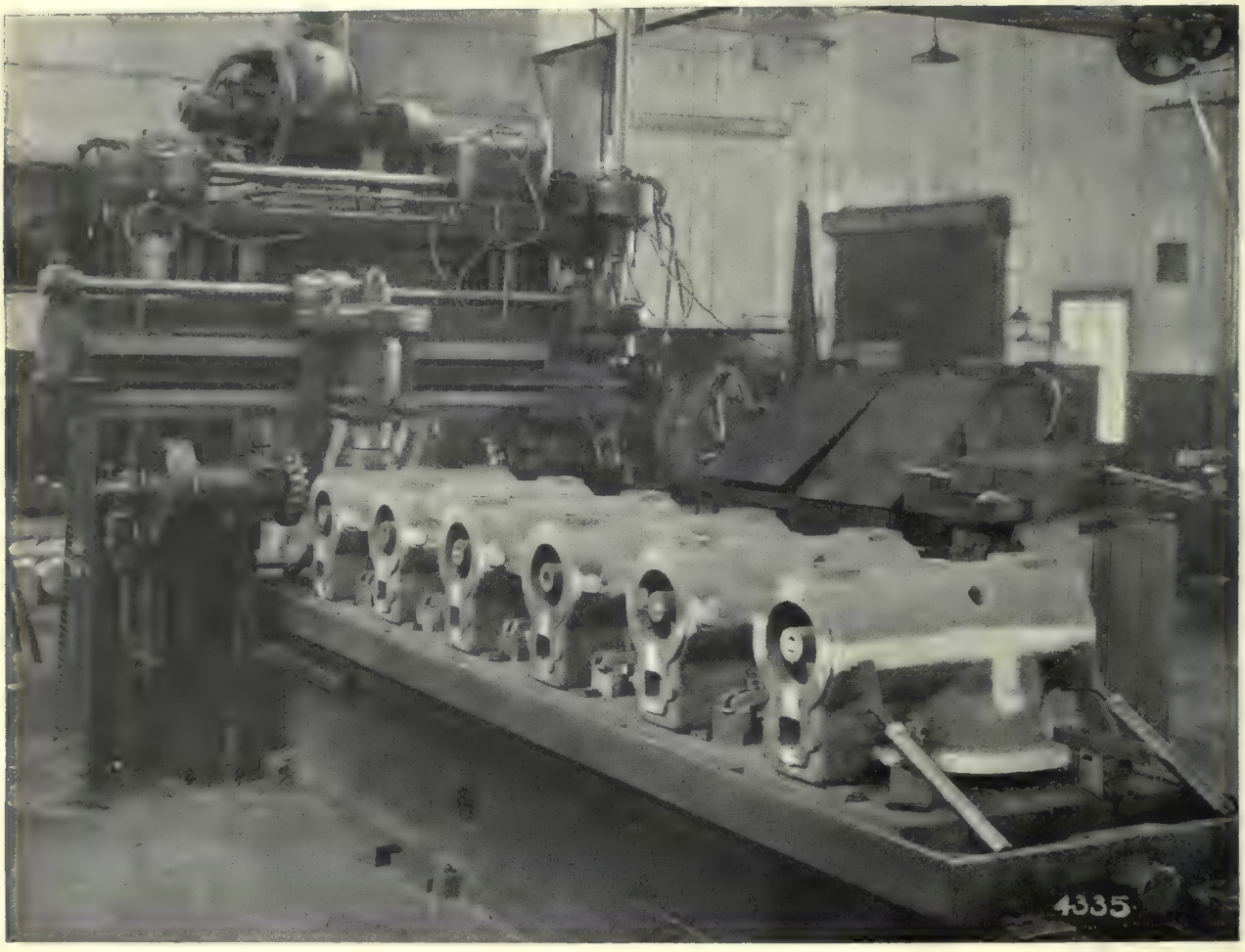


KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

CHICAGO OFFICE 631 WASHINGTON BLVD. CLEVELAND OFFICE 738 SUPERIOR AVE. N.W NEW YORK OFFICE 30 CHURCH STREET

Ingersoll Adjustable Rail Milling Machines

For General Shop Use



A three head Ingersoll Adjustable Rail Machine equipped with Ingersoll Type "B" Cutters, milling heavy cylinder heads in the C & G Cooper Shops at Mt. Vernon, Ohio

The Ingersoll Adjustable Rail Milling Machine is designed particularly for those shops that have a wide range of work going through in small quantities. A shop does not have to be in large production to keep this machine busy all the time. Many different operations on different sized parts can be performed to a decided advantage on it.

The machine shown here is in the C & G Cooper Plant at Mt. Vernon, Ohio, milling cylinder heads for 150 hp. Gas Engines. Not only the cylinder head but their entire engine is machined on this Ingersoll Adjustable Rail Milling Machine.

It will place you under no obligation to have us go over your work with you and make such recommendations as our thirty-seven years of milling experience enables us to make.

Any of the following bulletins will be be mailed to you upon request:

No. 38—Ingersoll Milling Cutters
No. 40—Ingersoll Installations of Milling Equipment
No. 41—Ingersoll Drum Type Continuous Milling Equipment
No. 42—Ingersoll Railroad Rod Milling Equipment

The Ingersoll Milling Machine Co.

Milling Machines and Their Equipment

Detroit: David Whitney Bldg. ROCKFORD, ILL. 50 Church St., New York

Make It Snappy

with a

JARVIS



The Jarvis Self-Opening Stud Setter Is the Coming Tool

One of the first of these Stud Setters was demonstrated at the Indiana Factory of an Engine Builder. If you had seen it in operation, you would have said it was one of the snappiest jobs you had ever seen.

They were setting studs in Engine Blocks. The Stud Setter was put in an Air Chuck. A boy started the studs in the block by just a turn, to hold them.

The stop collar was slipped over the stud (this being the positive type Stud Setter). The Stud Setter was allowed to drop down on the stud.

Zip!

It was ready for the next stud.

There was no slowing down of the Air Chuck. Tested for tightness, with a wrench, there was nothing for the wrench to do.

Tested for height, all studs showed an exactly uniform setting.

The Jarvis Self-Opening Stud Setters, equipped with Morse Taper Shanks, are adapted for use on Drilling Machine, Air Drill, or Electric Drill.

They are made in two styles, Positive and Friction.

There are four sizes, Nos. 1½, 2, 3 and 4.

Capacity: 0 to ½ in.
0 to ⅞ in.
0 to 1¼ in.
1 in. to 2 in.

Simple in Design
Quick Grip and Ready Release
Easy-Working

Jaws built for Long Service
High Grade Material, Hardened and Thoroughly Tested.

Different size jaws may be supplied for any size stud within the capacity of each tool.

The Jarvis Stud Setters can be fitted to the Jarvis Quick Change Chucks.

It is New You may not have heard of it but—

you will

Expensive?

Not a bit of it. That is another interesting feature. It has everything beaten in price, too.

Write for Circular and Price.

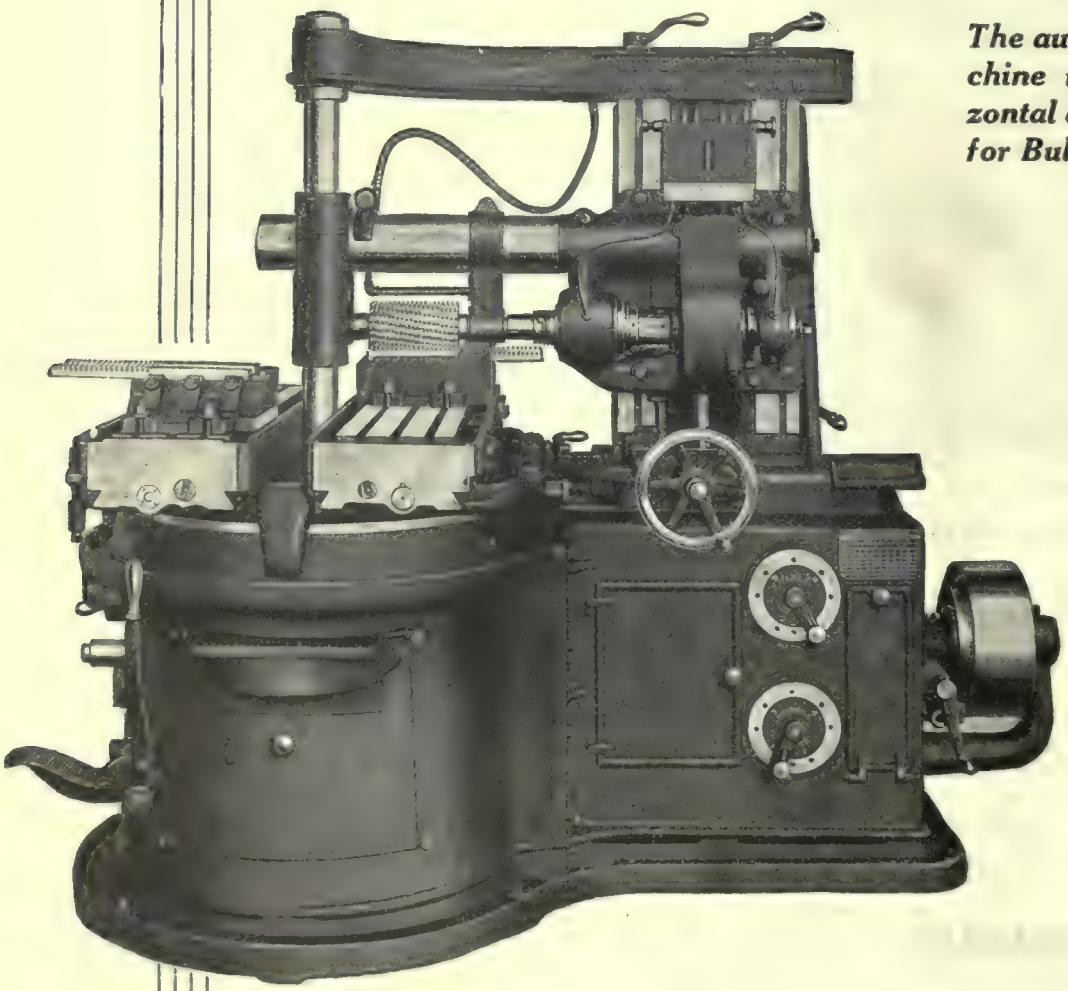
The Geometric Tool Co., New Haven, Conn.

Sole Distributors

AUTOMATIC MILLING

The Potter & Johnston Automatic Milling Machine is a strictly manufacturing milling machine for the manufacturer who is manufacturing duplicate parts on a strictly manufacturing basis.

This machine was designed for the purpose of Increasing Production by the elimination of machine idleness between cuts, which occurs through the ordinary type of milling machine, necessitating as it does much lost time in returning the table by hand, removing the finished work from the vise or fixture, brushing the chips out of the vise and inserting a new piece or series of pieces in the vise or fixture. On the Automatic Milling Machine, the operator is loading up on one table, while the cutter is milling work mounted on the other table, and with the exception of ten seconds required for indexing the table turret, and bringing the work in alignment with the cutter, and advancing the table automatically to the cutting point, there is absolutely no lost time, thereby insuring a greatly increased output.



The automatic milling machine is built both Horizontal and Vertical. Send for Bulletin 40-

Things Worth Knowing

One Potter & Johnston Milling Machine does the work of two or more ordinary milling machines, thereby saving a large amount of floor space. When loading and unloading fixture there is no arbor support to interfere with the operator.

Only one gang of cutters to keep up.

Only one machine to oil.

Only one motor to run.

As the machine is practically continuously milling there is No Waste Power, not so with the ordinary milling machine, just take into consideration the time the machine is stopped for loading and unloading and still the power goes on.

Next week we will continue this story of the Automatic Milling Machine

POTTER & JOHNSTON

Pawtucket, Rhode Island

New York Office: Hudson Terminal Bldg., 50 Church St., Walter H. Foster, Manager.

Detroit Office: The Potter & Johnston Agency Co., 535 Bates St.

Chicago Office: 3057 Eastwood Ave., Leslie J. Orr, Manager.

Pacific Coast Office: 2926½ Leeward Ave., Los Angeles, Cal., Chas H. Shaw, Manager.

Foreign Offices and Representatives:

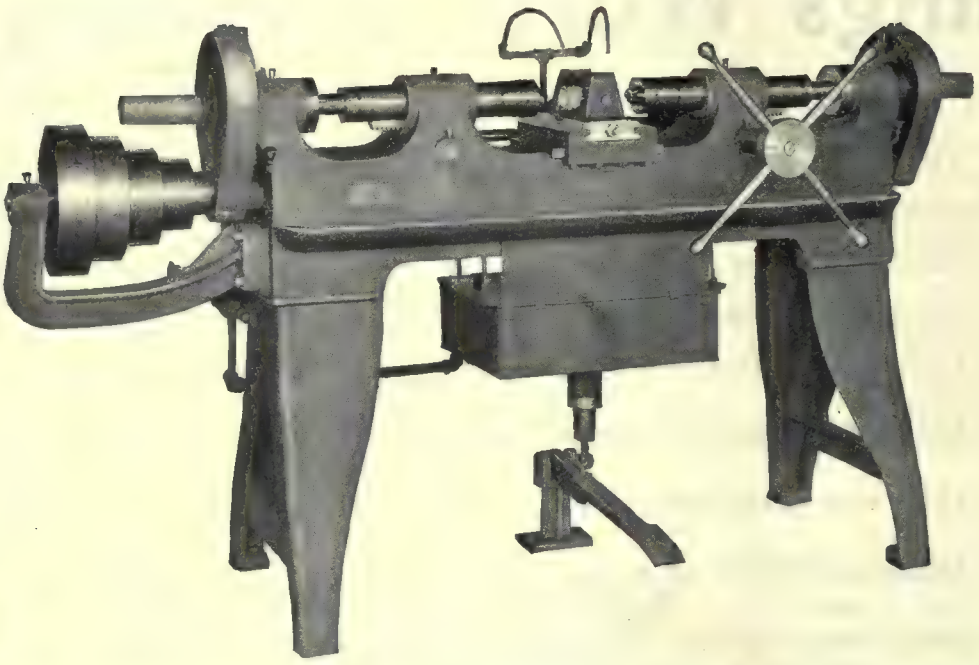
Offices for France, Belgium, Switzerland, Spain and Portugal: Potter & Johnston Machine Co., 68 Avenue de la Grande Armee, Paris, France.

Chas. Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland.

Ercole Vaghi, Corso Porta Nuova, 34, Milan, Italy.

Rylander & Asplund, Stockholm, Sweden.

Yamatake Company, No. 1, Yurakucho, Ichome, Kojimachiku, Tokyo, Japan.



Reaming—Chamfering Threading—Drilling— Tapping—Both Ends At Once

With this versatile Murchey machine you can perform such operations on studs, piston pins, nipples, hub caps, valves and many other similar parts.

And the beauty of it is you can finish both ends at the same time. The work is done better than by other methods, and at a much faster rate.

Forestall the possibility of the summer season increasing your costs, by installing these machines now. Write our nearest office for information.

Murchey Machine & Tool Co.

Detroit, Mich., U. S. A.

New York Office: 99 Warren Street; Cleveland Office: 1625 Williamson Bldg.; Pittsburgh Representatives: Laughlin & Barney, Union Arcade; Chicago Representatives: E. E. Ellis Engineering Co., 621 Washington Blvd.; Los Angeles Representatives: Harron Rickard & McCone, 225 So. San Pedro Street; Coats Machine Tool Company, 14 Palmer Street, Westminster, London, S W., England; Fenwick Freres & Company, 8 Rue de Rocroy, Paris.

NEWTON

(REGISTERED TRADE MARK)



CRANK PLANING MACHINE

Stroke 34 in. Max.

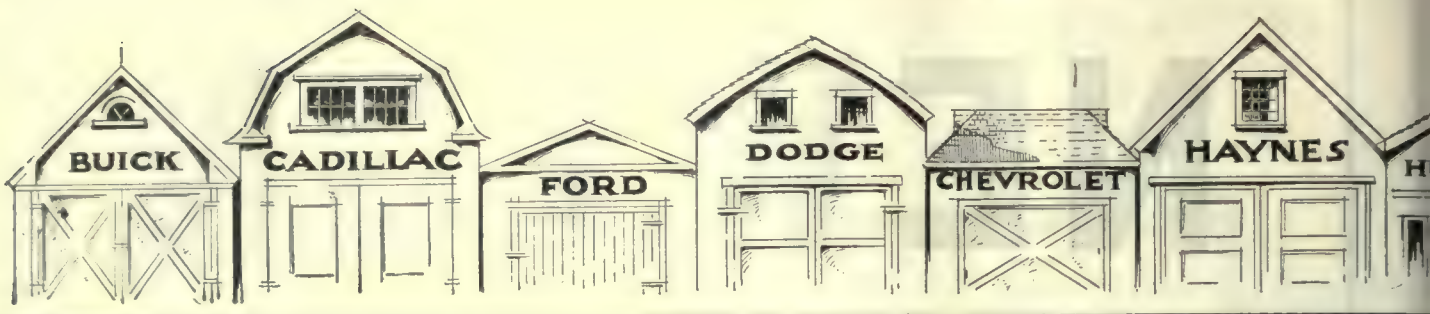
Positive stroke, quick return, proper speeds, 10 H.P. drive makes this the best tool for production on short single piece jobs.

Slotting Machines **Milling Machines**

Cold Metal Sawing Machines

NEWTON MACHINE TOOL WORKS, INC.

Twenty-third and Vine Streets **Philadelphia, U. S. A.**

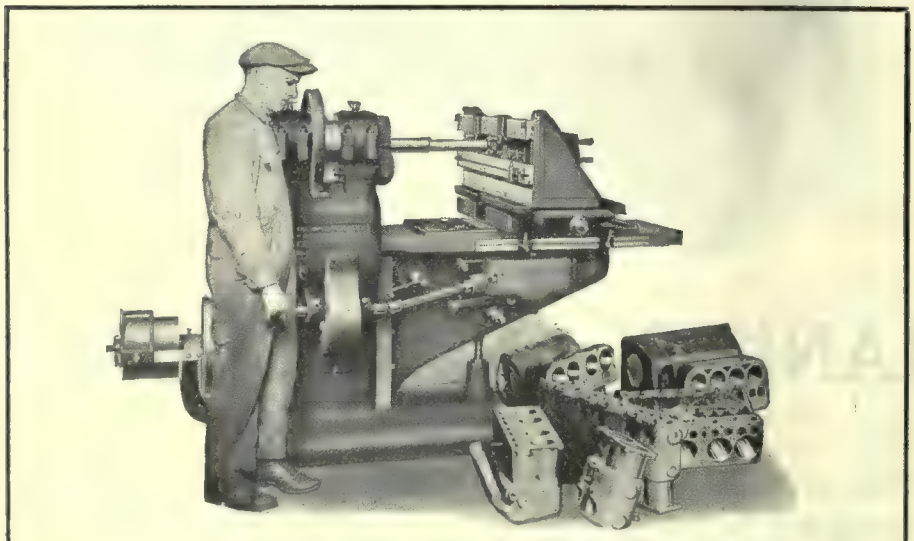


There's a Prospect

To the producers of high-grade auto vehicles there is no question as to the superiority of ground cylinder bores over those finished by boring and reaming nor as to the machine which gives the best results, for they all use a HEALD.

The mirror-like finish imparted through grinding assures smooth, silent action. The accuracy of the bore prevents gas leakage and oil seepage and thus results in fuel economy, minimized carbon deposits and giving greater power.

The purchasers of the lower cost cars are not slow in "getting on" to the advantages of reground cylinders. They figure the cost against the savings and find they are money ahead by having their cylinder blocs reground after their newly purchased machines had been run a few thousand miles.



The Heald No. 55 comes complete, ready to go to work

The Heald Machine Company,

BRANCHES:

New York.....839 Singer Bldg.
Philadelphia.....1302 Stephen Girard Bldg.
Chicago.....26 South Jefferson St.
Detroit.....400 Marquette Bldg.
Cincinnati.....705 Provident Bank Bldg.
Cleveland.....721 Engineers Bldg.
St. Louis.....710 Pontiac Bldg.



Behind Every Door

HEALD Cylinder Grinders are enhancing the value of auto vehicles of every make. They have the range that permits them to accurately and rapidly handle any cylinder bloc that comes thru your shop door. One hour they will be busily putting "pep" in the "flivver" and the next finds them adding quality to the car that lists at thousands.

You, Mr. Small Shop Owner, are the one to whom opportunity is beckoning. Just at this time you can afford to take on a little extra business. Your past experience fits you to handle regrinding in a most profitable basis and your equipment outlay is nothing to be frightened at.

Procrastination is keeping you idle when you ought to be working three shifts. Blow the dust off that letterhead on your desk and address it to HEALD, saying: *"Show me!"*



Think what this means when the checks come in the first of the month

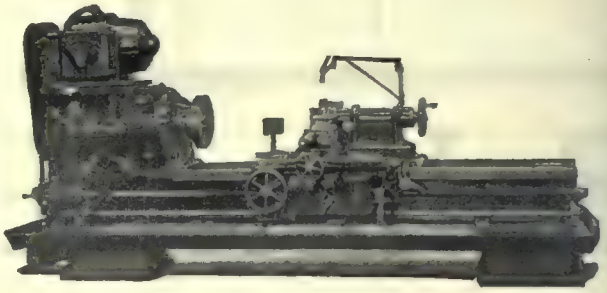
35 New Bond St., Worcester, Mass.

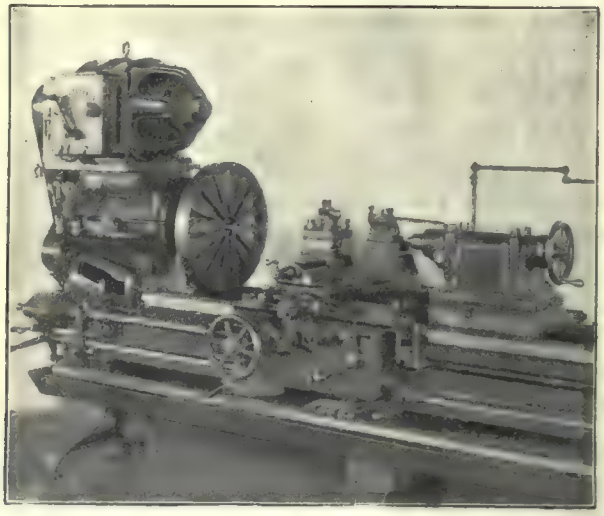
AGENTS: Eccles & Smith Co., San Francisco, Los Angeles, Portland and Seattle; Salt Lake Hardware Co., Salt Lake City; Hendrie & Bolthoff Mfg. & Supply Co., Denver; F. E. Satterlee Co., Minneapolis; The Oliver H. Van Horn Co., Inc., New Orleans; The Russell Hardware Co., McAlester, Okla.; The Young and Vann Supply Co., Birmingham; G. Norman Baughman Co., Tampa; The Walraven Co., Atlanta; Greensboro Supply Co., Greensboro, N. C.; Geo. F. Foss Machinery Co., Montreal, Can.; H. W. Petrie, Ltd., Toronto, Ont., Can.; Smith-Courtney Co., Richmond, Va.; Hamilton Machinery Co., Chattanooga, Tenn.; Krueger Machinery Co., San Antonio; Southwestern Sales Co., Phoenix, Arizona.

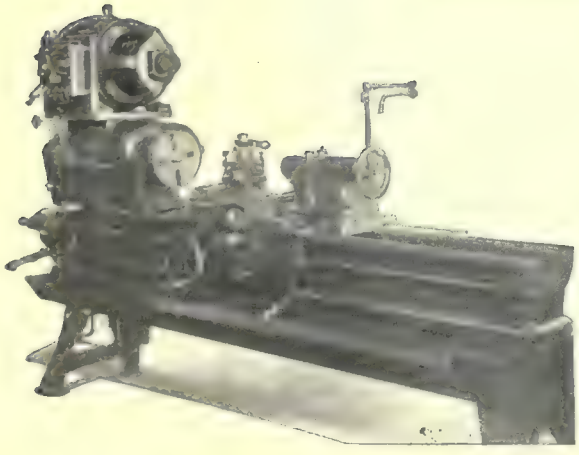
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A Complete Line of Direct Current Motors having every feature desired in machine tool drive.

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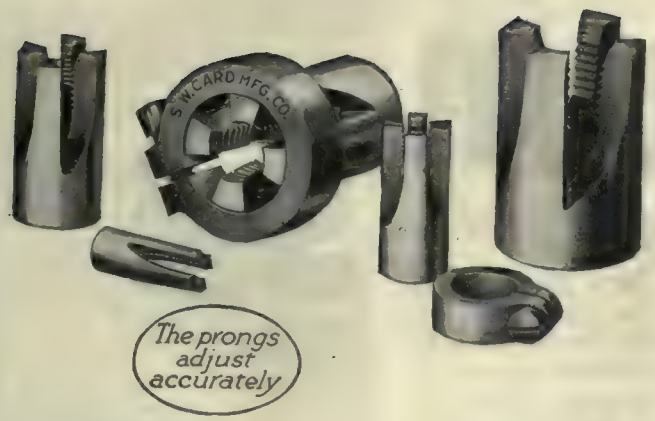
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Threading Tools of CARD Quality

In CARD Spring Dies the prongs do not close in the hardening operation



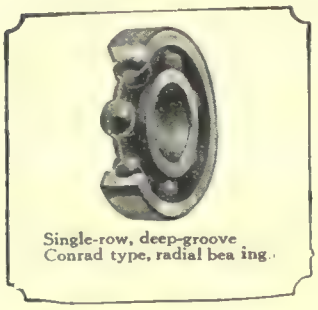
These dies are particularly adapted to screw machine work. A trial order will show you their quality. Catalog No. 30 is the latest.

Failure of the prongs to close uniformly is a common trouble with spring dies. CARD Spring Dies are free from this trouble, due to our special process of heat treating.

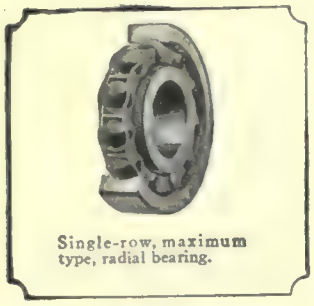
Card Spring Dies are relieved like a hand tap. They can be readily sharpened when dull by grinding the cutting faces and the muzzle end of the die. Users say they have longer life, produce a better quality of work, and are more durable than round dies.

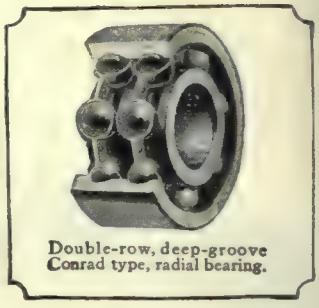
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DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS, U.S.A.

FOREIGN AGENCIES: CHARLES CHURCHILL & CO., ondon, Birmingham, Manchester, Glasgow and Newcastle-on-Tyne. V. LOWENER, Verterbrogade 9 B, Copenhagen, Denmark. AUX FORGES DE VULCAIN, General Office and Salesroom, 3 Rue St. Denis, Paris; Important Branches and Showrooms, Lyons, Bordeaux, Lille. V. LOWENER'S MASKINFORRETNING, Sverre Mohn, Christiania, Norway. C. CIVITA, Milano, Italy. R. S. STOKVIS & ZONEN, LTD., Rotterdam. J. LAMBERCIER & CO., Geneva, Zurich. V. LOWENER, Drottinggatten 90 Stockholm, Sweden. HIJO DE MIGUEL MATEU of Barcelona and Bilbao, Spain. R. D'AULIGNAC, Barcelona, Spain. ATELIERS DEMOOR, Brussels, Belgium. A. M. PAPASIDERIS & CO., Athens, Greece. ANDERSON, MEYER & CO., LTD., Shanghai, Changsha, Hankow, Harbin, Hongkong, Kalgan, Pekin, Tientsin, Vladivostok, China. M'ESTRE & BLATGE, Rio de Janeiro, Brazil, Buenos Aires, Argentine Republic.


Single-row, deep-groove Conrad type, radial bea ing.


Double-row, maximum type radial bearing.


Single-row, maximum type, radial bearing.


Double-row, deep-groove Conrad type, radial bearing.

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Strom bearings play an important part in high-speed production.

On machine tools and equipment they insure the precision necessary for the most exacting work.

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Angular contact bearing —combination radial and thrust.

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Single-acting thrust bearing with flat seats (grooved races). 1100-F Series.

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Double-acting, self-aligning thrust bearing with leveling washers. 2100-U Series.

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Double-acting thrust bearing, flat seats. 2100-F Series.


Double-acting, self-aligning thrust bearing 2100 Series


Single-acting, self-aligning thrust bearing, leveling washer. 1100-U Series.


Single-acting, self-aligning thrust bearing. 1100 Series.

It Isn't Being Done Now!

NOT SO long ago it was fairly common to walk into an engine room, or a shop, and see an oiler or an engineer mixing a batch o cylinder oil into his machine oil.

His plea was that his machine oil wasn't heavy enough and he had to load it up with the heavier cylinder oil.

Expensive?

Yes.

But, what's worse—Inefficient

Because this procedure was hit or miss, and he never got the same mixture twice. And then he had no guaranty that these oils would mix properly—and stay mixed.

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Careful engineers and informed master mechanics and oil buyers now buy from reliable oil companies, carefully made machine oils of the proper viscosity for the purpose.

Such oils are:

TEXACO NABOB OIL
A medium-bodied external lubricant

TEXACO ALEPH OIL
A heavy-bodied machine and engine lubricant

TEXACO ALTAIR OIL
An oil with a very heavy body and very high lubricating qualities

These oils are always the same no matter where or when you buy them. They are made to meet different mechanical conditions—and they do.

They save money and power loss, because having the correct body and high lubricating quality, they prevent undue friction.

These three oils are examples drawn from a list of Texaco Lubricants designed to meet every conceivable mechanical condition.

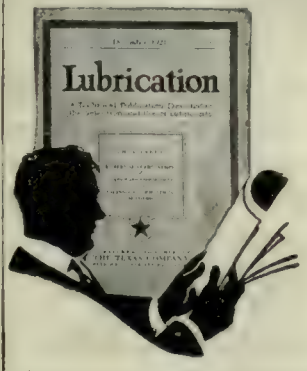
* * * * * *

Let Texaco Mechanical Engineers tell you what oils to use—and how much.

That's one way to cut down power bills and repair charges, and it's a good way because your superiors will like it, inasmuch as it does not entail any expense for mechanical devices or improvements.

Think it over and drop us a line. We are on our toes to serve you.

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ALOXITE "LL"



BACK UP YOUR VERTICAL GRINDER WITH AN ALOXITE "LL" WHEEL

THE modern, improved vertical grinder is a great machine. It has revolutionized the job of producing accurate, flat surfaces.

A maker of one of the best known of these machines says that the unusual success of vertical grinders is due in a large measure to the wonderful advancement in the art of wheel making—the production of a clean, free, cool cutting wheel such as the Aloxite "LL."

This wheel is helping vertical grinders to success in hundreds of plants. It is the wheel that backs up the machine.

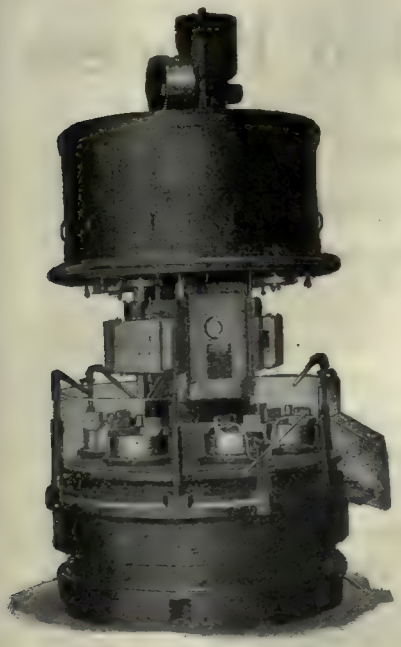
Every hard, sharp, tough Aloxite grain in an "LL" wheel gets a real chance to cut—to penetrate the work—to quickly remove stock and to keep friction and resultant heat down to a minimum, even when taking deep cuts. This is due to the peculiar open, porous structure of the wheel and the remarkable cutting ability of Aloxite.

On hard steels, on cast iron, on rough or close limit work it is equally successful. For vertical grinding where the run of work is widely diversified it practically becomes a universal wheel.

It is a wheel that is indeed worthy of a trial in your plant, and we believe that our Sales Engineering Department can help you better your grinding conditions by giving you the right wheel in the right place.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y., U. S. A.

New York, Chicago, Boston, Philadelphia, Cleveland, Cincinnati, Pittsburgh, Detroit, Grand Rapids, Milwaukee



BULLARD

MULT-AU-MATIC

One Man on One Machine in One Ten-hour Day

produces 430 Motor Bodies

The Bullard Mult-Au-Matic offers real hard dollars-and-cents Economy. Here is a typical case of Mult-Au-Matic Saving.

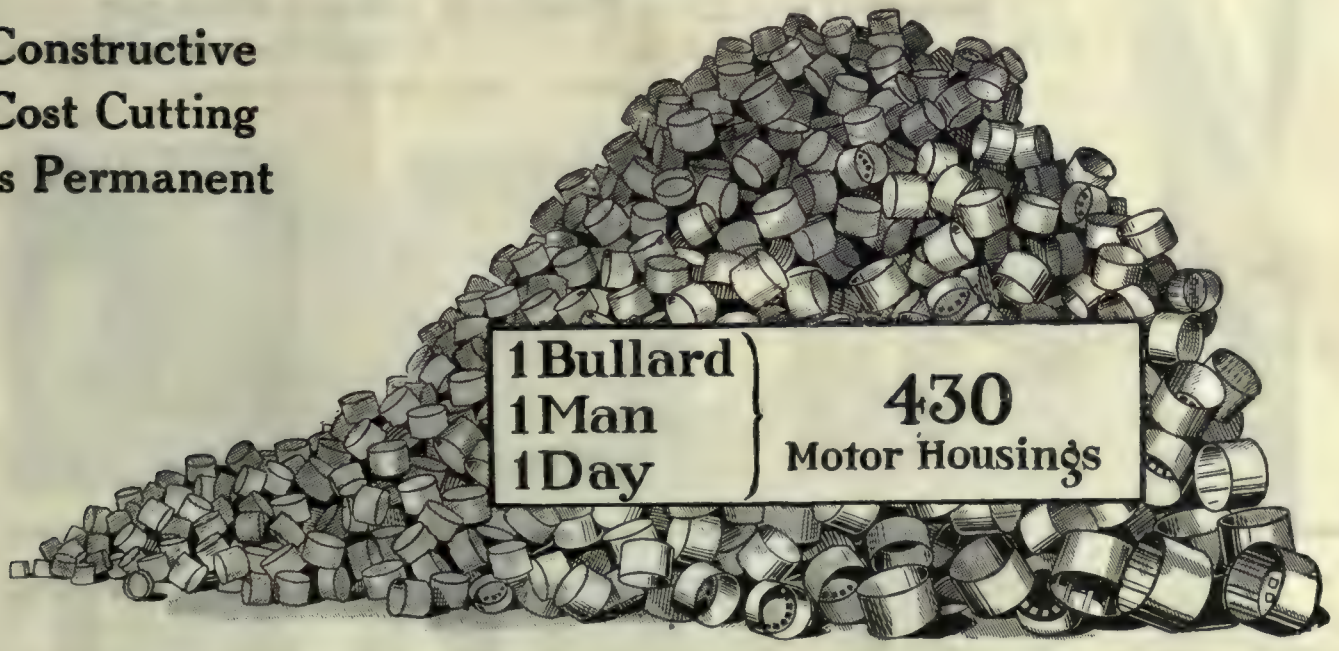
—One machine instead of three machines
—One operator instead of three operators
—One inspection instead of four inspections

with a saving in labor, floor space, maintenance, tools, power and supervision.

The Mult-Au-Matic is a mechanically correct combination of six vertical lathes. It requires the attention of but one operator whose sole duty is to chuck the raw casting or forging and unload the finished part. The daily output from one man and a Mult-Au-Matic is equivalent to that of several single purpose machines and their operators; while the quality of the work is always improved.

Our Engineers are anxious to tell you what the Mult-Au-Matic will do on your work. Send us prints or samples and specifications for a careful study of your problem.

Constructive Cost Cutting is Permanent



The Bullard Machine Tool Company

Bridgeport, Connecticut, U. S. A.



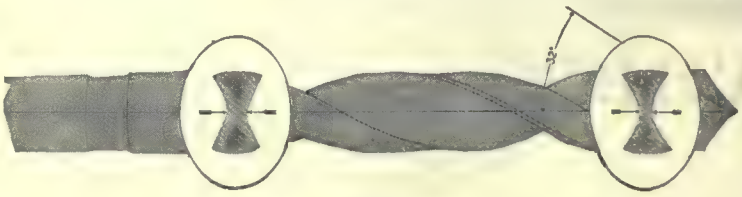
The Special "Hot-Rolled" Process

An Exclusive Development of the Detroit Twist Drill Company, based on 30 Years' Research

The records which have been made by the new Detroit Double-D Drill during the last few months have fully substantiated the early predictions made for this marvel drill of high tungsten, high speed steel.

The definite production increases running 25% or more have a very large significance for all industrial executives working with drop forgings, cored steel castings and other tough metals—as well as concerns who demand high efficiency in their ordinary drilling operations. Records of authentic tests have been prepared in convenient form and will gladly be forwarded to any manufacturer, production manager, or machinist who is interested. These will be mailed immediately upon request.

The wide flute insures ample chip clearance for deep drilling



Double-D hot rolled drills now available in sizes from ¼" to 1½"

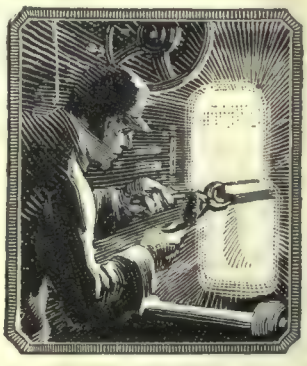
Detroit Twist Drill Company, Detroit, Michigan

45 Warren Street, New York **Metropolitan Building, Atlanta**

Canadian Detroit Twist Drill Co., Limited, Walkerville, Ontario

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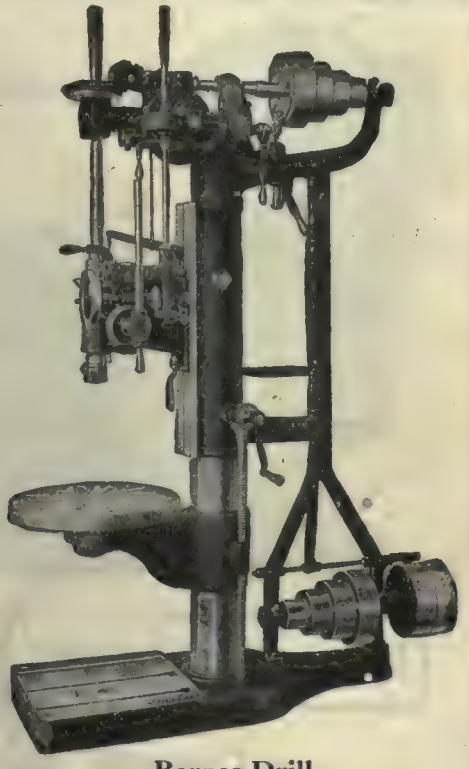


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Horizontal DRILLS
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Accuracy—Strength



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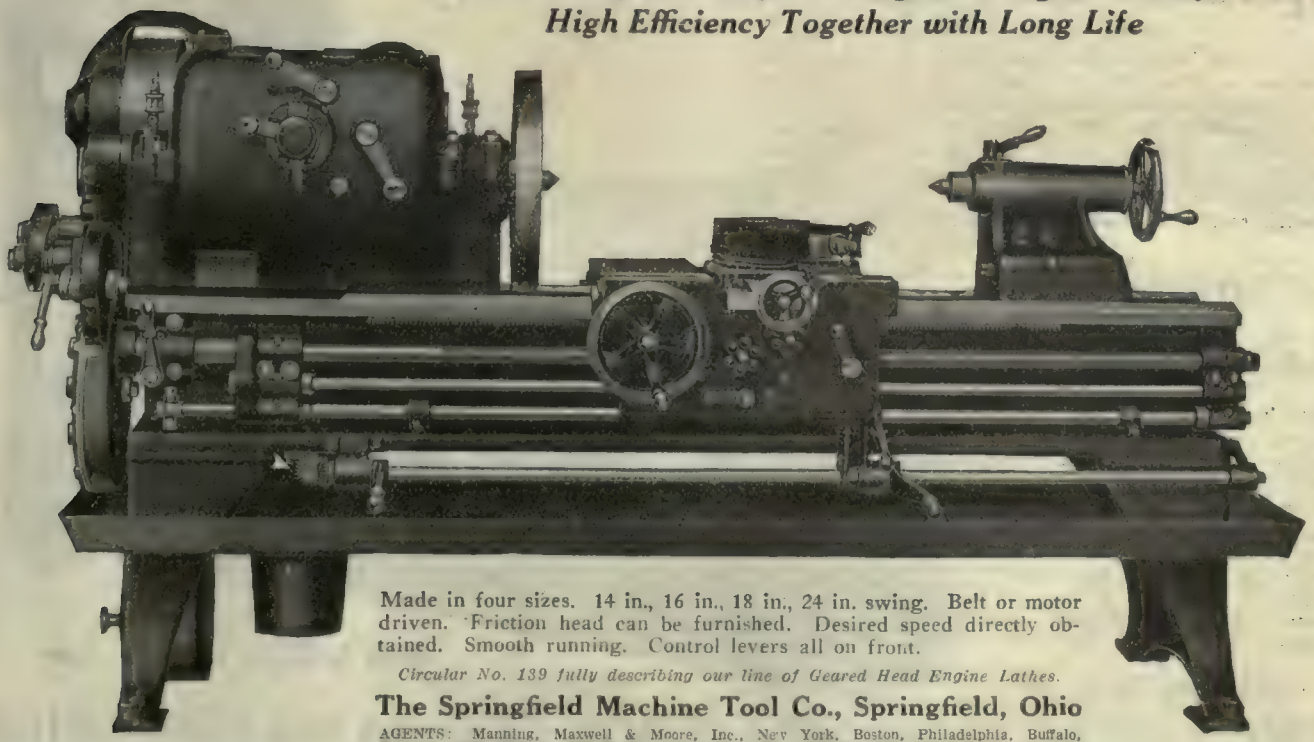
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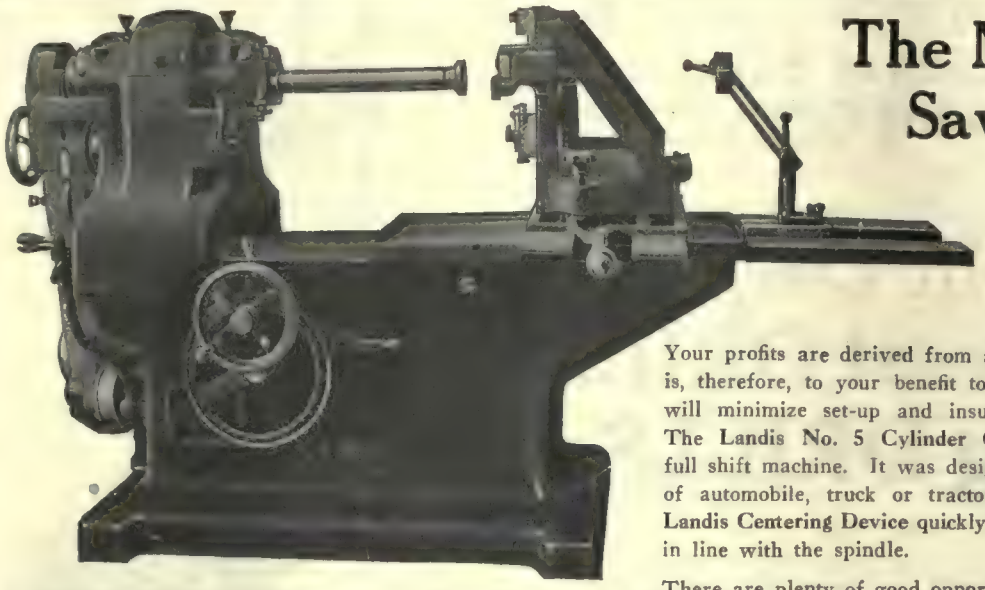


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The Springfield Machine Tool Co., Springfield, Ohio

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Your profits are derived from actual operating time. It is, therefore, to your benefit to select such machines as will minimize set-up and insure smooth manipulation. The Landis No. 5 Cylinder Grinder is practically a full shift machine. It was designed to handle any make of automobile, truck or tractor cylinder bloc and the Landis Centering Device quickly locates the cylinder bores in line with the spindle.

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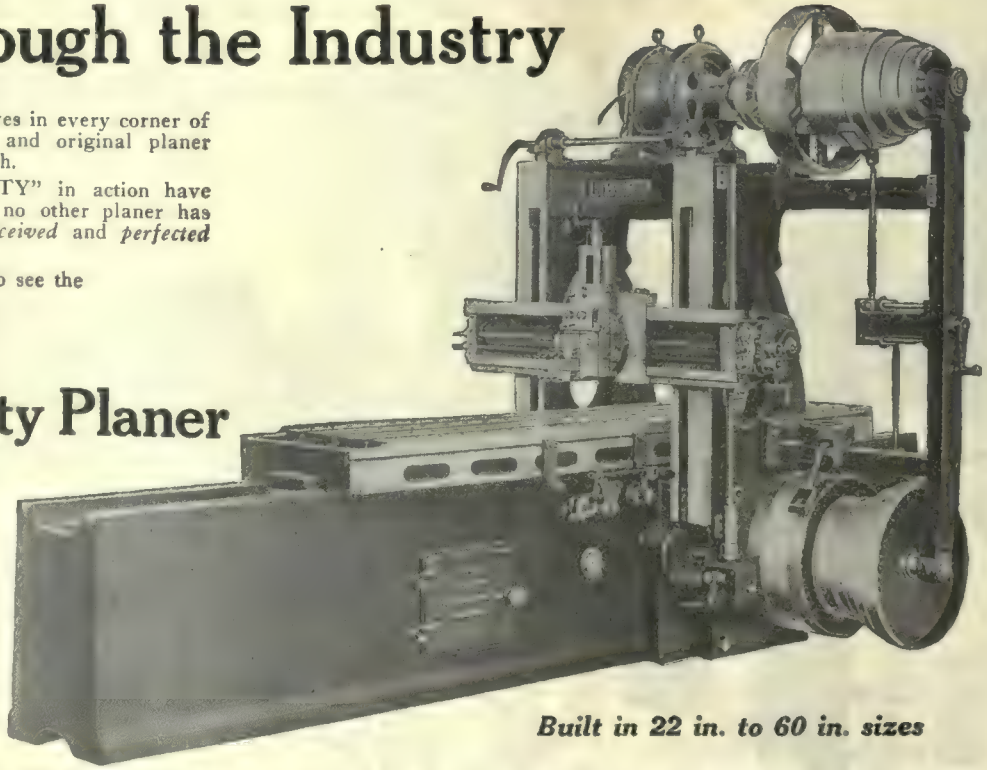
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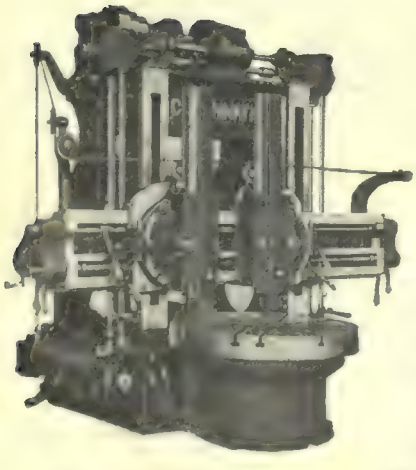
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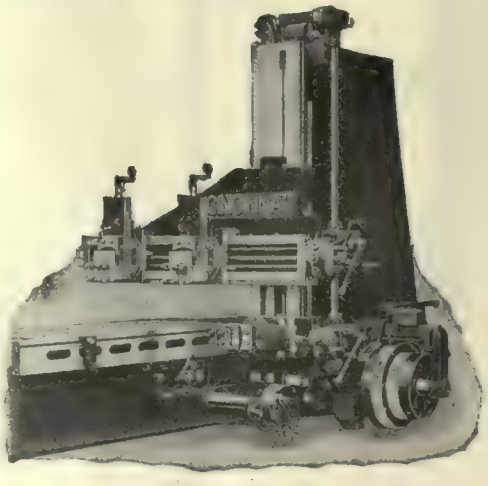


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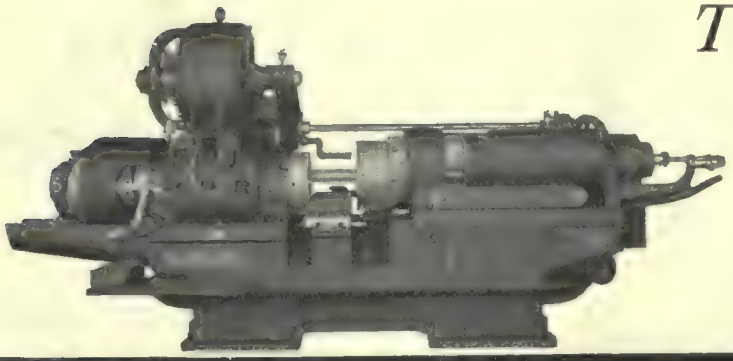
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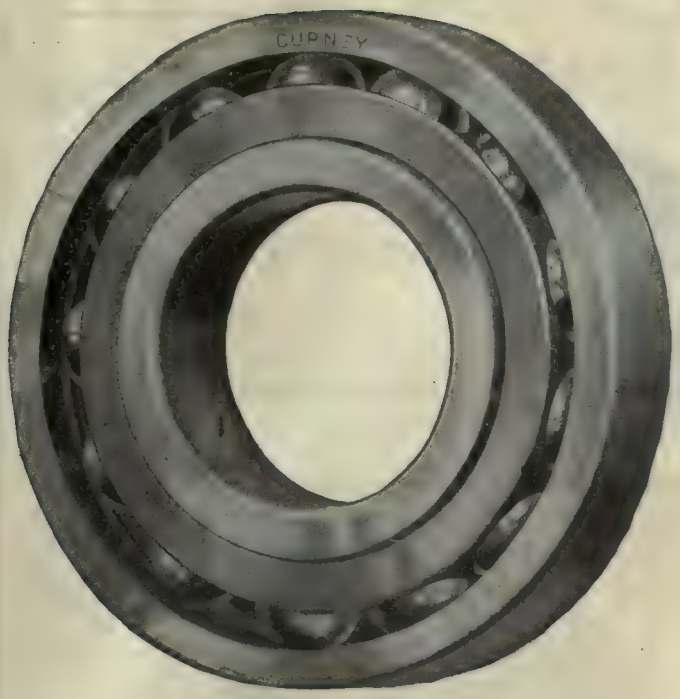


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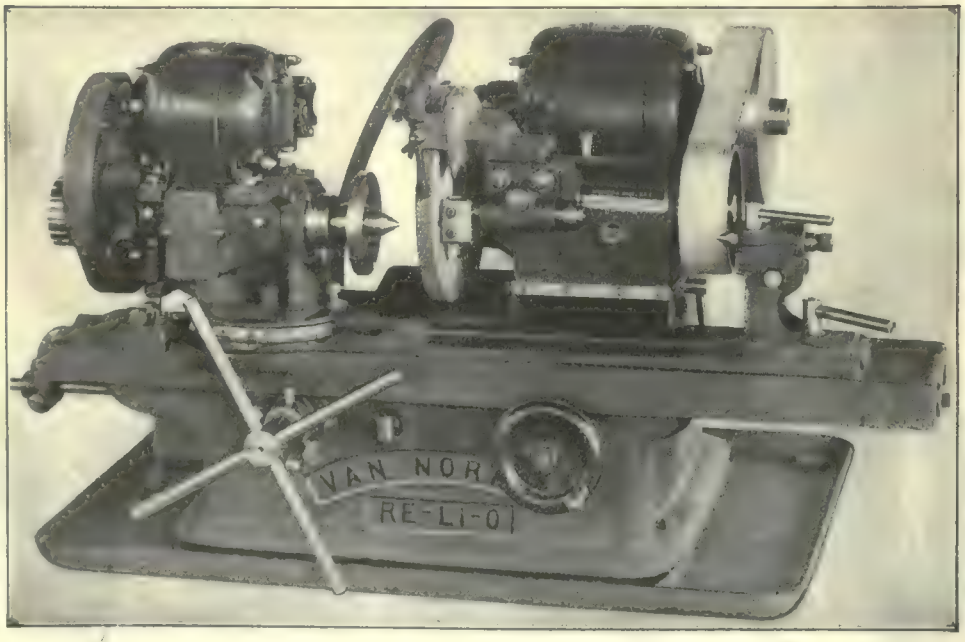
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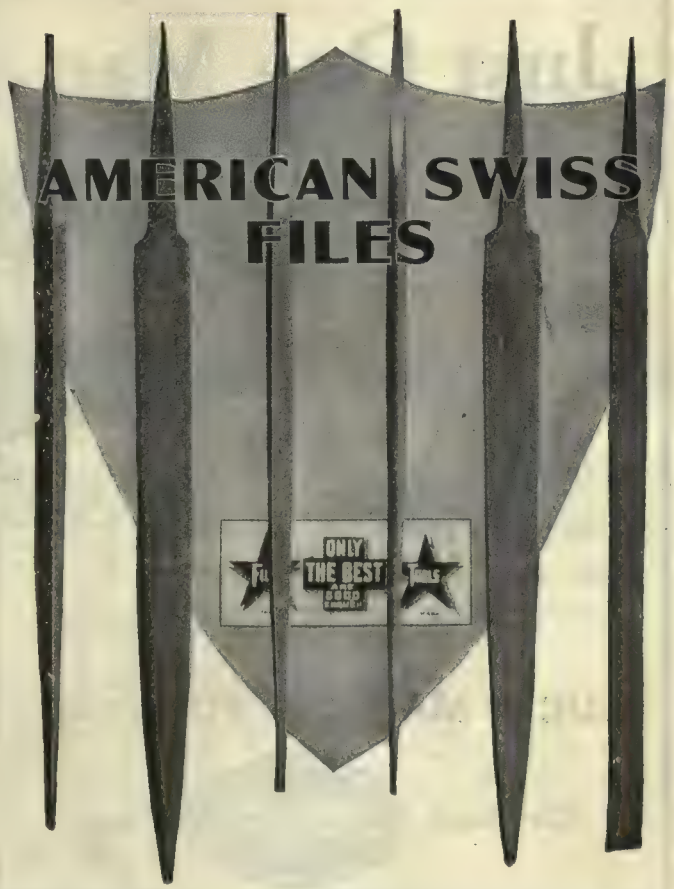
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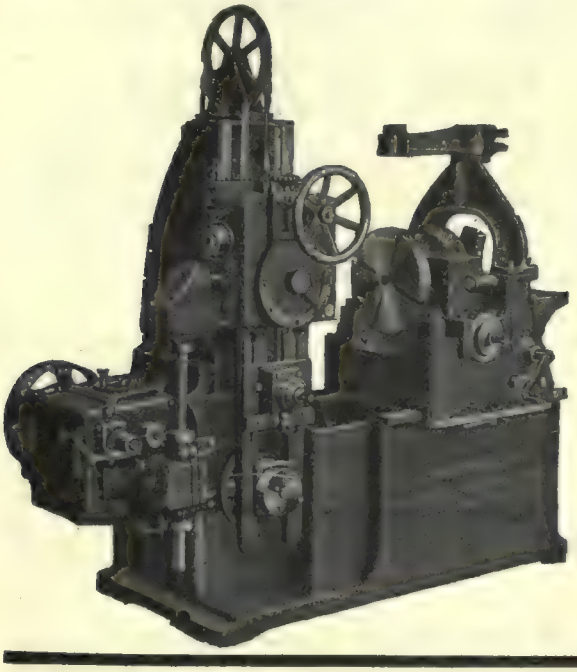
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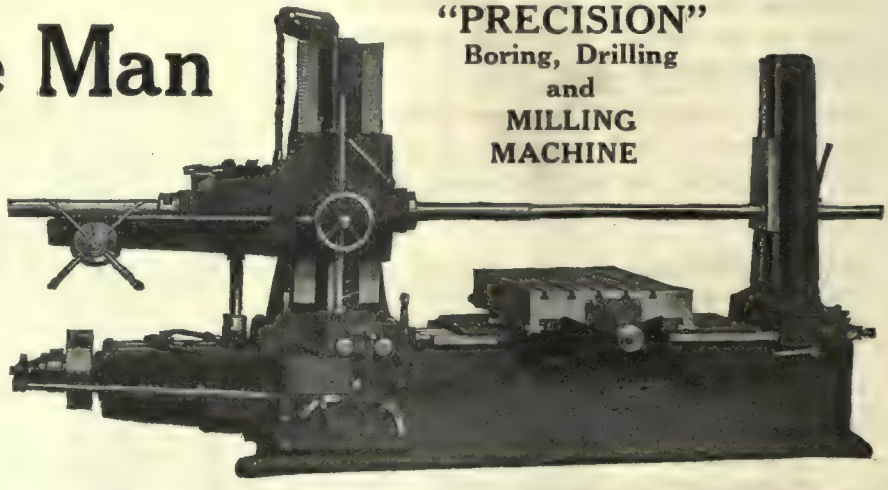
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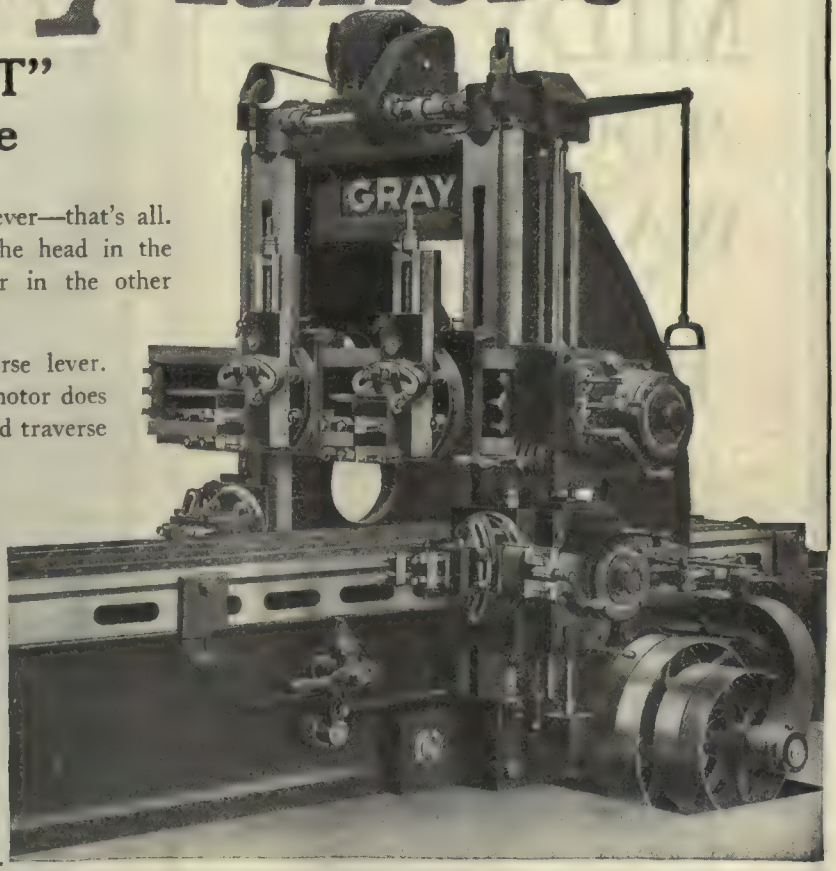
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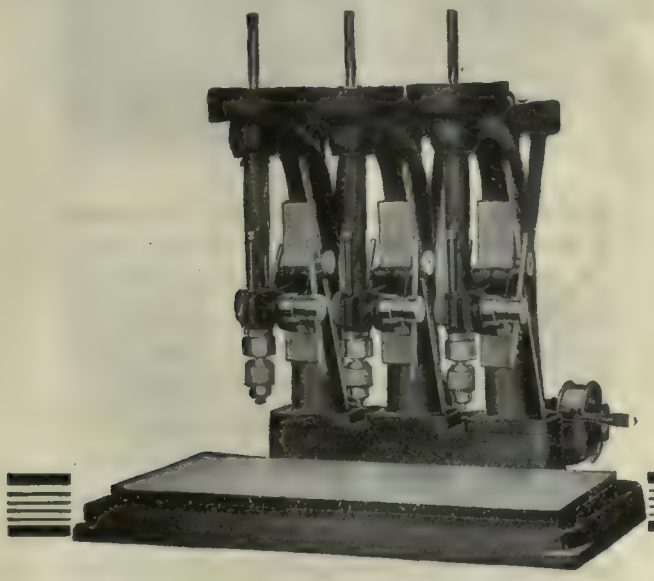


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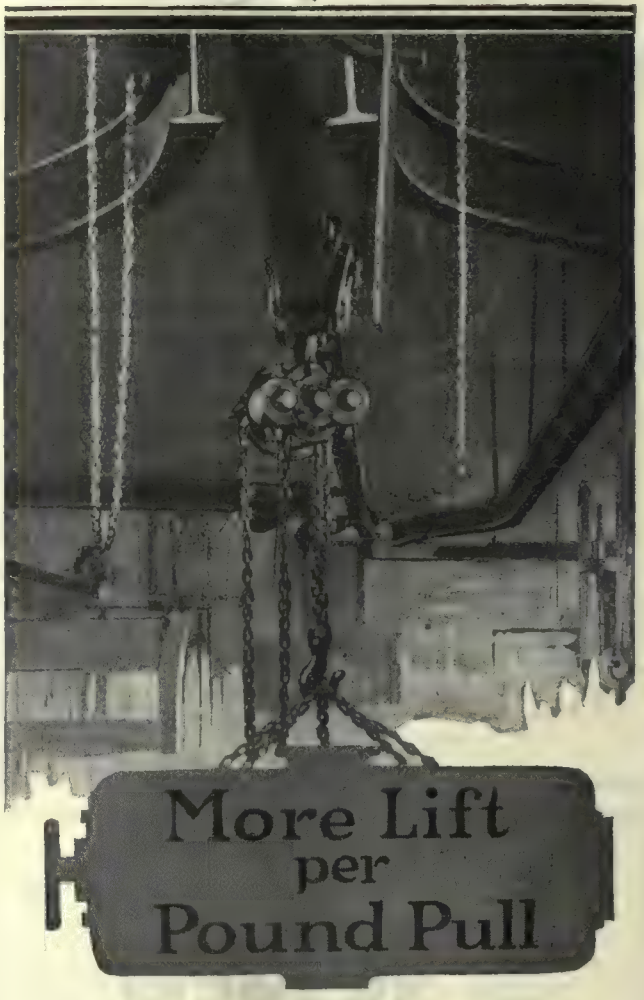
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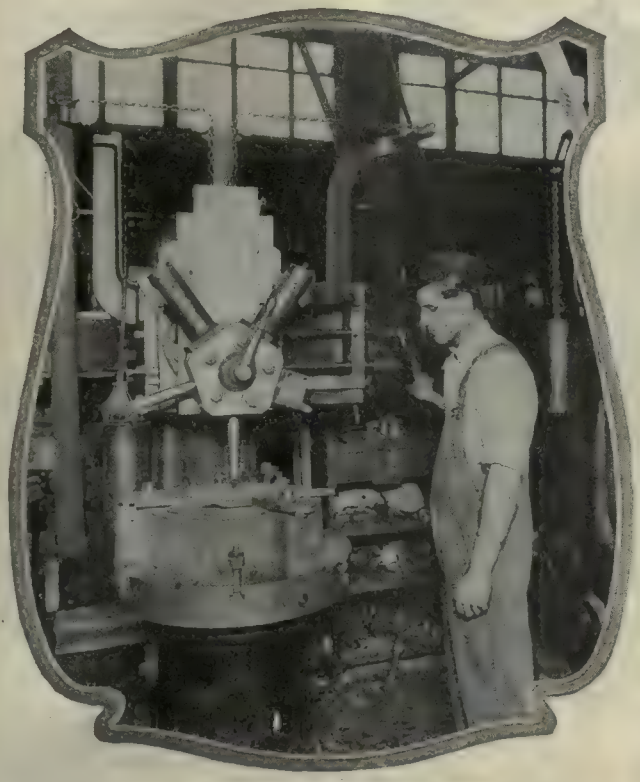
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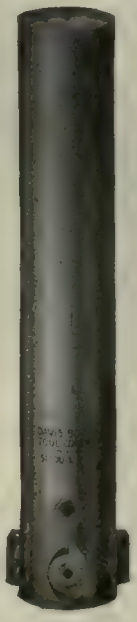
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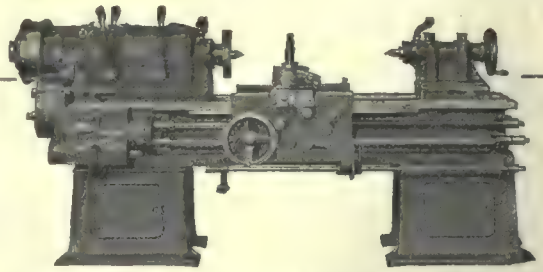


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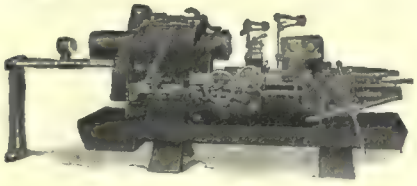
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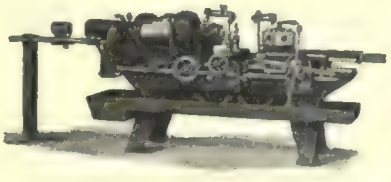
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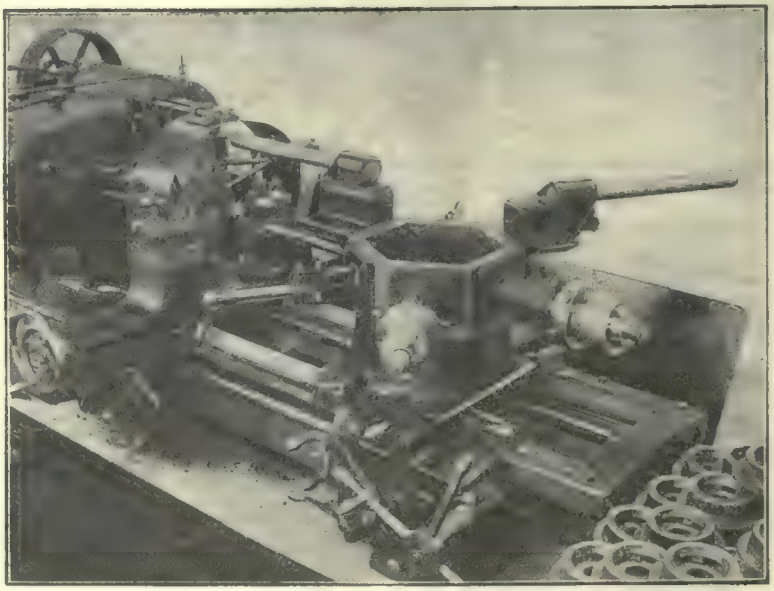
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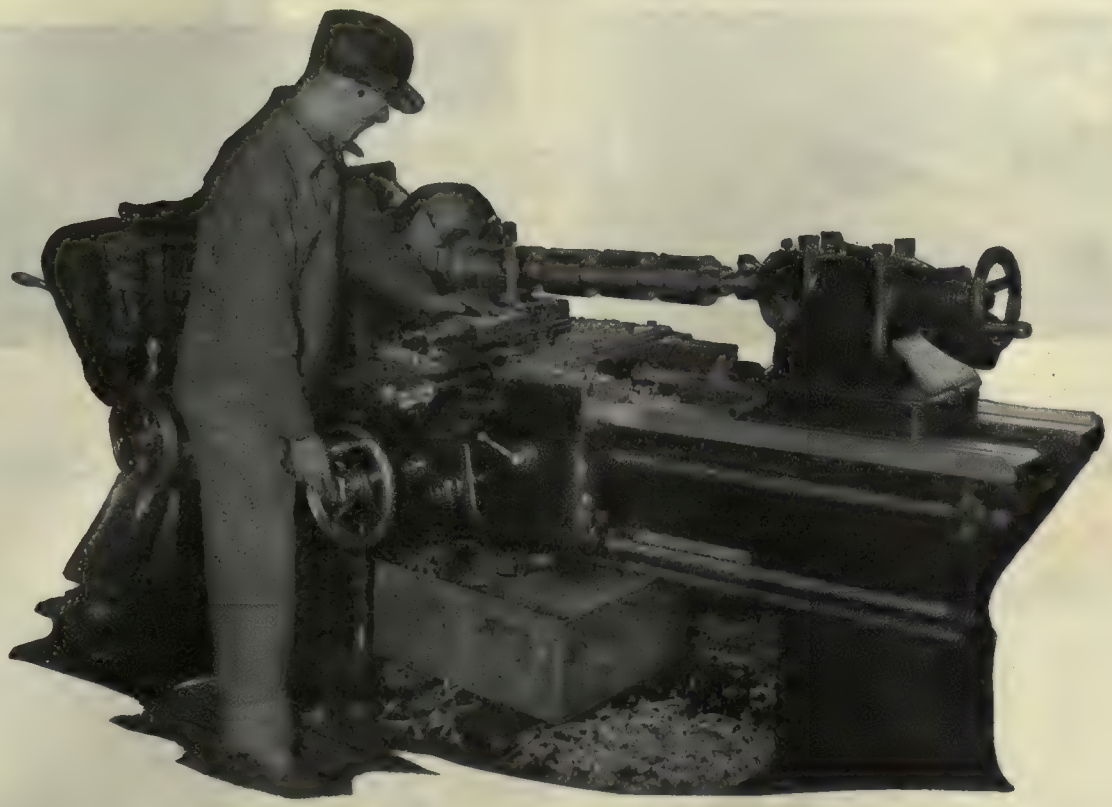
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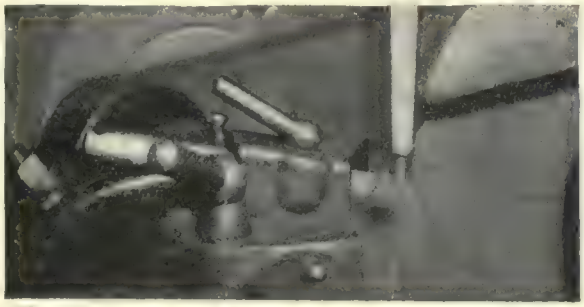
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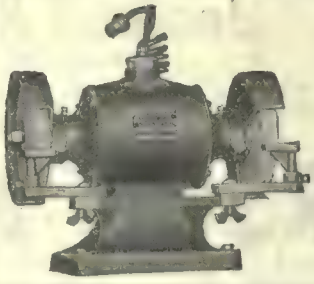
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Volume 56 NEW YORK, JUNE 29, 1922 Number 26

Railroad Repair-Shop Work

Cutting and Compressing Packing Rings—Portable Keyseating Device—Tools for Turning Spherical Joints on Steam Pipes—A Convenient Step Ladder

BY S. ASHTON HAND
Associate Editor, *American Machinist*

IN MANY railroad shops packing rings are cut apart with a hacksaw, the cuts being made at an angle so as to let the point at one part of the ring overlap that of the other part.

At the Huntington, W. Va., shops of the Chesapeake & Ohio Railway, where the data and illustrations for this article were secured, packing rings are cut apart on a shaper, as shown in Figs. 1 and 2. In Fig. 1 packing rings for piston valves are being cut apart, four at a time. The rings, as may be seen, are of an L-shaped section. The fixture is double and holds two sizes of rings, one at each end and each compartment is curved at the bottom, as at *A*, to the same radius as that of the rings to be held.

The tool is shouldered, the corners of the shoulders being rounded. The narrow part of the tool cuts the right amount out of the rings to give them the proper spring when closed. Before the rings are severed, the shouldered part of the tool cuts a slot with rounded corners in the inner webs so that when each ring is closed the slot will fit over a pin in the valve head to locate the ring and keep it from turning.

The rings shown in Fig. 2 are for main pistons. As these rings are much larger than valve rings, more is required to be cut out of them to give the proper tension when closed. As may be seen, two offset tools set in a holder are used, one side of each tool having a shoulder with a rounded corner to serve the same pur

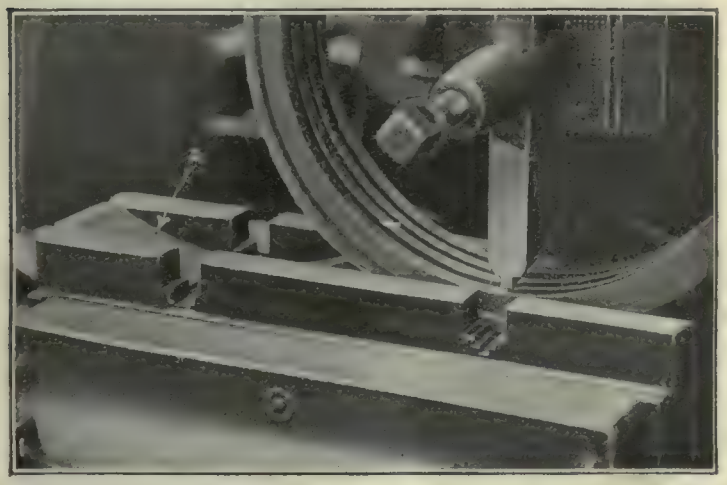


FIG. 1. SPLITTING VALVE PACKING RINGS.

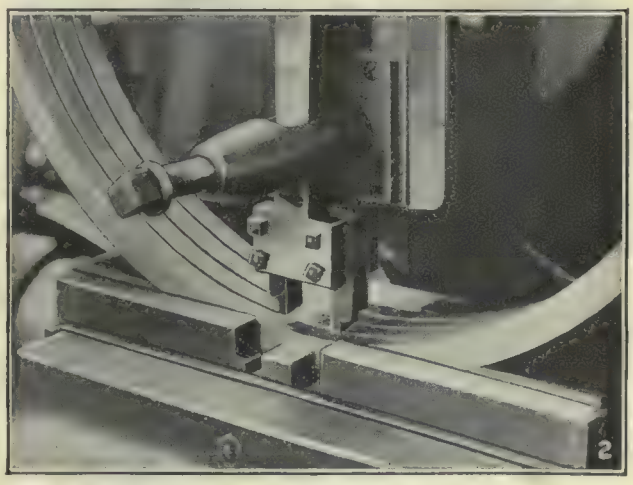


FIG. 2. SPLITTING PACKING RINGS

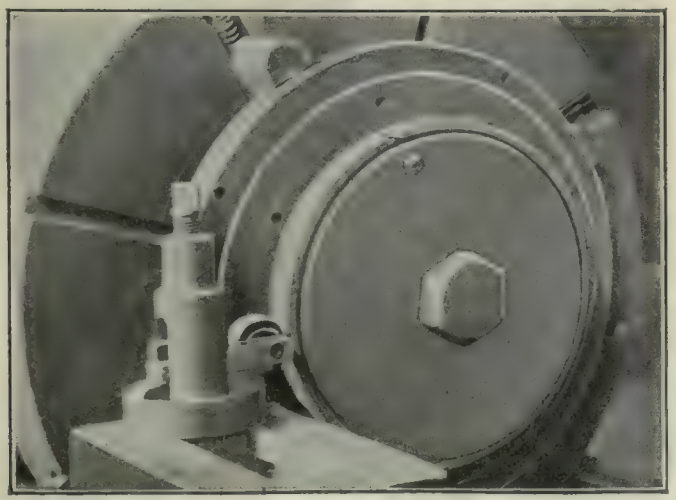


FIG. 3. COMPRESSING VALVE-PACKING RINGS.

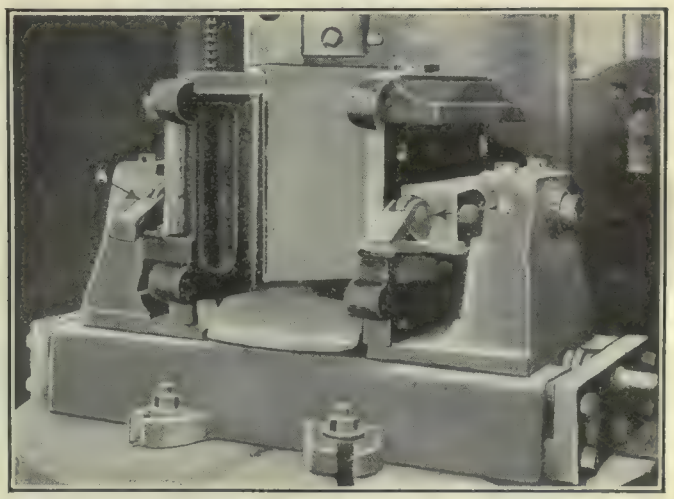


FIG. 4. BORING THE CROWN BRASS IN A DRIVING BOX

pose as the rounded corners on the tool shown in Fig. 1.

After cutting apart, valve packing rings are compressed and the outsides turned to fit the valve chamber. The operation of compressing a ring is shown

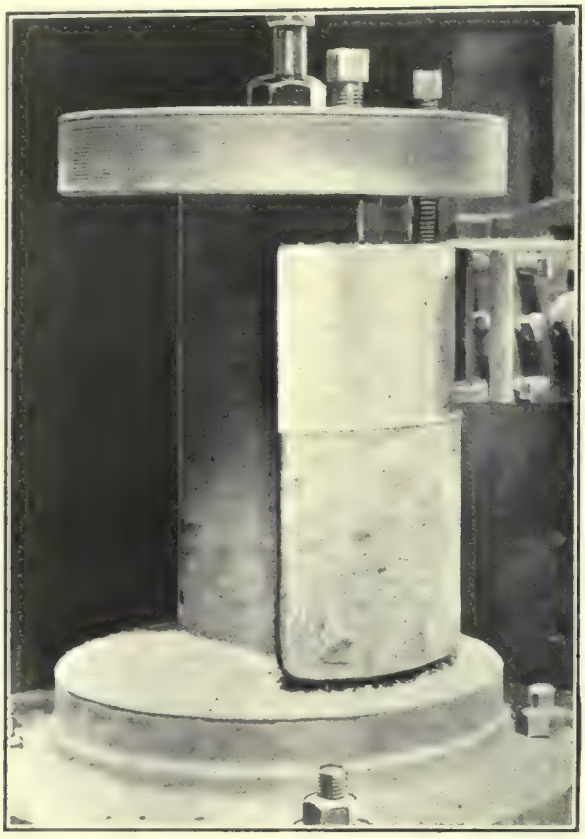


FIG. 5. TURNING THE OUTSIDE OF A CROWN BRASS

in Fig. 3. The ring is held by the web between the plane surfaces of a plate chuck and its cover by a pressure great enough to hold it against movement by its initial spring. While slowly revolved in the lathe, the roller tool shown is gradually fed against the outside of the ring until the ends meet. The cover is then screwed up tightly by the screw in the center and the ring machined on the outside. The small screw to be seen in the upper part of the cover, enters the slot in the web of the ring and prevents any slippage while it is being machined.

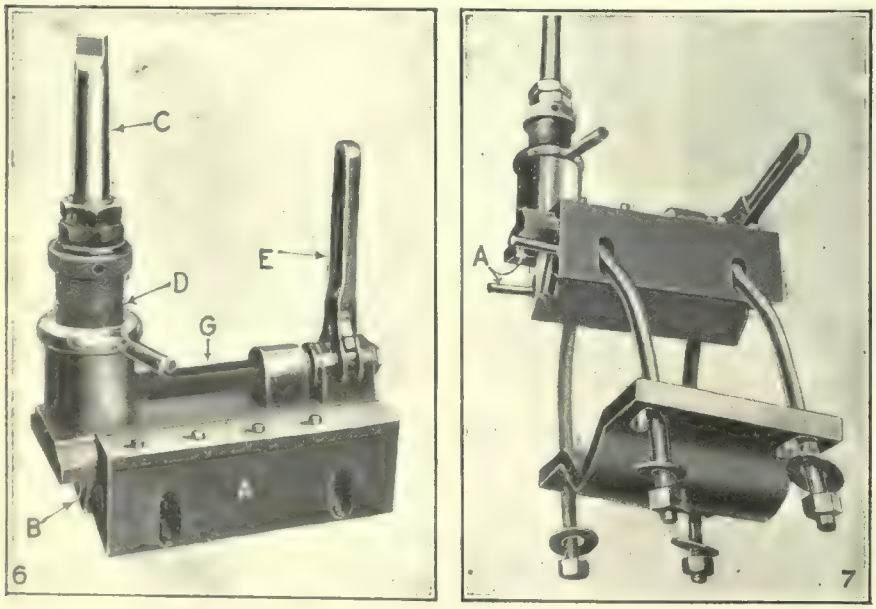
In this shop the Moss chuck, described in the article on the Richmond shops, is used on the vertical boring mill for boring driving boxes; but instead of using wedges to hold the boxes down on the parallels, cams attached to the chuck jaws, as at *A* and *B* in Fig. 4, are provided.

Machining the outside of a crown brass in a Bullard vertical lathe is shown in Fig. 5. The brass is centered by the column of the fixture and held at bottom and top between cup-pointed screws in the base and upper flange.

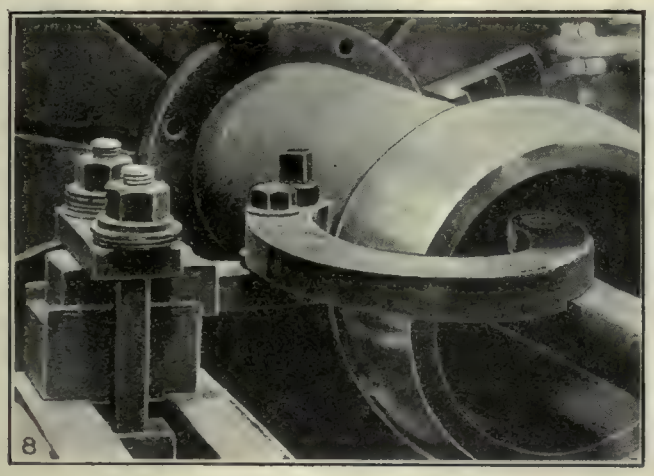
The tool shown in Figs. 6 and 7 is used for keyseating axles, both for the wheels and the eccentrics. Referring to Fig. 6, the body *A* has a V-groove planed in the under side for locating it on the axle to which it is clamped. The end mill at *B* is driven by a portable pneumatic motor through the taper shank *C*. The cut is regulated for depth by the threaded sleeve *D* while the cutter is fed longitudinally by the ratchet lever *E* through the screw *G*.

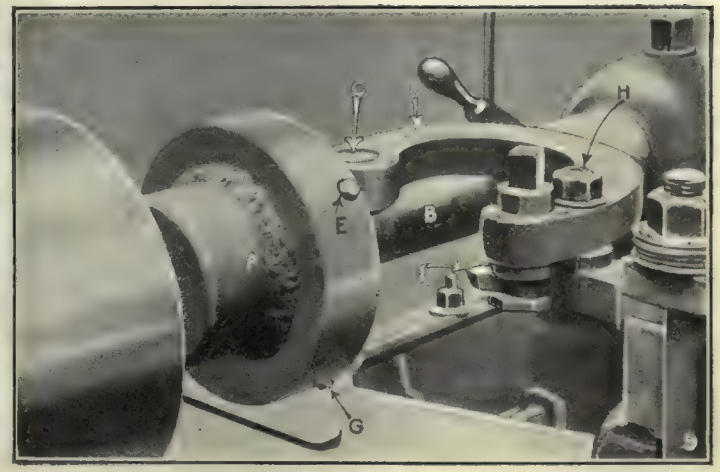
The device, as shown in Fig. 7, is equipped with its bolts and clamp for attachment to the axle. In order to save weight, the device has been made narrow and the bolts bent to span the axle. The bolts are held in the body of the device by the pins *A* which pass through eyes in their upper ends, so that they can be readily detached.

A device for turning spherical joints on the steam pipes of a Mallet locomotive is shown in Figs. 8 and 9. Fig. 8 shows the device, together with a finished joint, in the operating position in the lathe; in Fig. 9 it is shown in position, either for commencing the set-up or for removal after the operation has been completed. The pipe is held at one end in an ordinary four-jawed lathe chuck and supported at the outer end by the bushing *A* and the bar *B*, the latter being held in the tailstock of the lathe. In operation the bushing *A* is located within the steam pipe so that the pivot *C* of the swinging lever *D* is in the center of the partial sphere to be turned, and is then held by turning out four screws, two of which can be seen at *E* and *G*. These screws pass through a flange in the bushing so that their heads can be readily reached from the inner wall of the flange. The swinging lever is again pivoted at *H* to a bar held in the toolpost of the lathe. Underneath the extreme end of the swinging lever is the cutting tool *I*, so mounted that it is at the proper height and with provision for revolving it horizontally. When properly set the point of this tool must be directly opposite the center of the pivot *C*, in a direction at a right-angle to the axis of the pipe, and this when at the same radius as that of the finished joint. The regular crossfeed mechanism is detached, allowing the toolblock to occupy any position determined by the angular position of the pivots in the swinging lever *D*. It will be readily seen that the tool, controlled and guided as shown, will describe a circular path when motion is given to it by the



FIGS. 6 AND 7. DEVICE FOR MILLING KEY SEATS





FIGS. 8 AND 9. DEVICE FOR TURNING SPHERICAL JOINTS ON STEAM PIPES

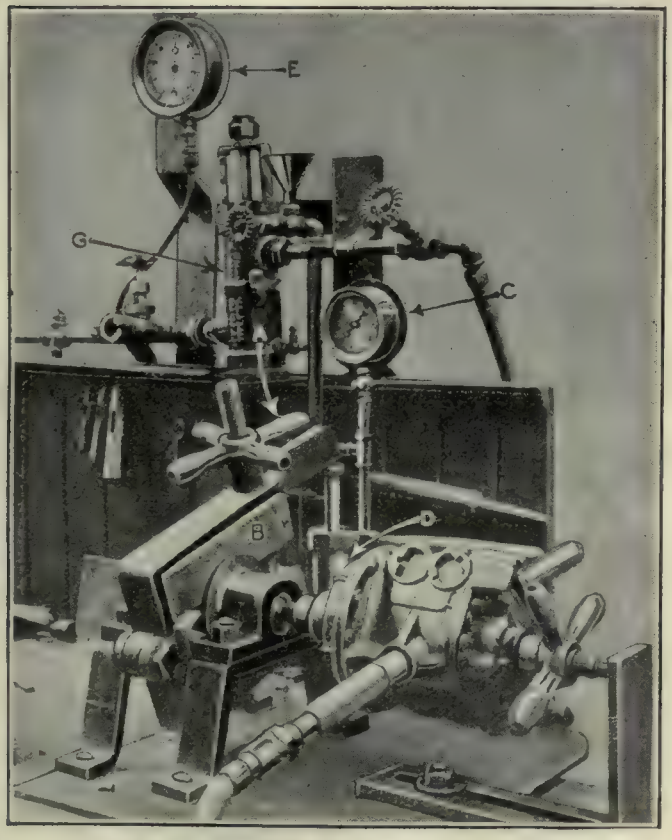


FIG. 10. TESTING A PNEUMATIC DRILL

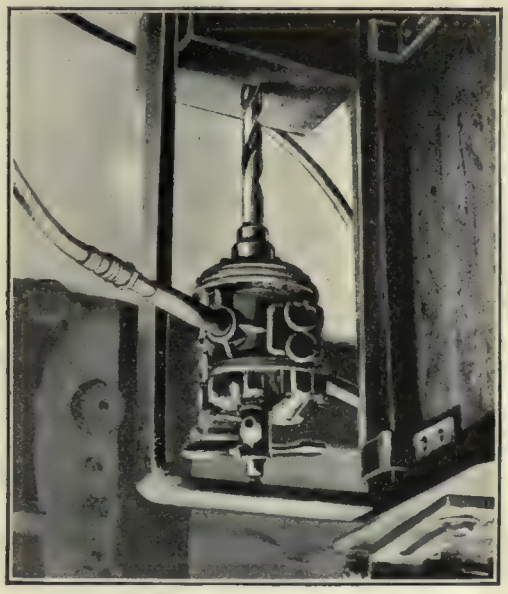


FIG. 11. THE PROOF OF THE TEST

longitudinal feed of the lathe. The swinging lever is curved so that it will not interfere with any part of the work during the operation.

Tests of pneumatic drills are regularly made to determine their efficiency as compared with records taken from new drills, and the testing apparatus is shown in Fig. 10. Pressure equal to that put on the drill in

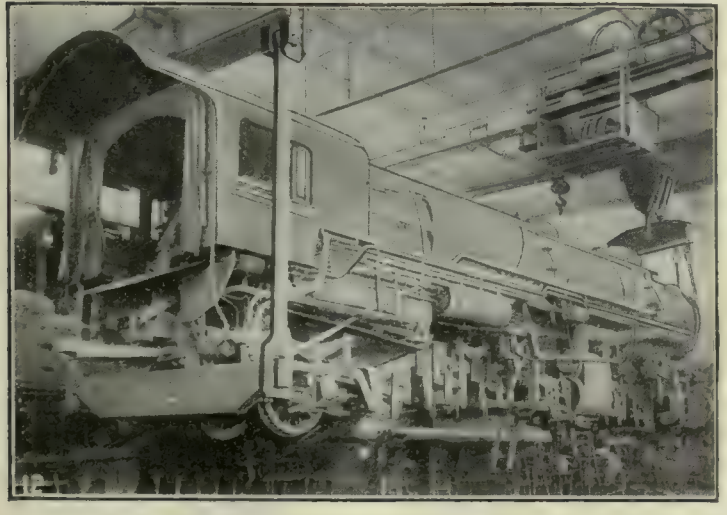


FIG. 12. TRANSFERRING A MALLET COMPOUND.

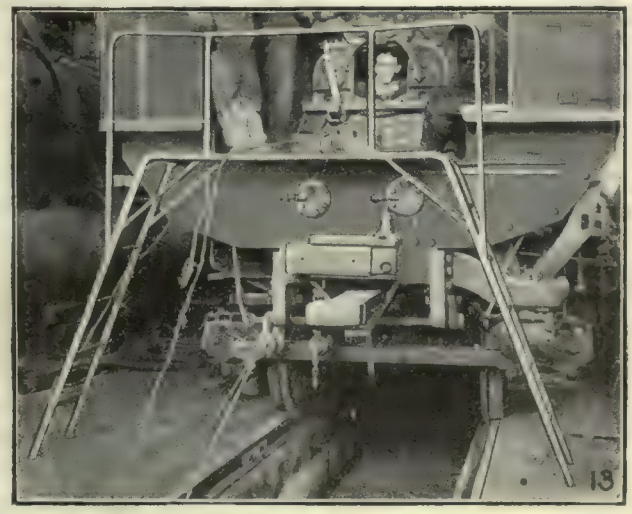


FIG. 13. A CONVENIENT STEP LADDER

regular operation is obtained by a screw operated by the pilot wheel *A*. The power delivered is weighed by the small prony brake *B*, and indicated on the gage *C*, to which the pressure is transmitted through oil, compressed by the turning action of the brake in the cylinder *D*. The air pressure on the line is shown by the gage *E*, while the tool-o-meter *G* registers the amount of air consumed.

By a comparison of these readings with those recorded from tests of drills in good condition the relative efficiency of the drill under test can be determined. As a further proof, the consumption of air is taken with the drill in actual operation, the drill being mounted as shown in Fig. 11. With such means for testing the drills it is a very easy matter to tell when they need overhauling.

Transferring a Mallet locomotive from one track to another requires the service of two cranes, as shown in Fig. 12, and the operators must work well together if the transfer is to be accomplished without accident.

The deck of an engine under repairs is neither easy of access from the shop floor, nor is it a safe place to work without some protection at the rear. In Fig. 13 is shown a portable ladder for use at the rear end of an engine. As can be seen, access to the deck can be had from both sides and the platform at the top forms an extension to the deck. In addition the railing at the rear of the platform prevents the shopmen at work from accidentally stepping off into space.

Turning Vitrified Abrasive Wheels with a Steel Tool

By A. Lambercier
Geneva, Switzerland

On pages 53, 140 and 210 of American Machinist, there appeared an article on the manufacture and use of diamond tools that was of interest to me, especially as I had just concluded an experiment in the boring of large abrasive wheels by means of steel tools.

In our machine shop where we do many kinds of special jobs, we not infrequently have occasion to enlarge the hole or modify the shape or face of hard, vitrified wheels and when much material has to be removed we have experienced difficulty with the ordinary form of diamond tool held in a steel holder.

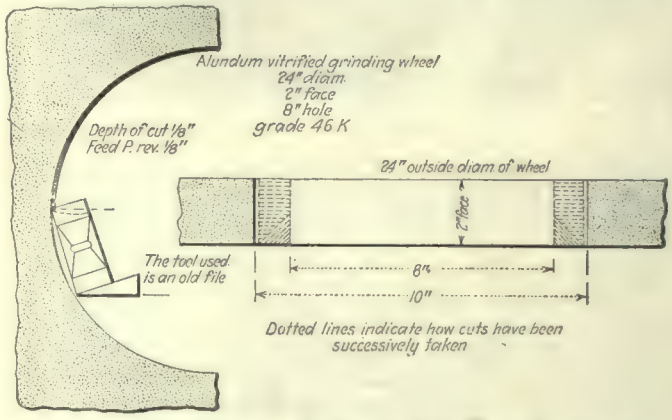
We had never given serious thought to the possibilities of accomplishing the result in some other way until we were confronted with the problem of enlarging the bore of eight 24 x 2-in. alundum wheels from 8 in. to 10 in. in diameter. This job was made necessary by immediate need for the wheels and the impossibility of securing quickly from the factory (alundum wheels are made in America and we are in Switzerland) wheels of the right bore of 10 inches.

We had in stock a sufficient quantity of the wheels that were right in every respect but the size of the hole and our job was, therefore, to remove approximately 57 cu.in. of alundum abrasive, grain 46, grade K, from each of the eight wheels.

The first wheel was mounted by means of four wooden jaws upon a large oaken faceplate and the boring started with the best diamond tool we had; but by the time the hole had been enlarged 1½ in. in diameter this tool was worn out, and a second tool lasted only just long enough to finish the first wheel. At this rate the job might have consumed perhaps two dozen diamonds.

It was at this stage that the idea came to me of the possibility of actually "turning" or "boring" out the excess stock by means of a steel tool. With the foreman I went to the scrap box where we selected an old Swiss file about 12 in. long. Breaking the tip by striking the file sharply across an anvil so as to secure a perfectly sharp edge, we ground it on the tool grinder to an angle something like a lathe tool, to give the necessary clearance.

This tool was clamped in the toolpost of the lathe and the work of boring started by pulling on the belt, as the slowest power-driven speed of which the lathe was capable was far too fast. I soon discovered that this



TURNING VITRIFIED WHEELS WITH STEEL TOOLS

tool worked as well as a bortz diamond and that the deeper the cut taken the better it worked.

The corner of the hole was taken off upon a 45-deg. bevel until the outer diameter of the bevel reached 10 in. Then the cuts were taken radially as shown in the sketch, about ⅛ in. depth of cut and ⅛ in. feed, until the diameter of the hole was within $\frac{1}{16}$ in. of size; then a single cut was taken from front to rear, finishing the hole.

As soon as the possibility of success was apparent a power drive was applied to the lathe by mounting a 6-in. pulley in the lathe in the next row and belting from it to the largest step on the cone of the lathe in which the work was being done. By using the back gears of both lathes we were able to get a rotative speed of four turns in five minutes, corresponding to a cutting speed of about 25 in. per minute.

On the first cuts great care was taken for fear that the pressure might cause the tool to "dig" and break out pieces of the material, but this did not happen. At the speed and feed mentioned there was no apparent wear upon the tool, but the slightest increase of rotative speed above this point resulted in immediate disaster to the cutting edge.

From this experiment I should say that, given a sufficient depth of material to be removed, there is no longer need for diamond tools for turning or boring vitrified wheels. A cut of less than $\frac{1}{32}$ in. would simply wear out the tool of hardened steel; and here, probably, the diamond remains the only possible working tool.

Under the best of conditions it would probably be the limit of elasticity of the steel that governed the depth of cut and rate of feed, but within its limits the steel tool is to be preferred to the diamond for several reasons.

The time of boring the first wheel by this method was about four hours "floor to floor," and it was done at one grinding of the tool.

Allowing for Gage Wear

Shall Master Gages Have a Fixed Tolerance or Shall Allowance Be Made for Wear? American and British Points of View at Variance

By R. DUMAS and E. C. PECK

INTERCHANGEABLE manufacture is so closely tied up with the question of gages and tolerances that a thorough understanding of the subject is necessary to avoid confusion and to secure economical manufacture. One of the troublesome problems is that of the wear of gages and the way in which this wear affects the work to be gaged.

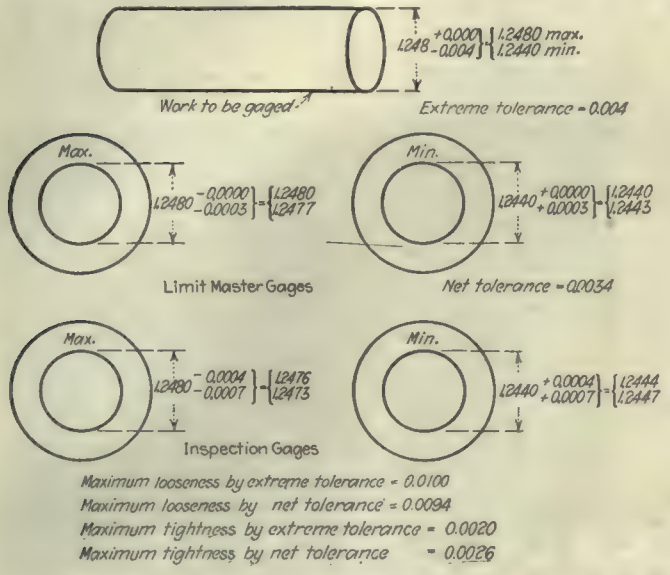


ILLUSTRATION OF RELATION BETWEEN DIMENSIONS OF WORK AND GAGES

There are two diametrically opposed points of view as to gage wear, one which we may perhaps call the American viewpoint since its general acceptance grew out of the war experience of the U. S. Army Ordnance Department, is "that the component dimensions as represented by master gages must never, from any cause, be exceeded either from wear of gages or inaccuracy."

The British Method of Gaging

The other view, held and practiced by the British War Office, allowed a tolerance for wear of the master gage and made a second set of tolerances to cover this. The two practices compared, in the following letters, are from R. Dumas, works manager of the British Thomson-Houston Co., and E. C. Peck, general superintendent of the Cleveland Twist Drill Co. It must be remembered that the latter was a Lieutenant-Colonel in the Ordnance Department in complete charge of gages and, that in this capacity, he put the department on a sound manufacturing basis so far as munitions were concerned. Mr. Dumas considers the American practice, as taken up by the American Society of Mechanical Engineers, unsound and states his case as follows:

"If manufacturer *B* contracts to make certain parts, such as plugs, for customer *A* to certain prescribed limits, customer *A* is not entitled to reject any parts which come up to the extreme limits mentioned. Customer *A* is entitled to gage the parts in order to see whether manufacturer *B* has complied with the requirements.

"If he is doing this with a limit gage, then it is clear that the 'go on' end of the gage must not reject any work which is up to the extreme limit, and as gages in themselves must have a tolerance it is clear from this that the gage tolerance must be on the plus side. If the gage tolerance were inside the limits, then it might easily result in parts being rejected which complied with the initial requirements, and manufacturer *B* would then have legitimate cause for complaint.

"It will be seen then that the legal aspect of the case determines the question, and it can be said with certainty that the extended experience obtained, when working on this basis during the war and since, has demonstrated that no practical objection to it exists.

"It is, in point of fact, a convenience, as it is so desirable as to be practically necessary to arrange for a slight difference to exist between work and inspection gages, in order to insure that work passed by the 'work' gages will run no illegitimate risk of being rejected by inspection gages."

Mr. Peck replies: "I am entirely familiar with the system carried out by the English in their munitions works during the war.

"When I took hold of the gage business in Washington, I found about half of the people trying to adhere to the English doctrine and the other half bitterly opposed to it. I made quite an extensive study of the practical use of it before coming to a decision as to what our own practice would be from then on. In my estimation, it was their practice of having a plus tolerance on inspection gages which caused the most of their trouble.

"The first thing I laid down for our observance in the Army was *that the component dimensions as represented by master gages must never from any cause whatever be exceeded either from wear of gages or inaccuracy.* This fundamental is conceded, by those who know the subject, to be so sound that it is rarely questioned. The old timers, generally those who think they adhere to a tolerance but do not, favor the practice used by England during the war.

"This subject was very extensively gone into by the Screw Thread Commission on its visit to England, and we spent an entire day discussing it. Every one at the conference table except one man from the Woolwich Arsenal, conceded the superiority of our method and also the economy in both production and gages.

"Proof of my statement that the system which I advocate works out is that immediately following its understanding and adoption, gage troubles became less and less until finally they were practically nothing. Under the English system they never got any less and there was always a constant quibble over how much over a mark a gage could wear.

"The following example will, I think, make this perfectly clear: The accompanying illustration represents the method I advocate. Either snap or ring gages can

be used and a check or plug made to master gage dimension will check the inspection gage against wearing beyond the limits. Where the inspection gage rejected work on account of 0.0004 in. (a very small amount) and the producer objected, the work was reinspected with an inspection gage worn to master gage size. However, this was rare, and most manufacturers preferred to work farther away from the danger line.

"The English, in a lot of their work, put on a second set of tolerances equal to wear limit of the inspection gages and began their inspection gage at master gage size and then made a second master, say 0.0004 in. large, and allowed the inspection gage to wear to this limit. This, of course, always violates the fundamental that component limits must not be exceeded. In fact, it sets up limits and then destroys them."

Instructions to Workmen

By C. J. Morrison

There are two extremes in giving instructions to workmen and they are about equally bad. In one method no detailed instructions are given while in the other specific directions are given for each detail of an operation. The first method denies the workmen help from those who are in a position to make a careful study of operations and leaves him to guess at cutting speeds and devices which may be used; while the second method kills initiative and confines the thinking to those who issue the instructions.

The operator on a vertical boring mill was handed detailed instructions covering the turning, boring and facing of an iron casting; he religiously followed the instructions so that each piece was completed in the estimated time of ninety minutes. The man who had made the schedule was delighted and the operator had nothing to say, but when the superintendent came along, trouble started. He demanded of the operator, "Are you trying to take as long as possible on that work? Don't you know that you can turn and bore at the same time?" To which the laconic reply was given: "Yes, I know it, but the instructions don't want it done that

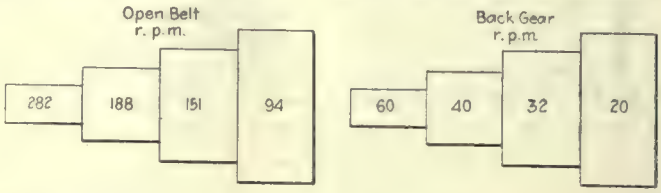
DRAWING NO.	PART NO.	
OPERATION	MACH. NO.	
	P.A.	O.A.
TIME		
SPECIAL TOOLS		
JIGS		
FIXTURES		
REMARKS		
	DATE	

FIG. 1. TIME CARD

way." An explosion followed and ended with orders to "forget the instructions." The castings were then machined in sixty minutes each.

A means that has been very successful is to give all the information that may be needed as a guide, but to put no limit on thinking or individual effort. Cards as shown in Fig. 1 were used and a card was given out with each job ticket. The entries except "Time" need no explanation except it might be well to state that symbols were used for the operations and that under "Remarks" any useful suggestions or necessary cautions were entered.

The time was divided into two parts, the "P.A." being preparation allowance or time necessary to get the machine ready to begin work and to restore it to normal condition after completing a job, while the "O.A." was the operating allowance or time necessary to perform



DIAM. IN INCHES	CUTTING SPEED FT. PER MIN.			
1	74	49	40	24
2	148	99	79	49
3	221	148	112	74
4	295	197	158	98
5		246	198	123
6		295	237	148
7			277	172
8			316	197
9				221
10				246
11				271
12				295
13				
14				
15				
16				
17				
18				
19				
20				

CUTTING SPEED FT. PER MIN.			
16	10	8	5
31	21	17	10
47	31	25	16
63	42	34	21
79	52	42	26
94	63	50	31
109	73	59	37
126	84	67	42
141	94	75	47
157	105	84	52
173	115	92	58
189	126	101	63
204	136	109	68
220	147	117	73
236	157	126	79
251	168	134	84
267	178	142	89
286	188	151	94
298	199	159	99
314	209	168	105

FIG. 2. SPEEDS OF A BELT-DRIVEN LATHE

the necessary operations on each piece. Naturally the P.A. would be allowed only once while the O.A. would be given as many times as the number of pieces called for on the job ticket and the total time would be the P.A. plus the O.A. for all the pieces.

As a further guide each machine was provided with a card showing the possible cutting speeds. Fig. 2 shows the card for a typical belt-driven lathe and incidentally shows the limitations of such a machine. In the case of a crank shaper the maximum speed attained for each combination of stroke and shaft speed is shown, but no explanation seems necessary for the speeds used in the cases of other machines.

Beyond the information described, the men were allowed to work out their own salvation and were generally able to do so, but, of course, there were cases where the prescribed time would not be made and there would be a request to see the detail sheet, which meant the sheet upon which the time estimate had been made and which naturally showed all the details such as number of cuts, speed, feed, etc. Usually a reading of the detail sheet solved the problem, but sometimes not, and then a request would be made for a demonstration. In such a case one of the demonstrators (men selected on account of their skill) would take the detail sheet and perform the operations just as laid out, and would usually succeed in equaling or beating the estimated time. Of course there were cases where the time could not be made, due to a variety of causes such as hard castings, defective tools, machine failure, etc., or a mistake in the estimate. In all such cases the difficulty would be remedied and when hard castings were encountered the extra time required for machining was charged against the foundry and soon eliminated hard castings.

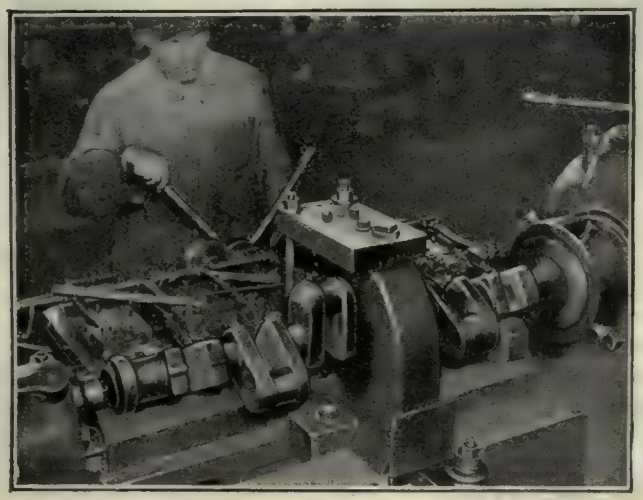
How Franklin Made Rolls-Royce Airplane Motor Crankshafts

Crankpins and Bearings Drilled to Reduce Weight—Finish Boring Two Crankshafts at Once—Special Fixtures for Milling and Other Operations

By FRED H. COLVIN
Editor, *American Machinist*

THE methods used by the Franklin Motor Car Co. in making crankshafts for the Rolls-Royce airplane motors are interesting as showing the removal of a large amount of stock and the machining of a thoroughly high-grade crankshaft. After the preliminary straightening, the insides of the crank cheeks were laid out to insure their cleaning up. The center bearing was then spotted for the steadyrest and the main bearings rough-turned in the Lo-Swing lathe as shown in Fig. 1.

The crankshaft was driven by a ball chuck which gripped the rough-turned flange at the end. The seven bearings were rough-turned at one setting, each with its own broad-faced tool. All the toolblocks were operated at once from one pilot wheel by means of the chain shown.



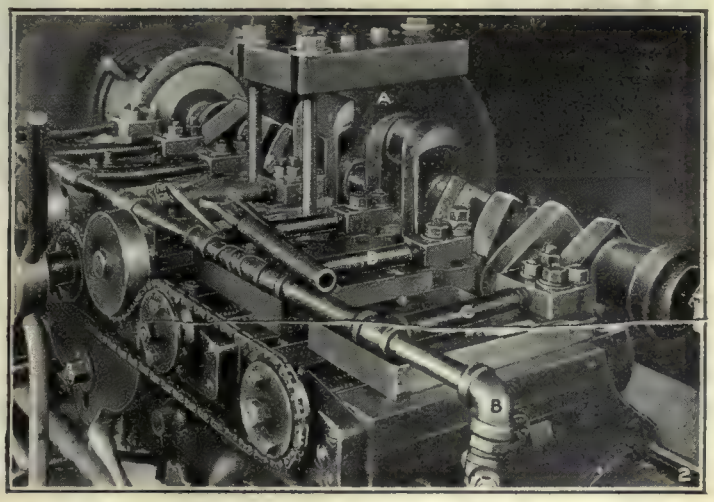
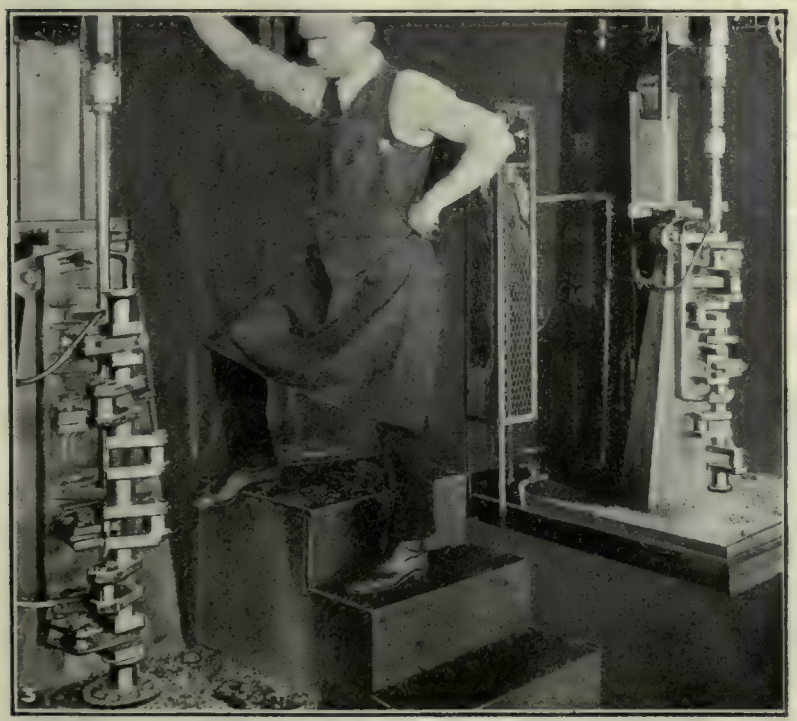


FIG. 1. ROUGH-TURNING ON LO-SWING LATHE. FIG. 2. FRONT VIEW OF SAME MACHINE



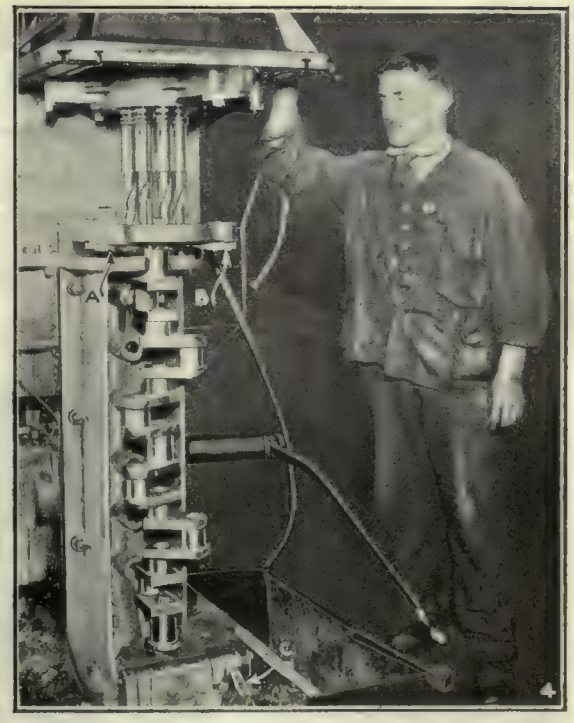
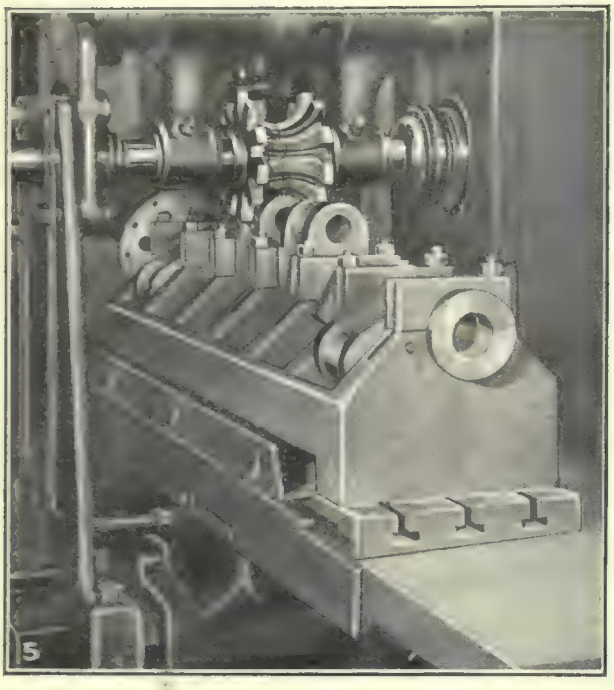


FIG. 3. DRILLING FOR LIGHTNESS. FIG. 4. DRILLING FLANGE HOLES



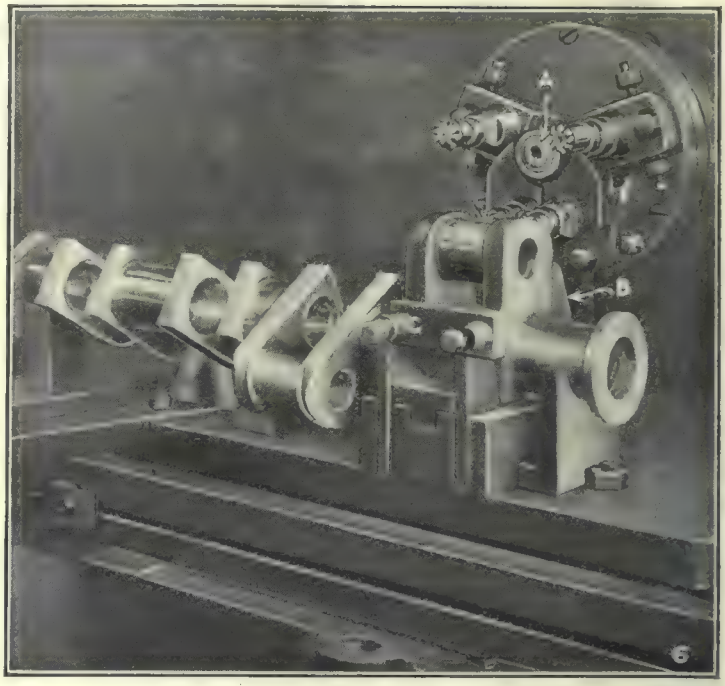


FIG. 5. MILLING ENDS OF CRANKS. FIG. 6. MILLING THE CORNERS OF CHEEKS

Another view of this set-up is shown in Fig. 2. The substantial steadyrest is shown at *A*. The tools were kept flooded with lubricant from the main pipe *B*, the hose connections *C*, *D*, etc., carrying it direct to each tool. This view also shows the chain which moves the different toolblocks into their work.

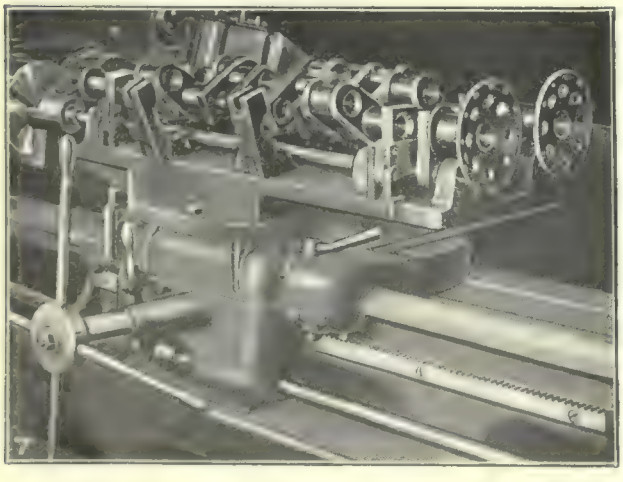
After the rest of the bearings were turned and the outside of the crank cheeks milled, both the crankpins and the main bearings were drilled for lightness. The rough drilling of both is shown in Fig. 3. The machine at the left is drilling the crankpins and the one at the right the main bearings. This view also shows the construction of the drilling fixtures, the method of clamping and adjustment for alignment. The use of wooden steps to enable the operator to easily see just what he is doing, may find uses in other operations.

The drilling of the lightening holes in the flange was done under a multiple drilling machine, as in Fig. 4. The flange was carefully centered by the clamping jaws shown at *A* and *B*, the thrust of the drills being taken by the step at the bottom. The step can be released by the treadle shown at *C*.

The rounded ends of the cranks were milled in the rigid fixture in Fig. 5. The shaft was clamped at every main bearing, swinging bolts being used for quick handling. Two cranks were milled at each setting, the illustration showing the two center cranks in position under the cutter. A noticeable feature is the chip guards at each side of the fixture. These guards are perforated at the bottom so that the oil or other cutting lubricant can drain off, leaving comparatively dry chips to be taken away.

A more unusual and consequently more interesting milling operation is shown in Fig. 6. Here the knee-type milling machine has a special fixture with four small auxiliary milling spindles bolted to the face of the column. These four spindles are driven from a central gear, but all four can be swung around a central stud *A*, and in this way are adjustable for position by the setscrews shown. This arrangement allows them to be positioned exactly as desired, so as to mill just the right round corner on the crank cheeks.

The two lower cutters set close together mill the inside and the two upper cutters the outside corners. The work is fed vertically past the cutters. The method of supporting the crankshaft and clamping can be seen



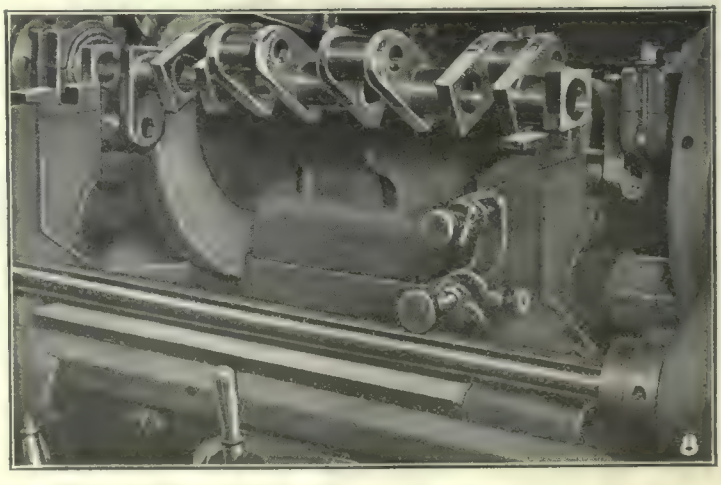


FIG. 7. FINISH BORING THE CRANKSHAFT. FIG. 8. GRINDING THE CRANKSHAFT

by noting one of the blocks *B* and the clamp *C*. The supporting blocks are enough narrower than the cheeks to allow the cutter to pass without interference.

For finish boring the holes in the crankshaft, so as to insure uniformity and aid in securing proper balance, a special fixture was designed for the double spindle Jones & Lamson flat-turret lathe as shown in Fig. 7. This fixture handles two crankshafts at once, cutting the actual machining time in half and hardly doubling the time required for handling. As shown the crankpins are being bored, Nos. 1 and 6 being in position for the boring bar. The method of clamping is clearly shown. The holes through the main bearings can be finish-bored in the same fixtures.

All the bearings are finished by grinding, as shown in Fig. 9. The special driving heads at each end have suitable indexes and are counterweighted to secure balance. As both heads are driven all danger of torsional stresses are avoided.

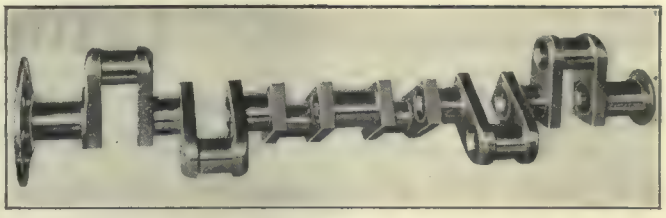


FIG. 9. THE FINISHED CRANKSHAFT

The finished shaft is illustrated in Fig. 9. It is finished all over and the hollow main bearings and crankpins make it very light for a crankshaft of its size. The motor has twelve cylinders and develops about 30 hp. per cylinder.

A Comparative Production Chart

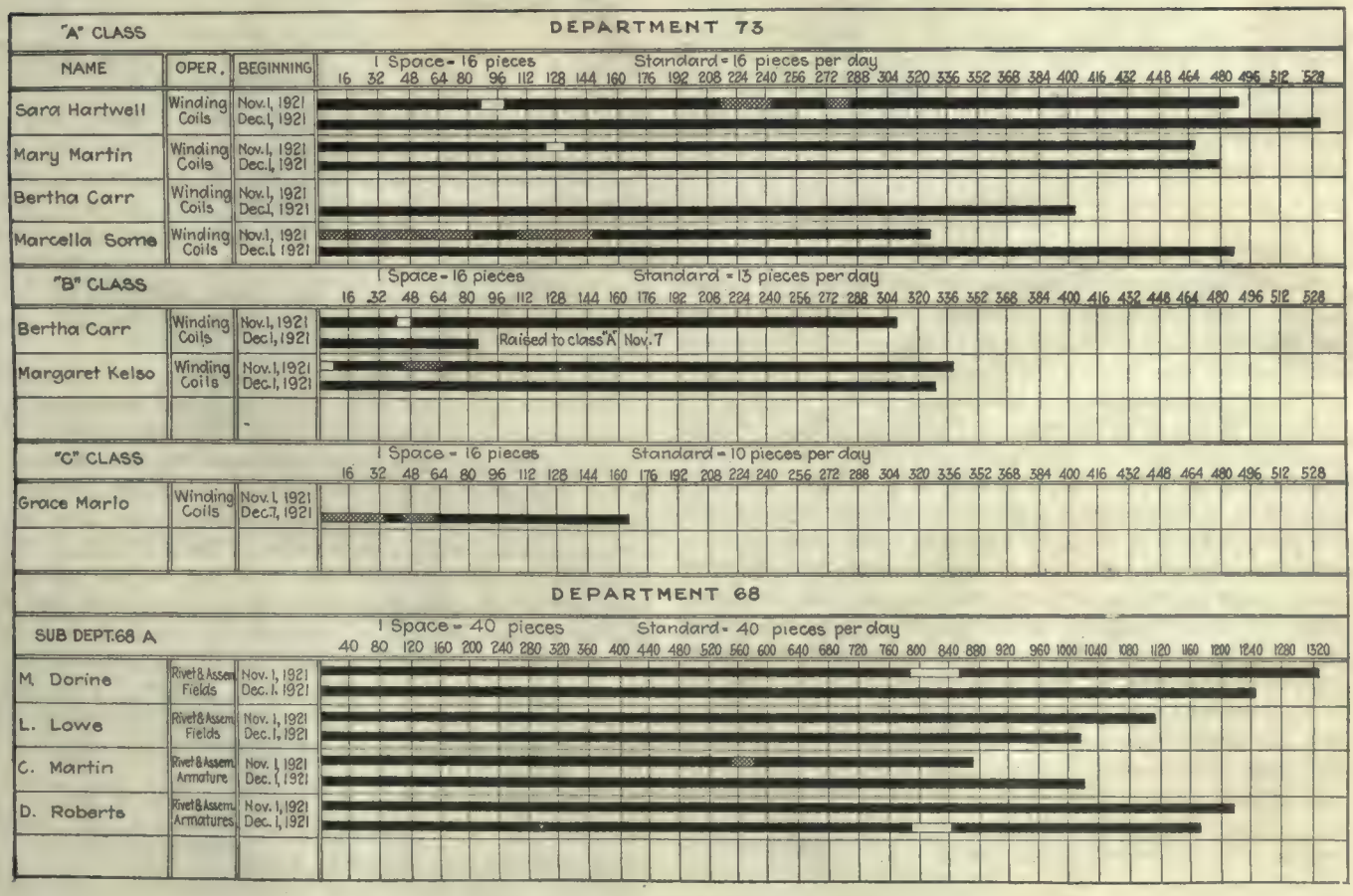
BY ROY BOOTH

The most straightforward, comprehensive and readable comparative production chart I have ever seen is the one in operation at the Brantford, Ontario, plant of the Robbins & Myers Co. It gives at a glance the rating of each worker.

The chart is divided into sections, each section representing so many pieces of work produced. The standard of each operation is given. Producing that standard or above, that number of pieces is marked in black on the chart. Failing to make standard gives the man a red patch (cross hatched in the illustration) on the chart. If he is absent, an average of his past two weeks' work is taken and the required number of pieces is left blank. If this absentee allowance were not made, a wrong impression of a worker's ability would be shown.

We divide the girls into three classes, with three different rates of pay and three different standards to maintain. A girl in class C (the lowest) must produce, say, ten pieces of her work per day. If, for a week, she goes beyond her standard and produces that of B class (thirteen pieces), she is raised to that class with that standard to produce and a higher rate of pay. Producing sixteen pieces (A-class standard) for a week raises her to that class.

When advancements are to be made, the chart again shows its usefulness. The fastest worker does not always make the best foreman, it is true, but to hold a responsible position over others a man must be reliable, dependable, and a leader of men by example.



COMPARATIVE PRODUCTION CHART

Cutting Fluids

Why Adhesion Is an Important Lubrication Factor—Relative Physical Properties Found by Tests—The Best Oil for Each Operation and Material

By EUGENE C. BINGHAM
Chemist, Bureau of Standards

IT IS a curious fact that so many of the very common operations of our ordinary life are without adequate explanation. A case in point is the use of soap as a cleansing agent. It used to be said that the hydrolysis of the soap produced an alkali which saponified the grease, but this explanation is not in accord with the known fact that soaps act very well as detergents, even when the grease is one not capable of being saponified, for example, a paraffin oil; to state that the soap emulsifies the grease is strictly in accord with the facts, but it in no wise explains the phenomenon—it merely describes it. So again, the use of lard oil or other liquid in various cutting operations in the machine shop is universally recognized as beneficial; but there is general disagreement as to the cause of the improvement which is brought about. Cutting oils are used partly on account of their cooling value, partly on account of their value as lubricants. But the value of an oil as a cutting lubricant is not measured by any known test.

It has been observed that the greatest wear of a tool in cutting operations is often not at the point of the tool, but on its face at some distance back from the point. This is a striking and very significant fact, and is proof of the very great friction between the chip and the face of the tool at some distance back from the point. The chip often adheres to the tool so firmly that a "bead" of metal appears to be "welded" to the face of the tool so that it is necessary to remove it forcibly. It has therefore been suggested that the cutting fluid acts primarily as a lubricant. Since the lubricant reduces the friction, the heat which otherwise would have been developed is avoided. If the lubricant also removes heat by conduction, so much the better.

Advantages of Adhesion

In examining the properties of the oils which might account for the marked superiority of the fixed oils, we find that lard oil has a lower temperature coefficient of viscosity than any of the common mineral oils. Lard oil therefore possesses an advantage over a mineral oil in that, although it is relatively fluid at ordinary temperature, it does not lose its viscosity rapidly at high temperatures. This explanation is good as far as it goes, but unfortunately it is not sufficient. There is a property which is entirely adequate to account for the differences noted, although it has not been sufficiently recognized in the past. It is the property of *adhesion*. That oil which adheres to the metal most strongly will most quickly form a film and most stubbornly resist all efforts to rupture it.

In lubrication it is of paramount importance to keep the surfaces from coming into contact, for wherever the solid surfaces touch adhesion will occur. The problem of lubrication is theoretically one of great simplicity. The two metals are prevented from seizure by means of a third substance which may be a solid such as graphite or talc, a liquid such as lard oil, or even a gas such as air. If the third substance is a solid, it must be soft so that it will readily undergo plastic flow. If it is a liquid, it must adhere strongly and it must not be too fluid, lest it squeeze out.

The cutting of metals offers the most severe conditions for lubrication. The tool is continually taking

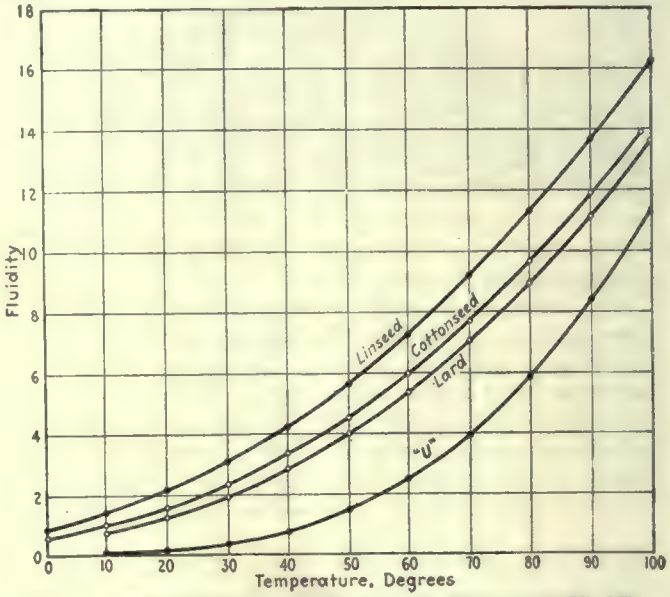


FIG. 1. FLUIDITY AND TEMPERATURE CURVES OF MINERAL AND FIXED OILS

off fresh metal, often at a high rate of speed and at high temperature. The pressure of the chip upon the tool is sometimes excessive. All of these causes tend to make adhesion between the chip and the tool very great and the need for a lubricant to prevent seizure may be imperative. That lubricant is best which has the greatest adhesion for the metal, since it is most strongly drawn into the space between the tool and the metal being removed.

But adhesion is extremely susceptible to the action of impurities. Oils will not wet many solids in the presence of a dilute alkali. On the other hand, the adhesion of oils is greatly increased by the presence of an acid in solution. According to this, the prevalent practice of excluding as far as possible free oleic acid from a cutting oil is shortsighted. We can even go further and predict that for many, if not all purposes, it may yet be possible to synthesize an oil which has all of the virtues of lard oil without its obvious defects. Thus sulphur in the free condition or as sulphide possesses a great amount of residual affinity. For it is to be noticed that small quantities of a substance of high adhesive qualities will entirely alter the properties of an inferior oil.

To test this further the author made a series of experiments. In correspondence and conference with a large number of practical users of cutting oils in quantity, it was found that some users were convinced

*Abstract of technical paper No. 204, Bureau of Standards.

that regardless of cost, or convenience, certain oils sold under trade names were indeed superior to even the best lard oil. Some of the best oils, according to general consensus of opinion, contain sulphur in large quantity.

In the study of cutting oils in particular and the question of lubrication in general, it seems necessary to determine the different properties of fixed and mineral oils which may possibly produce the effects upon their value as lubricants, which we have been discussing.

Each of the fixed oils here tested has a considerably higher specific heat than does the single mineral oil, which may probably be taken as typical. Even at that the highest specific heat is a little less than one-half that of water. The fluidities of the two fixed oils are generally greater than the fluidities of the mineral oil at the same temperature as shown in Fig. 1. The characteristic feature, however, is that the increase of the fluidity with the temperature is so much greater with the mineral oil. The contrast between the two classes of oils is brought out much more clearly in Fig. 2, when we plot the fluidities against the specific volumes. The viscosities in centipoises are plotted in Fig. 3. Only a small portion of the curve for the mineral oil can be shown on the plot. Although the specific heat and the slower change of fluidity with the temperature are both in favor of the fixed oils, we have tried to show that the adhesion is probably the main reason for the superiority of the fixed oils as *lubricants*.

G. Q. Lewis of the U. S. Navy Yard at Washington has made an elaborate study of the cutting properties of fixed oils, compounded oils, and trade preparations. He employed for the tests the actual machines and materials which are to be used in practice. He has found several trade preparations to be superior to even lard oil in boring chrome nickel steel propeller shafts

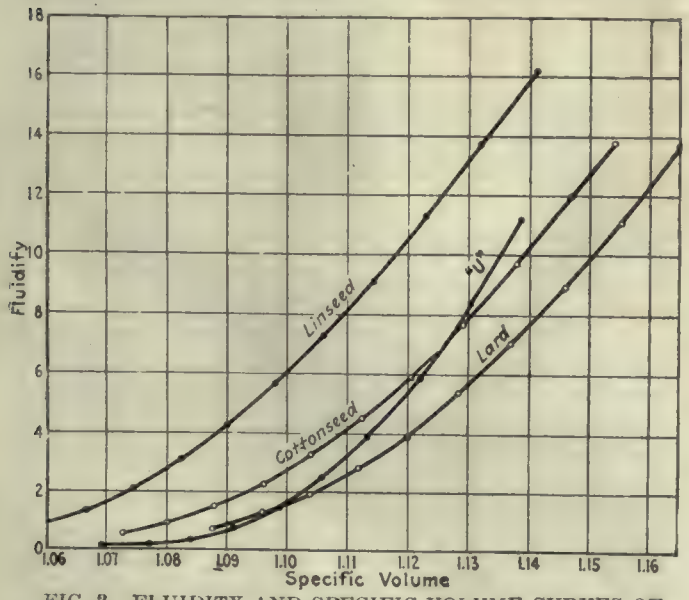


FIG. 2. FLUIDITY AND SPECIFIC VOLUME CURVES OF MINERAL AND FIXED OILS

with an elastic limit of 100,000 lb. per square inch. He has secured an increase of production of 50 to 100 per cent over the earlier practice, where a mixture of 10 per cent rapeseed oil and 90 per cent paraffin oil was used. A saving of 13 per cent in the cost of the oil was also obtained.

A graphical comparison of different oils so diluted with paraffin oil that each of the mixtures would cost 35c. per gallon is given in Fig. 4. The machine was run by its own motor which was connected with an ammeter and voltmeter, and was run at a rate of 120 r.p.m. with a feed cut of 8 in. per hour on chrome nickel steel. The watts and the temperature of the oil were measured and were plotted against the elapsed time. With lard oil or pure mineral oil the tool would break down at once. With two of the mixtures tested, Nos. 13 and 18, the tool worked steadily without any balk whatever. With the other mixtures the machine balked and had to be started over again, as can be seen by the sharp maxima appearing in the curves. Mixture No. 13 is the one which had been found in the earlier tests to give such superior results.

The author desired to test this oil on other operations. For this purpose a number of samples of oil were made up. A few of these were:

(1) The preparation which had given best results at Navy Yard.

(2) Lard oil.

(3) A mixture of 90 per cent of paraffin oil and 10 per cent of oleic acid. The oleic acid had been heated with sulphur.

(4) Pine oil, sulphur and turpentine.

These samples were placed in plain bottles with numbers only, sufficient dye and pyridine being added to the lard oil to disguise it. They were then given to a skilled mechanician to be used in threading wrought iron. The resulting threads were examined with a microscope by several independent observers. There was general agreement that the lard oil gave the best results and the new preparation, No. 1, the worst results. The results fell in the order, Nos. 2, 4, 3, 1. They were very decisive for this particular operation. Pure mineral oil was, of course, inferior to all of these.

It appears likely that lard oil is better than anything which has been devised for certain operations. The prediction seems to be amply justified that oils with high residual affinity, such as those containing oleic acid, or pine oil with sulphur, will be found best. But it is noted that the trade preparation No. 1 also contained several per cent of sulphur.

The purpose of a cutting fluid is to cool the work; to lubricate, thereby increasing the speed of production; to lessen the wear of the tool; to diminish the energy consumption; to insure a good finish and accurate dimensions; to wash away the chips; and occasionally to prevent the formation of metallic dust. There are two ways in which the use of a cutting fluid assists in getting accurate measurements: The work may be unduly heated and thereby expanded unless a good cutting oil is employed; the "finish" obtained by such an oil is often essential.

Cooling is said to increase the cutting speed on wrought iron and steel from 30 to 40 per cent and on cast iron from 16 to 20 per cent. It is to be noted that the most effective cooling is obtained by directing the cooling fluid on the shaving at the point where it is being formed, because thereby, through cooling, the plastic flow of the material is lessened as well as the tendency of the shaving to seize on the tool. At the same time the fluid can be drawn in readily between the shaving and the tool, as the pressure fluctuates, and act as a lubricant.

Washing away the chips is quite important in such operations as deep drilling. Securing a strong, continuous shaving is an advantage in such work and it is

necessary to have a lubricant with sufficient adhesion. The stronger the force of the stream of cutting liquid the better it will carry away the chips, as well as cool and lubricate the parts.

If the material is tough, a lubricant is necessary, but

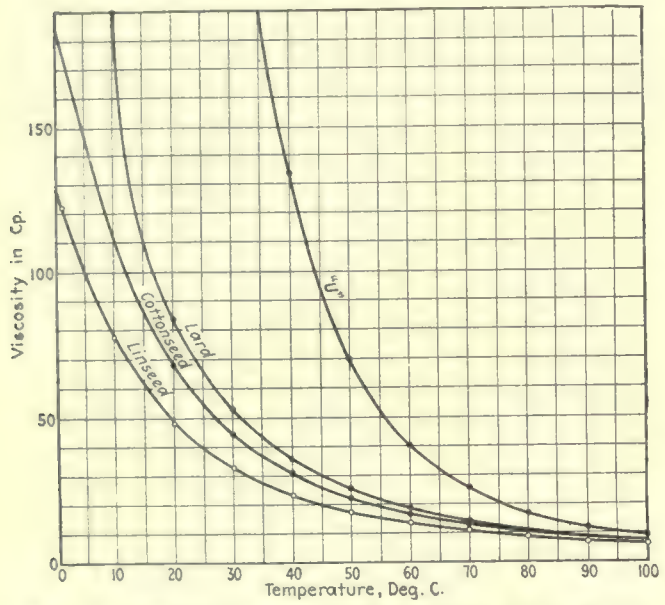


FIG. 3. VISCOSITY AND TEMPERATURE CURVES OF MINERAL AND FIXED OILS

if brittle, it may be dispensed with. The lubricant used in a given case will naturally depend upon the finish desired and the tolerances allowed. For roughing operations on a given material a cheap lubricant may suffice, whereas for fine operations on the same material, such as in the manufacture of micrometer screws, the best grade of lubricant is demanded regardless of price. There is the further fact that with some machines such as turret lathes and automatics, the cutting fluid and the oil used to lubricate the machine are liable to intermingle, and a cutting liquid must be used which will also serve to lubricate the machine.

The substances used as cutting fluids are oils, air, aqueous solutions, and emulsions. We may subdivide the oils used into fixed oils, mineral oils, and compounded oils, and the fixed oils may again be subdivided into animal oils, fish oils, and vegetable oils. Under animal oils we have the several varieties of lard oil, No. 2, No. 1, extra No. 1, and winter strained prime, tallow oil, neat's-foot oil, sperm oil, wool fat, horse oil, and whale oil. Lard oil is the cutting oil *par excellence*. It is used on the most difficult work such as cutting delicate threads, tapping and cutting gears, deep hole drilling in steel. It is not suitable for cutting very hard steel and glass, or where the heat production is excessive. Small amounts of free acid present in the oil are probably beneficial and they do not cause corrosion of brass parts. In the great majority of cases substitutes for lard oil can be used to advantage.

The very high cost of the fixed oils as a class makes it desirable that the purchaser make suitable tests to determine that the material is both unadulterated and sanitary. Not only should the free acid be not too high, but the stearin should be kept as low as possible. Sperm oil is practically interchangeable with lard oil as a cutting oil. Several users report fish oils satisfactory but the odor was so objectionable that their use was abandoned. Fish oils, however, can be deodorized. Under vegetable oils, olive oil, rapeseed oil, mustard-seed oil, castor oil, peanut oil, soya-bean oil, cocoanut oil, cottonseed oil, corn oil, and linseed oil have been more or less extensively used. Under the heading of vegetable oils we may also include creosote oil, turpentine oil, turpentine, pine oil, and rosin oil, although they are distillates and therefore are not "fixed oils."

The mineral oils are naturally cheaper than the fixed oils. In fluidity they range from kerosene, which is used in cutting brass and aluminum, to heavy engine oils. They prevent rusting and are very stable, so that corrosion, carbonization, and gumming are small factors. They are not cheap enough to compete with emulsions on the one hand; and on the other hand, because they do not have sufficient adhesion to those steels which are difficult to work with emulsions, their use is not very satisfactory.

Compounded oils are the natural result of the desire to secure the adhesion of the fixed oils combined with the stability and cheapness of the mineral oil. Some of the compounded oils contain considerable amounts of lard oil, while others contain none at all. It should be observed that "cutting compounds," which are very satisfactory to many large users, apparently contain no fixed oil whatever. Thus there is possible a great saving in fats by a knowledge of the best usage in regard to cutting oils. It appears probable that the necessary adhesion can be gained by thoroughly incorporating sulphur in oils, such as red oil (oleic acid) and pine oil, which themselves have considerable adhesion.

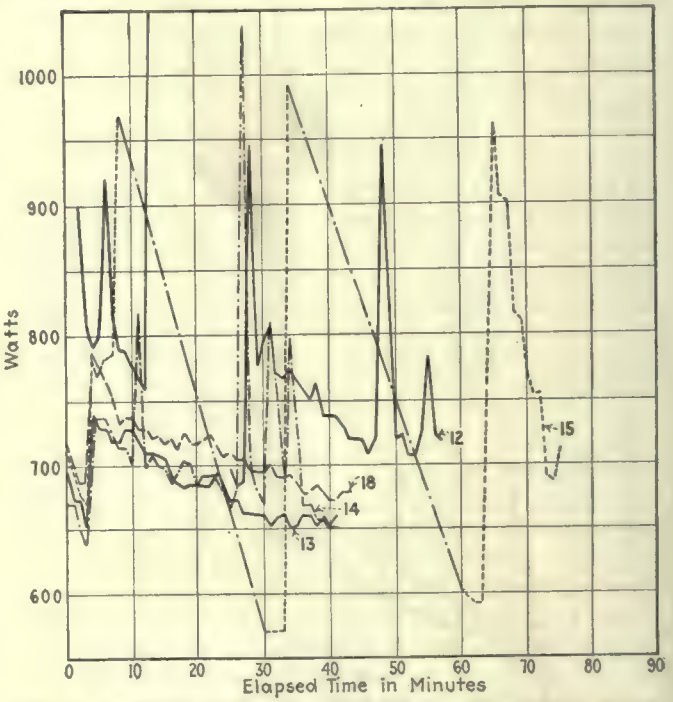


FIG. 4. FLUCTUATIONS IN POWER CONSUMPTION WITH VARIOUS LUBRICATION OILS

Air can not be considered as a lubricant for the purposes which we are here discussing, and it has very little cooling effect. However, with a brittle metal like cast iron it is used successfully to take away the chips. Water alone has been found satisfactory in some cases, as in the drilling of ship plates and boiler plates. Water does not generally give a smooth finish, nevertheless it

is sometimes used to give a bright, smooth surface to steel, which is called a "water-cut" surface. It may also be used on brass and aluminum, but water is in disfavor, owing to the fact, noted by every machinist, that it rusts the machines and the work as well if this is either iron or steel. To prevent rusting, an alkali may be added to water.

Ingredients of Emulsions

There are three types of material used for making emulsions: One is made from mineral oil compounded with a neutralized sulphonated oil. The second type of soluble oil is made from a mineral oil compounded with an alcoholic solution of soap. The third variant is marketed as paste made of a thick soap solution and mineral oil. These are known as cutting pastes or compounds. Of the three forms the last is the least desirable, and the second is perhaps the most so, as it may be made without expensive apparatus and requires much less technical skill to fabricate. Emulsions give trouble on automatics or machines with turret heads because the emulsion gets under the turret and displaces the lubricant.

Gum arabic and starch are sometimes added to cutting oils, presumably in order to increase the stability of the emulsion. The tendency of the oil to give trouble by gumming, and the fire hazard as well, can be reduced by diluting it with mineral oil. The objection to the fixed oil on account of expense does not apply to the distilled oils of vegetable origin.

The character of the operations performed, the shape and adjustment of the tool, the speed, feed, and depth of cut have more to do with the choice of a cutting fluid than the character of the steel. For drilling, an emulsion is most commonly used, but for light, slow work a compounded oil, or even lard oil, is resorted to. For rough drilling, water containing a little soda, soap, or borax is employed. For reaming, an emulsion is generally used, although the work is often done dry. For a high polish and for extremely heavy work, compounded oil or lard oil is resorted to. For milling, emulsions are almost universally used, with alkaline solutions, compounded oils, and lard oil as variants. Planing is often done dry. In many cases, however, an alkaline solution or a dilute emulsion is used.

In tapping and threading, emulsions are used in a large minority of instances. Lard oil and compounded oils are resorted to generally. Turning practice in different shops and for different operations shows the widest variance. Some workmen turn dry, others with alkaline solutions, emulsions, compounded oils, corn oil and—where a high finish is desired—lard oil and turpentine. On automatic screw-cutting machines and machines with a turret head it is best to use a compounded oil with as small a proportion of fixed oil as will serve the desired ends.

Recollections of an Old-Time Mechanic

By John J. Grant

Looking back on more than fifty years of my active life in the machine shops of America, with many ups and downs, I thought some of my experiences would be worth reading by men and boys in the same walk of life today.

I was born in Leicester, England, on March 22, 1844, and came to America in 1848. They tell me I came of a mechanical family; it must have been mechanical as it could not have been a financial one, for I have never heard of a rich Grant.

On arriving in America the school ma'ams commenced the arduous task of my education, or rather tried to cram book knowledge into my head, and from the various thrashings I can remember having received, it must have been an uphill job.

If there was any tinkering in the little old red school house, at the parting of the roads, where I got what book knowledge I received, I was the one to do it. Early in the game I was given up as a bad job in the literary line. I am sure of this as I was graduated without a diploma tied with blue ribbons, and was placed at work in a woolen mill at an early age, working only thirteen hours a day.

I can now look back with some amusement at an attempt I made, at the early age of eleven or twelve years, to revolutionize the manufacture of woolen cloth. My old father let my inventive ability have full scope if I did not neglect my work. Only once can I remember his getting out of patience with me, that was when I attempted to take off the electricity from the finishing cards caused by the rub rolls, and not being an Edison not only failed, but came near smashing things generally, including myself.

My father took me by the ear and said that there was altogether too much mechanic in me and that I had better attend to my work.

My first job in a machine shop was cutting, straightening, flattening and punching lead wire used for weights in jacquard looms, and a prouder boy never lived. Of course, I had several fights with the other boys because I felt my oats; one of these fights was with Christie Baush, father of the Baush boys of boring mill fame.

I got a little inside knowledge in machine work by helping the engineer who did the general machine work around the factory. I had never seen a steam engine to remember it and the mechanical germs having commenced to work, I sought knowledge of steam engineering of the engineer, with but little success, for he had never learned the trade and knew nothing about the construction of a steam engine; but he was sure that there was a cylinder, piston and flywheel and that the piston went back and forth. So with that knowledge I started in to make an engine, which at that time was the height of every boy's ambition who was mechanically inclined.

I succeeded after many failures, one of which was to get rid of the steam in the cylinder caused by there being no way for it to escape, as the D-valve had no exhaust chamber on the cylinder exhaust ports. But one day I discovered the trouble, made the necessary changes and the next time I tried to start the engine I had no trouble and it seemed to me that it must have made two million revolutions per minute, as I remember now after these many years.

Of course, nearly every one in the small village came to see my engine and from that day I was a second Watt—and all the other celebrated mechanics that any of the villagers had ever heard of.

Foundry Work on Motor Cylinders

Cores for Use in Molding Machines—Construction of Core Racks and Method of Handling—How Core-Sections Are Assembled

SPECIAL CORRESPONDENCE

THE operations described in this article are those of machine-molding motor cylinders which, of course, are water jacketed. The cores consist of a long hollow cylindrical core for the bore and two thin core shells for the water jacket. The main or central core has a liberal over-all length for hanging up at each end in the mold so that a neck at one end of this main core receives the two half shells for the water jacket, the shells being pasted to the neck and

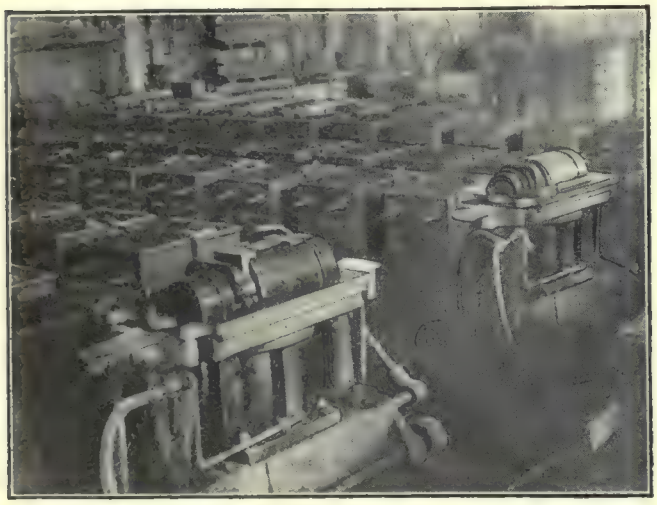


FIG. 1. MOLDING MACHINES WITH CORES SET



FIG. 2. CENTRAL CORES FOR CYLINDERS

wired together over wedges until set in place. A view in the foundry showing two molding machines and a large number of molds set up at the rear will be seen in Fig. 1. The two molding machines are shown with the cylinder patterns for cope and drag in place. The flasks are two-part, of iron, with handy trunnions at the ends for handling.

A group of cylinder cores are shown in Fig. 2, and at the base of each will be noticed the collar for seating the water chamber cores which are made in the iron box, Fig. 3. This box is also shown in Fig. 4. The making of the half-shell cores for the water chamber is accomplished as in the two illustrations just referred to. As is customary in this section, the core

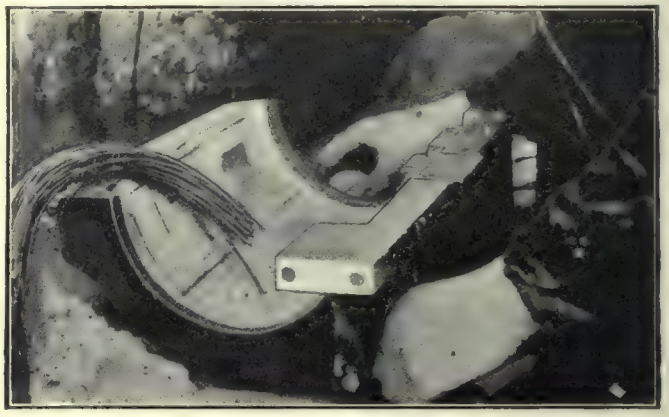


FIG. 3. MAKING CORES IN METAL BOX

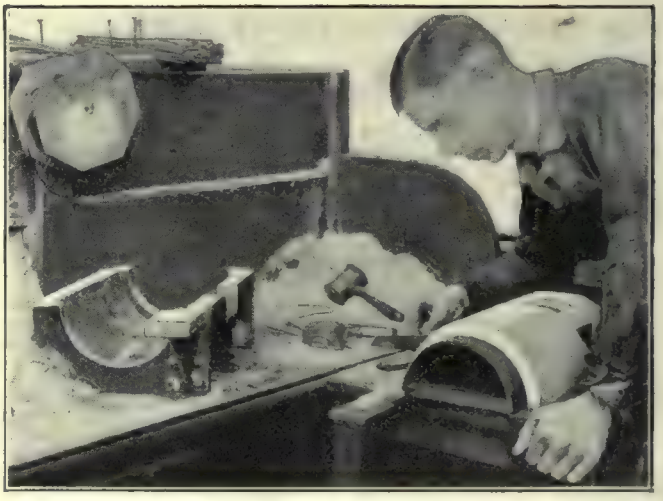


FIG. 4. CORE AFTER REVERSING BOX



FIG. 5. CORE RACKS

work is made up of Monterey core sand. The shells are quite thin and light and are reinforced by bent annealed wire placed around the curve of the work

while similar wires are placed straight from end to end to reinforce the material longitudinally.

These reinforcing wires will be seen in Fig. 3. The core is formed up to shape in the metal box as shown and is then turned over with the upper or convex metal form, as shown in Fig. 4, for the touching up of the edges and preparing of the work for baking in the ovens.

The method of carrying the cores on racks is illustrated in Fig. 5. These racks are of light stiff angle sections with cleats for eight or more shelves or open trays upon which work of this character is readily and safely placed for handling in and out of ovens and around the foundry in general. The racks are picked up by an overhead crane sling consisting of a long notched bar from which two suspension hooks are swung to grasp the rack by the upper frame member, thus keeping it in a level position as it is carried back and forth.

The cores when assembled appear as in Fig. 6. The

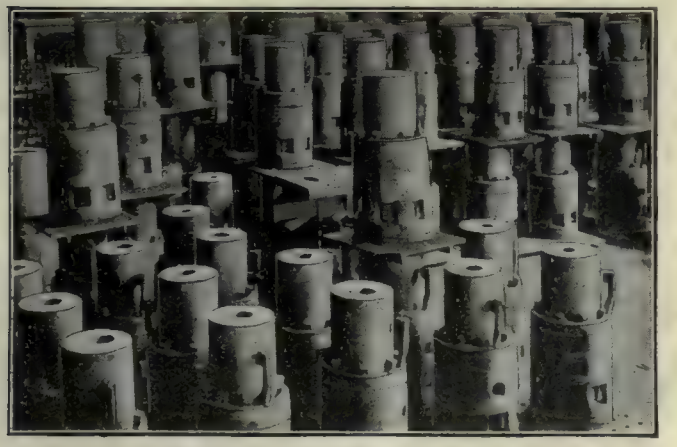


FIG. 6. ASSEMBLED CORES

two water chamber half shells are placed around the neck of the central core, as indicated, and pasted in position while held by wires around the outside, being kept in proper relation to the central core by light wood wedges inserted some eight or more in number around the opening between the outer and inner cores. Afterward the wedges are removed and the cores are ready for placing in the molds, which have been formed from the patterns on the molding machines.

The illustrations of this work are from the foundry of the Holt Manufacturing Co., Stockton, California.

No Seed, No Crop

By Robert Grimshaw

The best of all books tells us, what we should know without being told: "If ye sow not, neither shall ye reap." If the foreman is content to run along without implanting any useful ideas in the heads of his workers, without showing them how to better their work and their own condition, he must not expect his department to make a good showing.

Because the average foreman has waked up to the fact that he is a source of knowledge, skill and inspiration his workers and their products will surpass those of him who is content to be merely a messenger to convey the orders of the planning department.

If he sows seeds of discontent, he will reap a crop of disaster. If he sows no useful seeds, his crop will necessarily be meager and unsatisfactory.

Re-Echoes from the Oil Country

By E. W. Tate

The writer well remembers the "Echoes from the Oil Country" that were published years ago in the *American Machinist*, but to him, as well as to most other readers of that journal, it never occurred to presume that oil might possibly be located in the State of Maine. Such, however, is the case, and a real oil well drilling apparatus is in operation in the central part of the state, a few miles south of the town of Dover. A shaft 600 ft. deep has been drilled, and every evidence of a real oil country, except the oil, is present.

The intention of the writer is not to exploit the possibilities of locating oil, but to illustrate a "Down East" Yankee method of repairing a well drill shank. The shank was 6 in. in diameter by 40 ft. long overall, and a lathe with the distance between centers to accommodate it was not to be found within 200 miles.

In order that the drilling operations should be suspended as short a time as possible, the job of re-threading the broken end was put up to the superintendent of the Fay & Scott shops, at Dexter, Maine. The



USING TWO LATHES TO HANDLE A LONG JOB

longest lathe available in this shop was 24 ft. overall, but about 10 ft. away and practically in line with it, was a 16-ft. lathe of the same swing.

The manner in which the repair was made is shown in the accompanying photograph which, though it does not show the actual machining operation, indicates how the two lathes were coupled together to handle the job.

The tailstock of the shorter lathe and the headstock of the long one were removed, leaving a headstock on one and a tailstock on the other to provide the necessary centers. Both carriages were available for "spotting" the long shaft for the center-rests in which it was finally supported, and after this was done a second center rest was mounted on the 24-ft. lathe and the tailstock moved out of the way to permit the boring, turning and internal threading that was required.

For this work the positive movement of the lead screw of the partially dismantled lathe was, of course, necessary; and to accomplish this, two universal joints and a short length of shafting were used to join one lead screw to the other. With the proper change gears in place on the driving lathe, and an extension shipper rod to enable the operator to control its movements, the actual machining operation was performed with the carriage of the other lathe as readily as though a single lathe had been used.

Methods of Machine Tool Design

Further Continuation of the Fourth Part—Factors Affecting the Design of the Belt Shifting Mechanism—Peculiar Features of the Plate Planer

By A. L. DeLEEUW

ANY or all of these troubles may be met when an existing planer is speeded up or slowed down. Suppose the planer has been acting in a satisfactory manner and that we are speeding up, say 25 per cent. We will probably find that the over-run on the return stroke is excessive and that there is a great deal of squealing of the belt at the moment of reversal. The squealing is due to the fact that the unavoidable slippage between belt and pulley lasts over too long a period of time and the reason for this is, that the entire belt is on the pulley before the planer has come to a standstill. There are two reasons for this condition: In the first place, the speed of the table is greater, so that the belt is shifted at a more rapid rate; and in the second place, the momentum of the parts has been increased more than 50 per cent, so that not only should the belt not go on faster but, on the contrary, it should have gone on at a slower rate.

If, on the other hand, we slow down the same planer we may find that the machine refuses to reverse and, quite often, that the belt will fly off. The reason for this is that the belt comes on the pulley at a slower rate so that the planer has come to a standstill when only part of the belt is on its pulley. When this happens at the end of the cutting stroke we have the condition that a small momentum of the planer has been absorbed by friction in a relatively long time, so that no great assistance of the belt was required to bring the planer to a standstill. Now, however, this small fraction of the belt width must not only give the planer the momentum due to the higher return speed, but must also overcome the resistance of friction, which it may not be able to do.

This leads to the conclusion that every planer should have its shifting mechanism designed according to the conditions of cutting and return speed, and according to the maximum and minimum loads which may have to be moved. In all planers the load is rather uncertain. Fortunately the power required to create the energy of movement of table and load is a relatively small percentage of the total energy, so that quite wide variations of the load on the table do not have much effect on the shifting. On the other hand, a relatively small variation in the speed causes a quite perceptible variation in the energy required to bring the planer up to its speed.

Requirements of Shifting Mechanism

It was pointed out in a previous paragraph that planer belts should not run at less than 1,000 ft. per minute because they would not shift properly. It might seem that it would be possible to arrange the shifting mechanism in such a way that a small movement of the table will bring the belt on its pulley. It will be found, however, that if this is attempted one would merely succeed in making the belt eye turn or double the belt and that the upper part of the belt—that is, the portion which is running over the countershaft pulley—would not follow the movement of the shifter eye. As a result, the belt would tend to move back as soon as the shifter eye is no longer controlled by the dog of the table.

The conditions of shifting from cut to return are quite different from those when shifting from return to cut, on account of the difference in belt speeds and perhaps in pulley diameter. In order, then, to shift properly we should have an entirely independent shifting mechanism for cutting and return speeds. Such mechanism should be made adjustable so that when the speed is changed the shifter arrangement may be changed correspondingly. It is not practical to determine beforehand the exact conditions we will meet when running the planer. The friction is an uncertain amount and the total amount of momentum of the various parts is not easy to determine. It is therefore most likely that when the planer is run in we will find that the shifting mechanism does not act as we wish it. If means were provided to speed up or slow down the action of the shifter mechanism it would be a simple matter to adjust this mechanism so as to get the shifting as nearly perfect as possible. If a planer is built to run at one speed only, this adjustment might be locked, but if it is desired to run the planer at various speeds, then this adjustment should be made so that the operator can set his shifter mechanism for whatever speed he wishes to use.

An Important Consideration

The foregoing considerations are not of much value for small planers carrying light loads and running at moderate speeds; but when a planer becomes of large dimensions, carries heavy loads, and especially when it must run at high speed, it becomes very necessary to pay great attention to the requirements of shifting. As a matter of fact, the proper design of the shifting mechanism becomes then one of the main problems of the planer design.

In the fall of 1897 the United States Government asked for bids on a large number of machine tools specially adapted to the manufacture of armor plate. Among them were a number of planers, all of which were specified to have cutting speeds of 8, 16 and 24 ft. per minute. An analysis of the requirements of these planers along the lines shown in the previous paragraph convinced the writer that it was not possible to utilize the ordinary shifting mechanism commonly used on planers and that it would be necessary to have an independently driven mechanism do the shifting. This mechanism was to be adjustable for various speeds (though this feature was not of as much importance as some of the other features) and was to be started by a dog on the planer table. It will be noticed that the speed variation called for had a very wide range.

Similarly where a planer must be designed with a low cutting speed due to the hardness of the material to be cut, and a high return speed so as to bring the productive qualities of the planer up to the highest possible point, an analysis of the shifting conditions

should be carefully made and, if necessary, a shifting mechanism should be designed which will permit of proper belt shifting conditions.

As was pointed out, the main problem of a planer drive is to stop the momentum of the parts and start the momentum in the opposite direction. This problem becomes more difficult when cutting and return pulleys of the planer are of unequal sizes, because the smaller pulley is used for the return stroke which takes place at the higher speed, and we have the condition here that a belt working on a small pulley must give momentum to a large pulley. It was this momentum of the pulleys which for many years held the possible return speed of a planer down to a rather low limit. Various attempts were made to make a higher return speed possible.

The Doolittle Arrangement

One of these attempts was the Doolittle arrangement by which, at the beginning of the return stroke, a belt was placed on a rather large pulley, thus starting the return stroke at a comparatively low speed. Immediately after this speed had been attained the belt was shifted off this pulley and onto a small pulley which now had to increase the momentum of the parts an amount due to the difference between the previous low and the new high return speed. It was, of course, possible to put on as many sets of pulleys as might be required to bring the return speed up to the right point. Theoretically there was no limit to the return speed, but practical considerations will show that the gains made are not commensurate with the increased complexity of the mechanism. Besides, it was not possible to get the advantages of this arrangement on relatively short stroke.

In other arrangements aiming at higher return speeds springs were placed so that the table would butt up against them at the end of its stroke. This, of course, required an adjustable stop to butt against the springs. Part of the momentum was absorbed in the spring and given out again trying to start the table on its return stroke. Still other arrangements attached the rack to the table in such a way that a certain amount of movement was possible. This end movement of the rack would compress the spring. All these devices depending on springs were not practically successful. There was still the difficulty of giving a great deal of momentum to the planer in a very short time.

In 1906 the author introduced the aluminum driving pulleys on the planer. These have since been adopted by a number of planer manufacturers and have proved to be successful. Instead of finding some means to deliver a large amount of energy quickly to the planer, this method reduces the amount of energy which must be given. In a previous calculation it was shown that about 80 per cent of the energy of the moving parts of the planer was possessed by the rims of the driving pulleys. As aluminum has a specific gravity of only about one-third that of cast iron the "80" energy for cast-iron pulleys will be reduced to about 27, so that the total energy would be reduced from 100 to 47. We might expect, therefore, a possible return speed of about twice that of a cast-iron pulley. However, friction, etc., make this proportion considerably less. The Cincinnati Planer Co., which uses aluminum pulleys on its planers, states that in making a test on a 72-in. motor-driven planer it took 39 hp. at the point of reversal with cast-iron pulleys, while with aluminum pulleys only 30 hp. was required. In another test made on a planer with cast-iron pulleys the machine was capable of making 165 strokes in 30 minutes, while with aluminum pulleys the same machine made 189 strokes.

As a rule the greatest difficulties met in the design of a planer are caused by the fact that the return speed is much higher than the cutting speed, making it necessary to give momentum to a large pulley by the action of a belt on a small pulley. There is, however, another difficulty which shows up when the planer must be arranged for heavy cutting, and this difficulty is accentuated when the ratio between return and cutting speeds is high. To state the problem more definitely, if we must design a planer with a pull on the table rack of 30,000 lb., we have a difficult problem on our hands; but if, at the same time, the specifications state that the return speed must be $2\frac{1}{2}$ times the cutting speed, the difficulties of our problem have become greater. Suppose that we must provide for this table pull of 30,000 lb. and a cutting speed of 25 ft. per minute. Then we must give the table an amount of energy of 30,000 x 25 = 750,000 lb.-ft. per minute. In order to do so we will run the belt at a high speed—let us say 3,750 ft. per minute. The belt pull then must be 750,000 ÷ 3,750 = 200 lb.; and if we are willing to admit a belt pull of 50 lb. to the inch, we can get along with a 4-in. belt. So far we have met no particular difficulty because we have neglected to consider the return speed. Allowing a ratio of 4 to 3 between cutting and return pulleys, the return belt would have to run at a speed of $\frac{3}{4} \times 2\frac{1}{2} \times 3{,}750$, which is a little over 7,000 ft. This is, of course, too high. If now we reduce this return belt speed to 3,750 ft., the cutting belt will have to be 8 in. wide, which is too wide for a shifting belt. This condition used to limit the return speed of heavy planers. In 1898 the author applied for the first time the double driving pulley to overcome this difficulty. In this arrangement, shown in Fig. 57, there are two driving belts, each on its loose pulley. Both belts can be shifted to a tight pulley so that, though shifting narrow belts, we obtain an amount of power as if we had used a wide belt. Such double driving pulleys are occasionally used for the return belt.

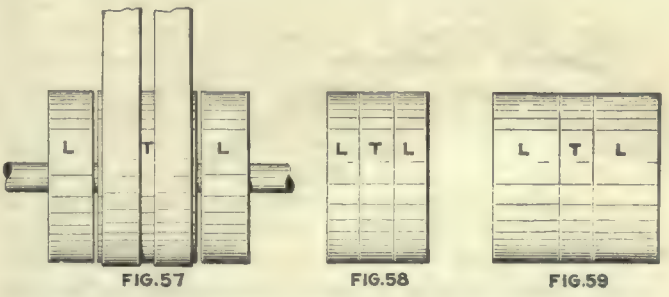


FIG. 57 FIG. 58 FIG. 59

FIG. 57—PULLEY ARRANGEMENT WITH TWO DRIVING BELTS. FIG. 58—ORDINARY ARRANGEMENT OF PLATE PLANER PULLEYS. FIG. 59—PLATE PLANER PULLEYS ON WHICH BELTS CAN BE SHIFTED SIMULTANEOUSLY

There is a limit to the amount of pull obtainable and the ratio of return and cutting speeds even when double belts are used. Allowing the ratio of 4 to 3 as the greatest practical ratio between cutting and return pulleys, allowing 5,000 ft. per minute as the maximum rim speed of a pulley, 3,750 ft. maximum belt speed, and 50 lb. maximum pull per inch width of belt, we can

readily calculate the amount of pull we can give to the table for various ratios between cutting and return speed. We will assume that the maximum width of belt which can be shifted is 6 in. and that the ratio of return and cutting speed is 2½. We will then find:

Speed of return belt—3,750 ft.; which makes speed of rim of cutting pulley 5,000 ft.

Speed of cutting belt—$\frac{1}{3} \times \frac{2}{5} \times 3{,}750 = 2{,}000$ ft.

Two cutting belts are used, each 6 in. wide.

Combined pull of cutting belts equals $2 \times 6 \times 50 =$ 600 lb.

Power on cutting stroke equals $2{,}000 \times 600 =$ 1,200,000 lb.-ft.

The actual available pull on the table will now depend on the cutting speed. If, for instance, the cutting speed were 30 ft., the maximum available pull would be 40,000 pounds.

If, on the other hand, we should have a planer in which the return speed equals the cutting speed we would find at once that we can run the cutting belt at 3,750 ft. and as we again use two belts, each 6 in. wide, we would have an available power of 2,500,000 lb.-ft. For any ratio between cutting and return speed the available power on the cut will lie between these two extremes—namely, 1,200,000 and 2,500,000 foot-pounds.

Various requirements of planers call for various arrangements of the belt drive. The simplest drive of

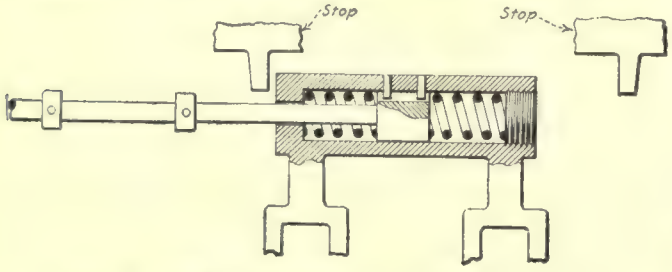


FIG. 60—SAFETY DEVICE BETWEEN ROD AND BELT SHIFTERS

all is that of the plate planer. This machine is generally arranged to have the tool work in either direction, so that cutting and return speeds are the same. In the ordinary planer the table is longer than the stroke so that it is possible to put the controlling dogs on the table itself. In the plate planer, however, a short carriage is used which carries the tool and not the work. This carriage is much shorter than the longest stroke of the planer and therefore cannot carry the dogs. Vaious arrangements are used to accomplish the shifting, all of which come down in principle to this: That a rod or bar is placed alongside of the bed, upon which collars can be adjusted, and these collars are struck by a projecting part of the carriage. The movement thus given to the rod is utilized for the shifting of the belt.

There are two possible arrangements of the pulleys: Either the one shown in Fig. 58 or that of Fig. 59. In the first case, the tight and loose pulleys have the same face and the belts are shifted in the same manner as on the regular planer; that is, one belt is shifted off the tight pulley before the other belt is moved on. In the second case, the loose pulleys have a face twice as wide as that of the tight pulley and the two belts are shifted simultaneously, as we did in some of the countershafts heretofore described. The first mode of shifting requires some device like that used on the regular planers which, by means of lever connections and a cam, shifts the two belts successively. The second arrangement does not call for any mechanism but permits the rod to pull the belt eyes direct. Fig. 60 shows a safety device between the rod and the belt shifters. If the momentum of the pulleys were not entirely taken up at the moment that the new belt has completely moved onto the tight pulley, then the carriage would go on and pull the belt eyes still further, which might cause trouble. To avoid this, the casting which carries the belt eyes is pulled up against a stop at either end, and if the carriage moves still further it merely pulls the rod which no longer moves the belt shifters, but merely compresses a loaded spring.

The Foreman's Place in Industry

C. E. JENSON

The foreman's place in industry is both peculiar and important, more so now than at any previous decade in industrial history. I say "decade" for two reasons —industrial history as such is so short that we cannot speak of this and that century in its development; and it is only about ten years since the problems, in the solution of which the foreman can so much aid, have assumed their present great importance.

This place in industry is both peculiar and important because industrial organization has somewhat changed, and we can no longer speak so definitely of "the foreman class." We have developed two distinct foremen's classes, or rather in retaining the old-time class we have developed a new one, calling for different attainments and having a different status.

But in either case, and in view of the increasing sharpness of the controversy—combat if you will—between so-called "capital" and so-called "labor," it is the foreman who can best serve the interests of both parties, by acting as interpreter and mediator, always with due regard to his position as member of one or the other of the two foremen's classes. Those classes I shall not define here more definitely than to say that the one holds the old place as in a military organization, in command of a particular squad, while the other has to do in a specified function with every employee in every squad where such function is usual.

The factors making up a foreman's success might be laid down as the possession of those qualities that make almost any leader successful: Knowledge of his own qualifications, of his defects, of the abilities and limitations of those with whom he comes in contact, of the activity in question, and of the ability to impart his knowledge and make himself obeyed.

But some things might be pointed out as the potent factors in a foreman's success. They may be worth cultivating if nature has not been generous in this connection at birth, and if opportunity and environment have failed to make amends for nature's neglect.

On broad general principles, the foreman is assumed to know more, even in petty details, than those under him. But if he cannot show this to the satisfaction of others he will be set down as wrong. Once his fallibility and ignorance are shown to exist and to be backed by his tacit or other declaration of infallibility, his influence for good, his strenuous seeking for progress in the work, his most earnest efforts for the betterment of his operatives' condition, are weakened, if not entirely destroyed.

Centerless Shoulder Grinding

Grinding Valve Stems, Spring Bolts and Other Similar Pieces—Feeding the Machine by Gravity—Some Production and Cost Figures

WESTERN CORRESPONDENCE

GREAT strides have been made in the last few years in the art of grinding shafts and similar work without the necessity of holding the work on centers. The same method is now being applied to "shoulder work."

At *A* in Fig. 1 are shown some of the spring bolts that are being ground on the Reeves roll grinding machine, shown in Fig. 2. The piece is held in the workrest *A*, which is seen more plainly in the drawing, Fig. 3. The workrest is raised and lowered through a cam arrangement, operated by the handle *A*, Fig. 4. The workrest also slides in the groove in which it rests, and can be moved in and out by hand. Thus the operation of placing a piece in position consists of raising the workrest, pulling it out (toward the operator), inserting the piece, sliding the rest back to a stop, and lowering it into position as shown in Fig. 2. The work rotates between the side of the wheel *B* and the face of the wheel *C*.

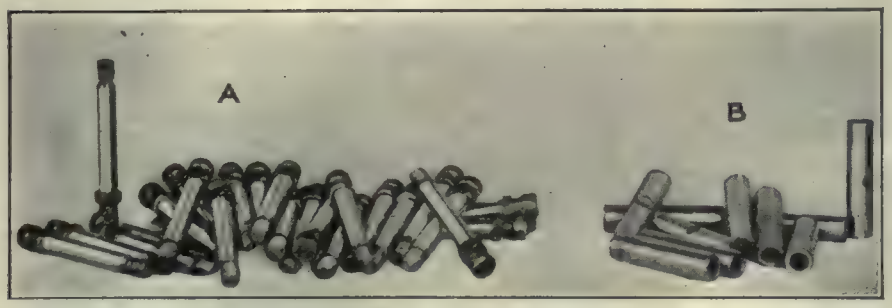


FIG. 1—SPRING BOLTS AND PISTON PINS GROUND IN THE CENTERLESS GRINDING MACHINE

Wheel *B* is a No. 120-W grade alundum wheel which, as grinding machine men know, is very hard. This wheel operates to hold the piece in place and to govern its speed of rotation rather than to grind it, as most of the grinding is done by the wheel *C*. The grade of wheel *C* is therefore governed by the work, a Grade M wheel being used in this instance. Wheel *B* is 18 in. in diameter and rotates at a speed of 18 r.p.m., giving a peripheral speed of approximately 85 ft. per minute. Wheel *C* revolves at a speed of 6,000 ft. per minute.

Another example of shoulder grinding on this type of machine is shown in Fig. 5. An intake valve for a twin Excelsior motorcycle engine can be seen protruding from the workrest of the machine. The workrest is not moved horizontally, as it is necessary only to raise it in order to change the pieces. From 0.010 to 0.015 in. of stock is removed in this operation, reducing the valve stem to a finished diameter of 0.310 in. The production is approximately 150 pieces per hour. The thickness of the workrest is approximately 0.300 in., as it is, of course, necessary that it be thinner than the thinnest piece to be ground, although this same rest is used for holding work of larger diameters.

One method of feeding straight work to a machine of this type is shown in Fig. 4, the material, in this instance, consisting of piston pins. A long trough is erected, as shown, and the pieces are fed to the wheel by their own weight. Due to the large amount of stock that was left on these pieces (approximately 0.020 in.), six cuts were required. They passed through the machine at the rate of 20 per minute for five cuts, then 10 per minute for one cut. If only 0.002 in. of stock had been left on the pins, two cuts only would have been required, according to the operator handling this job.

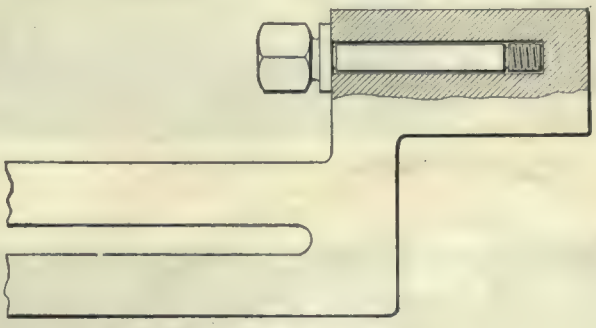


FIG. 3—WORKREST

The operation illustrated in Fig. 6 is that of grinding the rear hub ball retaining cup represented in Fig. 7. These cups are put through the machine four times, removing 0.005 in. of stock each of the first three cuts, and 0.001 in. in the last, or finishing cut. The operator feeds the pieces to the wheel by means of the trough shown in the illustration, after which they are carried on by the action of the wheel and eventually fall into a trough and thence to a box as shown in Fig. 8. These pieces pass through the machine at the rate of 1,600 per hour at each cut, or a total of 400 finished

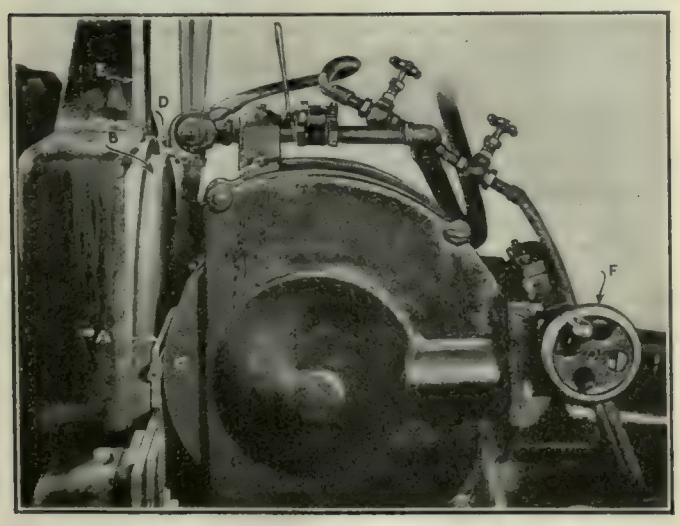


FIG. 2—SPRING BOLT IN POSITION FOR GRINDING



FIG. 4—GRAVITY CONVEYOR FOR PISTON PINS

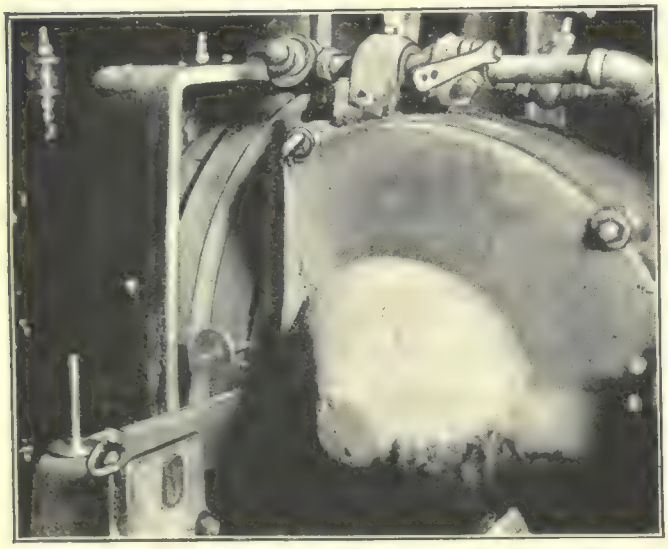


FIG. 5—MACHINE SET FOR GRINDING VALVE STEMS

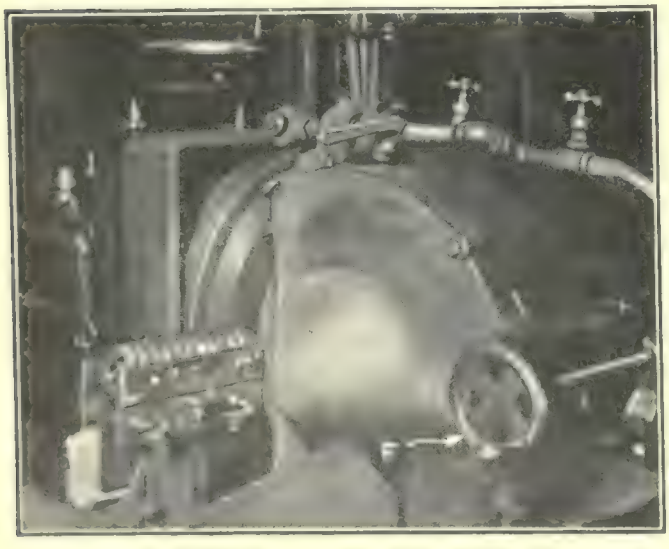


FIG. 6—GRINDING BALL RETAINING CUP

pieces per hour. The cost of this operation is $0.40 per hundred pieces.

The wheel *B*, Fig. 2, is dressed with a diamond that

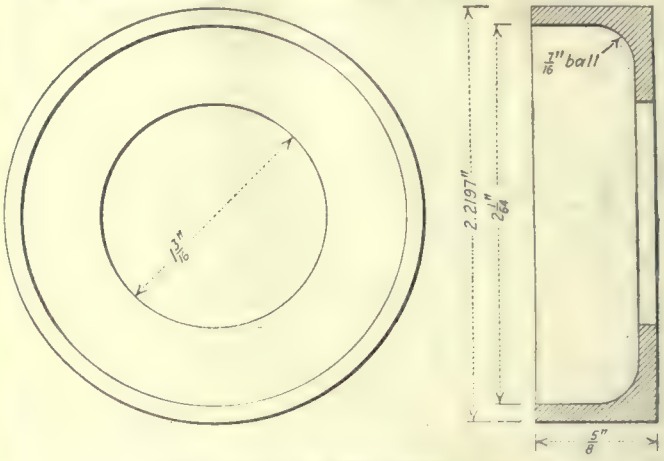


FIG. 7—BALL RETAINING CUP

is clamped into a holder which slides vertically on the gib *E*, and the wheel *C* is dressed by means of a diamond located in the back of the machine, where it is

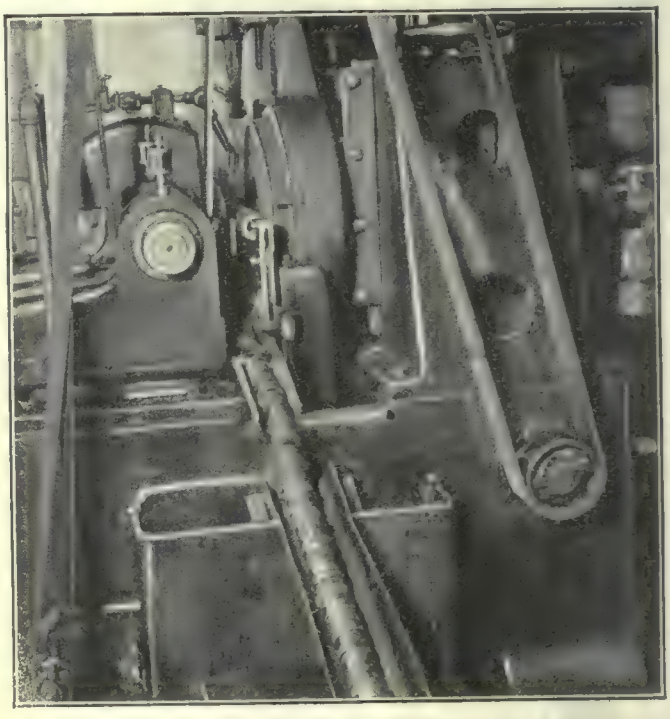


FIG. 8—VIEW OF REAR OF MACHINE AND GRAVITY CONVEYOR

controlled by the operation of the handwheel *F*, Figs. 2 and 6. This handwheel feeds the diamond back and forth across the face of the wheel.

The Desire to Grow

A. L. DEVINNE

The city, the tree, or the manufacturing establishment that has ceased to grow, has already commenced to decay; and the same is true, in a certain sense, of the man. If he has no desire to grow mentally, he will fall behind in growth and usefulness, in comparison with those who have the will to push up and out and take firmer root. Once the foreman thinks that he knows it all, or that it is not worth while to learn more, he commences to be a "has been."

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Production Work in an Engine Lathe

BY IRVING LAKE

The problem was to machine a batch of castings, as shown in Fig. 1, with an engine lathe as the only machine available. The work required boring to two diameters, reaming both bores to size and tapping in the center as can be seen by Fig. 1. Part of the solution at least is due to the use of milling cutters for reamers.

In order to secure uniform results as well as rapid production, a pot chuck was made as in Fig. 2, and also



FIG. 1—THE WORK TO BE DONE

several special tools for handling the work. The chuck *A* was screwed to the spindle nose *B* and a pilot bushing *C* fitted to the taper inside the spindle as a guide for the boring bar *D*. This bar rested in a block *E* and was held in the tool block by screw *F*. The bar had a keyway at *G* to hold the reamers and taps which were used later. The toolbits *O*, *P*, *Q*, and *R* were all so placed as to cut on the upper side of the hole as it was found that they produced a better job in that position than in any other.

The boring bar was properly located by placing it on centers, and then running the cross-slide under it, using a suitable V-block *E* to secure the proper height. The pilot bushing *C* was then put into the spindle, and

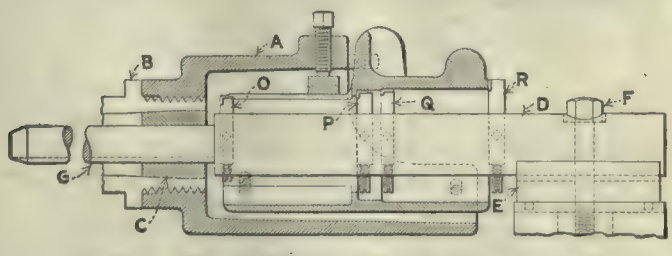


FIG. 2—THE CHUCK AND THE BORING BAR

the bar tried for accuracy between the tailstock center and the pilot bushing. The cross-slide gibs were set up tight and to avoid any chance of disturbing the setting of the bar, the cross-slide feed handle was removed.

Reaming the large end of the bore was an easy matter. The trouble came in reaming the small end with the two gaps, as these openings were approximately one half the diameter of the bore. Any mechanic will ap-



FIG. 3—REAMERS AND TAP

preciate just about how the ordinary reamer would behave. So in order to ream this open hole I secured the spiral slabbing cutter *A*, Fig. 3, and ground it to ream the desired size of hole. Then a key, fitted to match the keyway in the boring bar pilot, was set in the reamer and the reamer slipped on the pilot. A trial showed a round and accurate hole. The reamer for the big end of the bar was made out of a larger cutter shown at *B* in Fig. 3.

The tap *C* in Fig. 3 carries twelve chasers set as at *A* in Fig. 4. When entering the tap upon the pilot as at *B*, the chasers remain compressed by the springs *C*. By

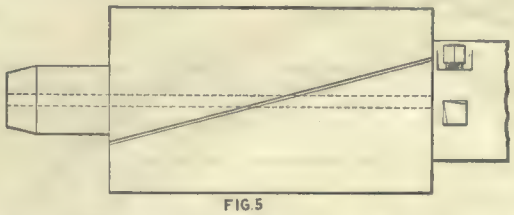


FIG. 5

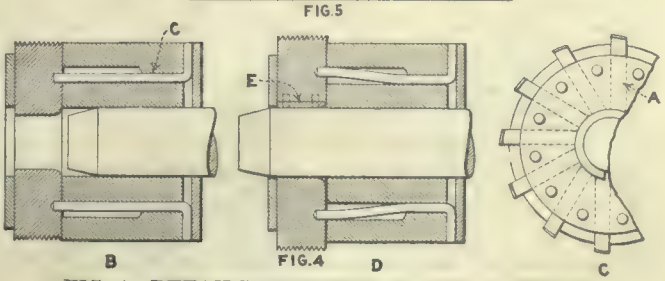


FIG. 4—DETAILS OF THE TAP. FIG. 5—SPIRAL REAMER IN PLACE

pushing the tap all the way back on the pilot the chasers are forced out by the taper end of the pilot and are then backed up by the pilot as at *D*. The chasers have shoes *E* pinned to their inner ends. These shoes can be re-

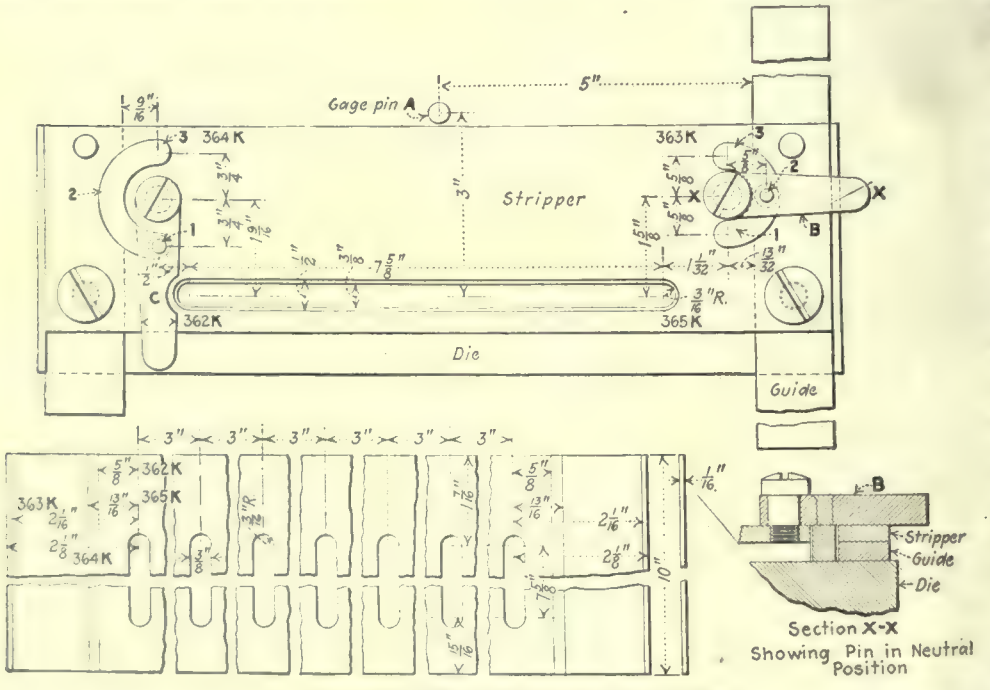
moved and shimmed to get any variation necessary in the size of the tap. While the tap would have worked perhaps as well with eight chasers, we wanted as many chasers as possible, as this tool was to be used to tap to a shoulder. This depended on the operator stopping the machine when the tap reached the shoulder and the greater the number of chasers would tend to prevent stripping the thread.

In operation the casting was placed in the pot chuck and the boring bar fed through the bore. When the boring operation was finished the feed was thrown out and the bar withdrawn from the work far enough to allow the spiral reamer *A*, Fig. 3, to be slipped on to the pilot as in Fig. 5. The bar with the reamer mounted on its pilot was now pushed through the bore and the bar was again withdrawn for enough to change reamers. After the second reamer was removed, the tap was slipped on the pilot and fed into the work until it came in contact with the shoulder at the end of the hole. The machine was then stopped and the bar and tap withdrawn. As the bar was withdrawn, the tap automatically collapsed as soon as the straight part of the pilot was disengaged from the inner ends of the chasers. Further withdrawing motion brought the tap out with the bar.

Variable Stops for a Slotting Die

By D. E. Smith

We had an order for a number of slotted plates of sheet iron, like that shown in the drawing, in which the distance from the edge to the center of the first slot varied. There were four kinds of the plates and the distances specified were $\frac{5}{8}$, $1\frac{3}{8}$, $2\frac{1}{16}$ and $2\frac{1}{8}$ in. The distance between centers of the succeeding slots was 3 in. and was the same in all lots.



SLOTTING DIE WITH VARIABLE STOPS

A gage pin *A* in the die determined the latter measurement, but the method of locating the first slot at the required distance from the edge was a problem that required some study.

The various lots of stock were designated at 362-K, 363-K, 364-K and 365-K, respectively, and these numbers appear on the stripper as an index to the position of the auxiliary stop levers marked *B* and *C* on the drawing.

The levers are fulcrumed on the stripper and are each provided with a pin at a suitable distance from the centers upon which they swing. These pins extend downward through the semicircular slots in the stripper so that they are in the path of the advancing stock. Figs. 1, 2, and 3 indicate the various positions of the levers. When both are at position 2 they are in "neutral" and the stock may pass freely through the die. With either lever at either extreme position, its respective pin forms a gage to position the stock with respect to the distance from the center of the first slot.

After the first slot is punched, the lever is placed at position 2, and thereafter the stop pin *A* gages the work on its passage through the tools.

Catching the Thread by the "Jumping" Method

By B. A. Donley

It oftentimes happens in machine shops, especially railroad machine shops, that a man will have occasion to do threading upon a lathe that has neither backing belt nor dial. I have seen the following described method applied in many cases and, under the manipulation of an expert, it serves its purpose admirably. It is called "jumping the thread."

Assuming a lathe with a "four" ($\frac{1}{4}$-in. lead) leadscrew, a piece of work on centers to be cut with a thread that is not a multiple of the leadscrew, and the tool set for cutting. The lathe is started, the first chip run up to the desired length, and the tool is withdrawn. Without stopping the lathe, the locknut is opened and the carriage run back to the starting point.

Now, bringing the cross-slide up so that the point of the tool will just clear the outside diameter of the work, the locknut is dropped in and the position of the tool point relative to the partly cut thread is noted. Four positions are possible; to right of thread, to left of thread, on top of thread, and correct. To the skilled workman the position will be apparent at a glance.

With the right hand on the lever of the locknut and the left hand on the traversing wheel of the carriage, the lever is lifted just enough to allow the nut to clear the threads of the leadscrew and the carriage moved back one, two, or three threads as indicated; the number so "jumped" being clearly perceptible by the feeling. Noting that the tool is now in the correct position the operator instantly "jumps" the carriage back four more threads, locks in the nut, feeds the tool forward to the

stop, and proceeds to cut the second chip in the same manner as the first.

This method of procedure is followed until the thread is finished, the lathe not being stopped at any time, and the movements may be made accurately, even at high speeds, after the operator has become accustomed to them. In any event it is far quicker than stopping the lathe and scaling for position, which is the only other method possible under the conditions. It is hardly necessary to state, however, that in learning the knack the beginner should run his lathe very slowly.

When skill has been acquired, lathes with other leads than four—say three or five—may be handled as readily as the four. There are, of course, a corresponding number of false positions and the final jump must be made to cover the corresponding number of threads of the leadscrew, but the worker soon becomes adept and rarely makes a mistake.

The only objection that might be raised to this method is that it is likely to induce rapid wear of locknut and leadscrew. To offset this the writer knows personally of lathes that have been in daily service under these conditions for twelve or fourteen years and are still doing duty without repairs to these parts.

[The Editor has done this little trick many times, but always on threads of comparatively coarse pitch. He would hesitate to tackle the job of cutting a 32 or 36 pitch thread on a lathe with a five pitch leadscrew.]

Cutting Diamond Screws

By Joseph Hewes

A part of the product of our shop consisted of screws having square right- and left-hand threads cut over one another on the same part of the body.

As will readily be understood, the resulting threads were crossed, leaving a series of diamond-shaped projections on which either a right- or left-hand nut could be screwed. The usual method for producing such screws was to cut a complete thread of one hand

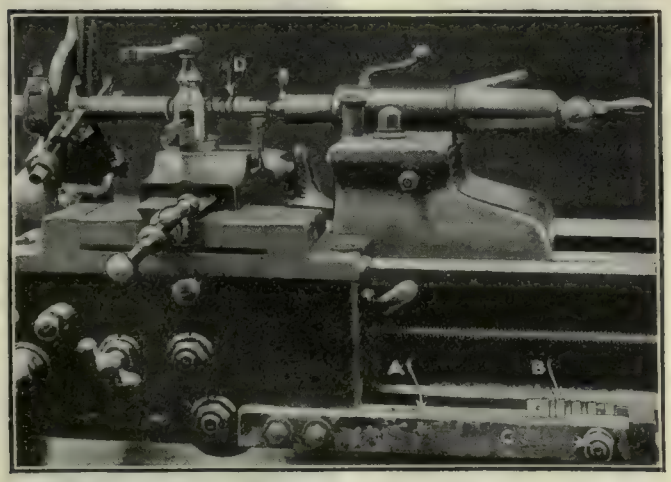


FIG. 1—LATHE RIGGED FOR CUTTING DIAMOND SCREWS (FRONT VIEW)

and then cut one of the opposite hand across it. To do this required two operations with the consequent loss of time in back travel of the carriage.

As there were many of these screws to make, we rigged up a lathe for the work, as shown in the illustrations herewith. The extension bar *A* was bolted on

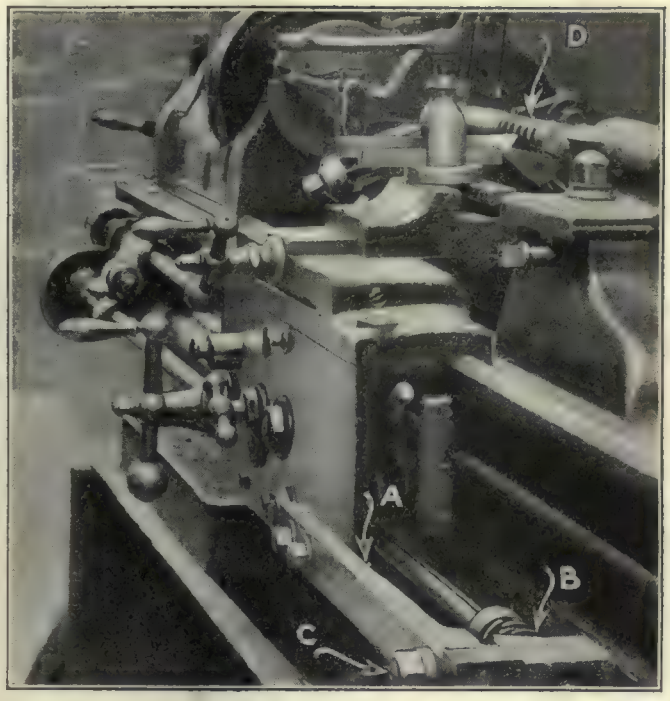


FIG. 2—LATHE RIGGED FOR CUTTING DIAMOND SCREWS (OBLIQUE VIEW)

the apron and carried at its outer end a bearing which was a running fit for a master diamond screw *B* fastened on the feed rod. A segment fitting between the threads and provided with a shank was pivotally attached to the bar at *C*. With the lathe running and all feeds disengaged, the carriage was moved back and forth by the master screw, the segment acting as a nut and entering the thread of opposite direction when its angle was changed by running against collars provided at each end of the screw.

With this arrangement it was only necessary to feed the tool in at the completion of each cycle of motion until the proper depth was reached, no withdrawal of the tool from work between cuts or reversal of the lathe being required.

The diamond screw being cut is shown at *D*. The same reference letters refer to like parts in both illustrations.

Who Remembers This Bicycle?

By George Wilson

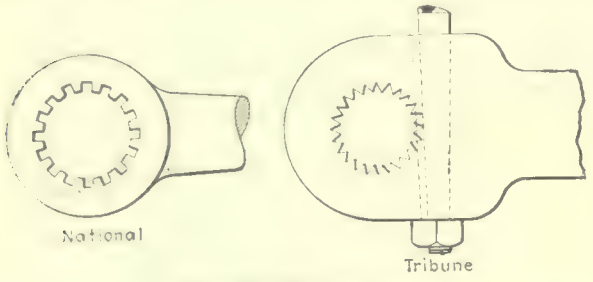
The article under the above title, by I. B. Rich on page 381 of *American Machinist*, brings to mind many incidents of the old bicycle days, for I guess I was a pretty ardent fan.

On the earlier wheels the cranks were attached by means of a taper pin slabbed off on one side to bind upon a flat milled on the sprocket shaft. The pin was driven home and held by a nut on its end. These pins were sources of trouble in that they would work loose, in which case it was impossible to keep them tight thereafter, as the corners would round off the flat on the shaft. Hardened shafts were not thought of in those days.

To obviate the loose crank all sorts of fastenings were devised until the one-piece crank and shaft, gotten out by Fauber, became generally used on most machines. However, the one-piece crank had the disadvantage that in order to assemble it in the bearings

the latter had to be too close together for good mechanical efficiency, that is, the sprocket and consequently the chain pull was too far out from the bearing.

Some designs had the crank and part of the shaft in one piece and joined in the hanger by means of a sleeve. A tongue and groove on the shaft ends locked



SPLINED BICYCLE CRANKS

the halves of the shaft together. This was the construction of the Columbia, Waltham and several other makes.

A construction similar to that shown by Mr. Rich was used on the Tribune, a fine machine built by the Black Manufacturing Company. In this construction the shaft was splined, or toothed, and the taper pin retained as shown in the sketch. However, a few makers stuck to the flattened taper pin to the end, until the Fauber one-piece hanger came into general use.

To show to what extremes the makers would go to provide an original and efficient crank fastening I will mention that used by the Overman Wheel Co. on the Victor bicycle. In this construction the shaft was hollow for the sake of lightness. The ends of the shaft were necessarily closed by the bosses that received the cranks. These bosses were bored tapering at right-angles to the shaft, and the tapered ends of the cranks fitted into the holes. To prevent the cranks from turning in the bosses under the pressure of the pedal, keys were placed in both crank and boss.

While writing this it has just come to mind that a splined shaft method of crank fastening, in which the splines were square as in present auto practice, was used in the National bicycle. I think some sort of nut was also used to hold the crank on, but am not sure. I would like to have one of the old boys clear this up.

An Easy Method of Lettering

BY LOUIS A. SCHLOSSTEIN

The usual practice for placing notes or titles on detail drawings is to measure off the desired height of the letters and then lightly draw guide lines which will govern the size of the lettering. However, a shorter method of free-hand lettering has been used by the writer for a number of years and has proved a great time saver, at the same time producing a neat job.

A thin triangle may be placed on the sheet in position where the lettering is to be done and its edge may be used as a stop for all downward strokes of the pencil and for ruling the horizontal portion of the lower edge of the letters. This will be found to be a rapid way of doing neat lettering along straight lines without ruling the lower line. With practice, the letters can be made of a uniform height without drawing the usual top line on the tracing, while the straight edge of the triangle takes care of the lower line.

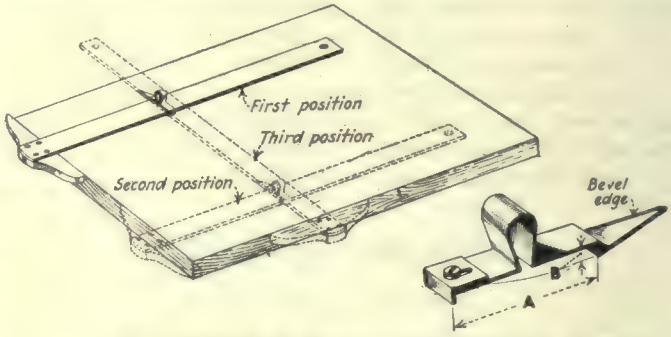
A little care will be necessary in making the letters the lower edges of which are curves such as: C, O, U, etc., as the curve must be started before the pencil strikes the straight edge. Capital letters as well as small letters may be made in this manner. When once a draftsman has "his hand in," he will always use this method.

A Drafting Room Kink

BY EDWARD HELLER

The little device shown in the accompanying drawing is very useful, particularly when large triangles are not available for drawing vertical lines that are required to be accurate. It is made of about ¾ x ⅛ in. cold-rolled steel. The dimensions are made to suit the width and thickness of the T-square blade. One end is made adjustable so that it can be used on T-squares with blades of any width.

In use the device is snapped on the blade at the required location as shown in "first position," and a short line drawn against the beveled edge. The



SUBSTITUTE FOR LARGE TRIANGLES

T-square is then moved to "second position" down the board and another line drawn in similar manner. The T-square is then used as a straightedge and a connecting line drawn through the two points thus obtained.

Fixture for Holding Goose-Necks

BY J. ROBERT PHELPS

The accompanying illustration shows a simple and inexpensive fixture used in the Atchison, Topeka & Santa Fe shops, San Bernardino, Cal., for holding tank goose-necks while machining the faces and valve seats.

The under side of the flange of the goose-neck rests on a shoulder in the interior of the fixture located just below the holding screws.



FIXTURE FOR HOLDING GOOSE-NECKS

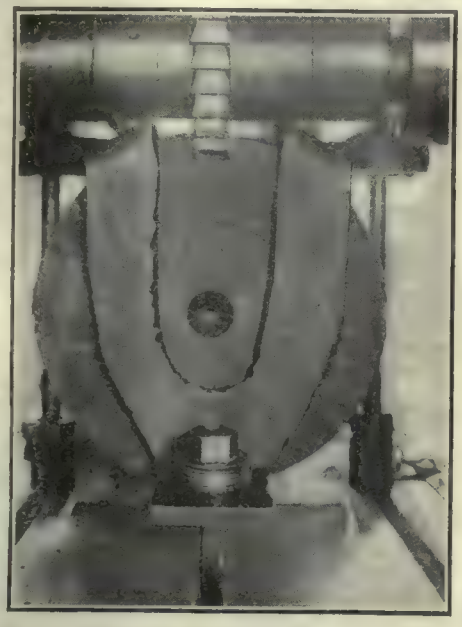
The fixture can be mounted on either a lathe or a boring mill where it should be chucked so as to run true before the goose-neck is inserted.

For drilling the necessary bolt holes in the flange of the goose-neck the fixture can be readily transferred from the lathe or from the boring mill to the table of the drilling machine.

Clamp for Holding Work in Keyseating

By J. Robert Phelps

The clamp shown in the accompanying illustration is in use in the shops of the Atchison, Topeka & Santa Fe Railway at San Bernardino, Cal., for keysetting locomotive axles. As will be seen from the illustration, the clamp proper is in one piece and can be quickly applied to the work without the blocking that would be required if two ordinary U-clamps were used. The cup pointed setscrews at the top hold the work firmly and serve in equalizing the clamping pressure. Neither the clamp nor its screws offer any interference to the cutter or arbor. The clamp can be made in a very short time by cutting from a sheet of heavy boiler plate by means of a gas or electric torch.



CLAMP FOR HOLDING WORK IN KEYSEATING

Enlarging Gas Engine Pistons—Discussion

By C. H. Skinner

I have read the article on the subject of enlarging gas engine pistons, by David Tyke on page 287 of American Machinist, as well as the letter of Ivan Beach appearing on page 638. In response to the editor's note, subjoined to the latter and requesting additional information from your readers, let me say that I have been enlarging pistons by heating for several years and find it successful if handled properly.

A charcoal fire is used and the piston is heated to a bright red. It is then covered with sawdust and allowed to stand until cool. The pistons will expand from 0.012 to 0.025 in., according to the size and thickness of pistons. It is advisable to leave the old piston pin in place during the process as it serves to prevent any warping of the piston.

Pistons expanded by heat and re-ground have been found as satisfactory as new pistons, wearing very little in use. In all regrinding jobs, 0.0005 in. per inch of diameter of cylinder is allowed for clearance which has been found to produce a very good job.

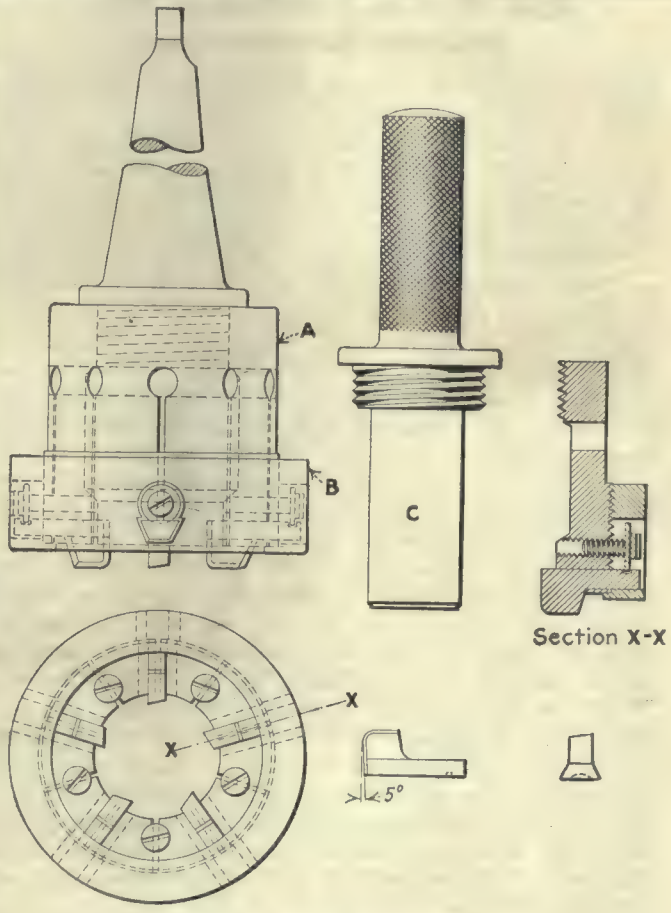
Inserted Tooth Hollow Mill

By Arnold J. Fleming

At a day's notice our shop was called upon to produce malleable castings to definite limits that hitherto had been good enough as they came from the foundry. Therefore, the castings had to be hollow milled.

We first made some mills from solid high-speed steel bar. These were too expensive. We also tried to purchase some but could not find any that we thought would do, so I designed this one.

The sketch shows the construction very plainly. The shell *A* is slotted in five places and the outer end of each slot was made to receive a correspondingly shaped cutter. Tapered head screws tapped into the end of the shell before the slots were cut serve to lock the cutters



INSERTED TOOTH HOLLOW MILL

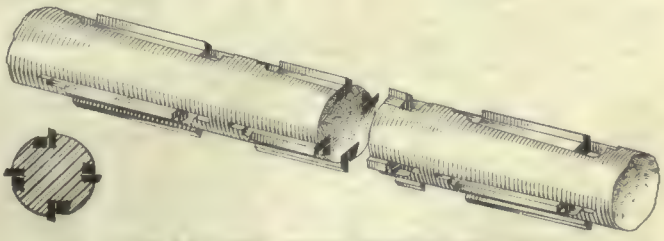
in position by expanding the shell inside the retaining ring *B*. The plug *C* screws into the shell for the purpose of setting the cutters.

Line Reamer with Wedged Blades

By L. E. Schaeffer

A line reamer with blades held in place by means of taper wedges instead of screws is shown in the accompanying cut.

The bottoms of the blades are inclined to a 5-deg.



LINE REAMER WITH WEDGED BLADES

angle which provides for the expansion of the reamer when necessary to regrind it. The wedges are tapered to 3 deg. in one plane and 15 deg. in the other, enabling them to hold the blades securely in place.

Editorial

How Machine Tool Design Will Probably Be Influenced

WHAT WILL be the next thing to exert a paramount influence on the design of machine tools? Will it be a new industry, standardization, competition, or a new tool steel? Old copies of magazines will show that we have come a long way from the frail machine that was once the best that could be bought.

As competition became keener more and more weight and power were given to machine tools so that they might do more work and reduce production costs.

The advent of Mushet and Taylor-White steels in turn showed that further strengthening of machines was necessary in order to work up to the capacity of the cutting tool. Multi-cutting and continuous cutting followed quickly and naturally—competition again.

The war, with its insatiable demands influenced further development of the single purpose machine and has undoubtedly left other influences on design.

What next? Machines are being built stronger and heavier than ever today. Single pulley and direct motor drives, wide belts, strong clutches and rigid holding devices are being designed and used, and now the capacity of the machine is greater than that of the tool steel.

Will not the next step be the improvement of the cutting tool? Experiments in alloying have been carried on for some time and have already produced alloys that are pointing the way toward greater production. There are, no doubt, other alloys that will be announced before long. We should not need to stretch our imagination to picture a continuance of the cycle—stronger tool, stronger machine.

Are You in a Rut?

WHEN you are up against a problem as to the best way to handle a production job; the sequence of operations and the design of the tools and fixtures, do you ever stop to wonder how the other fellow would do it?

When you are up against it to get more production out of the shop, do you ever go into some other fellow's shop where the same class of work is being done, and see how he is doing it?

You are bound to get into a rut at times and can only visualize one way of doing things—your own way; but is your own way the best way?

Did it ever strike you that you can sometimes learn more in a few hours trip through the other fellow's shop, seeing how he does things, than in working over your problems alone for a week?

Did it ever strike you that time spent in going through other shops with your eyes open for methods of doing work will amply repay you?

Did it ever strike you that intercourse with other shop executives is bound to result in your getting some helpful ideas as to how to do things better or cheaper?

If you are in a rut, get out of it. Don't be a stay-at-home forever. Get out into other shops and see what they are doing and how they are doing it.

Commercial Aircraft Cannot Be Developed in Arsenals or Navy Yards

THE Senate recently requested both the Secretary of War and the Secretary of the Navy to report on the feasibility of each arm of the service setting aside an arsenal or a navy yard for the manufacture of aircraft. The request grew out of the belief that aircraft are essential to national defense and that the aircraft industry cannot be developed through competition. The reply of both Secretaries was that the proposed plan was not feasible.

Nobody will dispute the statement that aircraft are essential as an arm of defense. But the idea that an aircraft industry cannot be developed except by governmental work through the Army and Navy is open to serious question. There is no doubt that many of the alleged benefits of competition have been over-rated, but an abandonment of the idea is hardly to be considered at this time. There is no question as to the possibility of building aircraft in both navy yards and arsenals. The splendid work of Capt. Coburn at League Island during the war is sufficient evidence. The difficulty is, that under the ordinary routine work of either Army or Navy, such men rarely find their way into the executive chair. In too many cases the man in charge happens to be on the list for such a position, due to seniority or other rulings, none of which depend on his fitness for the job. And unfortunately too many of the officers who really did things during the war have resigned from the service.

Government arsenals can undoubtedly build aircraft and the time may come when it is the proper thing to do. But our past experience with Army and Navy red tape, with the principal object of many being to play safe by never doing anything which has not been done before, does not encourage us to expect much from government aircraft building at present. Before it can be a success we all need a change of heart regarding our duty to the Government and its duty to us.

A few energetic and far-sighted men are putting commercial aviation across even though it be a slow and expensive process. At the present time probably the Aeromarine Airways Corporation stands out as actually doing a commercial business in various parts of the country.

More landing fields, the free use of all governmental fields by commercial fliers, rational federal control of flying and a greater development of the air mail service will do more for real aviation than the proposed building of aircraft by arsenals and navy yards.

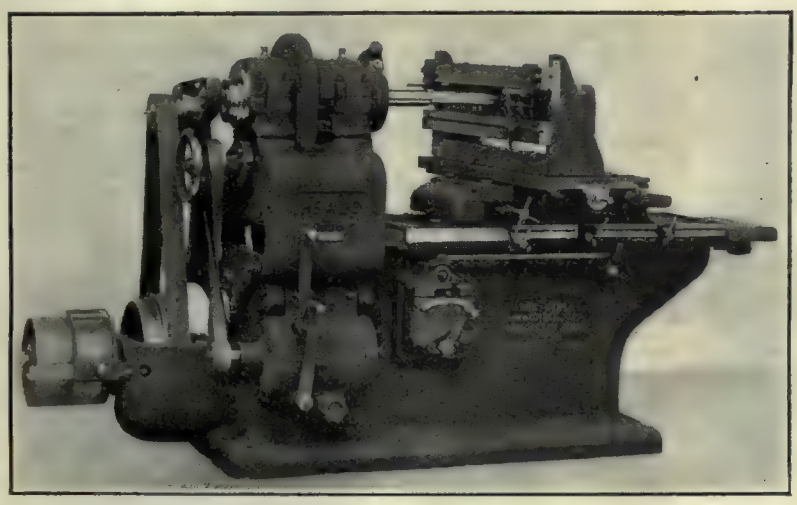
We are not keen on subsidies of any kind, but better far to grant a subsidy for commercial aviation than to drive out the few airplane builders who are actually working for the development of aviation. There are doubtless many more uses for arsenals and navy yards than those in vogue at present, but the development of a new industry cannot be expected from plants which have so many years been organized on a "stand pat" basis. We are strong for aviation and do not want to see it handicapped in the manner proposed.

Shop Equipment News

Heald No. 50 Cylinder Grinding Machine

A cylinder grinding machine designated as style No. 50 has been added by the Heald Machine Co., of Worcester, Mass., to its regular line. This machine, though built along lines similar to the previous model, is more massive in construction and embodies some ingenious features. It may be furnished for either belt or motor drive.

The drive shaft of the machine is mounted on ball bearings at the rear of the base in such manner that it may be removed entirely without disturbing other parts.



HEALD NO. 50 CYLINDER GRINDING MACHINE

In the belt-driven type of machine the power is delivered to this shaft directly from the main line without the intervention of countershafts. The tight and loose pulleys are 12 in. in diameter by 5 in. face, and run at a speed of 750 r.p.m. The loose pulley is also carried on ball bearings. The drive to the eccentric grinding shaft is by belt over a spring-suspended idler, as in the former machines.

The work table has been made somewhat wider than formerly, and automotive cylinder blocks of the largest size may be mounted without undue overhang. A vertical adjustment of $\frac{1}{16}$ in. to compensate for possible mis-alignment of the bores in a block of cylinders is provided by means of a pair of inclined planes, or sliding wedges, between the main table and the cross-slide or work table. This adjustment is easily and quickly made by turning a small capstan-head screw, and does not affect the point of reversal of the work with relation to the position of the grinding wheel.

A noteworthy feature of the machine is the absence of gear boxes. Power for reciprocating the table is transmitted through an hydraulically operated mechanism that is susceptible to minute variations of speed from zero movement to a maximum speed of traverse of 15 ft. per minute. This adjustment of speed from minimum to maximum is made by one movement of a throttle lever, the position of which in its quadrant determines and indicates the speed. The table movement is entirely free from vibration and shock at the point of reversal, even at the highest rate of table travel.

The rotative movement of the eccentric grinding head is derived from a belt running over a pair of three-step cones within the base of the machine. This belt is shifted by means of a lever on the front of the machine, and the shifting is stated to involve even less trouble than the movement of a gear-shift lever. Compensating adjustment for belt stretch is provided to maintain the belt under even tension.

The cross-slide, directly upon which the work is mounted, has a movement of 28 in. in a direction at right angles to the table traverse and is provided with a large micrometer dial on the cross screw, by which fine adjustment of center distance is easily secured.

The wheel spindle regularly furnished for regrinding automotive cylinders will grind holes $2\frac{3}{8}$ to 3 in. in diameter, in lengths up to 11 in., and also holes larger than 3 in. in diameter in lengths up to 18 in. For manufacturing work, the standard 15-in. spindle arm is regularly furnished for grinding from 3 in. in diameter and larger, and lengths up to 15 in. Other spindles for grinding smaller holes may be furnished. The belt pulleys are easily removable and interchangeable to secure proper grinding speeds. No adjustment of the belt tension is necessary, as that is taken care of by the spring idler.

The finished surface of the cross-slide is $43\frac{3}{4}$ x $16\frac{3}{4}$ in., and there are two T-slots extending the full length. The floor space occupied by the machine is 73 x 123 in., and the weight is approximately 5,000 pounds.

Buffalo Universal Slitting Shear and Bar-Cutter

The Buffalo Forge Co. of Buffalo, N. Y., has just placed on the market a universal slitting shear and bar-cutter, the driving side of which is illustrated. The machine is intended particularly for use where a punch is not needed, for example in iron shops, warehouses and similar locations.

The shear is equipped with 10-in. knives, which can cut plates $\frac{1}{2}$ in. thick of any length and width, or 6 x $\frac{5}{8}$-in. flats. The knives may be operated at the rate of thirty strokes per minute. The bar-cutter has standard five-piece knives which can cut structural shapes up to the following sizes: 4 x 4 x $\frac{3}{8}$-in. angles, 3 x 3 x $\frac{1}{4}$-in. angles at 45-deg. miter either left- or right-hand, 3 x 3 x $\frac{3}{8}$-in. tees, round bars up to $1\frac{5}{8}$ in. in diameter, and bars up to $1\frac{1}{2}$ in. square. With special knives that can be furnished the bar cutter will take 5-in. 9.76-lb. beams and 5-in., 9-lb. channels, or any other rolled section having the same weight and area of cross-section. One set of blades shears both channels and beams of the same size, and a different pair of blades is required for each size.

The machine has the Buffalo "armor-plate" frame, which is claimed to be unbreakable in service. The bearings are bronze-lined and the drive shaft bearings are oiled by means of rings. The gear and pinion are



BUFFALO SLITTING SHEAR AND BAR-CUTTER

cut from semi-steel blanks. Since the base of the machine is cast iron, a large concrete foundation is unnecessary.

Approximately 3 hp. is required to operate the machine at full capacity. The length of the entire machine is only 5 ft. 4 in., the width 2 ft. 8 in., and the height 6 ft. 4 in. The total weight is 4,500 pounds.

Hocking "Mirr-O-Ream" Expansion Reamer

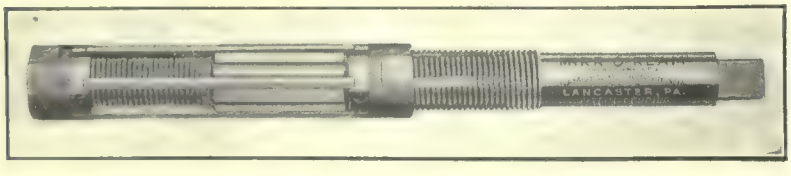
The inserted-blade expansion reamer shown in the accompanying illustration has recently been brought out by Samuel Hocking & Son, Lancaster, Pa. The adjustment in size is made by moving the blades along the slots, the depth of which decreases from the front end to the shank end of the tool. The shanks are made of alloy steel, and the blades of semi-high-speed tool steel.

The blades are ground with a double relief. The top of each blade is ground with a narrow land back of the cutting edge to give the proper relief. Near the back edge the blade is ground at a greater angle, in order to increase the relief and prevent dragging on the bore being finished. The method of grinding is stated to give a free cutting and durable edge.

The blades are held in place at each end by parts known as steady-rings made of nickel steel. On one side of each ring there are slots to receive the ends of the blades. The rings thus support the blades and prevent injury and breaking, particularly when the reamer is adjusted to its maximum size. The adjusting nuts operate against the smooth back surfaces of the rings, so that adjustment is easy and injury to the nuts or blades is not apt to occur.

When adjusting the size of the reamer, the shank is held in a vise, and a micrometer used to determine the size over the cutting edges. The tool is ordinarily adjusted so as to take very light cuts in the hole. In this way, more accurate work and greater smoothness of finish can be obtained.

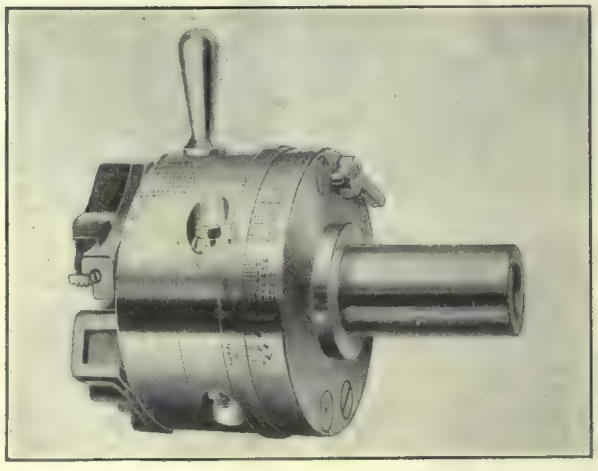
The tool is made in seventeen sizes, and can be furnished in sets. The smallest size can be adjusted in diameter from $\frac{15}{32}$ to $\frac{17}{32}$ in., has blades $1\frac{3}{4}$ in. long, and is $5\frac{1}{2}$ in. long overall. The largest size can be adjusted from $3\frac{1}{2}$ to $4\frac{1}{16}$ in. in diameter, has a blade length of $7\frac{3}{4}$ in. and a length overall of 24 inches.



HOCKING "MIRR-O-REAM" EXPANSION REAMER

Landis Automatic Die Head

The Landis Machine Co., Waynesboro, Pa., has recently placed on the market the automatic screw-cutting die head illustrated herewith, for application to turret lathes and hand screw machines. The principal feature is that the chasers are supported on the face of the head, which permits of easy access to the chasers when it is necessary to remove them for grinding and changing from one size to another.



LANDIS AUTOMATIC DIE HEAD

The head is made entirely of steel and constructed to give long life. It is applicable to practically all makes of screw machines and turret lathes on which the diameter of the head can be accommodated.. The head employs the regular Landis flat chasers. The style and size of the shank can be furnished to suit the requirements.

The head is opened automatically by retarding the forward motion of the carriage, and is closed by hand. It is locked by the engagement of two hardened cylindrical lock pins in hardened bushings. The correct sizes for the roughing and finishing cuts are obtained on the $1\frac{1}{4}$-, 2- and 3-in. heads by the movement of the lock-pin lever. When cutting threads in one pass, both lock pins are engaged. When cutting threads in two passes, both lock pins are engaged during the first cut, but for the second cut only one lock pin is engaged. The cutters are adjusted to

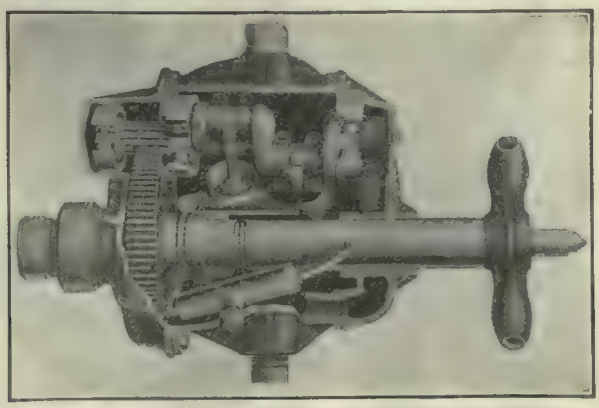
give the proper diameter of work by means of an adjusting screw, which engages the body of the head inside the rings. Since the operating, adjusting and closing rings remain in a fixed position when the head is closed, rotating the body within these rings gives all diameters that can be threaded within the range of the head. Each head is graduated for all sizes within its range of bolts, both right- and left-hand, and of right-hand pipe threads. To adjust the 1¼-, 2- and 3-in. heads for left-hand threading, reverse the position of the lock-pin lever in relation to its position for right-hand threading.

The chaser holders and trunnions on the ⅝- and ⅞-in. automatic heads are integral. The one set of chaser holders furnished with each head is suitable for threading all bolts and pipe within its range. When pitches and diameters other than U. S., "V," S. I., Whitworth and Briggs standards are to be threaded, special chaser holders with trunnions integral will be supplied. The chaser holder and trunnion may be easily removed from the die head by merely removing the shank and loosening one screw. These smaller heads are not equipped with roughing and finishing attachments.

The chaser holders and trunnions furnished with the 1¼-, 2- and 3-in. automatic die heads, such as illustrated, are separate. The heads are ordinarily furnished with right-hand bolt-chaser holders for cutting U. S. standard diameters and pitches. For threading pipe or cutting S. A. E. diameters and pitches, or diameters and pitches other than U. S., "V," S. I., Whitworth and Briggs standards, the proper chaser holders can be supplied. These larger heads are equipped with roughing and finishing attachments.

Developments in Chicago Pneumatic Drill

In order to obviate the necessity for frequent oiling of its pneumatically operated hand-portable drills, the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has recently developed an oil vent that can be attached in the interior of the drill. The oil vent is applicable to most sizes and types of the "Little Giant" pneumatic drills. Its purpose is to prevent leakage of the oil so that the frequency of oiling can be lessened, thus saving both time and labor.



CHICAGO PNEUMATIC DRILL WITH OIL VENT

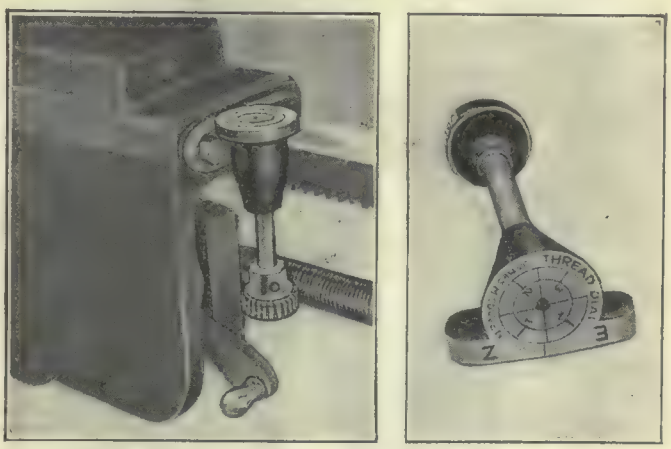
The oil vent can be seen in place in the cut-away section of the drill shown in the accompanying illustration. It consists of a sliding plunger having a cone at each end. Since this plunger is free to travel and close the passage of the oil from the drill, it prevents leakage no matter in what position the tool is operating.

The piston and connecting rod units, or toggles, are now made interchangeable in the drill. The connecting rod is fitted to the piston by means of a ball-and-socket joint. Two of them are secured in place on each crankpin by means of hinged split collars. The advantage of the arrangement is that it provides a large opening by which the lubricant can reach the crankpin bearings.

It is possible to assemble and disassemble any of the connecting-rod units without dismantling the entire drill. The mechanism is 30 per cent lighter in weight than that previously employed.

"E-Z" Threading Dial

A dial for attachment to lathes doing threading work has recently been placed on the market by James M. Colven, 20 Wolffe St., Yonkers, N. Y. The device, designated as the "E-Z" threading dial, is shown in the accompanying illustration both attached to and separate from a lathe carriage. The method of attaching the dial is very simple, as it is necessary to use only two screws in securing it to the carriage.



"E-Z" THREADING DIAL

The device consists of a cast-iron bracket carrying a brass sleeve, a brass dial, steel shaft and a brass worm gear. The worm gear is suited to the pitch and thread form of the lead screw on which it runs, and it is ordinarily covered by a small guard.

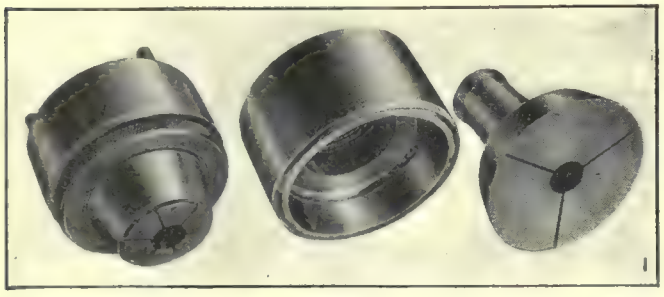
Since 4 in. travel of the carriage represents one revolution of the dial, it is easily possible to engage the half nut on the lead screw at the proper point, so that consecutive cuts can be taken in the same thread. When cutting an even number of threads per inch, the nut can be engaged when any one of the eight marks on the dial are opposite the index mark on the bracket. When cutting an odd number of threads, the nut can be engaged when any one of the four numbered lines are opposite the index mark. The dial can be used when cutting threads having a fractional number of turns per inch, as for 11½ threads the nut can be engaged at every one-half revolution of the dial.

The use of the device eliminates the necessity of stopping and reversing the lathe at the completion of each cut through the thread, and the lathe may be run continuously until the thread is finished. At the end of each cut the half nut is disengaged, the carriage is returned by hand, and then the nut is engaged when the dial indicates that the tool is in the proper position for the thread. The time of the operator can thus be

applied to cutting the thread, without the necessity of waiting while the tool is being run back through the thread. The dial aids in working close to a shoulder or boring to depth. When a lathe is equipped with the dial, it is not necessary to have a reversing belt.

Hartford Combined Collet and Step Chuck

The Hartford Special Machinery Co., Hartford, Conn., has just placed on the market a combination step and collet chuck intended for use on lathes and similar machines that are not provided with a through hole in the spindle, and also for use where a drawbar with the handwheel at the rear end of the spindle is undesirable. The chuck possesses the advantage of



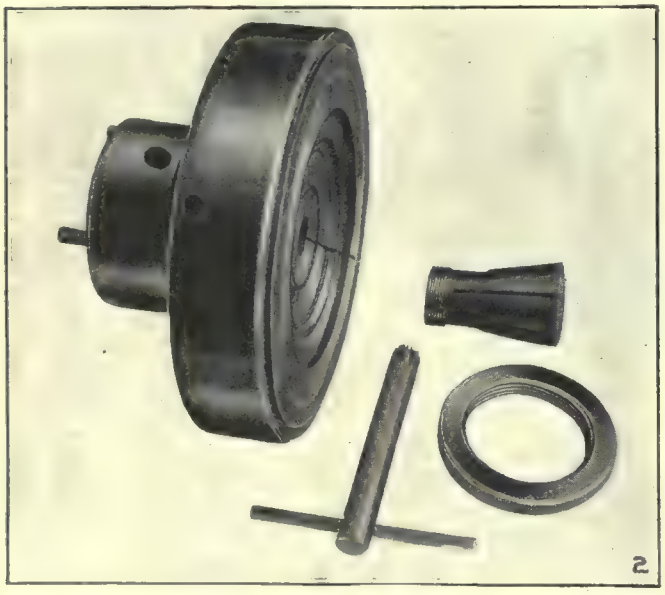


FIG. 1—HARTFORD COLLET CHUCK ASSEMBLED, AND SMALL CLOSING RING AND STEP COLLET. FIG. 2—CHUCK ASSEMBLED WITH LARGE SIZE CLOSING RING

admitting relatively larger sizes than usual, for the reason that the stock does not have to pass through a drawbar.

In Fig. 1 is shown the collet chuck complete at the left, while the other two parts shown in the same figure are the closing ring and step collet of the smaller size of step chuck. In Fig. 2 is shown the device assembled with the larger size of closing ring and step collet, and with the internal collet and thread guard ring shown at the right.

The same body is used for either combination. It does not screw directly upon the spindle nose, but is fastened by means of three long fillister-head screws to a small faceplate or chuck collar in the same manner as an ordinary lathe chuck. These faceplates must, of course, be fitted to the spindle nose of the machine upon which the chuck is to be used.

Within the body of the chuck is an annular bevel gear, mounted upon ball bearings and threaded internally to match the threaded end of the collets. This gear is turned to tighten the collets by means of the pinion wrench, which is inserted for this purpose in the hole that may be seen in the body of the chuck.

Internal collets are provided to hold all commercial sizes of round stock up to 1 in. in diameter. For work above that size the internal collet is taken out by backing the ring gear with the wrench, the knurled guard ring is removed, and the closing ring screwed upon the thread thus exposed. The step collet is now inserted and the ring gear turned forward to draw it to place.

Two sizes of closing rings are furnished with the chuck, and any number of step collets, especially fitted to whatever work is to be held, may be used. By means of the larger size of closing ring and corresponding step collet, work up to 8 in. in diameter may be held.

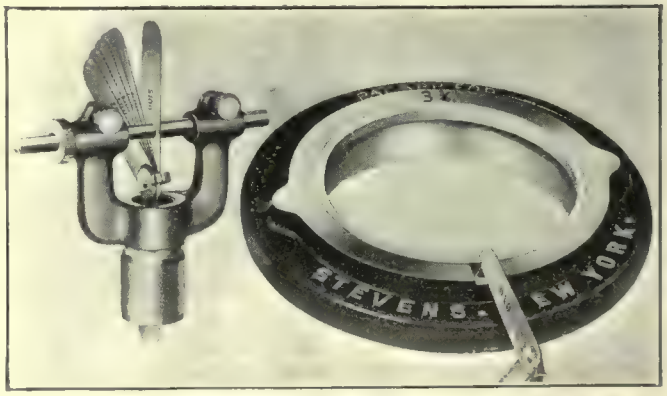
Stevens Cylinder and Piston-Ring Gages

Stevens and Co., 375 Broadway, New York, N. Y., have recently placed on the market some gages for facilitating repair work on automotive engines. At the left of the accompanying illustration is shown a micro-gage used in measuring the size of cylinders. The device consists of one fixed pin and one adjustable pin mounted in a holder. It is supplied in standard sizes to fit the size of cylinder to be measured.

The combined length of the two pins equals the standard diameter of the cylinder. In order to measure an over-size, a thickness gage can be inserted between the two pins. In this way, the oversize can be accurately determined. The tool is of particular use when fitting new pistons or new rings in the cylinder. It can be furnished with pins of the length desired, and with a thickness gage.

The ring gage shown at the right is intended for use when fitting piston rings, so that the fitting work can be done at the bench without the necessity of fitting directly to the cylinder block. First, one ring is fitted to the engine cylinder. This ring is then placed in the ring gage, and the opening measured by a thickness gage. By duplicating the measurement for all of the rings, correct fits can be obtained.

One side of the bore of the gage is chamfered slightly,



STEVENS CYLINDER MICRO-GAGE AND PISTON-RING GAGE

so that the rings can be easily inserted. The slot enables testing with the thickness gage. The device can be furnished in standard sizes and over-sizes to fit any make of car.

LeBlond 11-Inch Heavy-Duty Rapid Production Lathe

An 11-in. lathe for heavy-duty and large production where quick manipulation is required has recently been brought out by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The lathe is similar in most respects to the larger heavy-duty LeBlond lathes.

The headstock is of the selective-speed type, and provides six speed changes from 50 to 250 r.p.m. by means of sliding gears. The constant-speed driving pulley is 12 in. in diameter, and is driven by means of a 3-in. belt. A multiple-disk automobile type of clutch is used that runs continuously in oil supplied from the same source that floods the gears and bearings. The speeds are controlled by two change levers. The starting and stopping lever applies a friction brake on the spindle when the driving clutch is released, so as to prevent coasting. The driving pulley is carried on a bushing, so that the belt pull is relieved from the drive shaft.

The gears are made of nickel steel, and have stub-form teeth. The sliding gears are mounted on high-carbon-steel shafts fitted with four keyways, which are broached from the solid in the gears. The spindle runs in tapered babbitt-lined bronze bearings adjustable for wear, and it is provided with ball thrust bearings. The entire driving mechanism is inclosed in an oil-tight casting. The large hole in the spindle permits of passing work through it, and mounting draw-in or expansion chucks.

The bed is very deep in section and strongly braced. The carriage is long, and has a bearing for its entire length on the bed. The apron is of rectangular box form, cast in one piece. Both feed motions are operated by a single clutch, and are so arranged that only one feed can be in operation at a time. A plain block rest

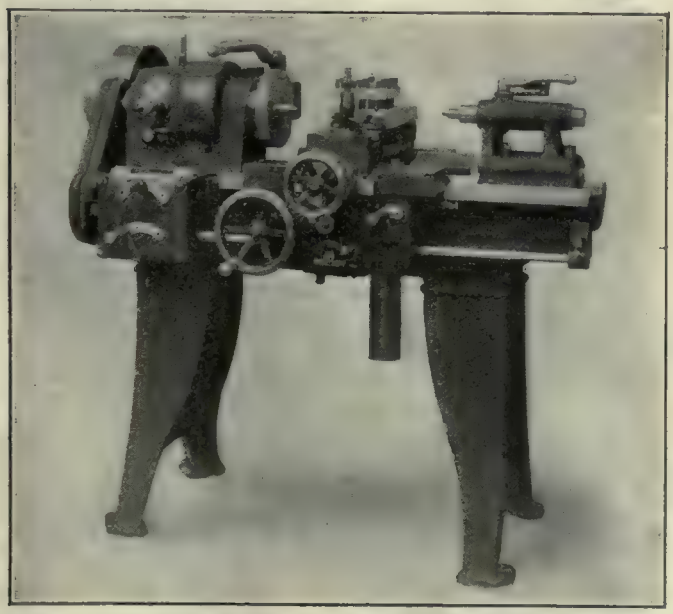


FIG. 1—LE BLOND 11-IN. RAPID PRODUCTION LATHE

and toolpost are ordinarily provided, although a turret toolpost can be furnished.

The feed box is of the automobile change-gear type, and provides nine feeds from 0.008 to 0.092 in. per revolution. All gears are made of heat-treated alloy steel. Two levers control the changing of the gears. The bottom lever compounds the feeds obtainable with the top lever, so that quick change from roughing to finishing feed is provided. The feed box is driven directly from the spindle by means of a roller sprocket chain adjustable for tension.

The tailstock is arranged to move and clamp the spindle by a single movement of the operating handle. The spindle has a travel of 2½ in. When work is being placed in the machine, the center can be brought in contact at the desired pressure by pushing the lever, and further movement clamps the spindle.

A facing attachment can be supplied. It enables facing and turning simultaneously, so that the lathe is converted into a semi-automatic machine that can handle many small jobs. The rear view of the machine in Fig. 2 shows how the facing attachment can be mounted

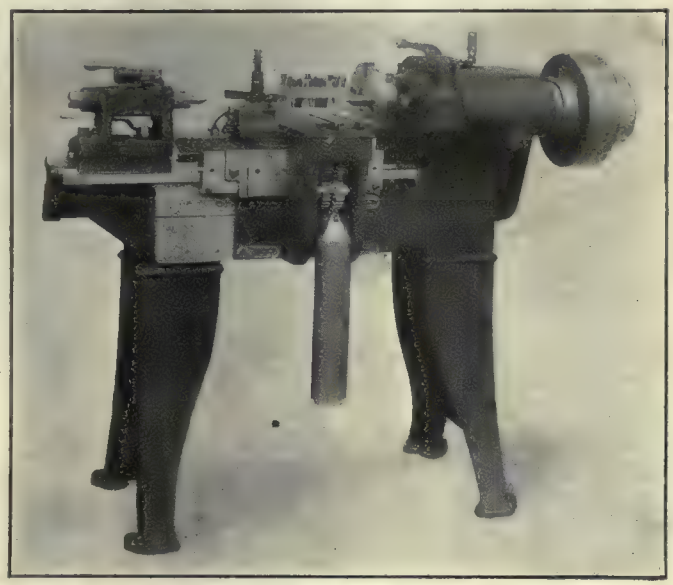


FIG. 2—REAR VIEW OF LE BLOND LATHE SHOWING FACING ATTACHMENT

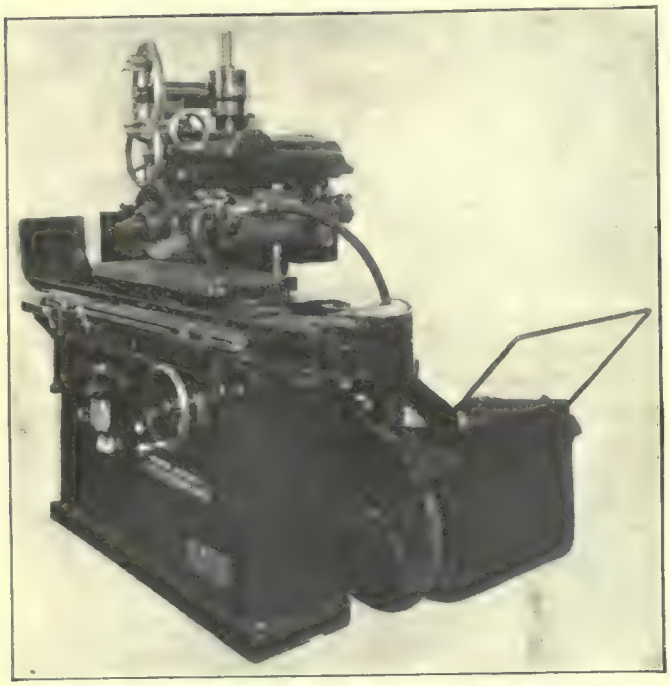
on a bracket bolted to the planed pad on the bed. The cast-iron form plate travels with the carriage, and is easily replaceable with one having the desired degree of taper, so as to vary the ratio of feed between the carriage and the facing slide.

The roller on the facing attachment engages this form plate and transmits the motion through a rack and a pinion to the facing slide, which is fed toward the center of the lathe on broad dovetailed ways. As the carriage is brought back along the bed to the starting position, the facing attachment is returned automatically by the weight. The multiple toolblock can be supplied to suit the work being performed.

The machine has a capacity to turn diameters up to 13¾ in., and lengths up to 18½ in. The bed length is 4 ft. The machine weighs 1,050 lb. net when equipped with a facing attachment, and 1,340 lb. when packed for shipment.

Norton 6 x 10 x 36-In. Surface Grinding Machine

The surface grinding machine illustrated herewith is a recent addition to the line of open-side surface grinding machines made by the Norton Co. of Worcester, Mass. The machine is intended for high production with great precision. The finished surface of the table is 6 x 36 in., and work 8½ in. wide may be ground. The height from the table to the lower side of a 10-in. wheel is 10¼ inches.



NORTON 6 x 10 x 36-IN. SURFACE GRINDING MACHINE

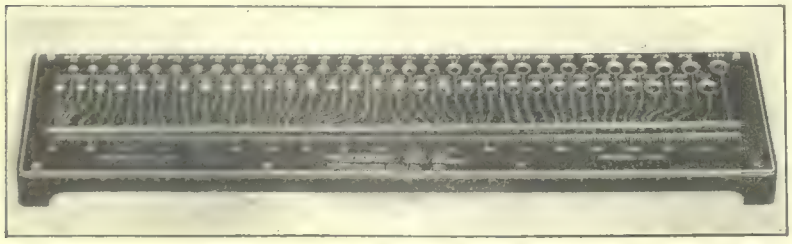
The chief feature of the machine is the improved spindle construction, as flood lubrication and thumb-screw adjustments for both radial and end thrust are provided. The thrust is taken by a hardened steel flange running between bronze washers. A standard grinding wheel 10 x 3 in. in size, with a 3-in. bore and held between 5½-in. flanges is used. The wheel spindle runs at 1,342 r.p.m, and is driven by a 4-in. belt. The main drive shaft runs at 815 r.p.m. and is driven by a 5-in. belt from a 15-hp. motor mounted at the rear.

The table runs at a speed of 80½ ft. per minute. The hand traverse mechanism engages automatically when the power traverse is disengaged. The cross-slide has two hand-operated feeds with a ratio of 1 to 38 between them. The vertical feed of the wheel can be power operated, and gives a feed of 0.00025 in. for each graduation on the index wheel.

The grinding lubricant is contained in a portable tank at the rear of the machine. This tank can be easily removed and cleaned in a few moments without seriously interrupting the operation of the machine. The machine is 6 ft. 3 in. in height, and requires 10 ft. 8 in. x 5 ft. 3 in. floor space, including the extreme overhang of the table. The weight is 6,500 pounds.

"Quikbak" Drill Gage and Holder

Harry Faltermayer, 1615 Sansom St., Philadelphia, Pa., has recently placed on the market the "Quikbak" gage and holder for twist drills. As can be seen in the accompanying illustration, the device is provided with holes in which the drills can be held vertically, and also with a tapered slot or V for measuring their size. The base is made of cast iron, although the V is formed by hardened and ground steel strips rigidly mounted in the base. An etched brass plate, having raised markings, forms the cover plate.



"QUIKBAK" DRILL GAGE AND HOLDER

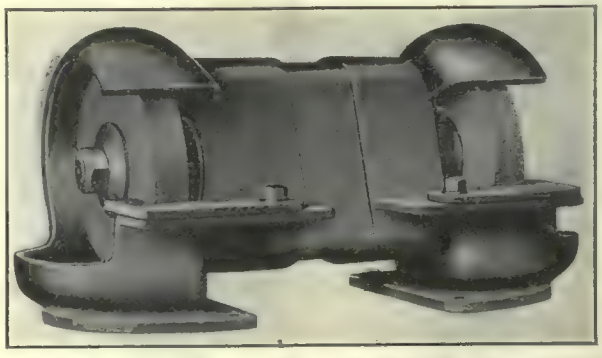
Since drills designated by wire gage sizes are uniform in diameter throughout the entire length, the V-gage can be employed to quickly determine their size. The shank is merely inserted in the slot and then moved down as far as possible toward the small end of the V. The guide line at the point where the drill stops leads to the proper hole for the drill. Each hole is marked with both its gage number and size in decimals of an inch.

On the front side of the slot is a scale graduated in thousandths of an inch on which the diameter of the part inserted in the V can be read. Thus the gage can be used for quickly and easily determining the exact size of drill rod and round pieces, without the use of a micrometer. A bench space of 13½ x 3½ in. is required.

Forbes & Myers Grinder With Flat-Front Motor

A small bench grinder, designated as Model 76, and providing clearance for the work in an unusual manner, has recently been placed on the market by Forbes & Myers, 172 Union St., Worcester, Mass. As shown in the accompanying illustration, the front of the motor frame is flat. This construction is obtained by using a squirrel-cage induction motor having windings on the back side of the stator only. The windings are compensated, so as to avoid undue heating and to provide satisfactory starting qualities.

When 6-in. wheels are used, they project 1¼ in. further forward than the front of the motor, thus making it possible to wear down three-fourths of the abrasive



FORBES & MYERS GRINDER WITH FLAT-FRONT MOTOR

before the wheel is even with the front of the motor. The motor has ½ hp., and can be operated on either two- or three-phase, 60-cycle current of 110, 220, 440 or 550 volts, to suit the conditions. The speed is ordinarily 3,600 revolutions per minute.

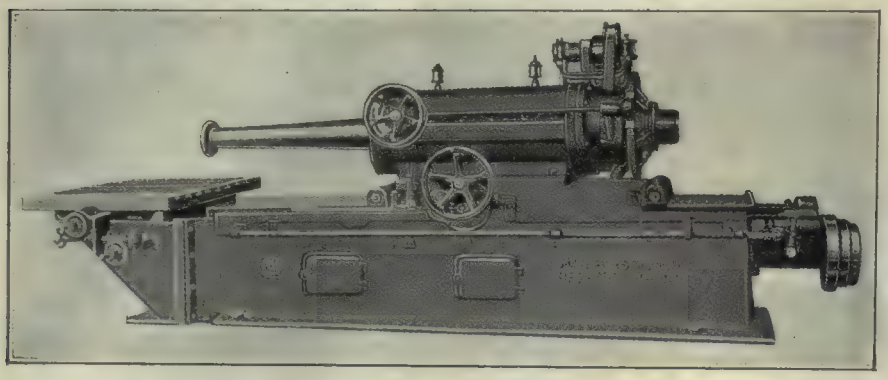
Guards are provided for the wheels. Flat, steel tool-rests adjustable in two directions are mounted on the front of the machine. The wheel flanges are 2¾ in. in diameter and bear on the outer edges only. The spindle is ¾ in. in diameter and runs in Norma ball bearings.

The height of the spindle above the bench is 4¼ in., or a stand can be furnished to make the spindle 40 in. above the floor. The weight of the bench-type machine is 35 lb.; with the stand 140 pounds.

M. S. O. Automatic Internal Cylinder Grinding Machine

The accompanying illustration shows the M.S.O. automatic internal cylinder grinding machine that is being introduced into this country from Europe by Marburg Bros., Inc., 90 West St., New York, N. Y. This machine, designated as Type FX-10, differs from the grinding machines ordinarily made in this country not only in the large range of sizes in which it is built, but also in the arrangement of the grinding head and work table.

In most small cylinder grinding machines, the grinding head remains stationary while the work table is moved back and forth automatically. In the machine here shown, however, the work remains stationary while the grinding head is reciprocated. The operation is entirely automatic. The machine is regularly built in seven sizes, suitable for grinding cylinders of from 1 or 2 in. up to about 32 in. in diameter and of lengths up to about 80 in. The construction is very rigid, and a high degree of accuracy in performance is guaranteed.



M.S.O. AUTOMATIC INTERNAL CYLINDER GRINDING MACHINE

The grinding head slides on the heavy bed, and is moved longitudinally by automatic feed, while the operating speed is changed by means of cone pulleys. The automatic reversal is adjustable as to position, and takes place without shock. The automatic movements can be quickly released, so that the head can be moved freely by hand. All bearings and operating surfaces are liberally proportioned and run in oil.

The grinding spindle both rotates around its own axis and revolves about another axis parallel to its own. The eccentricity or distance between the axes is adjustable automatically or by hand. A scale and stop are provided for aiding the adjustment.

Interchangeable grinding spindles and spindle arms are furnished with each machine, in order to accommodate a large range of cylinder diameters. The grinding spindle runs in bronze bushings and ball bearings. The grinding wheel is held between two flanges which are centered on the grinding spindle by means of conical holes fitting a conical extension of the spindle. The grinding spindle is driven by means of intermediate pulleys which follow the eccentric motion of the spindle. Overhanging parts which might interfere with the accuracy of the grinding operation are not employed.

To make the work table absolutely true, it is finished by grinding after mounting on the machine. It is accurately adjustable, both vertically and laterally. Its stationary position during cutting aids in obtaining accuracy on the work.

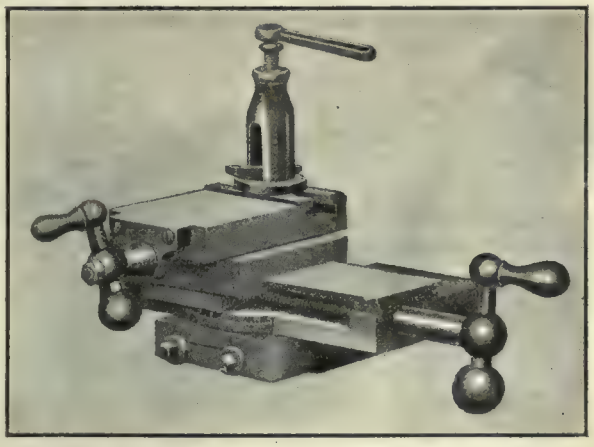
For the removal of grinding dust, an exhaust fan and flexible hose with suitable attachments are furnished with each machine. This thorough removal of the dust insures a better finish, and in addition protects nearby parts of the machine and also the operator. The exhaust air is taken to a coke filter, where the dust is retained.

The larger sizes of the machine are intended for use on cylinders of steam engines and such machines. It is stated that the results obtained on large cylinders are comparable in excellence to those obtained when grinding automotive cylinders. In order to give an idea of the wide range of sizes of the machine, a few specifications of the Nos. 2 and 7 sizes will be interesting. The maximum grinding diameters are 7 and 31½ in., respectively, and the maximum lengths of the ground surfaces 15¾ and 78 in. The work table sizes are 17¾ x 21⅝ in. and 78 x 118 in. respectively. The maximum movements of the grinding heads are 33½ and 106 in., and lateral adjustment of the table 15¾ in. for both sizes.

The heights of the grinding spindles above the floor are 39⅜ and 54 in., and the floor space 4½ x 9 ft. and 13 x 31¼ ft. Horsepower required, 4 and 25, respectively. The net weights are 3,750 and 70,000 lb., and the weights boxed, 4,200 and 75,000 lb. The countershafts weigh 200 and 1,100 lb. additional. The illustration shows Size 5, which grinds cylinders up to 12 in. in diameter and 44 in. long.

Milliken 11-Inch Slide Rest

An 11-in. slide rest for lathe use has just been brought out by the Milliken Machine Co., West Newton, Mass. The maker calls attention especially to the method of securing the rest to the base, as the rest can be swiveled or held firmly in position. A tapered hub on the rest fits in a tapered hole in the base, and a sliding segment is clamped by means of the two collar screws shown in the accompanying illustration.



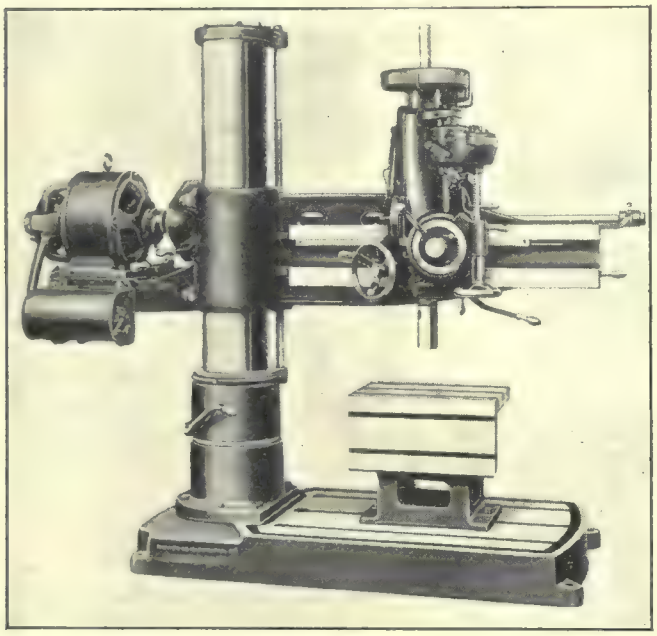
MILLIKEN 11-IN. SLIDE REST

The feed screws have 10-pitch square threads. The swivel is graduated, and a standard toolpost is provided. All bearing surfaces are scraped, and the rest is finished all over. A lateral travel of 5¾ in. is provided; also a cross travel of 2½ inches.

Motor-on-Arm Drive for Morris Radial Drilling Machine

The accompanying illustration shows a drive arrangement with the motor mounted on an extension at the back of the swinging arm, that has recently been applied by the Morris Machine Tool Co., Court and Harriett Sts., Cincinnati, Ohio, to its radial drilling machines.

The location of the motor serves to balance the weight of the arm carrying the head. It is thus easier to raise and lower the arm on the column, so that the head can be positioned more rapidly than when it is not balanced. The elevating mechanism is mounted as a unit on the back of the arm near the motor drive gears, and is in



MORRIS RADIAL DRILLING MACHINE WITH DRIVING MOTOR MOUNTED ON EXTENSION OF ARM

operation only when the arm is being raised or lowered.

The vertical screw is stationary. The revolving unit is bronze and mounted on ball thrust bearings that can easily carry the weight of the arm, motor and other parts. A safety mechanism is provided to disengage the clutch when the arm has reached the upper and lower limits of the travel. The controller is mounted below the motor within easy reach of the operator.

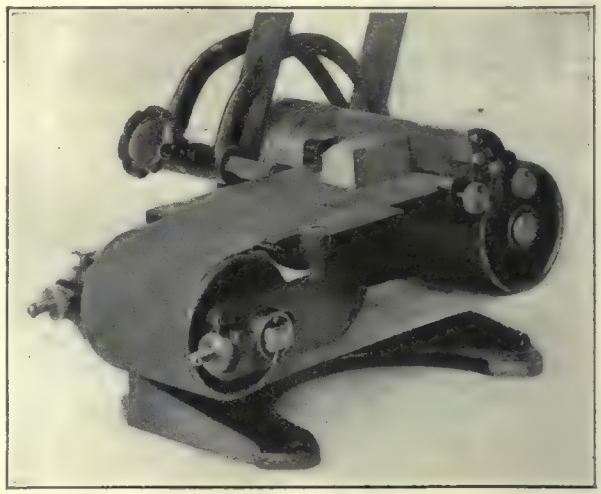
A 3½-hp. motor is required to drive the machine here shown, which is of the 4- and 4½-ft. size. The head is of the same style as on the standard drilling machine, and has spindle speeds of 26 to 450 r.p.m. The back gears and clutches are nickel steel.

Coats Bench-Type Belt Grinder

A bench-type belt grinder for finishing flat surfaces on small metal parts and castings has recently been placed on the market by the Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y.

The machine carries a jointless woven belt or band of abrasive material 4 in. wide and 36 in. long that travels over a flat table 10 x 5½ in. in size. The grinder is more suitable to certain work than a disk grinder, as the speed of the entire abrasive belt is uniform and a greater surface is available. The bands wear evenly and can be easily replaced. For tensioning the belt, no jockey pulley is provided; but a positive motion of the front band pulley is obtained by means of two nuts.

The bearings are long and are guarded to make them dust-proof. They are fitted with screw-down lubricators. The main shaft runs in an oil-retaining bushing 6¾ in. long, which extends to the center of the driving pulley. The loose pulley is reduced in diameter, so that the strain on the driving belt is released when the machine is not running. It does not run on the spindle



COATS BENCH-TYPE BELT GRINDER

of the machine, but on a cast-iron sleeve extending from the base castings. The pulleys are 5½ in. in diameter and are driven by a 1½-in. belt, the speed ordinarily being from 500 to 1,000 r.p.m. A detachable, graduated rest or back-stop for the work is provided that can be swung through 45 deg. to either side. The approximate net weight of the machine is 60 pounds.

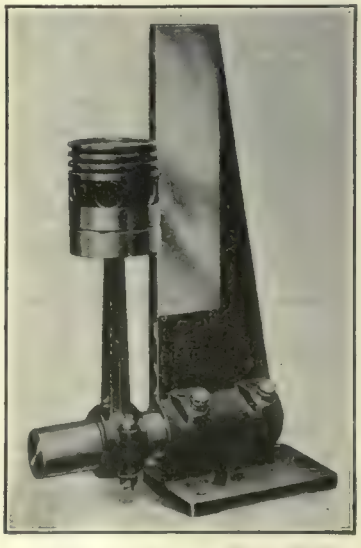
Stevens Piston Aligning Gage

The accompanying illustration shows a gage for use in aligning automotive pistons on their connecting rods. The device was recently brought out by Stevens and Co., 375 Broadway, New York, N. Y.

The device is intended for mounting on a bench. Any twist or bend in the connecting rod can be detected by fitting the large end of the rod on the arbor and placing the piston against either the edge or the flat side of the vertical straightedge. Deviation from the true position can be detected by the eye.

The device serves also for trial fitting the connecting-rod bearings on the crankshaft. It is not necessary to do the fitting at the motor itself, so that the work can be done at the bench.

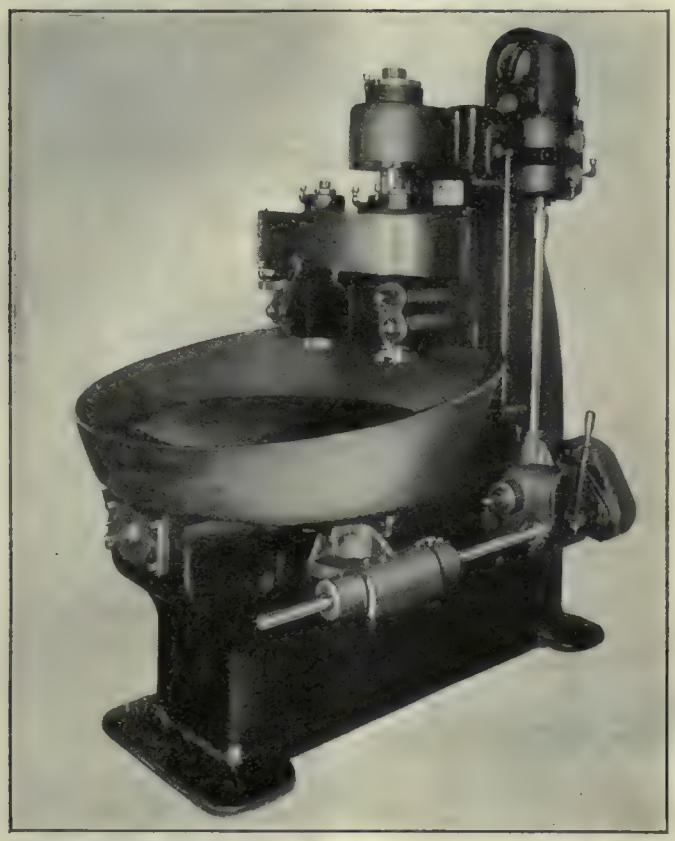
Arbors can be furnished for any size of bearing required. They weigh from 6 to 8 lb., depending on the size. The gage itself is 19 in. in height and weighs 19 pounds.



STEVENS PISTON GAGE

Newton 30-In. Continuous Milling Machine

A continuous milling machine of the rotary-table type that has recently been placed on the market by the Newton Machine Tool Works, Inc., of Philadelphia, Pa., is shown in the accompanying illustration. The machine is ordinarily equipped with two spindles mounted on the same head, although it can be supplied with but one spindle for special types of work. The tub or chip



NEWTON 30-IN. CONTINUOUS MILLING MACHINE

guard shown around the table is for use when coolant is employed. It is, of course, not necessary when cast iron is being machined.

The column and the bed of the machine are cast in one piece. The machine can be driven by a single pulley, or by a 7½-hp. motor running at 1,200 r.p.m., and mounted on top of the machine so as to be directly connected.

The height from the top of the table to the faces of the spindles can be varied from 4 to 12 in. The maximum distance from the center of the spindle to the center of the table is 18 in., and the minimum distance is 8½ in. when the tub is mounted, and 4½ in. without the tub.

The rotary table is carried on a circular saddle, so that its distance from the spindle can be easily adjusted. It can be rigidly locked in place after it has been located. The saddle contains the bearings for the table, and also the gears by which the table is rotated. The table is held in double bearings, the annular bearing being 28¾ in. in diameter. It has a solid top to which the jigs and fixtures for holding the work can be bolted. The rotary feed of the table is operated through a helical gear 24 in. in diameter, driven by means of a worm and worm wheel.

Two types of feed motions are provided for the table. The first one is continuous and used for ordinary continuous milling. In the other, an intermittent feed and rapid traverse are provided, the rapid traverse being 10⅔ times as fast as the feed for cutting. It is used when the surfaces to be machined are not close together, as when only small surfaces are to be finished on large pieces of work.

The clutch used for engaging and disengaging the feed provides a safety device to prevent breakage of the machine in case of jamming or over-loading. The feeds and speeds used can be varied by means of removable change gears. The spindles have No. 5 Morse tapers in the ends and keyways in the faces. They are driven by hardened steel gears that run in oil. The quills are 6½ in. in diameter and have 2-in. individual vertical adjustments for setting the height of the cutters.

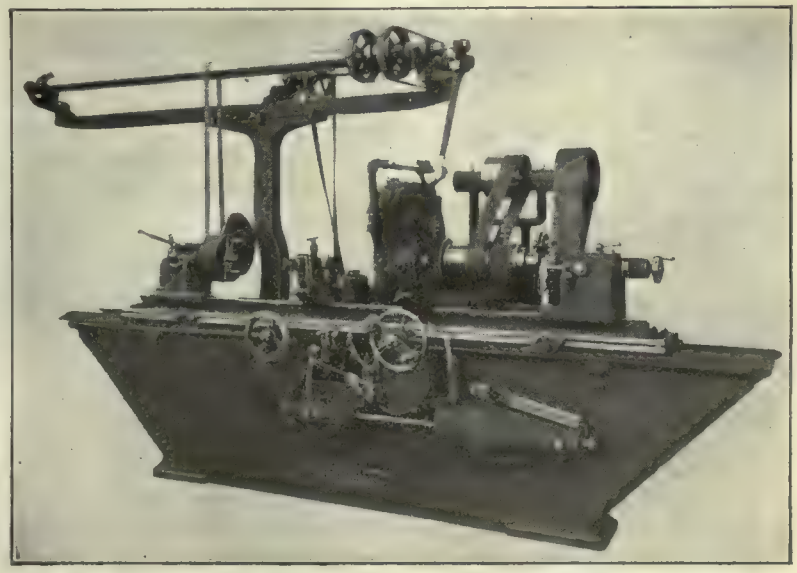
The slide carrying the spindles can be adjusted to suit the height of the work. Cutters up to 10 in. in diameter can be employed. The centers of the spindles are 13 in. apart and 10 in. from the upright. The overall height of the machine is 8 ft. The machine without the coolant tub requires a floor space of 74 x 38 in., and with the tub 81 x 54 inches.

Norton 18 x 72-Inch Autopart Regrinding Machine

The accompanying illustration shows an 18 x 72-in. size of the autopart regrinding machine that is made by the Norton Co. of Worcester, Mass. This machine provides a greater capacity than the standard 18 x 55-in. machine, so that it is applicable to a greater variety of work.

In order to fit the machine to general use a power-driven table traverse mechanism is incorporated. The machine is arranged for drive by belt from a lineshaft or from a motor placed in the rear of the machine. The machine is thus self-contained. It can be adapted to all sorts of cylindrical grinding.

The dimensions of the wheelslide, headstock, footstock and other principal members of the machine are the same as on the corresponding parts of the standard 18 x 55-in. autopart regrinding machine.

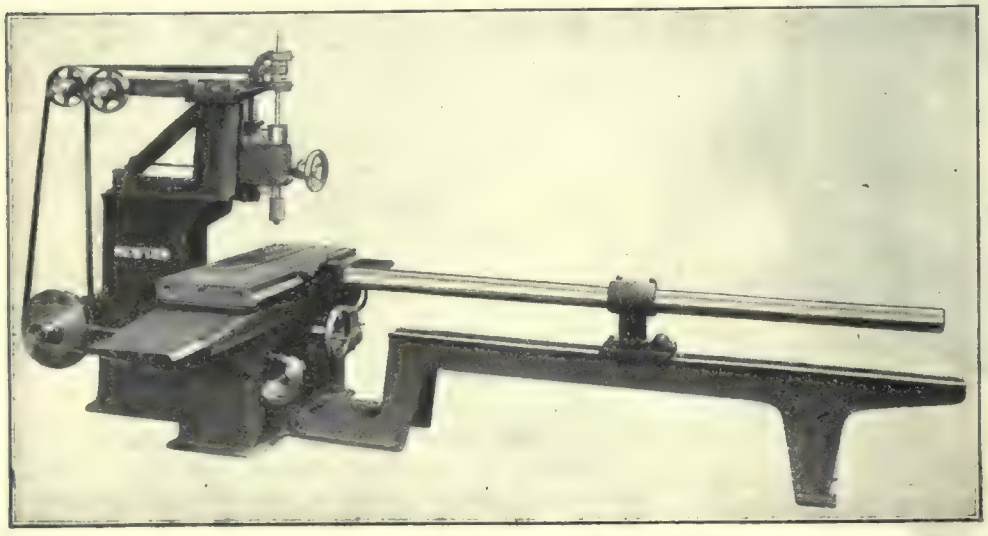


NORTON 18 x 72-INCH AUTOPART REGRINDING MACHINE

Newton Radius Link Grinding Machine

A radius grinding machine that is intended particularly for finishing the reverse links and blocks used on locomotives has recently been placed on the market by the Newton Machine Tool Works, Inc., Philadelphia, Pa. The base is a box-type casting, to the front of which is secured the radius arm support, and to the back the column. The arrangement of the parts, particularly of the radius bar, can be seen in the accompanying illustration. This bar is a tube 4 in. in diameter, and has its outer end supported on a slide, so that the length of the radius can be easily adjusted by means of a rack and pinion, and read on a scale on the slide. The radius can be varied from 18 to 100 inches.

The table has hand adjustment and is reciprocated automatically by the use of dogs. Three speeds are provided. The maximum stroke of the table is 30 in., and the minimum 2 in. There is a dwell at the end of each stroke, so as to give time for operating the vertical feed. Cast-iron shields prevent the bearings from becoming uncovered at the ends of the stroke. The table is 18 x 42 in. in size.



NEWTON RADIUS LINK GRINDING MACHINE

The spindle head is adjustable on the upright to suit the depth of cut and the position of the work. The spindle itself is carried in a quill and counterweighted. It is provided with both hand adjustment and an automatic oscillating motion for use with wide-face wheels.

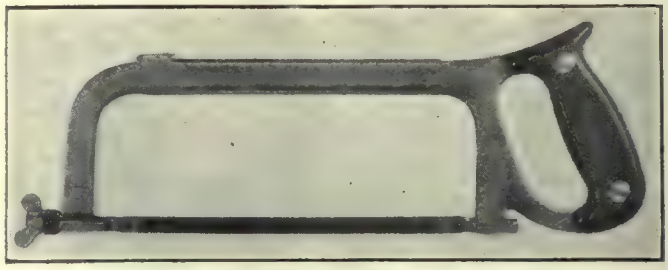
The drive is by a 5-hp. motor running at 1,200 r.p.m., or a single-pulley drive can be employed. The spindle ordinarily rotates at 6,000 r.p.m. Self-aligning ball bearings are used in the driving mechanism.

A device for truing the wheel is conveniently mounted at the right side of the spindle. The vertical motion of the spindle slide is used, so that the operation can be quickly performed. The diamond holder can be readily moved out of position when not in use.

The spindle runs on ball bearings, and the driving pulley is carried on separate bearings, so that there is no belt pull directly on the spindle. The quill has 3 in. adjustment in the slide. The distance from the center of the spindle to the column can be varied from 7 to 13 in. The height of the spindle flange to the table is 7 in. as a minimum, and 18⅝ in. as a maximum. The floor space occupied by the machine is 14 ft. 3 in. x 9 ft. 6 in., and the height overall is 6 ft. 7½ inches.

Starrett Pistol-Grip Adjustable Hacksaw Frame

The L. S. Starrett Co., of Athol, Mass., has just brought out the pistol-grip hacksaw frame No. 169 that is shown in the accompanying illustration. Con-



STARRETT PISTOL-GRIP HACKSAW FRAME

stant tension is maintained by springs on the bolts holding the blade. This feature, in connection with the positive adjustment on the back, enables easy and rapid changing of the blades. The pawl for adjustment is set down inside the frame as low as possible.

The back is constructed of steel tubing which is strong enough to prevent buckling. All steel parts are nickel plated. The blade may be set to cut in any one of four directions by turning the wing nut. It is not necessary to remove the wing nut entirely in order to turn the saw.

The frame has a depth of 3⅜ in. from the cutting edge of the blade. The adjustment permits the use of blades from 8 to 12 in. in length. The hard rubber, checked handle provides plenty of finger room and gives a comfortable grip for the operator. The device is well balanced, so that it can be easily and rapidly operated.

The Importance of Timekeeping

By A. W. Brown

In some industries, iron founding for example, it was almost impossible to persuade employees to record the time spent on piecework. The reason for such record, however, which should have been obvious, was eventually brought home to many of the employers as well as the workers.

While the purchasing power of a dollar varies from year to year—as all of you have noticed—there always will be just sixty minutes in an hour. If only money units are recorded, they will be useless later on for correctly estimating the cost of the same or similar work. But if the hours and minutes spent on a job for one year are recorded, their value may readily be computed at the new time rate, if the rate has been changed.

Timekeeping on all kinds of work also facilitates the correct estimation of possible delivery time, which is often of prime importance in making out orders.

Semi-Annual Meeting of the Society of Automotive Engineers

White Sulphur Springs Scene of Large Gathering—Good Technical Program—Sports, Dancing and Motion Pictures Feature Entertainment Arrangements

AN ENCOURAGING feature of the semi-annual meeting of the Society of Automotive Engineers at White Sulphur Springs was the attendance, which exceeded committee estimates by more than twenty per cent. Probably the time of year, June 20 to 24, and the fact that White Sulphur is about equally distant from the principal automotive centers had something to do with it. Most of the old guard were on hand, as usual, and many members brought their wives and daughters.

The council met on Monday and the special trains from the East and West brought in the members on Tuesday morning in plenty of time for the opening of the Standards Committee meeting at ten o'clock. E. A. Johnston, chairman of that committee, presided at both morning and afternoon sessions, at which were presented reports from the following divisions: Agricultural Power Equipment, Axle and Wheel, Electrical Equipment, Engine, Iron and Steel, Lighting, Non-Ferrous Metals, Parts and Fittings, Passenger-car Body, Screw Threads, Springs and Stationary Engines.

Most of the reports were approved, both by the committee and by the society at its business meeting in the evening, but some few were amended or referred back for future consideration. Those accepted must be approved by letter ballot of the whole society.

Numbering Engines and Cars

A feature of this meeting, of interest as well to manufacturers of other kinds of machinery, was a report from a sub-committee on methods of numbering engines and cars so that obliteration or change of the numbers would be impossible without easy detection. The committee had had samples made up to test several of the most promising suggestions, but admitted that it had been somewhat taken back by the ease with which all of them had been beaten by the Underwriter's Laboratories. One of the difficult problems to be considered is the existence of some ten million cars now on the road, numbered by all sorts of haphazard methods, and how to apply any new system to them.

In connection with a recommendation limiting the clear opening of the crankcase drain to ¾ in. discussion developed which brought out the sense of the meeting that such a move would be an incursion into the field of design, which would be a bad precedent and possibly harmful to the standardization movement.

Instead of the usual dry formality that is apt to accompany business meetings, this one was marked by a lively interchange of opinion on qualifications of engineers and requirements for admission to the S. A. E. President Bachman made an excellent address in which he called attention to the advisability of opening the roster of the society to operation and maintenance men as well as to designers and producers. He commented on the effect of the business depression on the membership and on the income of the society, and also on the industry in that three new types of vehicle had arisen in the speed wagon, motor bus and railroad motor car. In closing he pointed out the increasing seriousness of the urban traffic problem and urged that careful thought be devoted to aiding traffic administrators in its solution.

A message from Secretary of Commerce Hoover offering the aid of his Division of Simplified Practice to the S. A. E. in securing the adoption of their standards was presented by R. M. Hudson of the division. It was received with enthusiasm by those members of the Standards Committee who heard it.

American Spirit Leads the World

Mr. Hudson said: "When it comes to sizing up a situation, deciding what needs to be done, and then doing it, we Americans like to believe we lead the world. As a national characteristic, we pride ourselves on our ability to get results, and to get action when action counts most. It's *that* spirit, or 'pep,' which has developed our industries, broadened our markets, increased our national wealth, raised our standard of living, and given us many of the opportunities, advantages, and pleasures of the present day. We've been so busy pushing ahead we've not taken time to look back, nor to 'check up'—consequently, when the committee from the Federated American Engineering Societies presented its report on 'Waste in Industry,' it gave us a jolt! Prior to the war we had considered our industries highly efficient, and so they were. With their automatic machinery, their progressive manufacturing methods, their utilization of byproducts, and all the other illustrations of efficient operation, it seemed as though the maximum advance had been made. Then the World War forced us to conserve our materials, our labor, and our other resources, and to concentrate our energies on the big job of winning. Under the stress of war conditions, greater advances were made in industry. Again we felt we had reached a maximum of achievement. The one big thing brought out by the engineers' report is that we have only started, the job is a long, long, way from being finished! The facts revealed in the assay of waste serve as a foundation for the further advancement of American industry.

"When Herbert Hoover came into the position he now occupies, he immediately proceeded to get action in truly characteristic manner. You are all familiar with his activities in the President's Unemployment Conference, the study of business cycles, the super-power project, the Colorado River development, the present coal strike, and many other matters of current interest. They all bear on his one great aim which combines the elimination of waste in industry, the preservation of the high standards of American living, and the maintenance of that great principle of American individualism.

"His secondary objective is that the Department of Commerce shall be the worthy servant and representative of American business, and a true interpreter of industries' needs. The entire organization of his department has been revamped and changed until it is

now rapidly taking form as a great 'service-rendering' body whose value to American business men is becoming increasingly evident. Our Bureau of Foreign and Domestic Commerce is helping to broaden the markets for our goods; our Bureau of the Census has developed a statistical service carrying live information on the trends of current business to executives, who in turn, are regulating the activities of their individual enterprises in accord with the relative opportunities shown. Our Bureau of Standards is co-operating with many industries in highly technical research work, leading to the solution of important scientific problems.

"In the Division of Simplified Commercial Practice (so-called because we feel it has a more psychological approach to the lay mind than does the word 'standardization'), we are co-operating with many industries in the establishment of those elementary standardizations of nomenclature, grade, and size which make for greater economy in production, distribution, use, and maintenance of our common commodities. You may consider, if you wish, that we are carrying on those eliminations of excess variety, and simplifications of process, inaugurated by the conservation division of the War Industries Board. Many of you had a part in that work, and will recall how, at first, it seemed there would be a stoppage of all progress, and a suppression of all individuality in design, and style, if manufacturers of a specific line were forced to reduce the varieties in their products. But when the representatives of the industry met with those of the Government, and the necessity for the maximum concentration of our resources was demonstrated, 'excess variety' became a target for concerted action. There resulted many eliminations in agricultural implements, horse-drawn vehicles, road-making machinery, bicycles, stoves, furniture, refrigerators, garments, shoes, and 101 other articles of every-day usage. The most skeptical among the manufacturers, distributors, and even consumers, found that the resulting advantages to them were greater than they realized were possible. They all gained, in relative degrees.

"When the armistice was signed, a sufficient community of interest had sprung up among manufacturers to warrant further efforts toward simplification. The United States Chamber of Commerce, through its Fabricated Production Department, has been, and is now, devoting its energies to educational work designed to increase the appreciation of the American public for the real values of standardization.

Progress of Simplification

"Recently Secretary Hoover requested the American Engineering Standards Committee to canvass the various technical bodies for their suggestions as to what simplification in manufactured products is most needed and most desired. In this way, every industry will be reached, and the summary report of industry to the Secretary (by way of the American Engineering Standards Committee) will be acted on by, and through, our Division of Simplified Practice. We are now in contact with over seventy-five industries, through their trade associations. We have completed certain simplifications in some of them; surveys are under way in others; and committees are being formed, or considered, in still others for the purpose of working out those simplifications, which each industry as a unit regards as of greatest advantage to it. It is entirely a voluntary matter on the part of industry; there is nothing of government dictation, regulation, or supervision in it. We're here to help those who want us to help them! We make no claim of technical knowledge in the specific industry with which we may be working at the time, but we do have resources, contacts, and connections, which enable the Department of Commerce to render some highly effective assistance, when it is asked to do so. Our division is mainly a co-ordinating unit.

"We seek to bring together the commercial and the technical groups interested in a certain elimination, or simplification, and then, when a unanimous recommendation has been produced, the Department of Commerce adopts it, and publishes it as its own. These 'Simplified Practice Recommendations,' which recognize the several elements contributing to their development, are broadcast in pamphlet form. It is expected that, through their wide distribution, and through follow-up of the application of these recommendations to commercial practice, there will be obtained a much greater support and adoption of the best thought and practice of the industry.

Continue Standardization

"As for the exact application of our service to the automotive industry, Secretary Hoover has a high regard for the pioneer work done by the S. A. E. in educating the automotive manufacturers, also the distributors and users of their products, to their present high regard for standardization. He is, however, looking to your society to continue your efforts beyond the technical and commercial advantages into the economic phases of the subject. Not only is the broader application of the principle of paramount importance in the restoration of prosperity and the solution of many of our current domestic problems, but it is vital to the successful meeting of foreign competition. Many foreign countries are carrying on standardization activities, and these, coupled with the low wage of native labor, and its willingness to work long hours, mean American business men should act quickly to eliminate waste, adopt and apply standards, and in the broadest sense possible, conserve their resources to the end that this country can maintain its position."

On Wednesday morning two simultaneous sessions were held, a motorbus and an aëronautic session. The relative interest in the two topics was shown by the very small attendance at the aëronautic session. Some unusually interesting army motion pictures were shown at the end of this session. They served to attract about five times as many members as did the excellent papers presented.

J. V. Whitbeck presided at this session. The speakers and their subjects included: "Overhead Camshaft Passenger-Car Engines," by P. M. Heldt; "A New System of Spring Suspension for Automotive Vehicles," by H. M. Crane; "The Automotive Engineer and Our Service Problems," by F. A. Bonham.

The Thursday session was devoted to research. Considerable interest attached to the report of Dr. H. C. Dickinson, research director of the S. A. E., as he made several very plain statements. Passenger cars were discussed on Friday, and fuel and engines on Saturday.

At the fuel and engine session the papers presented were: "The Hot-Spot Method of Fuel Preparation," by F. C. Mock and M. E. Chandler; "Detonation Characteristics of Some Blended Motor Fuels," by Thomas Midgley, Jr. and T. A. Boyd; "Oil Pumping," by G. A. Round; and "Oil Consumption," by A. A. Bull.

News Section

Freight Loadings and Repairs

Loading of revenue freight during the week which ended on June 10 totaled 846,002 cars, compared with 750,645 cars during the previous week, or an increase of 95,357 cars, according to reports just received from the railroads of the United States by the Car Service Division of the American Railway Association. This increase was largely due to the fact that the previous week included the Decoration Day holiday. There was an increase, however, of 24,871 cars compared with the week before the holiday. The loading for the week of June 10 also came within 33 cars of the largest loading for any week this year preceding the coal strike.

Compared with the corresponding week last year, there was an increase of 58,719 cars, but compared with the corresponding week in 1920, the total for the week of June 10 represented a decrease of 84,974 cars.

Freight cars idle on American railroads because of business conditions on June 8 totaled 465,837 as compared with 480,266 on May 31, or a decrease of 14,429 cars.

Of the total, 284,189 were surplus freight cars, while the remaining 181,648 were freight cars in bad order in excess of the normal number unfit for service.

Of the 2,273,924 freight cars on line, reports showed 340,822 or 15 per cent to be in need of repairs compared with 334,108 or 14.7 per cent on May 15, an increase of 6,714. Allowing 7 per cent as representing the normal number in need of repairs would leave 181,648 as the number in bad order and idle because of business conditions.

Southern Metal Trades Holds Convention

The fifth annual convention of the Southern Metal Trades Association, was held at Savannah, Ga., June 19 to 20, with a large attendance of members from every southern state. Despite the unfavorable conditions prevailing for the past year and a half, the consensus of opinion among the delegates seemed to be that the industry had weathered the storm of business depression in a manner most satisfactory. That the turning point is now at hand and that business is rapidly on the upward grade, was the general feeling of those present. By the end of the present year as compared with pre-war times, a majority of the foundry and machine shop operators anticipate fairly normal conditions.

Headquarters of the convention were at the Savannah Hotel. The first day, Monday, was given over to reports of officers, appointment of committees, discussion of business conditions and the outlook, and addresses on important subjects of interest to the metal trades. Among the speakers Monday was Horace Lanier, president of the West Point Iron Works, West Point, Ga.; Gus F. Meehan, president of the association; William E. Dunn, Jr., and J. W. Moore, secretary and treasurer of the association respectively; T. M. Cunningham, Jr., president of the Chatham Savings and Loan Co., Savannah, and Patrick Dwyer, editor of *Foundry*.

The following officers were elected for the ensuing year: J. H. Dore, Houston, Tex., president; J. R. Hedges, Chattanooga, Tenn., vice-president; W. E. Dunn, Jr., Atlanta, secretary; J. W. Moore, East Point, Ga., treasurer.

The 1923 annual meeting will be held at Memphis, Tenn.

Joint Committee to Consider Automotive Standards

A joint committee has been appointed by the Society of Automotive Engineers and the National Automobile Chamber of Commerce to take up with the Division of Simplified Practice of the Department of Commerce the question of wider adoption of S. A. E. standards. The S. A. E. members are J. G. Vincent, W. G. Wall, F. E. Moskovics, C. M. Manly and C. F. Kettering. Mr. Moskovics also represents the N. A. C. C. which has appointed in addition D. C. Fenner, Salisbury and M. K. Pulcher. Those members of the joint committee who were present at the beginning of the S. A. E. summer meeting at White Sulphur Springs, had a conference with Secretary Hoover's representative, M. R. M. Hudson. A start will be made on tires, rims, bearings and spark plugs.

Problems of the Steel Worker Discussed

The American Society for Steel Treating, New York Chapter, considered chiefly the problems that confront the worker, at its June 21 meeting in the Woolworth Building. A. H. Kingsbury, of the Crucible Steel Co. of America, spoke on the troubles that are encountered in handling tool steel. He said that great progress is being made in the art of making and treating tool steel, and that the exchanging of data as now practiced is accomplishing a great deal of good. Mr. Kingsbury called attention especially to the desirable properties of tungsten steels for tools. The factors entering into the problem of making good tools, and methods of overcoming the numerous difficulties were taken up.

Molten salt baths for use in carburizing were discussed both broadly and in detail by Sam Tour, metallurgist of the Doehler Die Casting Co., of Brooklyn. Mr. Tour told of investigations made in a search for the best salt bath, and he gave the data and properties of a number of baths. The commercial salt baths and other less known baths were discussed, the conclusion being, however, that there is still much to be desired in the properties of the baths now available.

Engineering Educators Plan Greater Activity

The necessity for a new and broader vision of engineering education, based on the requirements and demands of industry, was outlined by the president, Prof. Chas. F. Scott, of Yale University, at the annual convention of the Society for the Promotion of Engineering Education held last week in the University of Illinois in Chicago.

Resolutions were adopted for enlarging the scope and the securing of funds to carry on the work on a broader scale. A committee of five members, including the president, was appointed to study the development of the society and to formulate an answer to the question, "What can the society do in a comprehensive way to develop and enrich engineering education?" The keynote of the discussions at all sessions was the development of teachers who can train engineers, with analyses of plans that are now being studied to make university training more effective.

At the conclusion of the convention, the following officers were elected for the ensuing year: Chas. F. Scott, Yale, president; D. S. Kimball, Cornell, and F. G. Higbee, Iowa, vice-president.

Committee To Study Friction Bearings

The Chief of Ordnance has appointed a committee to conduct a series of tests on anti-friction bearings both in the Bureau of Standards and in service stations. Col. Stayer, of the Ordnance Corps, is chairman of the committee and the members are Messrs. Runge and Brunner, respectively vice-president and chief engineer of S. K. F. Industries, Inc., Mr. Snyder of the Dixon Crucible Co., and Mr. Ungar, consulting engineer. The tests will extend over a year and will cover comparative service and endurance tests on ball and roller bearings and on lubricants prepared for use with anti-friction bearings. They are intended to be essentially practical in nature and scope.

Increase in Automobile Production

Figures received by the Department of Commerce show a very large increase in May in the production of passenger automobiles and trucks. The total production of passenger cars in May, so far reported, amounted to 231,699, compared to 197,221 in April. This is an increase of nearly 18 per cent.

The total truck production in May was 24,603 machines.

Reports have been received this month from a number of companies which have not reported previously. This has necessitated a revision of the figures for earlier months. For the month of May 91 companies have reported on passenger-car production and 82 companies on trucks.

Business Conditions in England

BY OUR LONDON CORRESPONDENT

After a lockout of fourteen weeks duration, the Amalgamated Engineering Union has voted to accept the employer's proposals—and an early resumption of industrial activity seems now in sight. While some doubt is entertained in certain quarters, it is generally hoped that the return of the employees to work will come in time to rescue, to some extent, a season which, a few months ago, gave promise of being a very successful one.

The effect of the lockout and its monetary loss to industry is difficult to estimate. Certain electrical engineers are today complaining of a marked decrease in orders as a result of the inactivity. In the automobile industry, more especially in the lighter branches, in which the early prospects seemed particularly bright, there has been a marked falling off in orders. Shipbuilding costs are still held to be prohibitive.

German Imports

The machine tool trade shows little change. While a fair number of machine tools have been exported, the relatively few imports of this character have been mainly from Germany. In a recent month that country sent in 140 tons out of a total of 259 tons. The United States accounted for a little over 50 tons and France for less than 40 tons. Although German tools are coming into the country, it is difficult to discover accurately to whom they are actually being sold. To a large extent they are being hawked about by relatively small men. That the prices are low may be gathered from the fact that a month or so ago drilling machines imported from Germany as compared with those coming from the United States were approximately equal in money value, although the total weight of the German tools was seven times that of the American tools. This is, perhaps, an exceptional case but it does not stand alone altogether.

The coal industry generally has been on the up grade. Wages paid, however, have fallen, in many instances, below what can be regarded as a reasonable level in these times. The output, nevertheless, is moving upwards and is definitely beyond the corresponding figure for last year. Foreign markets are being recovered rapidly, including certain ones that were thought to have been lost. With a revival in home industry prospects would be entirely satisfactory, as it has been admitted that the workmen, generally, are working hard with increasing output. Apart from wages, there is the handicap resulting from high prices for coal as delivered to the consumer. The high price of coal is regarded as about the main reason for the collapse of the tin-mining industry in Cornwall, where not a single tin mine is working. Generally speaking, it is felt that the production side of the coal industry is being run at a loss, despite low wages being paid. A return to the 8-hour day has been suggested, and it is claimed that this would reduce the price of coal by 2s. 6d. a ton. A better remedy, perhaps, would result from a thorough examination into the methods and costs of distribution. The South Wales district especially has been cited as a case in point on the ground that the output there has reached 1,100,000 tons a week, as compared with 1,250,000 tons in the record year of 1913. Despite this showing, however, the business has not been profitable as is seen from the auditor's certificate just issued for the coal trade of this area for April showing a total deficit of more than £316,000.

That industrial conditions, on the whole show improvement is indicated by the unemployment returns, the figures recently published showing a reduction for the year of 309,500. The total number of unemployed workers—men, women, boys and girls—is stated, at the present time, to be 1,514,200. The number of workers on short time and drawing benefit for intervals of unemployment also shows a marked reduction, the latest figure being 120,000.

It is hoped that the reduction of the income tax by 16 per cent will do much to stimulate trade. Even with this reduction the tax is held to be the major handicap on enterprise, and the demands of the tax gatherer are certainly detrimental to expansion. On the other hand, doubt is expressed as to the wisdom of the present reduction, it being maintained that the Chancellor of the Exchequer is taking more or less risk. The slight reduction in postal rates may furnish some relief. Figures for the cost of living show still further declines, being now 81 per cent above pre-war rates. For a time they will probably be stationary at or near that figure, as the wholesale price tendency has been to increase very slightly.

Government Credit

The government is lending such assistance as it can, as evidenced by the credit of £3,000,000 granted to Portugal by the export credit department of the board of trade. According to the conditions of the loan the funds must be applied exclusively to the purchase in England from English firms of goods produced or manufactured wholly or in part within the United Kingdom. Articles of luxury, arms and munitions, generally, are not included in the terms. Although under the conditions English firms and payment in England are mentioned exclusively, doubtless Great Britain and British firms are really meant.

Conditions in Norway are regarded as showing improvement, reports stating that certain stocks have been absorbed and credit thus relieved, so that with an improvement in the currency situation an increase in the volume of business between the two countries is anticipated.

The Safeguarding of Industries Act, by which a duty of 33⅓ per cent has been imposed on a considerable number of imported articles, largely chemicals, has proved to be full of absurdities, nothing being more ridiculous than the means employed to obtain the return of money wrongly paid as duty. In the course of the operation of the Act, customs officials have levied a duty on a number of articles which, it has been held, should not have been placed on the list. Nevertheless, the duty has been paid and the officials have refused to refund it. Merchants, therefore, have been compelled to re-export such goods to a convenient continental port, claim the drawback provided for by the Act, and then re-import the goods free of duty.

Interference Methods in Precision Gages

Precision gages are used in the shops as reference end standards for checking micrometers and other measuring instruments, and also as distance pieces or size blocks for precise mechanical work. The extensive use of precision gages necessitated by the small tolerances allowed in the manufacture of interchangeable machine parts, has required more accurately determined end standards and more rapid and precise methods for comparing gages with these standards than have previously been available. Since comparisons of end standards with line standards by means of micrometer-microscopes and of precision gages with end standards by means of contact instruments are subject to appreciable errors, methods which make use of the interference of light waves have been used by the Bureau of Standards in making these measurements.

Scientific Paper No. 436 of the Bureau of Standards has been prepared and describes interference methods by which the planeness and parallelism errors of precision surfaces can be measured, and the length of standard gages can be determined by direct comparison with the standard light waves with an uncertainty of not more than a few millionths of an inch. The errors of other gages can be determined by comparison with these calibrated standards with equal precision. The process makes the standard light waves, which have been determined to 1 part in 4 or 5 million relative to the international meter, the standards for this work. The paper may be obtained from the Government Printing Office, Washington, D. C., at ten cents a copy.

Dornbirer Gives Machine to Alma Mater

Rose Polytechnic Institute, at Terre Haute, Ind., has received its first gift for the new institution, which is being completed east of that city. It is a Cleveland open side planer and will be the center-piece of all other machinery installed in the new building. The machine is the gift of J. C. Dornbirer, machine tool manufacturer of Cleveland, Ohio.

At the age of twenty-nine, Mr. Dornbirer went to Terre Haute to attend Rose. He spent two years in school before branching out as a manufacturer. Dr. Philip Woodworth, president of Rose, voiced his deep appreciation and the gratitude of the institution.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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A report of the Federal Income Tax Bureau giving the individual incomes returned from 1914 to 1920 was published last week. I cannot do more than advert to them in this letter but the figures are so important that I have prepared an exhaustive analysis of them that I shall be glad to send gratis to those who may write me at 16 Exchange Place, New York.

Briefly they show that within three years the number of those having incomes of as much as $100,000 or more has been nearly halved. On the other hand the number of those reporting incomes of from $1,000 to $3,000 increased from 2,479,465 in 1917 to 5,241,266 in 1920, in which year there were 7,259,944 persons in the United States who reported incomes of $1,000 or more. Of these 33 had incomes of $1,000,000 or more, 3,649 had incomes of $100,000 or more and only 226,120 had incomes of $10,000 or more.

Industry Gaining

It is hard to believe that the larger incomes are so few in number, but if the returns reflect the facts the rich are no longer growing richer and the poor poorer as was formerly asserted.

The reasons for the change cannot be here discussed, but one result is likely to be an increased demand for the inexpensive staples and necessaries that are bought by people of small incomes and a restricted sale of the luxuries and superfluities formerly purchased by the rich.

The record of the week bespeaks continued gain in commercial and industrial activity. Bradstreet's and Dun's reports of last week agreed that business sentiment is cheerful and trade and industry are better situated than for nearly two years. The Social Service Bureau in Detroit announced that "well paid jobs for 400 men are going begging" and from all over the country a growing scarcity of labor is reported.

Charcoal iron is $1 higher at $26.50 per ton as compared with $22 two months ago, and Birmingham pig is up to $20 a ton. The steel mills are all busy and in the Youngstown district they are working up to maximum capacity to supply the demand from the automobile makers. Ingot production for the whole country is now at the rate of 39,000,000 tons annually as compared with 20,000,000 tons last December. Even copper, the laggard among the metals, is firmer though still for sale at slightly under 14 cents. The paper industry is operating at capacity and lumber of all sorts is again higher.

The sugar refineries are exceptionally busy. The domestic as well as the export demand is unusually large and refined sugar is up to 6.30, with every prospect of higher prices. The cotton goods market has been very active. It is estimated that 300,000 pieces of print cloth were sold in New York during the first three days of last week and the distribution in other lines was relatively as large. Raw cotton has been firm and the whole world seems imbued with the belief that it will be a season of very high priced cotton, although crop reports are slightly better and a prominent South Carolina planter has announced that by using a mixture of molasses and arsenate of lime he has conquered the boll weevil.

The New England textile strike is practically over with. The advance in wool seems to be halted but more woolen goods than are for sale appear to be wanted. Crude rubber is firmer and slightly higher, which is not surprising when the demand for tires is considered. Railroad officials are looking for a large increase in freight traffic after July 1 and many railroad consolidations are being talked of, including one that will take in the "Clover Leaf," the Western Maryland, the Wheeling and Lake Erie, and the Buffalo, Rochester & Pittsburg.

The New York and Boston Federal Reserve Banks have reduced their rediscount rate to 4 per cent and it is expected that the other banks will soon follow their example. The reserve ratio is 79.1 per cent as against 77.4 a week ago, and the gold on hand is increased by $12,000,000. Call money has averaged about 2¾ per cent, and 4 per cent is the rate for commercial paper and time loans.

Contemplating such a roseate outlook it is somewhat surprising that speculation should have suddenly become lethargic. But it is summer time and there are many who believe that the improvement in general business was discounted by the advance in stocks occurring prior to the first of June and that the bond market has been "fed up" with new issues that will have to be digested before a fresh appetite will be felt. This is probably true, but unless something untoward occurs before the harvest season ends a fresh upward movement on the Stock Exchange in which railway securities are likely to lead seems likely.

Coal Strike Serious

The repressive factors at present include not only the unsettled coal strike but a vaguely threatened strike of the railway operatives whose wages have been reduced by the Labor Board. The well informed regard the latter as almost impossible but its possibility breeds caution and it must be admitted that the continuance of the coal strike is creating a situation that will become grave unless it is soon ended.

A scarcity of coal is already felt in some directions and as we are not far away from the time at which the winter's supply would normally be accumulated there is reason to expect trouble unless full production is resumed by the first of August. The present hope of consumers is that the non-union mines can supply the demand if they are worked to full capacity but this is very doubtful and the need of effective intervention in the settlement of the dispute is becoming increasingly evident. The Geological Survey reports that reserve stocks of bituminous are now down to 26,000,000 tons, which is within about a week's consumption of the official danger mark of 20,000,000 tons.

Another somewhat disturbing feature is the low price of wheat, which is said to be inciting a holding movement among the farmers that would tie up much money and restrict the autumnal liquidation of agricultural debts to which the country's business is adjusted and accustomed.

Improved Foreign Outlook

The fumbling at Washington with a tariff bill of which hardly anyone approves is another disconcerting influence but because the public have become somewhat accustomed to the ineptitude of Congress the effect is not quite as depressing as it might be and there is some hope that out of the delay a rational measure may be evolved.

From London there have come reports of an amicable interview between Lloyd George and Poincare which have been construed to mean that the French will shortly make it possible for the bankers to reconsider their decision and bring out a German loan. The market for foreign exchange advanced sharply upon this assumption but there is nothing official to confirm it, logical as it would be.

The reports of Lenin's complete incapacity are confirmed and denied, but the weight of evidence indicates his final passing as a political power in Russia.

The settlement of the Mexican debt agreed upon by the Lamont Committee and Huerta awaits Obregon's approval which some believe will be conditioned upon the recognition of his government at Washington. The news from Cuba indicates progress toward the re-establishment of normalcy and in China the military leaders on both sides seem to be talking rather than fighting. In so far as overseas conditions are concerned they seem to be improving in the Orient as well as in Europe. Though progress is slow, there are no new developments that are adverse to American business and with the exceptions above noted, there is nothing in sight to disturb business confidence in the present or future.

Pig Iron Prices

Pig iron sales in the Birmingham district during the third week of June, according to the report of the Southern Metal Trades Association, showed a price range of from $18 to $20 per ton. The greater portion of the tonnage sold for delivery during the latter part of the third quarter was at $19 per ton, with a price of $20 per ton base prevailing for the fourth quarter.

Washington Notes

By Paul Wooton

Criticism of secret formulas by which decisions are reached by the Internal Revenue Bureau in tax matters, based on letters from Ernest F. DuBrul, general manager of the National Machine Tool Builders Association of Cincinnati, has been made by Senator Pomerene of Ohio in the Senate, in a speech in which the Senator urged the creation of a Court of Internal Revenue Appeals. Mr. DuBral, in his correspondence with the Senator, points out that the revenue bureau uses three confidential formulas for determining various things in fixing income taxes, and that additional taxes have been levied thereon. He stated that the formulas should be made available to the public to determine the justness of the tax. Secretary Mellon of the Treasury, who was appealed to on the matter, justifies the secrecy on the ground that the comparatives used are drawn from returns filed by other taxpayers and that it is unlawful to reveal them. He states that no "hit or miss" policy is pursued, but that adjustments in income and invested capital are made upon the basis of principles defensible under the tax laws. To this Mr. DuBrul replied that as the formulas are used in determining what salaries should be paid to officials of companies, the absence of knowledge of the formula made it impossible for a taxpayer to check the correctness of the formula. In claiming that the formulas, by which the bureau measures salaries to determine whether or not they are excessive, should be made public, Senator Pomerene declared "there is secrecy about the administration of the Bureau which discredits it."

The Budget Bureau has asked Congress to pay $199 to the Empire Machinery and Supply Corporation of Norfolk, Va., for balance due on account of materials furnished in connection with construction operations at the Cape Charles quarantine station. The supplies consisted of plumbing and heating materials.

The Budget has also requested that the Public Health Service be allowed to use $50,000 already appropriated for the West Roxbury, Mass., hospital, for constructing an auxiliary steam line.

Senator Willis, Ohio, has presented to the Senate a protest of the National Machine Tool Builders' Association of Cincinnati, E. F. DuBrul, general manager, against the recent action of the Senate in reducing the duty on machine tools from 35 to 15 per cent ad valorem. The petition also denies the statements of Senator Simmons of North Carolina, in the tariff debate that exorbitant profits are made by the machine tool manufacturers.

The deficiency appropriation bill reported to the House by the appropriations committee authorizes an appropriation of $271,000 for replacement of equipment and enlargement of the Capitol power plant to connect with the government printing office and the Washington city postoffice.

A correspondent is anxious to secure a copy of Chordal's letters by James W. See. Any reader having a copy to dispose of is requested to write to the editorial department of *American Machinist.*

Business Items

I. B. Williams and Sons, Dover, N. H., manufacturers of leather belting, announce the establishment of a new department of their business for the manufacture of mill strapping of all kinds. T. L. Chapman, for many years New England manager for the Deford Co., has been placed in charge of the new department.

The Worcester Machinery Co., machinery dealers, 86 Foster St., Worcester, Mass., will remove to its new location at 140 Commercial St., Worcester, on July 1.

The Barber-Colman Co., Rockford, Ill., manufacturer of cutting tools, has filed notice of a reduction in capital from $2,500,000 to $1,000,000.

The Pennsylvania Pump and Compressor Co., Easton, Pa., announces the opening of a branch sales office at 105 West Monroe St., Chicago, Ill., with H. M. Montgomery in charge.

The Star Foundry and Machine Co., Sharon, Pa., has taken over the plant of the Turner Fricke Manufacturing Co., of that city and will continue the production of gas engines and accessories.

The Master Trucks, Inc., 3122 South Wabash Ave., Chicago, Ill., manufacturer of motor trucks, has arranged for an increase in capital from $1,500,000 to $1,710,000 for expansion.

The American Car and Foundry Co., Terre Haute, Ind., is planning to reopen its local plant on July 5, following a shutdown for a number of months past. About 700 men will be employed, of which approximately 300 will be engaged in the repair departments.

The Fall River Sheet Metal Co., Fall River, Mass., has removed its plant from 247 Malden St., to 43 Fourth St., where facilities for increased production will be provided.

The Southern Dry Dock and Shipbuilding Co., Orange, Tex., will increase its working force to handle a contract for car repair and rebuilding work, recently secured from the Gulf Coast Railroad. About 200 men will be employed in this department.

The Buffalo Steel Car Co., Cheetowaca, N. Y., is arranging for a preferred stock issue of $1,000,000, a portion of the proceeds to be used for general expansion.

The Moline Plow Co., Moline, Ill., has arranged for a change in its corporate name to the Illinois-American Plow Co.

The Iron Products Corporation, which controls the Central Coal and Iron Co. and the Central Foundry Co., of Birmingham, Ala., announces the removal of its central sales offices from Chattanooga and Atlanta, to Birmingham. The change is effective immediately.

The American Bridge Co., New York City, has announced the removal from 30 Church St. to 71 Broadway, of the following departments: vice-president, chief engineer, eastern division contracting and treasury. The eastern division engineering, traffic and subcontract departments will remain at 30 Church St.

The Machinery Dealers, Inc., 453 Chapel street, New Haven, Conn., recently incorporated to deal in machinery, tools, etc., elected the following officers last week: W. E. Daley, president and treasurer; C. C. Sibley, secretary and assistant treasurer; directors, W. E. Daley, C. C. Sibley, and Arthur C. Bisgood, of Bridgeport, and E. M. Daley, of New Haven, Conn.

The Hartford Auto Parts Corp., Hartford, Conn., has been incorporated under the laws of Connecticut, with a capital stock of $430,000, to manufacture automotive machine parts, etc. The company will acquire the plant formerly owned by the Hartford Automotive Parts Co., Broad and Lawrence Sts., Hartford, which was recently sold at public auction to Robert C. Morris of New York, for $350,000. The incorporators of the new company are: Lucius F. Robinson; Lucius F. Robinson, Jr., and Frances E. Jones.

The Waterbury Standard Tool and Machine Co., Waterbury, Conn., has recently voted to dissolve the business and a certificate to that effect has been filed with the Secretary of the State of Connecticut. Harry B. Jenkins, 53 Euclid ave., Waterbury, has been appointed agent, and all claims should be forwarded to him.

The firm of Many & Mayer, Indianapolis, Ind., manufacturers of machinery for printing plants, has purchased a tract of ground on No. Ellsworth St., Indianapolis, where a new machine shop will be constructed in the future.

The Syracuse Sander Manufacturing Co., Inc., of Syracuse, N. Y., has filed notice of an increase in its capital stock from $10,000 to $50,000. The company makes special machinery and tools of various kinds.

The Electric Manufacturing Co., of Syracuse, N. Y., has been incorporated to make electrical machinery and devices. Incorporators are: Charles L. Amos, Florence B. Conway, and E. Merritt Larkin.

The E. Z. Car Control Corporation, Syracuse, N. Y., with a capital of $100,000, has been organized. William M. Lawyer, Franklin A. Lawyer and Albert C. Coon are the incorporators.

The Waterbury Farrel Foundry and Machine Co., Waterbury, Conn., it is announced, is completing an order for coining presses, rolling and punching machinery valued at $500,000, to be used in the new Shanghai mint. The work is being done under the supervision of Clifford Hewitt and his son, Harold, the former being the designer and builder of the U. S. Mint in Philadelphia.

The Fred C. Dickow Machinery Co., of Chicago, has removed to 2105 W. Lake St.

A portion of the No. 3 plant of the Wilson Foundry and Machine Co., at Pontiac, Mich., has been taken over by the Willys-Knight concern. The move was made to allow for expansion of the motor division.

The Willys-Overland plant at Poughkeepsie has been sold at a receivers' sale. Clement O. Miniger, of the Auto-Lite Corporation, was the purchaser and the price paid was $2,000,000.

Personals

ALBERT E. NEWTON, for many years with the Reed-Prentice Co., Worcester, Mass., has just been made general manager of the Collins Company, Collinsville, Conn.

FRANK W. OLIVER, well known in twist drill circles, has become associated with the Whitman & Barnes Manufacturing Co., in the capacity of Eastern sales manager with headquarters at 64 Reade St., the company's New York City store.

A. B. NEUMAN, for the past three years chief consulting engineer for the Steel and Tube Company of America, has opened offices as consulting engineer in the Peoples Gas Building, 122 S. Michigan Ave., Chicago, Ill.

A. J. MASKREY, for eleven years general superintendent of the Carnahan Sheet and Tinplate Co., of Canton, Ohio, has been made general manager of the Falcon Tinplate Co., this company having recently taken over the Carnahan plant.

CHARLES A. STREB, formerly secretary and paymaster of the Carnahan Sheet and Tinplate Co., Canton, Ohio, has been appointed general superintendent of the Falcon Tinplate Co.

HARRY BROWN, formerly connected with the Diamond Rubber Co. and the Williams Foundry Co. has been appointed factory superintendent of the Franz Foundry and Machine Co., Canton, Ohio.

R. P. VOLKNER, formerly purchasing agent for the Tate Jones Co., has been appointed to the position of sales representative of the Colonial Steel Co., Pittsburgh, Pa., with headquarters at Cleveland, Ohio.

J. W. HEMMERLE, formerly manager of the machine tool department of the Fairbanks Co., has become associated with L. A. Greene, 1113 First National Bank Building, Pittsburgh, Pa., supervising the machinery and equipment division of the business.

WILLIAM KNOX, for many years associated with the American Sheet and Tinplate Co. at their plant at Wellsville, Ohio, has been appointed to the position of assistant manager to succeed John Dunlop, resigned.

J. S. BLACK, for the past two years assistant machinist sales manager of the New Britain Machine Co., New Britain, Conn., has been appointed to the position of works manager of the Corbin Screw Division of the American Hardware Corporation, New Britain, Conn.

ROSWELL SORROW, for the past two and half years works manager of the Corbin Screw division of the American Hardware Corporation, New Britain, Conn., has tendered his resignation to take effect July 1.

HAZEN B. HINMAN, until recently in the sales department of the Stanley Works, has become associated with the Trumbull Steel Co., Warren, Ohio, in the capacity of superintendent.

GEORGE S. BARTON, president and treasurer of the Rice, Barton and Fales Machine and Iron Co., Worcester, Mass., has returned to Worcester from his recent European trip.

HENRY D. ROLPH, of the export department of the Yale and Towne Manufacturing Co., Stamford, Conn., will leave shortly for the Orient on a business trip that will take about two years. Mr. Rolph, will visit China, India, Manchuria, Australia, New Zealand, Malay States, Java, Sumatra, Siam, Philippine Islands, South Sea Islands etc.

WILLARD L. CASE, treasurer of the Yale and Towne Manufacturing Co., Stamford, Conn., has resigned his position with the company, to become a partner in the firm of Searle, Nicholson, Oakey and Lill, Accountants and Engineers, New York City.

JOSEPH N. LAPOINTE, president of the J. N. LaPointe Co., New London, Conn., has been appointed temporary receiver of the Arnold Electric Tool Co., New London, Conn., by Judge James H. Webb of the Superior Court. Mr. LaPointe is an officer and one of the principal stockholders of the Arnold firm.

J. H. TOWNE, secretary of the Yale and Towne Manufacturing Co., Stamford, Conn., has been elected treasurer of the company, to succeed Willard L. Case, recently resigned. Mr. Towne, will fill the offices of secretary and treasurer.

CHARLES A. DANA, directing head of the Spicer Manufacturing Co., South Plainfield, N. J., manufacturer of universal joints and propeller shafts, has been elected president of the Hartford Auto Parts Corp., Hartford, Conn., recently incorporated to manufacture automatic parts.

ADDISON BOREN, for the past few years connected with Yale and Towne Manufacturing Co., Stamford, Conn., has recently been elected comptroller of that company.

JOHN F. TINSLEY, vice-president and general manager of the Crompton and Knowles Loom Works, Worcester, Mass., has been appointed a member of the committee to promote a New England Industrial Exposition in Worcester in 1925, by the Worcester Chamber of Commerce.

Trade Catalogs

Steel Casements and Windows. David Lupton's Sons Co., Philadelphia, Pa., General Catalog No. 11, 191 pages, describing Lupton service and product, extensively illustrated and containing considerable data of value to architects and engineers in the application of Lupton's steel sash, casements and windows to industrial, office, apartment and residential building construction of all classes. The special catalog of 41 pages on casements and double hung windows, also available, is designed especially for architects and operative builders to show the application of steel windows to every room in the home. Both publications are of artistic merit, representing an innovation in catalogs of this kind, and are comprehensive handbooks on the steel sash industry in its broadest phases.

Grinding Practice. Norton Co., Worcester, Mass. An eight page bulletin with an artistic arrangement reviewing the progress of grinding practice with cuts illustrative of numerous modern grinding methods applied in the plant of the International Motor Car Co.

Squaring Shear Knives. Niagara Machine and Tool Works, Buffalo, N. Y. A bulletin which is, in reality, a valuable instruction sheet for users of the Niagara squaring shear. Instructions for testing the shears, as well as detailed information relative to procedure to be followed in attaching, adjusting and re-grinding the knives is given.

Drawing Instruments. The C. F. Pease Co., 813 North Franklin St., Chicago, Ill. Catalog C-22 illustrating various types of special American made drawing instruments as well as complete sets of draftsmen's tools.

Air Drills. Chicago Pneumatic Tool Co., Chicago, Ill. Bulletin 598 descriptive of various types and sizes of Little Giant air drills with tabulated data containing specifications obtaining on each size. The bulletin also contains illustrative and descriptive matter covering the Little Giant pneumatic grinders and close quarters drills.

Pyrometers. Thwing Instrument Co., 3339 Lancaster Ave., Philadelphia, Pa. Bulletin No. 11, containing 15 pages descriptive of Thwing radiation pyrometers, their construction, theory of operation and application in various industries.

Malleable Nickel. American Nickel Corp., Clearfield, Pa. Bulletin No. 101 containing useful information and tables on the chemical and physical properties of nickel.

Taps and Dies. Vermont Tap and Die Corp., Newport, Vermont. A twelve-page catalog giving information and tables of sizes of taps and drills made by this company.

Gear Cutting Machinery. Newark Gear Cutting Machine Co., 69 Prospect St., Newark, N. J. Catalog No. 4 describing the Newark No. 2-B Spur and bevel gear cutting machine for light and medium work. Complete specifications of the machine, illustrations showing samples of work done and various tables are given.

Forging and Heating Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 241 descriptive of heating furnaces for forging, tire, plate and angle heating with introductory matter on the subject of methods of heating and its cost.

Hardinge Conical Mill. The Hardinge Company, 120 Broadway, New York. A four-page bulletin describing the new conical mill which is made to grind both wet and dry ores for metallurgical processes and materials for industrial uses. The machine is described and illustrated in detail, and specifications and tables of operations are given.

Overhead Conveying System. Dreis and Krump Manufacturing Co., 2909 South Halstead St., Chicago, Ill. A four-page circular describing the Atlas carryall overhead conveying system.

Pamphlets Received

Getting Railroad Facts Straight. A fifty-one page pamphlet on wages, maintenance and valuation by Dr. C. S. Duncan; published by the Association of Railway Executives, 61 Broadway, New York City.

Powdered Coal Installation. A fifteen-page pamphlet by H. D. Savage, member of A. S. M. E., presented before Engineers' Society of Western Pennsylvania, Pittsburgh, Pa., describing powdered coal application. The pamphlet is published and distributed by Combustion Engineering Corporation, New York City.

Weighing by Substitution. Bulletin No. 208 of the Bureau of Standards, Washington, D. C., prepared by C. A. Briggs and E. D. Gordon, Associate Physicists of the Bureau. For sale by the Superintendent of Documents, Washington, price five cents.

Forthcoming Meetings

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

American Society for Steel Treating. Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4,600 Prospect Ave., Cleveland, is secretary.

American Manufacturers Export Association annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

National Founders Association, Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

The Weekly Price Guide

RISE AND FALL OF MARKET

Advances.—No. 2 foundry pig iron up 50c. per gross ton in Philadelphia and Chicago; heavier advances in Cincinnati. Scarcity of Connellsville coke; prices higher. Mill price of steel shapes, plates and bars, $1.70, f.o.b. Pittsburgh; quotations as high as $1.75 per 100 lb. for deliveries within 30 days. Very few orders for structural steel now being accepted at $1.60. Lower discounts quoted on bolts, rivets, nuts and washers in New York and Cleveland warehouses. Linseed oil up 2c. in New York and 7c. per gal. (5 bbl. lots) in Cleveland.

Declines.—Tin quoted in New York at 31⅜c. as against 32¼c. and zinc at 6⅛c. as compared with 6¼c. per lb., last week. Zinc sheets and solder cheaper in New York; babbitt metal down in Cleveland and New York. Old brass, heavy, down ⅛c. per lb. and sal soda 10c per 100 lb. in Cleveland.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	26.50
Southern Ohio No. 2	29.16
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	27.32
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Detroit	7.0	4.5	3.0
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5
Cincinnati	6.0	5.0	4.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2 40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No. 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4.20	3.60	4.30
Nos. 25 and 26.	3.10	4.25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.35	3.75	4.45
Nos. 12 and 14.	3.25	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	¾ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	3.23
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.00		12@13
1/8	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	31.75
Lead (up to carlots), St. Louis, 5.60; New York	6.25
Zinc (up to carlots), St. Louis, 5.30; New York	6.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	21.00	23.00
Copper wire (carlots)	16.00	17.00	16.25
Copper rods (ton lots)	19.00	22.00	19.50
Copper tubing (100-lb. lots)	22.75	24.00	23.00
Brass sheets (100-lb. lots)	16.75	18.00	18.75
Brass tubing (100-lb. lots)	20.00	21.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	16.00	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.00	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	.....
Solder (½ and ½), (caselots)	21.00	22.00	20.00
Babbitt metal (fair grade)	24.00	41.50	36.00
Babbitt metal (commercial)	11.00	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	11.50
Copper, heavy, and wire	12.00	11.25	10.50
Copper, light, and bottoms	10.00	9.50	9.75
Lead, heavy	4.75	4.75	4.75
Lead, tea	4.25	3.50	3.75
Brass, heavy	7.00	6.00	9.00
Brass, light	6.00	5.00	6.00
No. 1 yellow brass turnings	6.50	6.00	6.50
Zinc	3.00	3.00	3.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.60	7.25
IC, 14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.11½
Cotton waste, mixed, per lb.	.055@.09	.09	.08
Wiping cloths, 13½x13½	..... per M.	50.00	per lb. .10
Wiping cloths, 13½x20½	..... per M.	55.00	per lb. .13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.88	1.07	.96
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$7.50@$8	
Coke, prompt foundry, Connellsville	per net ton	$8.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	65-10%	60%
1½ and 1¼x3 in. up to 12 in.	33⅓%	60%	60-10%
With cold punched sq. nuts	35%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	40%	.....	$4.00 off
Button head bolts, with hex. nuts	25%	$3.90 net	.....
Hex. head and hex. nut bolts	30%	.....	65-5%
Lag screws, coach screws	50%	.....	60-5%
Square and hex. head cap screws	70-10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	40%	60%	50-5%
Bolt ends, with hot pressed nuts	50%	.....	55%
Tap bolts, (h. h. plus std. extra of 10%)	10%	.....	.....
Semi-finished nuts ⅝ and larger	65%	70-10%	80%
Case-hardened nuts	60%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	3.50	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	2.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	2.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	70%	60-10%
Rivets, tinned	60-5%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$4.00	$3.25	$3.10
Cone heads, ditto (net)	4.10	3.35	3.20
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	55-5%	50%	50-%
Copper burs	35%	50%	20%
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.28@0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.40
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Birmingham—The County Coal Co., 6833 1st Ave., H. Neny, Purch. Agt.—small lathe, drill press for 2 in. drill, and general equipment for machine shop. Also bids on all-steel tipples.

Col., Denver—The Chicago, Burlington & Quincy Ry., 547 West Jackson Blvd., Chicago—
One slotter with 20 in. and one with 16 in stroke.
One 48 in., one 42 in., one 32 in., one 30 in., one 36 in., seven 24 in., one 28 in., seven 18 in. and three 16 in. engine lathes.
One 7½ in. heavy duty type turret lathe, one 4½ in. hollow hexagon turret lathe, one 3¼ in. hollow hexagon turret lathe, with automatic fed and power traverse to turret, one flat turret lathe to handle chuck work up to 16 in. diameter, one 3¼ in. hollow hexagon turret lathe arranged for motor drive, 440 V. A. C., with automatic chucks, sets of bushing, universal turners, automatic opening die head, two tool holders and one pointing tool, one 2¼ in. Universal hollow hexagon turret lathe.
Two full Universal monitor lathes.
One squaring shear foot power.
Two hand bending rolls.
One bolt centering machine.
One hydraulic driving wheel press, 600 ton capacity, one hydraulic vertical type press, 100 ton, one hydraulic horizontal type press, 100 ton.
Two vertical power presses.
One 5,000 lb., one 2,000 lb., one 1,800 lb. double frame steam hammers.
One 500 lb. and one 200 lb. upright Helve hammers.
One pneumatic flanging clamp, one pneumatic flanging machine.
One open end type bar iron shear capacity to shear bars to 1½ in. diameter, one open end type bar iron shear capacity to shear bars up to 2¼ in., two double end punch and shear.
One single end horizontal type punch.
One sheet metal cutter.
Twelve pedestal dry grinders, one pedestal twist drill grinder, two pedestal wet grinders, one plain grinder, one Universal grinder, one vertical single spindle grinder, one oscillating surface grinder, four 48 in. grind stone mounted in metal casing for wet grinding.
Four heavy duty type upright drills, two 72 in. and one 48 in. radial drills, one 36 in., one 24 in. and three 20 in. upright drills.
One crank and four heavy duty type crank shapers.
One double spindle drill press.
One 96 in., one 54 in., one 42 in., one 36 in. and one 30 in. vertical boring mills.
One 36 in. x 36 in. x 10 ft., one 72 in. x 72 in. x 30 ft. and one 48 in. x 48 in. x 10 ft. bed planers.
Two heavy duty type milling machines.
One 2 in. forging machine.
One single head and one triple head bolt cutters.
One double head staybolt and crownstay machine.
Two pipe threading and one pipe bending machines.
One 3½ in. horizontal boring machine.
Above tools for use in shops here.

Ill., Chicago—Toth & Co., 1301 Larabee St.—machine tools and dies for machine shop.

Ill., Joliet—Bd. of Educ.—twelve 14 in. x 6 ft. standard lathes; twelve 14 in. x 6 ft. Mendley or American engine lathes with quick change gears and taper attachment; one American or Hendley tool room lathe; one No. 2 turret lathe; one 4 in. centering machine; one 8 in. x 36 in. Universal grinding machine; one small surface grinder; one 2½ in. drill grinder; six No. 2 Universal milling machines; two duplex No. 2 milling machines; one 30 in. vertical boring mill; one 30 in. x 30 in. x 6 ft. planer with one head on cross rail; eight 16 in. shapers; one small hardening furnace; seventeen bench vises with swivel cases.

Ind., East Chicago—Green Eng. Co.—two heavy duty drilling machines and one double disc grinder.

Kan., Cheney—E. J. Robinson—equipment for machine shop including lathes, forge presses, drills, grinder, etc.

Kan., Wichita—Motor Q Battery Co., 1619 East Douglas Ave., J. W. Martin, Purch. Agt.—drill press, lathe, emery wheel, belting, motor for power equipment.

Kan., Wichita—Richmond Electric Co., 237 South Topeka Ave., G. E. Richmond, Purch. Agt.—one power lathe.

Kan., Wichita—J. Spear Motor Specialty Shop, South Topeka Ave.—power lathe for machine shop.

Kan., Wichita—W. Sterling, 113 West 3rd St.—power lathe, drill press, emery wheel, and combination saw with motor and belting.

Kan., Wichita—Wichita Key & Novelty Co., 132 North Topeka Ave., J. Walker, Purch. Agt.—keyseating power machinery, lathe and hand drill press.

Kan., Wichita—Woods & Bailey, 153 North Emporia Ave.—portable electric drill, taps and die machine for garage.

Mich., Wyandotte—The All Metal Products Co., Labadie St.—miscellaneous metal working equipment for machine shop.

Mo., Kansas City—P. W. Deem, Fairmont Park—power wood lathe and band saw.

Mo., St. Louis—J. O. Coleman, 106 North 3rd St.—electric power drill for machine shop.

N. Y., Buffalo—J. Blatz, 343 East Ferry St.—equipment and machinery for proposed garage and service station.

N. Y., Buffalo—The Bd. Educ., 1401 Telephone Bldg., will receive bids until July 5, machine tools and equipment for woodworking shop, line shafting and pulleys, tempering furnace and blower, printing press.

N. Y., Brooklyn—Empire Metal Specialty Co., 327 16th St.—machine for light metal die works.

N. Y., Buffalo—M. Gevertzman, 1330 Genesee St. — equipment for proposed garage.

N. Y., Buffalo—J. Naples, 219 South Division St.—equipment for garage and service station.

N. Y., Buffalo—Swan Garage, Inc., East Swan St.—additional machinery, tools and equipment for proposed garage.

N. Y., Buffalo—M. Swerldorf, 2297 Main St.—equipment for proposed garage

N. Y., Buffalo—C. H. Tracey, 127 Allen St.—additional equipment for automobile service station on West Utica St.

N. Y., Copenhagen—Deer River Power Co., Inc.—equipment for machine shop.

N. Y., Mt. Vernon—J. Moller, 7 Valentine St.—flexible shaft for grinding dies.

N. Y., New York—Rathbun & Bird, 17 Walker St.—one vertical milling machine with rotary table.

O., Canton—The Arctic Ice Machine Co., Market St., S. and Penna. Ry.—machinery and equipment for proposed machine shop in connection with factory.

O., Cleveland—The Ohio Body & Blower Co., Detroit Ave. and 91st St.—one double crank press.

Pa., Bridgeville—Universal Steel Co.—roll turning lathe for 8 and 10 in. mill rolls.

Pa., Greenville—Greenville Steel Car Co., foot of Union St.—machinery and equipment for proposed factory and foundry, for the manufacture and repair of steel cars.

Pa., McKeesport—The Bd. Educ.—four band saws, ten 12 in. lathes, 1 planer, 1 shaper, 1 milling machine.

Pa., Mercer—Elliott Blair Co., East Market St.—equipment for proposed addition to steel plant.

Pa., Phila.—The Jones Machine Wks. Co., Landowne Ave. and 53rd St.—machinery and equipment for new machine shop.

Pa., Pittsburgh—The Stonecrete Corp., 6023 Penn Ave.—one small and one large drill press, 2 engine lathes, 1 shaper, 1 band saw, 1 punch and shear, 1 boring mill, belting, shafting, motors, and other equipment (used).

Pa., Pottsville—T. Golden, 315 North Center St.—small tools and equipment for large automobile service station and repair shop, soon to be constructed.

Tex., Beaumont—Gulf Welding & Machine Wks., 357-359 Pine St.—foundry and machine shop equipment.

Va., Big Stone Gap—H. C. Stuart—machinery and equipment for proposed garage.

Va., South Boston—South Boston Mfg. Co., J. O. Watkins, Secy.—machine shop and foundry equipment.

W. Va., Huntington—W. O. Hundley—machinery and equipment for auto repair and machine shop.

Wis., Boscobel—C. P. and H. F. Miller Co.—equipment for proposed auto repair shop.

Ont., Georgetown—J. O'Neill & Son, (garage and auto repair shop)—tools and equipment.

Wis., Kenosha—G. L. Ross, Public Service Bldg.—gasoline storage tank and pump and small tools for proposed garage.

Wis., Milwaukee—M. Froehlig, c/o P. E. Schaefer, Archt., 401 4th St.—gasoline storage tank with pump for proposed garage.

Wis., Milwaukee—Rautbord Mfg. Co., 86-88 Detroit St.—shaper and punch press.

Ont., London—London Metal Products, Ltd., D. Soper, Mgr.—wood and metal working machinery and tools for new plant.

Ont., Palmerston—I X L Mfg. Co., J. Youngson, Mgr.—tools and special machinery for the manufacture of batteries and materials.

Machinery Wanted

Ark., Fayetteville—Parker Bros.—2 revolution front delivery pony cylinder press, Miehle preferred.

Ark., Little Rock—Arkansas Fdry. Co., 6th St.—foundry equipment to replace that which was recently destroyed by fire.

Cal., Los Angeles—Imperial Cotton Mills Co., Loews State Theatre Bldg.—$750,000 worth of spindles and machinery for proposed cotton mill.

Fla., Frostproof—Chase & Co.—machinery and equipment for proposed fruit packing and canning plant.

Fla., Jacksonville—Milldale Ice Co., 1010 East Bay—machinery and equipment for proposed ice manufacturing plant.

Ga., Forsyth—Forsyth Hosiery Mills—Scott & Williams needle machines (220) Model B-5 (used).

Ga., Macon—Amer. Bakeries Co., 501 Cotton Ave.—equipment for new bakery.

Ga., Macon—Case-Fowler Lumber Co.—machinery for proposed lumber mill.

Ia., Chariton—The School Board, P. T. Perry, Secy.—manual training equipment for proposed high school.

Ill., Chicago—Chicago, Burlington & Quincy R R., Jackson Blvd. and Clinton Sts—two gantry cranes, 105 ft. between legs and 155 ft. over all; three 15 ton, two 225 ton, two 50 ton and two 10 ton cranes.

Ill., Chicago—M. M. Rothschild Co., Inc., 717 Federal St., (job printers)—power automatic press.

Ill., Chicago—Western Newspaper Union, 210 South Desplaines St.—Optimus printing press.

Ill., Rock Island—Servus Rubber Co., J. T. Crowley, Purch. Agt.—vulcanizers.

Ia., Thurman—F. Flatt—linotype machine.

Ia., Waterloo—Rath Packing Co., Inc.—machinery and equipment for packing and power house.

Kan., Wichita—Advance Publishing Co., 137 South Topeka St., L. C. Ball, Purch. Agt.—automatic power paper cutter.

Kan., Wichita—C. W. Gothern, 304 North Main St.—power grinding machinery.

Kan., Wichita—Steffins Ice Cream Co., 623 East 1st St., J. B. Pottinger, Purch. Agt. —shafting, belting, hangers, bearings and pulleys for new factory.

Ky., Princeton—J. L. Poole—flour mill machinery and equipment for plant, 100 bbl. per day capacity, (new or used).

Md., Hagerstown—Hagerstown Re-Tinning & Plating Wks., M. L. Bingley, Pres.—machinery and equipment for plating and re-tinning works.

Mich., Detroit—Bernard Stamping Co., 7175 Clayton St.—miscellaneous equipment for manufacturing metal stampings.

Mich., Detroit—Burr-Patterson Co., 4211 Woodward Ave.—miscellaneous equipment for the manufacture of jewelry.

Minn., St. Paul—L. F. Dow Co., 381 Jackson St.—machinery equipment for proposed half million dollar plant; equipment for print shop, lithographing, leather goods, manufacture, etc.

Minn., St. Paul—The State Board of Control, D. F. Mullen, Secy.—electric crane and air compressors to equip new mines experiment station at State University physical plant.

Minn., Scanlon—Minnesota Slate Co., G. W. Edwards, Pres.—machinery for mining, manufacturing and preparing slate for roofing.

Minn., South St. Paul—Katz & Horne Packing Co., L. D. Horne, 229 East 4th St., St. Paul, Purch. Agt.—machinery and equipment for proposed packing plant.

Miss., Hazelhurst—W. H. Emerson—refrigeration machinery and equipment for 25 ton ice plant.

Miss., Jackson—Clarion-Ledger—proof press for 8 column, 21 in. page galley.

Mo., Kansas City—Riggen-McLaughlin, 18th and Montgall Sts., job printers—12 x 18 Miller power press.

Mo., St. Louis—Modern Printing Co., 2604 Olive St.—12 x 18 Chandler & Price printing press.

N. J., Anglesea—The Arctic Ice Co., W. E. Epler, Genl. Mgr.—two 50 ton ice machines for refrigeration and cold-storage plant.

N. Y., Buffalo — Allen Mfg. & Welding Corp., 163 Adam St.—welding machines and equipment for factory on Washington and Tupper Sts.

N. Y., Buffalo—Behringer Bros. Planing Mill, 171 Imson St.—quantity of 8 and 12 in. leather belting.

N. Y., Buffalo—M. Brownstein, 396 Bway. —machinery and equipment for the manufacture of candy.

N. Y., Buffalo—Eastern Oil Refining Co., J. S. Embleton, Vice-Pres.—one 12,000 gal. gasoline storage tank, also one 550 gal. tank and pump for filling station.

N. Y., Buffalo—The Eberhardt Steel Products Co., 43 Chelsea St.—machinery and equipment for small blacksmith shop.

N. Y., Buffalo—C. LaDuca, 224 Front Ave.—equipment for large bakery.

N. Y., Buffalo—H. Wile & Co., Ellicott and Carroll Sts.—one portable electric sander for refinishing table tops.

N. Y., Brooklyn—J. P. Stenger & Son, 226 Van Sicklen Ave. (glass labels)—small oval glass cutting machine.

N. Y., Gorham—Babcock Pickling & Canning Plant—machinery and equipment for cabbage and canning plant now under construction.

N. Y., Jamestown—Ulrich Plan File Co., 516 West 4th St., manufacturer of vertical filing equipment for offices, etc.—machinery and equipment for proposed factory including buzz saws, etc.

N. Y., New York—Star Photo Mountings Co., 242 Lafayette St.—one No. 4, 14 x 18 in. embossing machine for paper.

N. Y., New York—Sterling Shop, 206 West 29th St.—one jig saw, suspension type.

N. Y., Rochester—Du Bois Press, 82 St. Paul St.—machinery and equipment for remodeled printing plant.

N. Y., Rochester—The Morrey Co., 42 Cortland St.—equipment for proposed addition to sheet metal plant.

N. Y., Rochester—The North East Electric Co., 348 Whitney St., address Purch. Dept.—sand blast barrel, New Haven No. 2 preferred (used).

N. C., Rutherfordton—Peoples Ice and Fuel Co.—machinery and equipment for propoesd ice manufacturing plant.

N. C., Sanford—Sanford Sash & Blind Co., plans to establish match plant—machinery for the manufacture of matches.

O., Akron—Akron Engraving Co., 330 South High St.—proof press.

O., Columbus—E. A. Prentice Lumber Co., Vine and Armstrong Sts.—one window frame machine, one small planer, and other woodworking machinery.

O., Ironton—Ironton Boiler Wks. Co.—one 20 hp. double drum hoisting engine, without boiler, one 5 ton and one 10 ton stiff leg derrick (new or used).

O., Kenmore—The Palmer Match Co., Inc.—machinery and equipment for proposed match manufacturing plant.

O., Newton Falls—Newton Steel Co.—three cranes, including one 10 ton and one 30 ton.

Pa., Bradford—Hall & Thomas, 45 Hilton St., B. F. Hall, 210 South Ave., Purch. Agt. —machinery and equipment for the manufacture of waterproof cement caskets.

Pa., Bridgeport—Gehret Bros.—machinery and equipment for proposed iron works.

Pa., Erie—Erie Burial Casket Co.—machinery for new casket manufacturing factory.

Pa., Frankford (Phila. P. O.)—Amer. Pile Fabric Co.—one padding mangle machine for goods about 56 in. wide (used).

Pa., Hershey—Wirth Chocolate Co., Inc. —machinery and equipment for chocolate factory, to be established at Cleon.

Pa., Oil City—National Pump & Machine Co.—machinery and equipment for new foundry.

Pa., Phila.—Philadelphia Paper Co., Nixon and Fountain Sts.—overhead cranes and conveyor equipment for proposed paper storage plant.

Pa., Pittsburgh—Star Ornamental Iron & Wire Co., c/o H. Blum, 2525 Frazier St.—equipment for iron works.

Pa., Sharpesville—Sharpesville Furnace Co.—skip hoist machinery.

Pa., Sheffield—T. N. B. Stover—machinery and complete equipment for drilling operations (oil and gas) near here.

Pa., Wampum—J. Wirtz—equipment and machinery for proposed concrete block factory, on farm.

Pa., Williamsport—J. Peters Packing Co., 1320 East 3rd St.—machinery for proposed cold storage and refrigeration plant.

R. I., Westerly—W. MacKenzie, Box 432, manufacturer of textile machinery—spinning frames, (used).

S. C., Laurens—W. G. Lancaster—machinery and equipment for small ice manufacturing plant, (new or used).

S. C., Sumter—Gable-Christal Co., Inc.—special machinery for the manufacture of insect traps, etc.

Tex., Breckenridge—The Ebony Carbon Co.—machinery and equipment for new carbon black factory.

Va., Harrisonburg—The Newtown Giant Incubator Corp., J. P. Burke, Mgr.—woodworking machinery, incl., tenoner, surfacer, jointer, mortiser, chipbreaker, etc.

W. Va., Hookersville (Muddlety P. O.)—Muddlety Valley Clay Products Co., F. Herold, Almorris, Mgr.—machinery and equipment for the manufacture of brick and other clay products.

Wis., Allenville—H. H. Kalbus, Route 18 —cheese making machinery and vats.

Wis., Beloit—T. B. Goodall, Broad St.—pump, storage tanks, etc., for proposed filling station at Clinton.

Wis., Iola—Gronwald & Co., S. A. Gronwald, Pres.—machinery for cutting and polishing monuments and stone.

Wis., Manitowoc—A. M. Ritcher Sons Co., South 8th and Madison Sts.—machinery for proposed vinegar factory.

Wis., Merrill—Wisconsin Valley Co., Inc., c/o W. H. Au Buchon, Secy., 400 Mills St.—special machinery for proposed excelsior factory.

Wis., Milwaukee—Opitz Mfg. Co., 67 Erie St.—Peerless or Racine hack saw.

Wis., Milwaukee—F. L. Reitz, 266 14th St.—paper baling machine.

Wis., Milwaukee—Sewerage Com., 508 Market St., J. F. Fowles, Secy.—will receive bids until July 7, for one 20 ton electric traveling crane.

Wis., Waunakee—A. Simpson—stamping machines.

Wis., Racine—J. Horlick, Route 2, Box 10, Horlicksville (Racine P. O.)—seed grinding machinery for proposed grist mill.

Wis., West Allis—J. Souska, National Ave.—electric shoe repairing machinery.

Alta, Chipman—The Chipman Flour Mills Corp.—machinery and equipment for mills.

N. B., Hillsborough—A. Peck—machinery and equipment for proposed woodworking factory.

Ont., Lynden—R. A. Thompson (lumber mill)—machinery for sawmill addition.

Ont., Niagara Falls—Niagara Falls Arena Co., Ltd., c/o G. Morse, Main St., Niagara Falls South—equipment for proposed artificial ice and refrigeration plant.

Ont., Welland—The St. Thomas Packing Co., Ltd.—refrigerating equipment for proposed cold storage plant.

Ont., Welland—Tomkins Bakery, North Main St.—bakeshop equipment to replace that destroyed by fire.

Metal Working Shops

Cal., Berkeley—Bd. Educ. will soon award the contract for the construction of 1 story school shops for the Berkeley School Dist., 2133 Alliston Way. Estimated cost $16,000. W. H. Ratcliff, 1st Natl. Bank Bldg., Archt.

Cal., Porterville—Porterville Union High School Dist., E. St., has awarded the contract for the construction of a shop building for the Union High School Dist. Estimated cost $38,283. Noted Jan. 19, 1922.

Cal., San Diego—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., has awarded the contract for the construction of hangars, shop, oil and paint storehouse, gasoline tanks, pumps and distributing system, etc., at the Naval Base here. Estimated cost $243,500.

Conn., Branford—Military Emergency Bd., State Armory, Hartford, has had plans prepared for the construction of a 1 story, 85 x 150 ft. shop, at rear of State Armory, here. Estimated cost $40,00 Payne & Keefe, Manwaring Bldg., New London, Archts.

Ill., Chicago—E. Edelmann & Co., c/o D. S. Klafter, Archt., 64 West Randolph St., is having plans prepared for the construction of a 2 story, 150 x 250 ft. factory for the manufacture of auto accessories. Estimated cost $250,000.

Ill., Chicago—Ideal Sheet Metal Wks., 213 North Morgan St., is having plans prepared for the construction of a 3 story, 72 x 125 ft. factory, for the manufacture of auto and aeroplane supplies, at 2039-43 West Jackson Blvd. Estimated cost $75,000. M. O. Nathan, 70 West Monroe St., Archt.

Mass., Dorchester (Boston P. O.)—P. B. Mutrie, 11 Pearl St., plans to build a 1 story, 90 x 110 ft. garage on Pearl St. Estimated cost $40,000.

Mass., Springfield—W. Lay, Bridge St., has awarded the contract for the construction of a 1 story, 100 x 150 ft. garage and sales room. Estimated cost $50,000.

Mich., Detroit—A. Kahn, Archt., 1000 Marquette Bldg., is receiving bids for the construction of a 2 story, 40 x 106 ft. jewelry factory on Rose and 16th Sts., for Burr-Patterson Co., 4211 Woodward Ave. Estimated cost $40,000.

N. J., Hoboken—Fischer & Sweeney Bronze Co., 312 Adams St., will soon award the contract for the construction of a 1 and 2 story, 100 x 200 ft. foundry on 13th and Grand Sts. Lockwood Green, 101 Park Ave., New York, Engrs. and Archts.

N. Y. Brooklyn—Kruse Motor Co., 1111 Flatbush Ave., has awarded the contract for the construction of a 1 story, 100 x 100 ft. garage and service station on Nostrand Ave. and Ave. I. Estimated cost $50,000.

N. Y., Buffalo—Swan Garage, Inc., East Swan St., plans to build a 3 story 90 x 118 ft. garage. Cost to exceed $40,000. C. J. Irwin, Pres. Architect not announced.

N. Y., Jamestown—Ulrich Plan File Co., 516 West 4th St., plans to build a factory on Murray Ave., for the manufacture of vertical filing equipment for offices, etc. Estimated cost $18,000. Architect not announced.

O., Cleveland—F. Fanta, 5813 Clark Ave. will receive bids until July 5, for the construction of a 1 story, 44 x 116 ft. garage at 5914 Merrill Ave. Estimated cost $40,000. Private plans.

O., Cleveland—Greenwald, Stecker & Wallach, 535 Society for Savings Bldg., has awarded the contract for the construction of a 2 story, 67 x 268 ft. garage and store building at 1934 East 105th St. Estimated cost $125,000. Noted Nov. 17, 1921.

O., Cleveland—The Independent Towel & Supply Co., 1822 Central Ave., has awarded the contract for the construction of a 1 and 3 story, 80 x 100 ft. and 79 x 90 ft. laundry and garage. Estimated cost $100,000. Address S. Miller, c/o owner.

O., Cleveland—The Ohio Crank Shaft Co., 982 East 152nd St., has awarded the contract for the construction of a 1 story, 60 x 200 ft. factory at 6510 Clement Ave. Estimated cost $70,000. Noted June 8, 1922.

Pa., Greenville—Greenville Steel Car Co., foot of Union St., will build a 73 x 390 ft. factory and foundry building, 42 ft. high, for the manufacture and repair of steel cars. Estimated cost $200,000.

Pa., Mercer—Elliott Blair Co., East Market St. plans to build a large addition to its steel plant. Estimated cost $250,000. Architect not selected.

Pa., New Castle—Penn-Ohio Electric Co., plans to issue $1,950,000 bonds for extensions and improvements to its lines, shops and stock.

Pa., Pittsburgh—Mueller Bros., 5101 Baum Blvd., plans to build an 80 x 160 ft. auto sales and service station addition on Baum Blvd. and Woodworth St.

Pa., Shamokin—I. H. Wetzel will soon receive bids for the construction of a 2 story, 80 x 100 ft. garage and service station. Estimated cost $75,000. W. H. Lee, 32 South 17th St., Phila., Archt.

Pa., Trafford City—Westinghouse Electric & Mfg. Co., East Pittsburgh, is having plans prepared for the construction of a 1 story, 50 x 135 ft. tin shop here. Estimated cost $40,000. B. H. Prack, Keystone Bldg., Pittsburgh, Archt.

S. D., Mitchell—The Rozum Motor Co., 400 East 4th Ave., has awarded the contract for the construction of a 1 story, 142 x 150 ft. garage. Estimated cost $40,000.

Va., Big Stone Gap—H. C. Stuart is having plans prepared for the construction of a garage. Estimated cost, including machinery and equipment, $20,000 to $30,000. Architect not announced.

Wis., Boscobel—C. P. and H. F. Miller Co. are having plans prepared for the construction of a 2 story 50 x 95 ft. garage. Estimated cost $40,000. Private plans.

Wis., Kenosha—G. L. Ross, Public Service Bldg., has awarded the contract for the construction of a 1 story, 66 x 126 ft. garage on Sheridan Rd. Estimated cost $40,000. Private plans.

Wis., Milwaukee—P. E. Schaefer, Archt., 401 4th St., is receiving bids for the construction of a 1 story, 50 x 125 ft. garage on Center and 29th Sts., for M. Froehlig, c/o Architect. Estimated cost $40,000.

Wis., Waukesha—G. W. Harter has awarded the contract for the construction of a 1 story, 50 x 90 ft. garage. Estimated cost $40,000. Private plans.

General Manufacturing

Ariz., Morenci—Stargo Mines, Inc., will build a cyanide mill. Estimated cost $75,000.

Cal., Colusa—California Prune and Apricot Growers' Assn. is receiving bids for the construction of a 1½ story cannery. Estimated cost $100,000. Private plans. Noted June 8, 1922.

Cal., Los Angeles—Imperial Cotton Mills Co., Loews State Theatre Bldg., has awarded the contract for converting a brewery into a cotton mill, and building a 2 story addition for weave room containing 60,000 sq.ft. floor space. Estimated cost $250,000. Moran Co., 207 Kerckoff Bldg., Engrs. and Archts.

Cal., Napa—California Prune & Fruit Growers Assn., Market and San Antonia Sts., San Jose, will soon receive bids for the construction of a 141 x 144 ft. addition to its cannery, here. Estimated cost $75,000. Private plans.

Cal., Oakland—Tribune Publishing Co., Oakland Tribune Bldg., is having sketches made for the construction of a 15 story newspaper, publishing, and office building at 13th and Franklin Sts. E. T. Foulkes, Croker Bldg., San Francisco, Archt.

Cal., Pittsburg—Pioneer Rubber Mills, 68 Sacramento St., San Francisco, having plans prepared for the construction of a factory here. Estimated cost $100,000. G. Towne, Genl. Mgr. B. G. McDougall, 381 Bush St., San Francisco, Archt.

Cal., San Francisco—L. R. Lurie, Mills Bldg., has awarded the contract for the construction of a 1 story printing plant, on Howard near 5th St. Estimated cost $25,000. Leighton Press, 516 Mission St., lessee.

Cal., Stockton—The City of Stockton had plans prepared for the construction of a shop and alterations to old shop on high school grounds. Estimated cost $25,000. L. Stone, Belding Bldg., Archt.

Conn., Essex—E. E. Dickenson & Co. will soon award the contract for the construction of a 2 story, 40 x 100 ft. addition to its witch hazel plant. Estimated cost $40,000. Bilderbeck & Langdon, Inc., 159 State St., New London, Engrs. and Archts.

Conn., Hartford—Buck & Sheldon, Inc., Engrs. and Archts., 60 Prospect St., are receiving bids for the construction of a 1 story, 100 x 110 ft. printing plant on Franklin Ave., for R. S. Peck & Co., 26 High St.

Fla., Frostproof—Chase & Co. will soon receive bids for the construction of a 2 story, 75 x 150 ft. fruit packing and canning plant. Estimated cost $30,000. G. R. Williams, Mgr. and Engr. Private plans.

Fla., Leesburg—Municipal Ice Plant plans to alter and improve its plant. Estimated cost including new machinery $50,000. Address W. E. Rogers, Leesburg, Engr.

Idaho, Nampa—Idaho Sash, Door & Glass Co. plans to build a sash and door factory. Estimated cost $60,000. M. Frenzill, Pres. Private plans.

Ill., Chicago—M. M. Fishman, Archt., 118 North La Salle St., is receiving bids for the construction of a 3 story 133 x 166 ft. factory for the manufacture of brassieres and corset accessories, on Irving Park Blvd. and Hermitage Ave., for Natures Rival Co., 306 South Franklin St. Estimated cost $180,000.

Ill., Chicago—Shea-Smith & Co., 322 Federal St., has awarded the contract for the construction of a 4 story, 86 x 150 ft. printing plant on Ashland Ave. Estimated cost $250,000.

Minn., St. Paul—L. F. Dow Co., 381 Jackson St., plans to build a printing plant and office building on University and Hampdon Aves. Estimated cost $400,000.

N. H., Nashua—Nashua Mfg. Co. has awarded the contract for the construction of a 1 story, 50 x 140 ft. addition to its cotton goods plant. Estimated cost $30,000.

N. H., Plaistow—Merrimack Clay products Co., 38 Newbury St., Newton Center, Mass., plans to build a 1 story plant here, for the manufacture of hollow tiles. Estimated cost $125,000. M. A. McGrath, Treas. Private plans.

N. J., Trenton—Freeman Electric Co., 803 East State St., plans to renovate its porcelain plant and build a 1 story addition. Estimated cost $50,000. R. G. Consolloy, Commonwealth Bldg., Archt.

N. Y., Long Island City—Ridley's, 345 West 40th St., New York, has awarded the contract for the construction of a 4 story factory for the manufacture of candy, on Queen Blvd. and Moore St., here. Estimated cost $150,000.

N. Y., Long Island City—Wheeling Corrugating Co., 16 Desbrosses St., New York, has awarded the contract for the construction of a 6 story plant on Nelson Ave. from School St. to Vandam St., here, for the manufacture of paper. Estimated cost $250,000.

N. Y., Lowville—Silicia Products Co., Inc., plans to build a factory for the manufacture of silicia products, on North State St. Estimated cost $100,000.

N. Y., Phelps—A. S. Rathbun plans to build a 3 story, 45 x 65 ft. flour mill on Canandaigua Outlet, to replace one destroyed by fire. Estimated cost $25,000. Architect not announced.

N. Y., Rochester—Amer. Woodworking Mchy. Co., Lyell Ave., plans to build a 110 x 130 ft. addition to its factory. Estimated cost $18,000. Architect not announced.

N. C., Winston-Salem—Bailey Bros. will receive bids until July 15 for the construction of a 5 story, 60 x 150 ft. factory for the manufacture of cigarettes. Estimated cost $100,000.

O., Cleveland—Cleveland Kraut & Pickle Co., 1191 East 22nd St., plans to build a 2 story, 80 x 130 ft. factory at 3333 Lakeside St. Estimated cost $50,000. D. S. Duncan, Mgr. Architect not selected.

O., Cleveland—Penton Publishing Co., c/o R. E. Powers, Treas., 1136 Chestnut Ave., has awarded the contract for the construction of a 9 story, 135 x 135 ft. publishing plant on West 3rd St. and Lakeside Ave. Estimated cost $500,000. Noted April 13, 1922.

Pa., Franklin—Lakeside Refining Co., plans to make improvements to plant taken over from the Foco Oil Co. Estimated cost $60,000.

Pa., Kane—Amer. Plate Glass Co. has awarded the contract for the construction of a 1 story, 80 x 100 ft. addition to its factory.

Pa., Lancaster—Bayuk Bros., 3rd and Spruce Sts., plan to build a 3 story 80 x 176 ft. factory for the manufacture of cigars. Estimated cost $105,000. E. A. Wilson, 1208 Chestnut St., Archt.

Pa., New Kensington—Premier Baking Co., c/o Fayette Baking Co., Connellsville, is having plans prepared for the construction of a 3 story, 80 x 99 ft. bakery here, on Stanton Ave. Estimated cost $100,000. B. H. Prack, Keystone Bldg., Pittsburgh, Archt.

Pa., Phila.—Colonial Biscuit Co., 12th and Brown Sts., is receiving bids for the construction of a 2 story, 65 x 65 ft. cracker factory. Estimated cost $30,000. Private plans.

Pa., Pittsburgh—Atlantic & Pacific Tea Co., Bay St., Jersey City, N. J., has awarded the contract for the construction of a garage, warehouse and stable on Dallas Ave., here. Estimated cost $500,000.

Pa., Pittsburgh—J. L. Beatty, Archt., Jackson Bldg., is receiving bids for the construction of a 5 story, 135 x 350 ft. candy factory at 13th and Pike Sts., for Hardie Bros., 1601 Liberty Ave. Estimated cost $170,000.

Pa., Sharon—Valley Packing & Provision Co. plans to build a 40 x 70 ft. addition to its packing plant on Franklin St. Estimated cost $5,000. Architect not announced.

Pa., Washington—Observer Publishing Co. has awarded the contract for the construction of a 2 story, 60 x 150 ft. publishing plant on Main St. Estimated cost $150,000.

Pa., West Hickory—H. H. Smith & Co., Ridgeway, Pa., plans to rebuild its tannery destroyed by fire, here. Estimated cost $50,000. P. R. Smith, Mgr. Architect not announced.

R. I., Providence—Silver & Drain Co., Inc., 228 South Main St., plans to build a 1 story 50 x 100 ft. addition to its plant, for the manufacture of ventilating equipment. Estimated cost $25,000. Private plans.

Va., Abingdon—Abingdon Lumber Corp. plans to build additions to its mill. Estimated cost including machinery, $16,000 to $20,000. T. M. Clapp, Secy.

W. Va., Hookersville (Muddlety P. O.)—Muddlety Valley Clay Products Co., is receiving bids for the construction of a 20 x 120 ft. plant. Private plans. F. Herold, Almorris, Mgr.

Wis., Clinton—T. B. Goodall, Broad St., Beloit, has awarded the contract for the construction of a 1 story, 50 x 55 ft. filling station on Main St., here. Estimated cost $40,000.

Wis., Fort Atkinson—Fort Atkinson Canning Co. plans to build a 2 story, 75 x 200 ft. canning factory. Estimated cost $150,000.

Wis., Manitowoc—A. M. Ritcher Sons Co., South 8th and Madison Sts., has awarded the contract for the construction of a 1 and 2 story 110 x 122 ft. factory for the manufacture of vinegar. Estimated cost $40,000.

Wis., Merrill—Wisconsin Mfg. Co., c/o E. Chauvin, plans to build a 2 story 50 x 90 ft. factory for the manufacture of sweeping compound. Estimated cost $45,000. Architect not selected.

Alta., Sawridge—Field & Patterson plan to build a sawmill. Estimated cost $30,000. Architect not announced.

Ont., Lindsay—J. Hadley plans to build a shingle factory to replace the one destroyed by fire. Estimated cost including machinery $60,000.

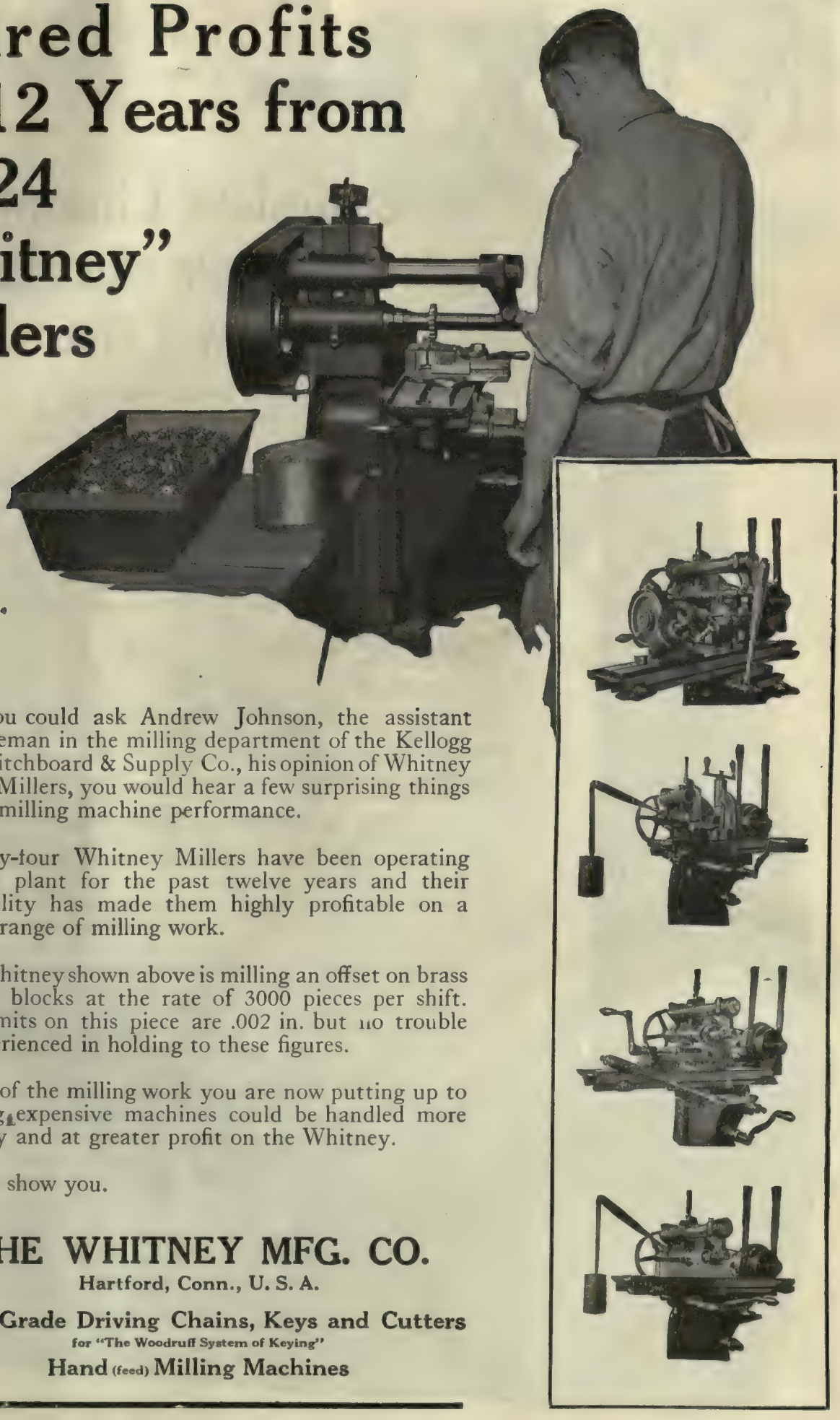
Ont., Millbank—H. E. Ratz Co. plans to rebuild its sawmill which was destroyed by fire.

Ont., Niagara Falls—Niagara Falls Arena Co., Ltd., c/o G. Morse, Main St., Niagara Falls South, plans to build a 1 story ice arena (5,000 seating capacity), to be used as a skating and hockey arena, and also for the manufacture of ice for domestic use, and for cold storage purposes. Estimated cost $50,000.

Ont., Tillsonburg—W. Ruth plans to build a 2 story, 40 x 50 ft. bakery. Estimated cost $20,000.

Que., St. Johns—Franco-Canadian Dyeing Co. has awarded the contract for the construction of a 1 and 2 story, 300 x 300 ft. plant, including carpenter shop and garage. Estimated cost $180,000.

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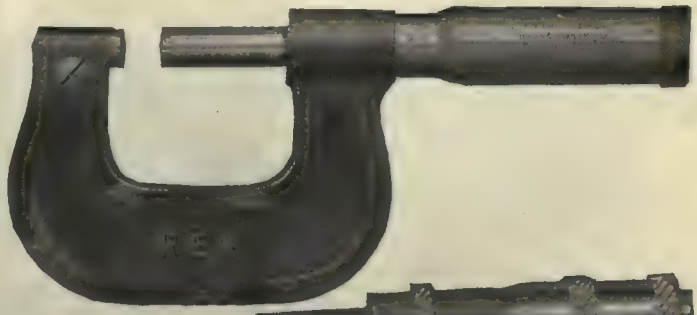
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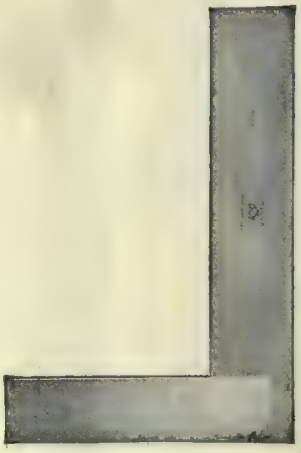


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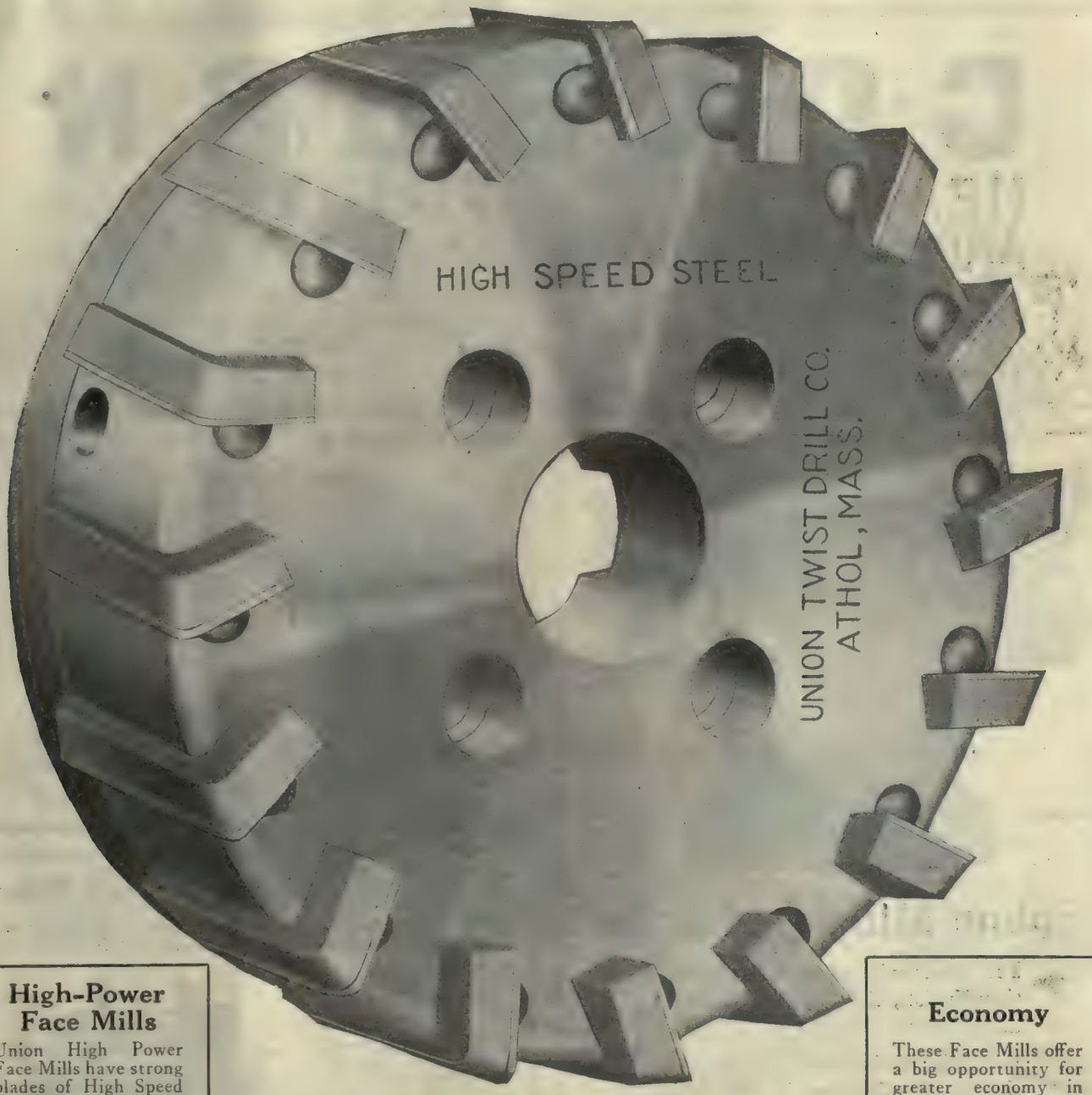
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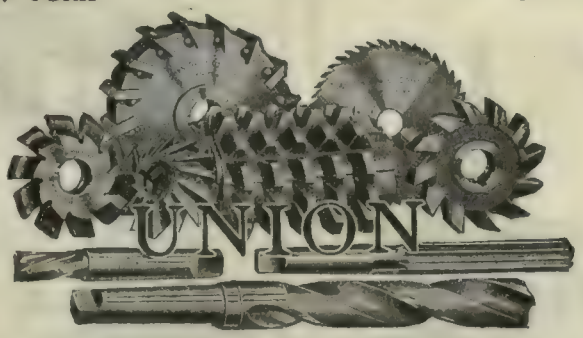
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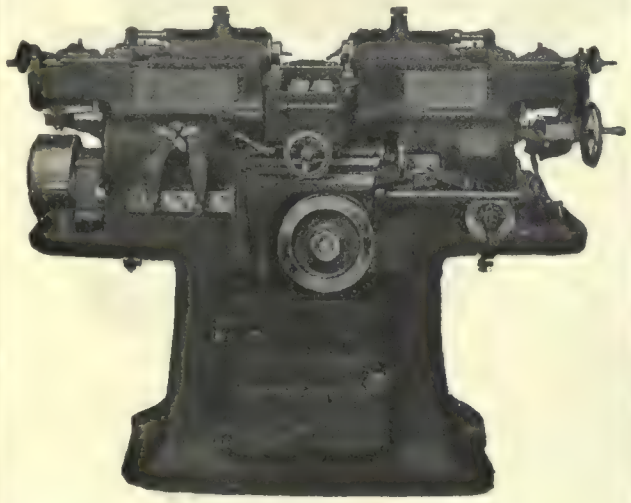
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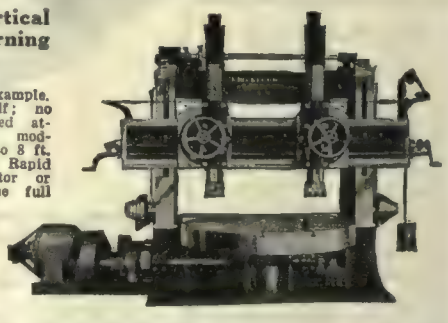
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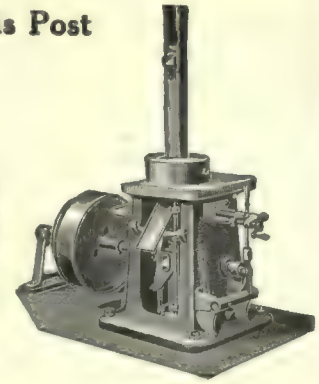
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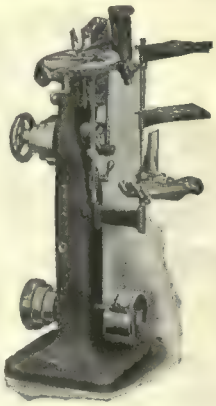
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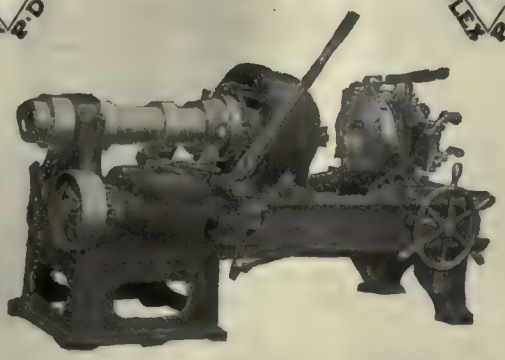
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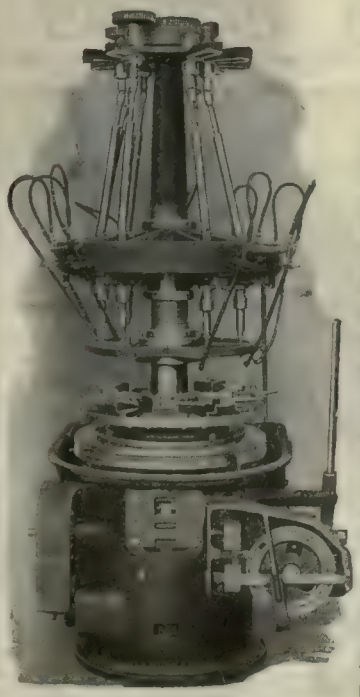
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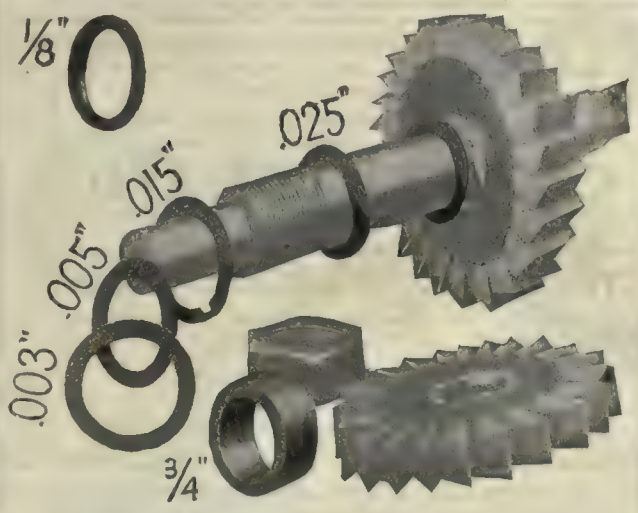
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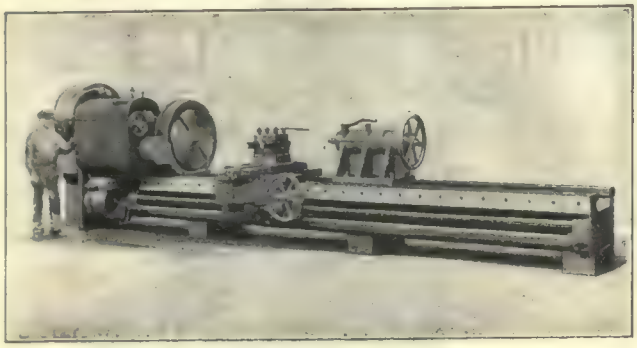
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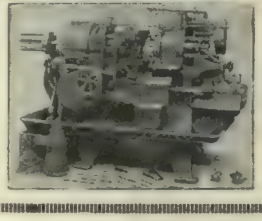
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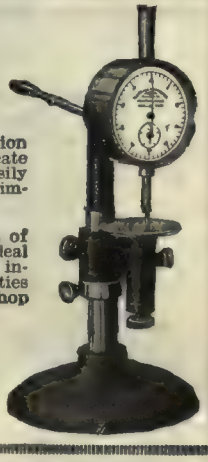
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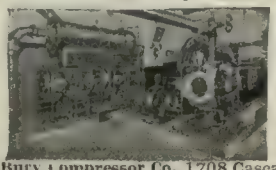
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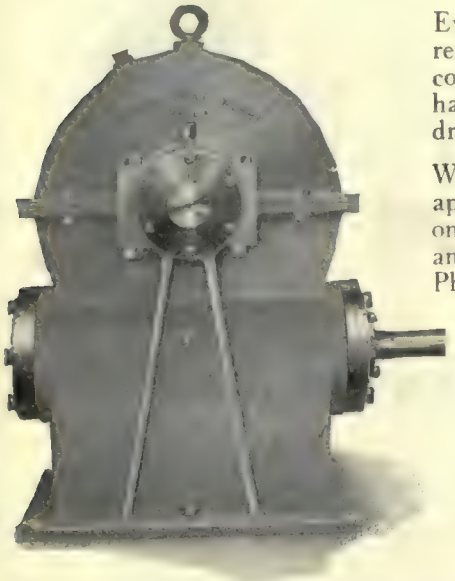
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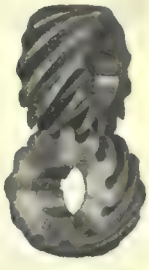
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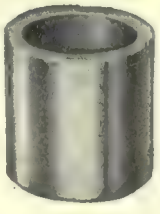


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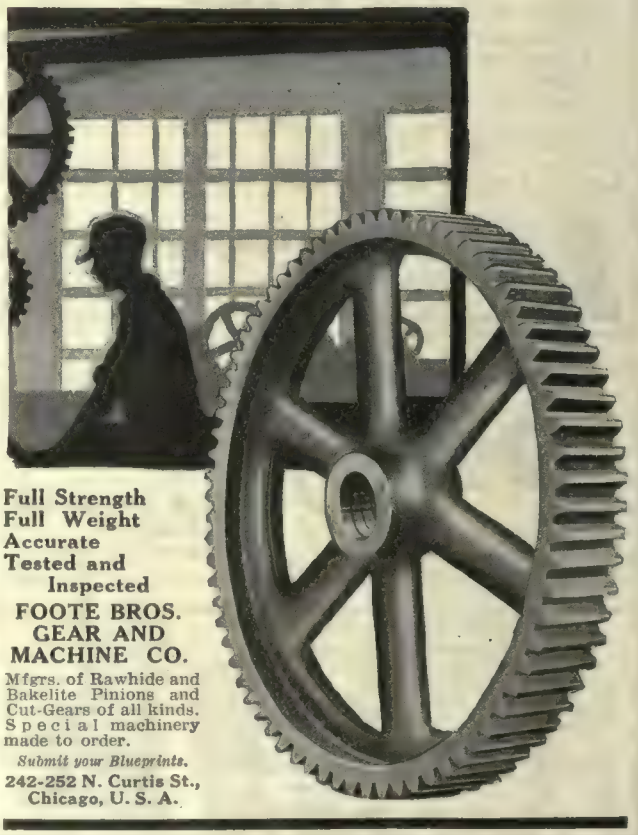
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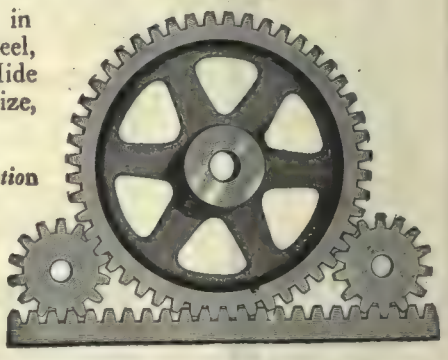
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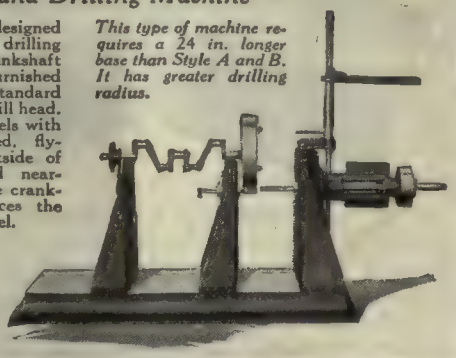
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Balancing and Drilling Machine

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In drilling flywheels with crankshaft attached, flywheel is hung outside of balancing standard nearest drill head. The crankshaft counterbalances the overhanging flywheel.

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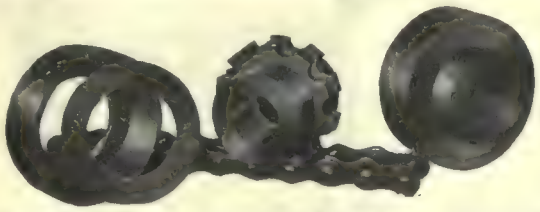
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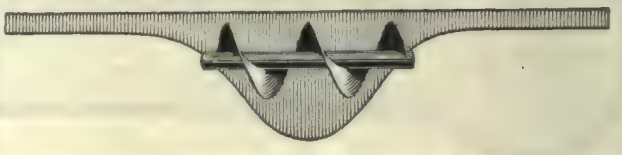
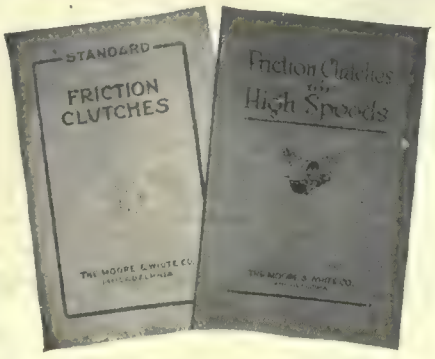


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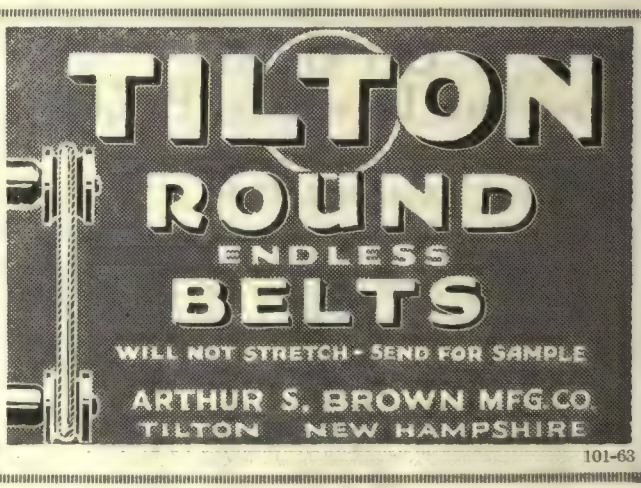
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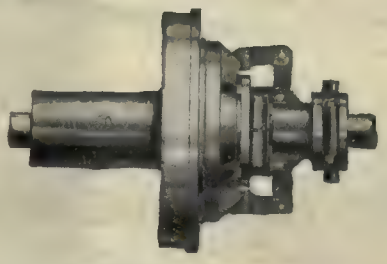
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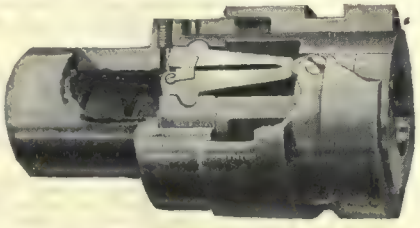
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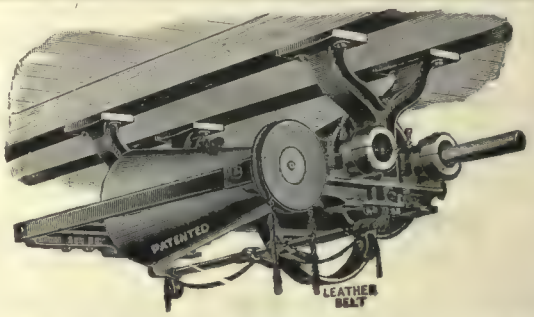
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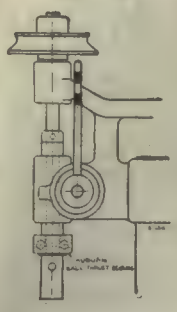


Fig. 11
The Small Sensitive Drill Press gives better service, when the thrust of the spindle is cared for by an Auburn Ball Thrust.

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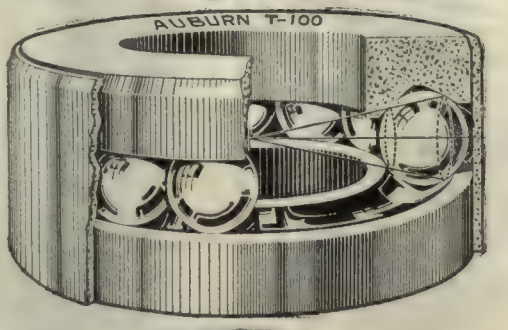
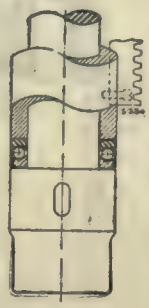


Fig. 13
The Heavy Radial Drill delivers more power to the drill point when the thrust is taken on an Auburn Ball Thrust Bearing.



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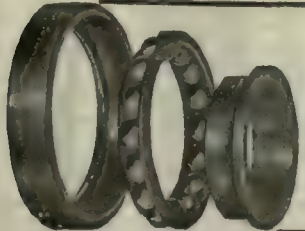
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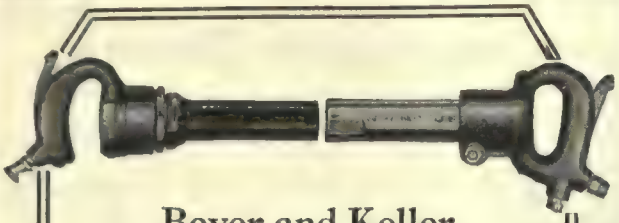
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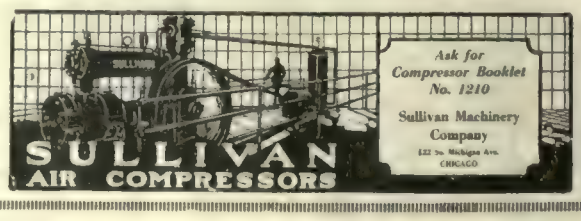
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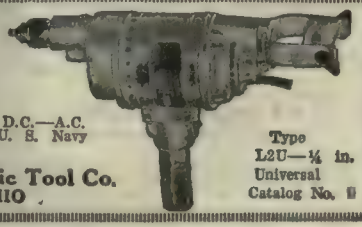
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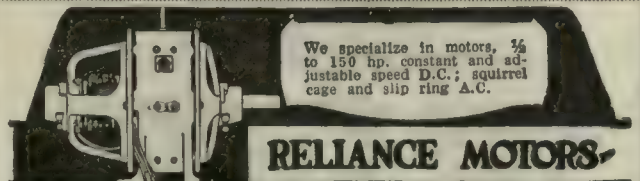


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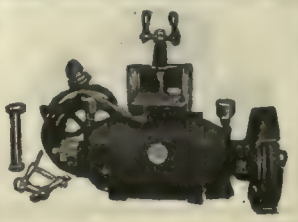
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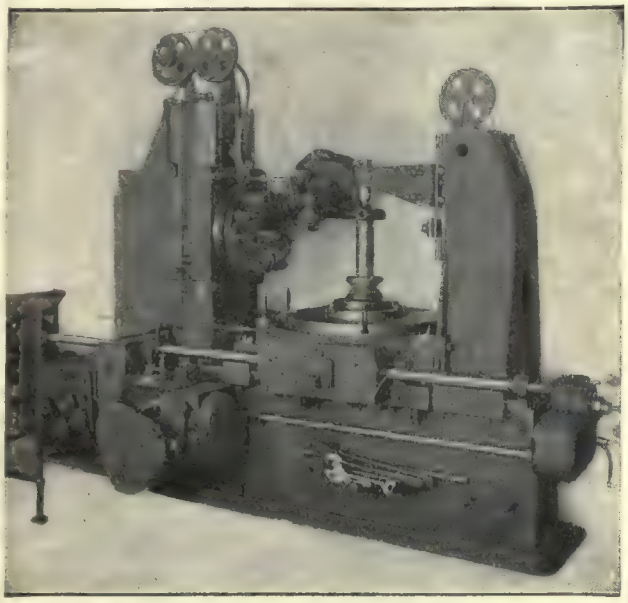
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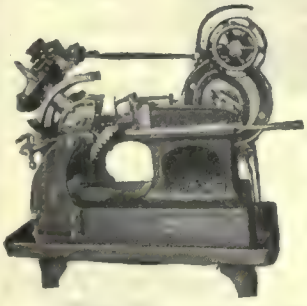


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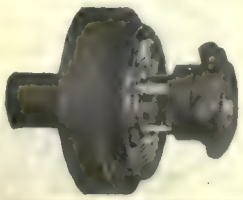
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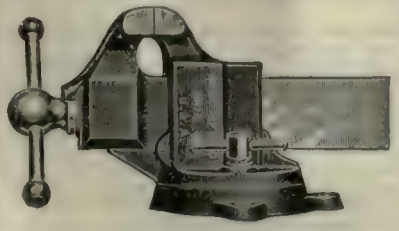
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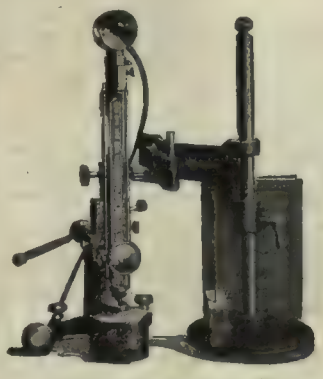
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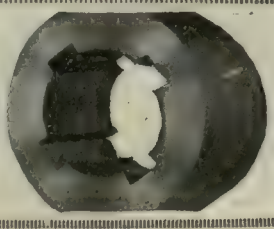
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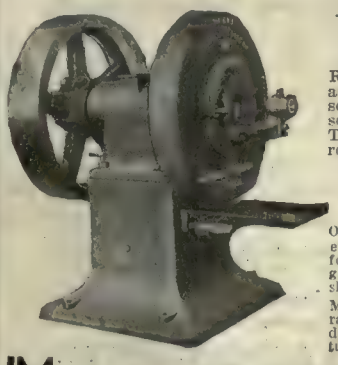
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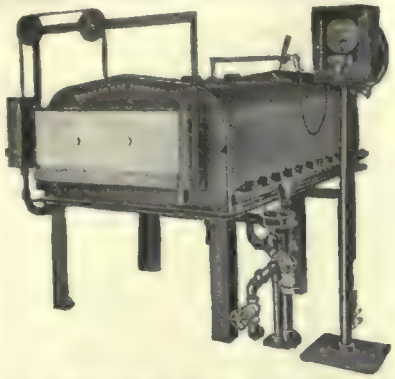
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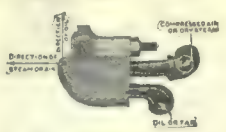
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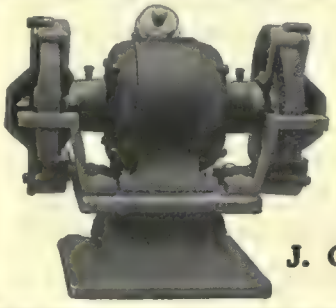
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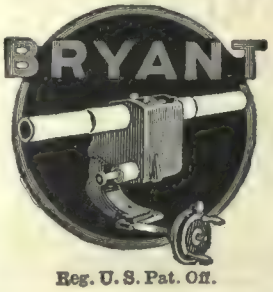


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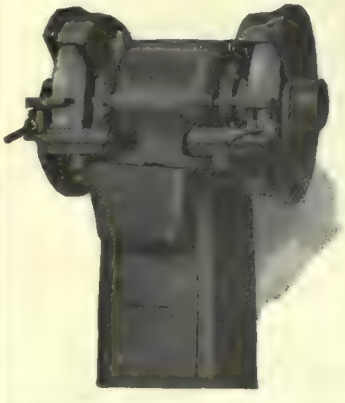
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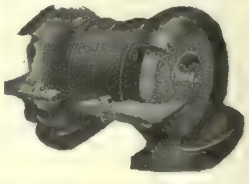
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Let us know your grinding requirements and we will suggest a **Vitrified Wheel** that will give you a better service.

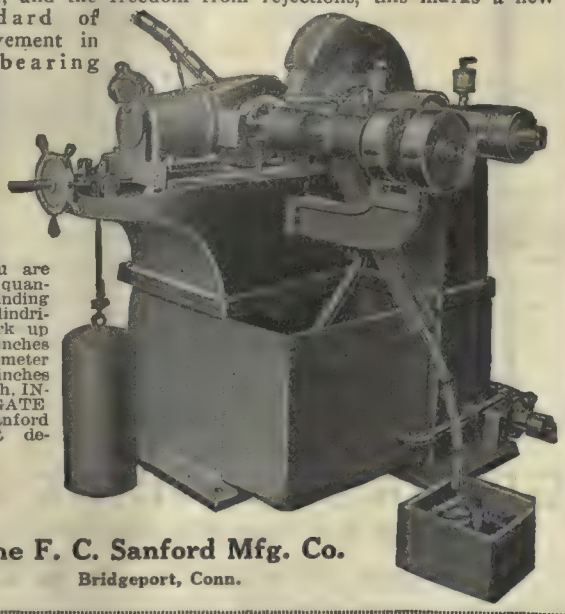
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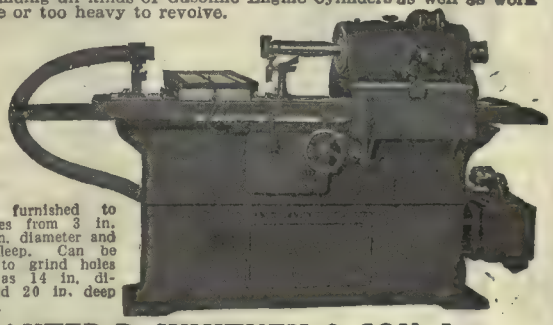
An error in judgement when buying diamonds may result in big losses while right choosing will result in gratifying economies. Much good material is often spoiled in attempting to use the wrong diamond in the wrong place—total loss will result if the stone should shatter while being misused. Do not take that risk—be sure your diamonds are properly mounted—we know how.

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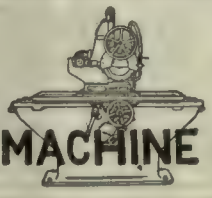
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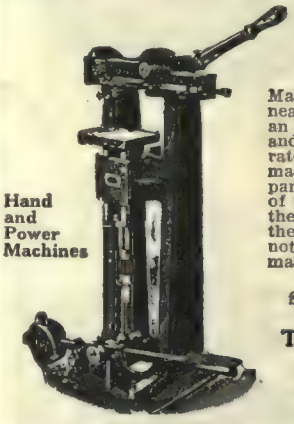


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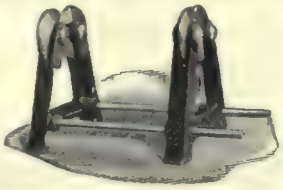


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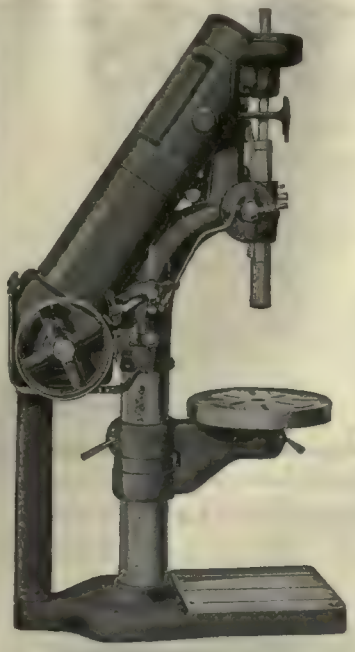
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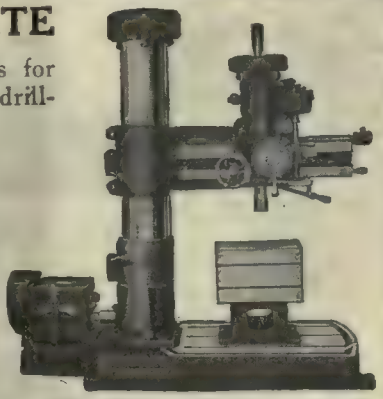
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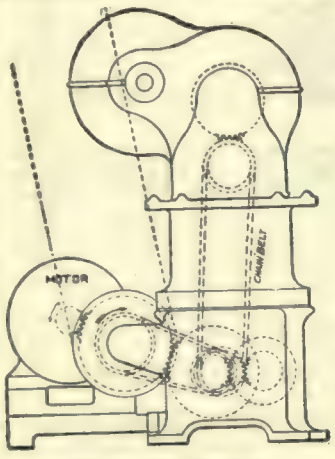


Fig. 1. End Elevation "Showing down-pull"

The Down Pull

means freedom from chatter

BRADFORD
Geared Head Lathe

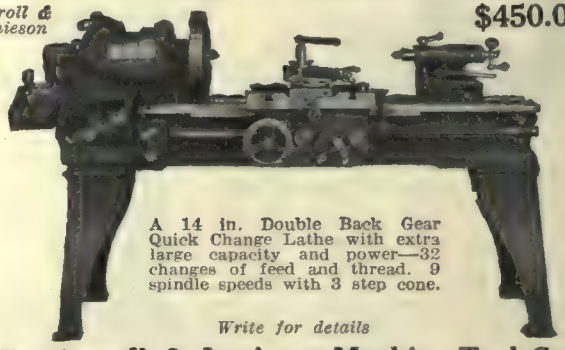
By the famous "down-pull" principle it applies power to spindle through a chain belt, thus binding the head to the bed, removes that last trace of chatter which many machinists claimed was inevitable because of the "up lift" of the tool. The convenient control gives the operator the best possible chance to pile up big production.

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THE BRADFORD MACHINE TOOL CO.
Cincinnati, Ohio, U. S. A.

You Can't Duplicate This Lathe Value

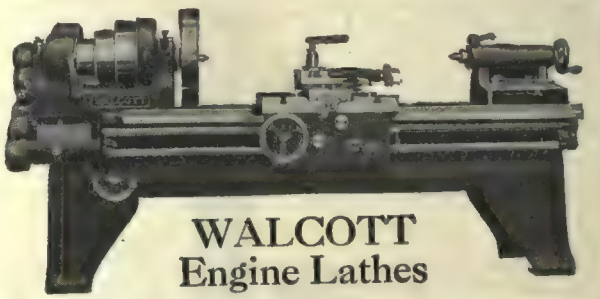
Carroll & Jamieson **$450.00**



A 14 in. Double Back Gear Quick Change Lathe with extra large capacity and power—32 changes of feed and thread. 9 spindle speeds with 3 step cone.

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The Carroll & Jamieson Machine Tool Co.
Davis Ave., Batavia, Ohio



WALCOTT
Engine Lathes

A High-Grade Lathe—at Low Cost!

WALCOTT LATHE CO.
Jackson, Michigan, U. S. A.

STEINLE TURRET LATHES

A modern high power, high duty production turret Lathe for bar or chucking work. Designed and built sufficiently powerful and rigid to enable use of greatest number of multiple cutters and thus insure rapid, accurate and economical work. Why not write us for full particulars.

STEINLE TURRET MACHINE CO.
MADISON, WIS. U. S. A.

MILLHOLLAND
TURRET LATHES AND SCREW MACHINES

MODERN DESIGN—
DISTINCTIVE OPERATING ADVANTAGES

Built for a big day's work every day.

MILLHOLLAND MACHINE COMPANY
1102 W. 23rd St., Indianapolis, Ind.

Sidney Service Always

Lathes designed and built to give the right kind of service.

Lathes sold with advice. Particulars on request.

The Sidney Machine Tool Co.
Sidney, Ohio, U. S. A.

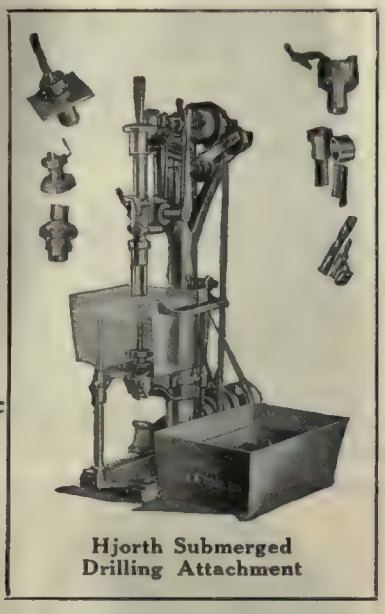


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Greaves-Klusman Heavy Duty Lathes

have no peers as producers of precision. They lack nothing that furthers economical performance.

The Greaves-Klusman Tool Co.
Cincinnati, Ohio



Hjorth Submerged Drilling Attachment

Economy!

By Increased Production

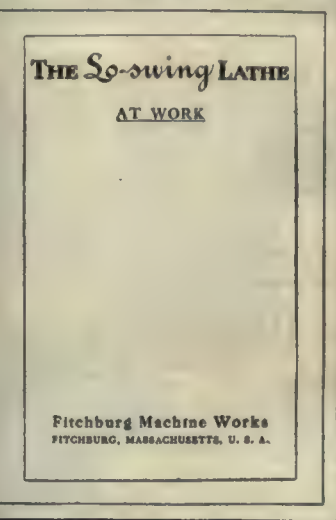
Bigger output per man and per machine means greater earnings at less cost. Drilling production is more than trebled by the Hjorth submerged method. It prevents overheating, eliminates wear and maintains perfect centering.

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Office: Boston, Mass. Works: Woburn, Mass.

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So-swing



So-swing

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FITCHBURG, MASS.
U.S.A.

The Seneca Falls "Star" Lathe Agents

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Milliken 11 inch Slide Rest



possesses several points of excellence. Especial attention is called to our new method of securing rest to base, which allows the rest to swivel and which holds it firmly in any position. This is accomplished by a taper hub on rest and a corresponding orifice in the base with a sliding segment clamped by two collar screws shown. The bearing surfaces are scraped and this slide rest is nicely finished all over.

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ANOTHER REDUCTION
In Prices June 1, 1922
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Size of Lathe	Standard Change Gear	Quick Change Gear
9 in. x 3 ft. Lathe	$150.00	$189.00
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13 in. x 5 ft. Lathe	259.00	301.00
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16 in. x 8 ft. Lathe	385.00	436.00

also 18 in., 21 in. and 24 in. swing

SOUTH BEND LATHE WORKS: 422 Madison Street, South Bend, Ind.

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The economy of these lathes is in the small investment, to perform work, within their size, as well as on larger and more expensive lathes. In fact, for some classes of work there is no substitute for the fine accuracy and convenient operation obtained on Wade Bench Lathes. Let us know your problems.

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If you have a quantity of small holes to grind at a high rate of production, consider the Rivett No. 103 Internal Grinder. It will probably solve your problem. Our prices practically equal those of 1915.

Dealers in principal cities to serve you.

Rivett Lathe and Grinder Company
Brighton District of Boston, Mass.



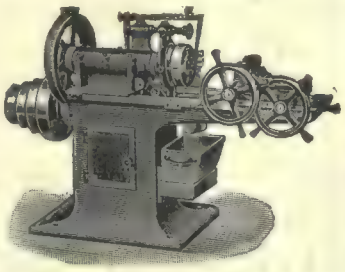
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Small and medium sized work can be handled with accuracy, speed and economy on the Ames Bench Lathe. By means of our interchangeable attachments you can do turning, drilling, grinding, milling and thread cutting. A great many plants are saving money by their use. **Write for our Bulletins.**

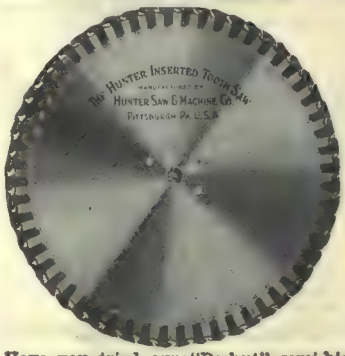
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HIGH SPEED
LENOX
HACK SAWS
AND
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"The Blade in the Plaid Box"
AMERICAN SAW & MFG. CO.
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are fitted with the well-known Acme Die Head, which has a special adjustment for adjusting the dies to size without stopping the machine. The dies are all made interchangeable with the steel caps; dies changed from one size to another in less than one minute. Acme Die Heads are all lined with tool steel hardened and ground to size. Write for Catalog "M."

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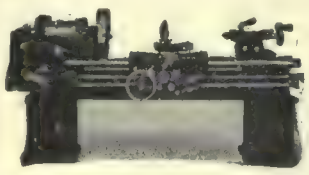
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Inserted tooth saws, solid tooth milling saws made of chrome alloy, semi-high and high-speed steels, hot saws, friction discs. Saw sharpening machines.

Have you tried our "Beskut" semi-high speed milling saws? They will cut costs on hard jobs.
We also manufacture and carry in stock a full line of rivet sets and chisel blanks.

HUNTER SAW & MACHINE CO., Pittsburgh, Pa.



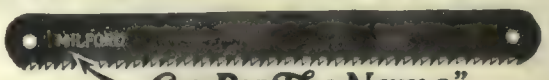
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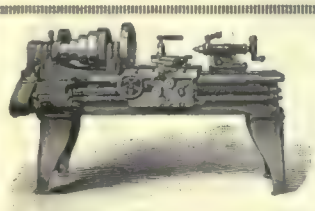
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"MILFORD" HACK SAW BLADES



"Go By The Name"

Sample sent on request
The HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.



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LATHES

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HACK "STERLING" SAWS



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Precision Bench Lathes



Bench Millers

STARK TOOL CO., Waltham, Mass.
Originators of the American Bench Lathe *Established 1864*

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Sheet Metal Working Machinery

THE D. H. STOLL CO., Inc.
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A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. Let us give you full details.

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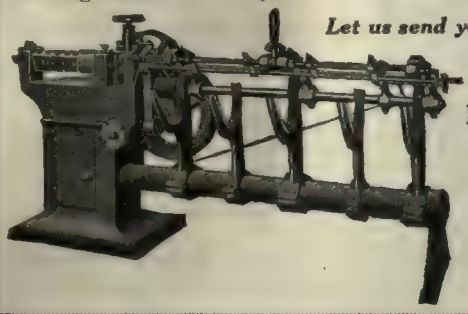
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Hamilton Lathes, built in a wide range of sizes and styles, reach the peak of modern precision—plus—production. Their economy, viewed from any angle, makes it advisable for you to get complete description at once.

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and placing the new coils of wire, is practically all there is to operating Shuster Automatic Wire Straightening and Cutting Machines. They save their cost in a short time.



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Established 1866

The "MARVEL" No. 8 Metal Band Saw

THE large number of satisfied users of this high-grade saw like it because of the large capacity, the great variety of work it handles, that it saws at an angle right or left, that the work is held stationary and blade feeds itself forward into the work.

They like the large, roomy bed or work table. It solves their sawing problems.

Let us tell you more about the "MARVEL" No. 8.

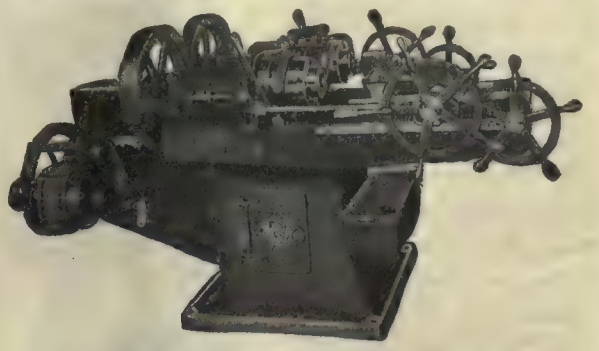
Armstrong-Blum Mfg. Co.
347 N. Francisco Avenue, Chicago



The No. 8 Marvel Band Saw

The "STANDARD" Double Bolt Cutter

Column and headstock are cast in one piece, assuring permanent alignment and rigidity. Will stand up and do perfect work under the most trying conditions. Six sizes: 1½ in., 2 in., 2½ in., 3 in., 3½ in., 4 in.



Improved Die Head and Control Exclusive and Superior Design

All parts strong and substantial yet micrometer adjustment or set is so sensitive that bolts may be cut *over* or *under* size and dies set to again cut *exact* size—at will of operator, while machine is running, adjustment not affected by opening or closing of dies. Feed is automatically stopped when desired length is cut.

Circular gives details—write for it.

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All Sizes ⅛ to 18 in. inclusive

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Pipe Threading and Cutting Machinery

Hand or Power Operated

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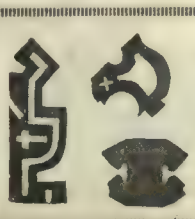
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Lea Simplex Cold Saws

Fast—Easy to Operate—Large Capacity
Minimum Waste of Stock

Designed, Manufactured and Sold by
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Gray's Sheet Metal Cutter Cuts Shapes Like These

Made in four sizes for cutting shapes from ⅛, 3/16, ⅜ and ⅝-inch plate.

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Made of the finest tungsten steel by specialists of many years' experience. Specify "QUALITY" on your next order and settle your Hack Saw Problem.

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Producing with Pep and Precision

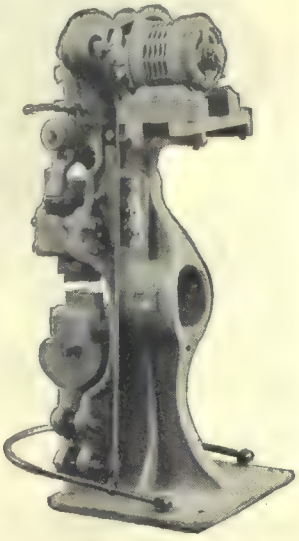
The Bradley Compact Hammer here shown is a speedy producer of accurately forged parts.

The blows can be closely regulated to suit the work being fashioned, thereby insuring precision and conserving power.

All **Bradley Hammers** are cushioned hammers.

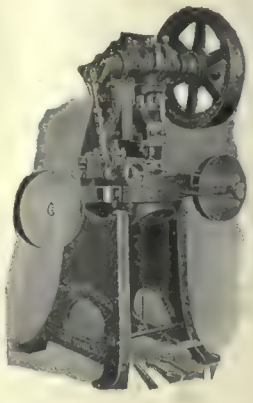
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The stock and scrap rolls are made integral with the press. No wasted, cluttered-up floor space.

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To get you to fix your mind on our:

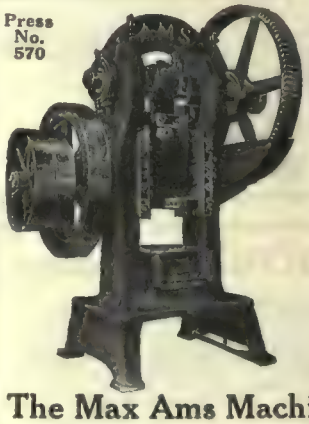
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"West" Hydraulic Tire Setters, Hub Banders, and Presses (100 to 300 tons capacity).

Special heavy Machines built to order.

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Look for it.

It's your security.

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Manufacturers of Power presses or Brakes and Squaring shears in capacities from the lightest gauges to ¾ in. and from 4-12 feet long. We also manufacture Mitre presses, Mitre dies, Forming dies and Shear blades. Twenty years' experience of our engineering department can undoubtedly be of assistance to you.

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Built in three types, six sizes, with capacities up to 7 in. square.

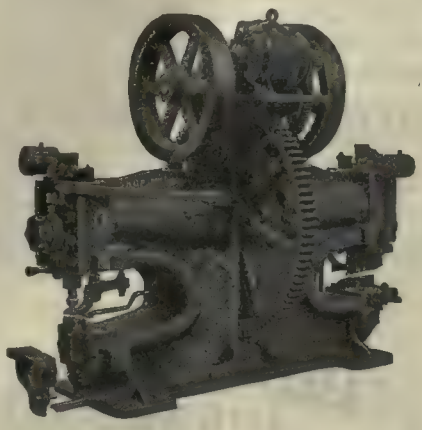
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Punch and Shears



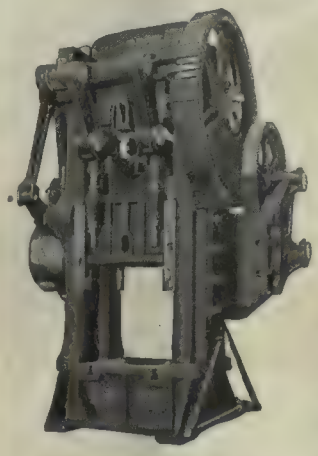
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Single and Double Crank Toggle Drawing Deep Stamping PRESS



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Presses for Every Purpose

"TOLEDO" Patented Toggle Presses, built in 50 sizes (7,500 to 650,000 lbs.) are widely used for drawing stamped steel and enameled ware, seamless steel bath tubs, metallic caskets, auto radiator casings, fenders and similar parts, mail boxes, vending machines and innumerable other objects made from copper, brass, aluminum, steel or tinplate.

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have flanged inlet, outlet and stuffing box around shaft. Send for Cat. No. 38.



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Forges, Drills, Punches, Shears, Bending - Machines, Tire-Setters, Wood - Workers, Blowers, Exhaust Fans, Disc Fans and Ventilating Apparatus.

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Special machinery built to order from customers' blue-prints

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THE CLEVELAND KNIFE & FORGE CO.
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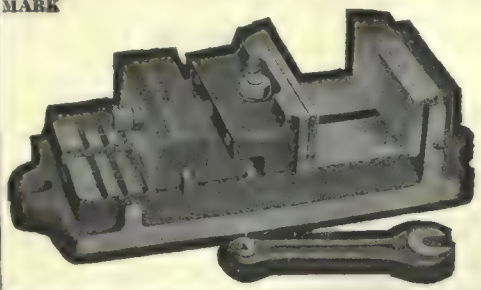
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TRADE MARK



Truly "The Handy Tool"

Work can be firmly held in it, one operation completed, the vise turned upon its edge, and a second operation completed without reclamping the work in the vise.

Send for illustrated circular showing sizes, prices, etc.

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New Britain, Conn., U. S. A.

Established 1887

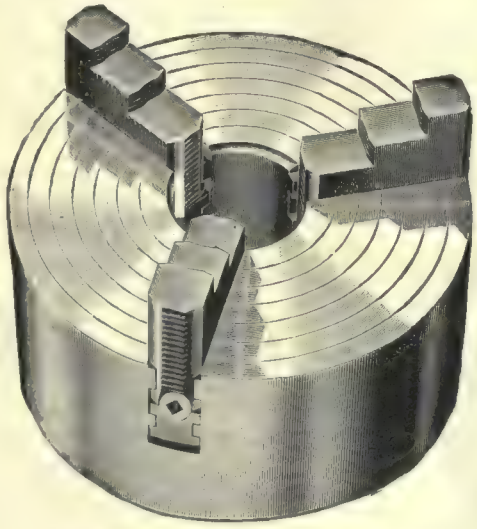
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The ample jaw bearing in **Whinton Geared Scroll Combination Chucks** assures a firm grip on the work with slight set-up effort.

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THE NEW STEEL CHUCK
Improved Body Design
Perfectly Aligned Hard-Surfaced Jaws
Hard Self-Cleaning Screws
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Interchangeable Parts
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Right Angle Transmission
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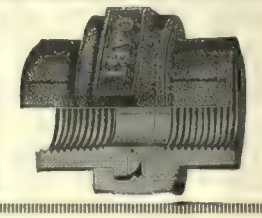
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Drives Straight and True
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American Equipment Company, Detroit



Absolutely Tight

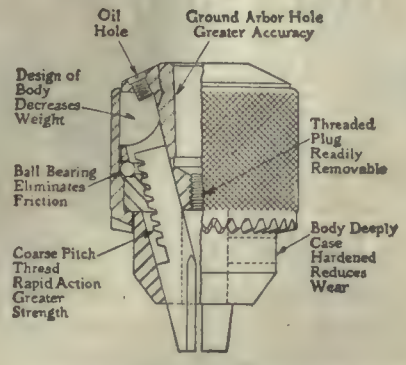
non-corrosive bronze seats accurately ground together make Dart Unions non-leaking. A free sample on request. Write for catalog and price list No. 20.

E. M. Dart Mfg. Co. Providence R. I.

The Fairbanks Co., Sales Agents
Canadian Factory, Dart Union Co., Ltd., Toronto.

Ask your dealer for prices

Looking Behind the Scenes



The Jacobs Super Chuck looks good on the outside, but the inner workings are responsible for its popularity.

It sets up readily, grips firmly, centers the drill every time and runs in perfect balance. Case hardened body and jaws give long life; working members ground on centers assure precision; every feature in its make up promotes speed.

Get Bulletin A-17 and note the Jacobs line

The Jacobs Manufacturing Company
984 Park Road, Hartford, Conn.

ERRINGTON



Quick-Change Drilling, Tapping, Studding Chuck

Style E. P.

This automobile crank case has 24 holes tapped and studded.

5 holes ⅜" x 16"; 12 holes ½" x 13"; 6 holes ¼" x 20" and 1—½" hole for pipe tap.

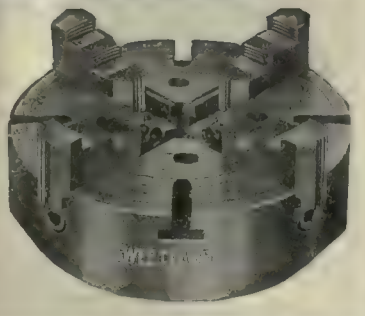
These holes are tapped in 4 *minutes;* and the 24 studs are set in 3 *minutes*, with a total of 64 crank cases handled per each nine-hour day.

Errington Mechanical Laboratory
Broadway and John St., New York City
Machinery Hall, 549 W. Washington Blvd., Chicago, Ill.
831 Old South Bldg., Boston, Mass.

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differ in several essential particulars from the conventional "combination" chuck.

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Our Catalog shows full line. Send for your copy.

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For Butt or Straddle milling of a square or hexagon nature.

Will clamp in either a horizontal or vertical position.

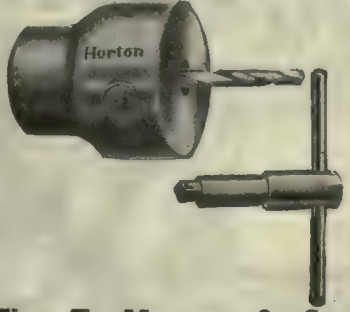
Made in two sizes:

1 in. size, ¼ to 1 in. cap.
2 in. size, ¼ to 2 in. cap.



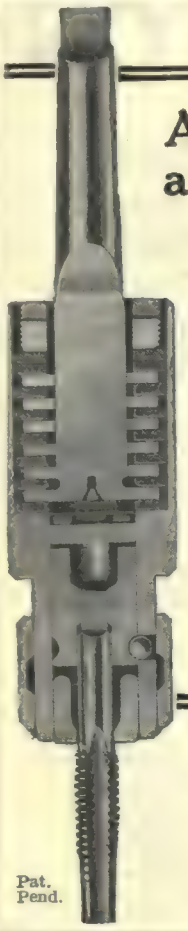
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Safety Tap Holder

knows exactly when to slip. Note the big area of friction surface—did you ever see a tap with more positive grip? For holes in tough metal and blind holes you can drive to the limit. Don't worry about the scrap-pile.

It meets all tapping requirements on single or multiple spindle installations. Ideal for close center distances.

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Guaranteed to tap bottom holes without breaking taps.

Pat. Pend.

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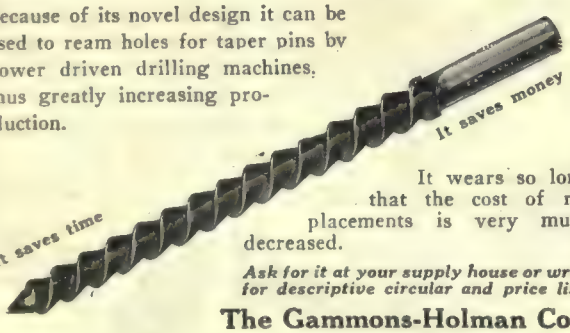
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Manufacturers: LATROBE, PA.

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This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards

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National Cleveland "EXTRA SERVICE" Tools



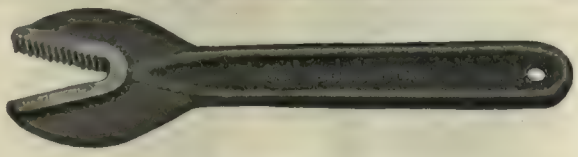
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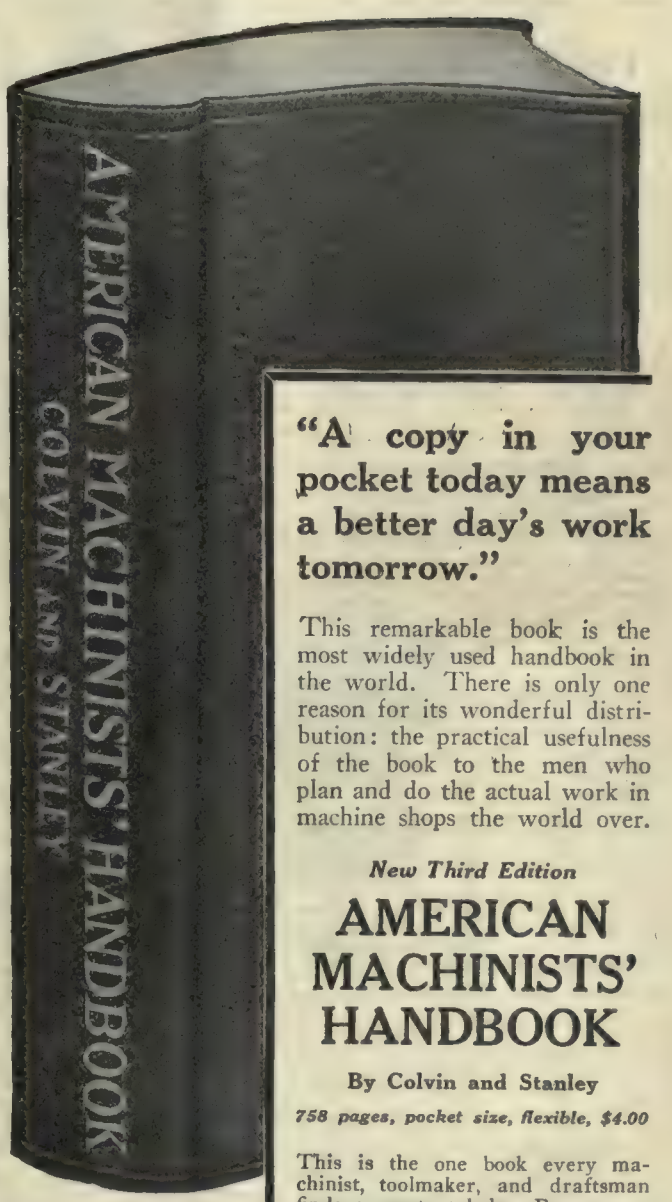
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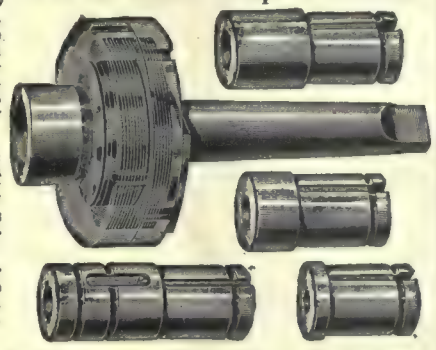
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Nothing to *break* or get out of *order*. Made in 4 sizes covering, from 0 to 2½ in. diameter.



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Such a finish depends, for its durability, on having been baked hard over a durable undercoat—one that is elastic and adheres toughly to the metal.

Hilo 922 Black Baking Japan as an undercoat makes a good foundation for a durable finish. It hangs on firmly to the metal. It acts as a cushion against the many knocks and jars on the outer surface.

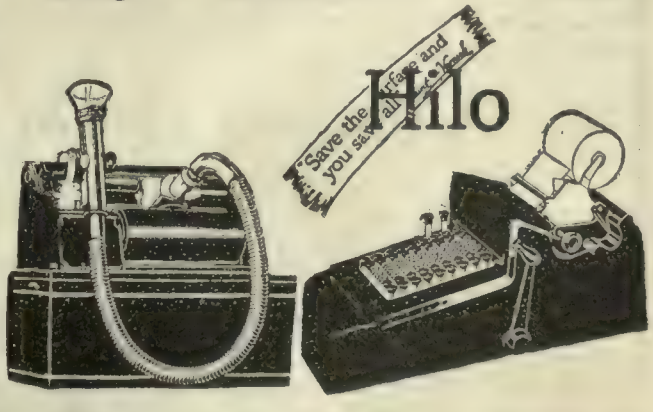
This undercoat adheres tenaciously to iron, steel, aluminum, brass. It is a good covering black, which *hides solidly in one coat,* even over sharp edges, bright metal, rolled seams, etc.

Try Hilo 922 on your work

If some of your japanning requires an extremely elastic, "fast-holding" undercoat—try Hilo 922 Black Baking Japan. You will be pleased with the results.

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But the reason, like the explanation of any successful invention, is simple. H & G dieheads are designed on principles that are fundamentally and mechanically correct. The construction is substantial and strong, the operation sure and certain.

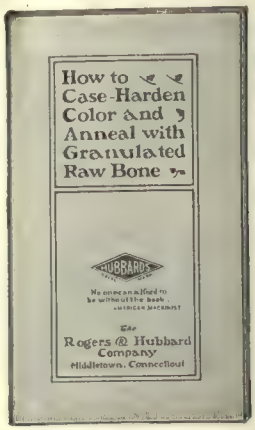
The diehead closes, the stock goes in. The thread is cut—clean, smooth, perfect. *Click!* The diehead flies open, ready for the next piece. This performance goes on day after day, hour after hour, without a halt on account of trouble, with longer intervals between grindings of the chasers than you ever thought possible. It's the tough, staysharp character of H & G chasers that gives this service.

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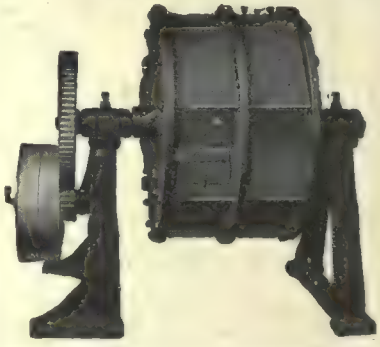
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1—24-in. x 10-ft. American, gd. head.
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28—26-in. x 10-ft. Niles-Bement-Pond
70—26-in. x 10-ft. Bridgeford, Q.C.G.
22—26-in. x 12-ft. Bridgeford, Q.C.G.
2—26-in. x 16-ft. Bridgeford, Q.C.G.
2—26-in. x 18-ft. Bridgeford, Q.C.G.
2—26-in. x 20-ft. Bridgeford, Q.C.G.
6—30-in. x 11-ft. American, gd. hd.
1—30-in. x 20-ft. American, gd. hd.
19—32-in. x 12-ft. Pittsburgh, Q.C.G.
2—36-in. x 14-ft. Johnson, triple gd.
1—36-in. x 19-ft. Johnson, triple gd.
15—36-in. x 30-ft. Pittsburgh, gd. hd.
1—Each 36-in. x 36-ft. and 42-ft. LeBlond, Q.C.G.
4—36-in. x 37-ft. Niles-Bement-Pond triple geared.
2—45-in. x 24-ft. Pond, Triple Gd.

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2—Type 11, 8-spdl. Natco Multiple.
1—1-spdl. Henry & Wright.
1—2-spdl. Henry & Wright.
3—3-spdl. Allen Sensitive.
4—4-spdl. Allen.
16—6-spdl. Allen.
3—No. 6-B Henry & Wright Sensitive.
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1—25-in. Silver Sliding Head.
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3—3-ft. American Sensitive.

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1—30-in. Bullard Vertical.
1—30-in. Gisholt Vertical.
1—36-in. Bullard Vertical.
1—37-44-in. Colburn Vertical.
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1—4-in. bar Niles Horizontal.
1—Beaman & Smith Horiz., 2 hds.
1—2-spdl. Espen-Lucas, 2 hds.
1—Cleveland Horizontal.
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5—6 x 32-in. Norton Plain.
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1—No. 2 Brown & Sharpe Universal.
1—10 x 36-in. Thompson Universal.
2—No. 3 Landis Universal.
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1—Randall Cylinder.
3—No. 70 Heald Internal.
2—No. 2 Gardner Disc.

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1—No. 38 Chicago Small.
2—No. 1 Brown & Sharpe Plain.
1—No. 1 ½ Cincinnati Plain.
1—No. 1 ½ Brown & Sharpe Plain.
2—No. 20 Ohio Plain.
1—No. 2 Ohio Plain.
1—No. 24 Ohio Universal.
8—No. 2 Kempsmith Plain.
2—No. 2 Brown & Sharpe Plain.
2—No. 2-A Brown & Sharpe Universal
1—No. 2-B Milwaukee Plain S.P.D.
1—No. 3 Brown X Sharpe Plain.
12—No. 3 Kempsmith Plain.
1—No. 4 Cincinnati Universal SPD
1—No. 4 LeBlond Plain.
4—No. 4 Cincinnati Plain, Cone.
2—No. 4 Cincinnati, Plain, S.P.D.
1—No. 2 ½ Milwaukee Vertical.
1—No. 3 Cincinnati Hi-power Vert.
2—No. 4-B Becker Vertical.

MILLERS (Continued)

1—No. 3 Brown & Sharpe Vertical
1—17-in. x 10-ft. Beaman & Smith 3 hds.
1—No. 1 ½ Newton Duplex.
1—24-in. x 6-ft. Ingersoll Slab.
1—48-in. x 10-ft. Newton Slab.
1—Beaman & Smith Open Side Slab

SHAPERS AND PLANERS

1—15-in. Potter & Johnson.
1—16-in. Queen City, Back Geared.
10—16-in. Walcott, Back Geared.
1—17-in. Smith & Mills, Bk. Gd S.P.D.
7—20-in. Walcott, Back Geared.
7—24-in. Walcott, Back Geared.
2—26-in. Niles-Bement-Pond, B.G.
1—24 x 24-in. x 12-ft. Whitcomb.
1—30 x 30-in. x 10-ft. Woodward & Powell, 3 hds.
1—30 x 30-in. x 10-ft. Cincinnati.
2—36 x 13-in. x 14-ft. Niles-Bement-Pond, Frog and Switch.
1—36 x 36-in. x 10-ft. Bickett, 3 hds.
1—38 x 30-in. x 8-ft. Cincinnati, 2 hds.
1—56 x 56-in. x 10-ft. Gray.
1—60 x 48-in. x 10-ft. Gray.
1—96 x 72-in. x 20-ft. Bement-Miles.

TURRET AND SCREW MACHINES

12—6-A Model 2 Potter & Johnson.
1—1 ¼-in. Gridley Auto. Screw.
2—No. 75 National-Acme Automatic
1—1-in. Pratt & Whitney.
13—1-in. Warner & Swasey, No. 2.
5—1-in. Foster, No. 2.
4—1 ¼-in. Foster, No. 3.
3—1 ½-in. Warner & Swasey, No. 4.
5—1 ½-in. Wood No. 4.
3—No. 8 Warner & Swasey.
1—2-in. Brown & Sharpe, No. 6.
2—2-in. Pratt & Whitney.
2—3 x 36-in. Jones & Lamson.
1—3 x 36-in. Acme.
16—18-in. Libbys.
19—24-in. Gisholt.
17—26-in. Libbys.

GEAR CUTTERS AND HOBBERS

2—No. 1 Farwell Gear Hobbers.
1—No. 00 Schuchardt & Schutte Gear Hobber.
4—No. 1 Schuchardt & Schutte Gear Hobbers.
2—Lees-Bradner Gear Hobbers.
4—18-in. Gould & Eberhdt Hobbers.
2—26-in. Brown & Sharpe.
1—30-in. Flather Gear Cutter.
2—36-in. Cincinnati Gear Cutters.
3—36-in. Gould & Eberhardt Hobbers
7—No. 6 Fellows Gear Shapers.
1—No. 612 Fellows Gear Shaper.
1—36-in. Gleason Spur and Bevel Gear Shaper.

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If the tools you want are not listed here, write and ask us.

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BORING MILLS—HORIZONTAL AND VERTICAL
1—No. 32 Giddings & Lewis; Hor.
1—No. 2 Rockford; Hor.
1—34-in. King Vertical Turret Lathe.
1—30-in. Rogers & Hemphill Vertical
1—42-in. Putnam, 2-hd. Vert., latest type.
1—48-in. Gisholt 2 head; S.P.D.
1—72-in. Niles, 2 head, cone drive.

RADIAL DRILLS
1—6-ft. Bickford Universal; S.P.D.
1—6-ft. Baush Plain; belt drive.
1—6-ft. Reed-Prentice Plain; S.P.D.
1—5-ft. N-B-P Semi-Universal; S.P.D.
1—4-ft. Reed-Prentice Plain; S.P.D.
1—4-ft. Western Plain; S.P.D.

DRILL PRESSES
4-, 5- and 6-spindle Allen H.S.
3—Moline hole-hog.
4—NEW 36-in. Snyder upright.
2—No. 310 Baker.
10—NEW 20-in. Champion.

LATHES
1—20 x 10 Reed-Prentice S.P.D., geared head.
2—16 x 8 Hendey, geared head.
1—NEW 14 x 6 Hendey.
1—14 x 6 Pratt & Whitney tool room lathe.
3—21 x 10 LeBlond S.P.D., geared head.
1—NEW 21 x 12 South Bend Gap.
1—NEW 21 x 14 South Bend Gap.
1—NEW 24 x 14 South Bend Gap.
2—24 x 14 Boye & Emmes D.B.G, Q.C.G.
2—NEW 24 x 10 Ryerson; cone drive.
1—30 x 30 American, all geared head.
2—NEW 30 x 30 LeBlond, geared head; triple speed motor drive.
3—36 x 36 LeBlond cone drive; triple geared.
3—42 x 32 Bridgeford heavy duty; all geared head; 2 carriages.

PLANERS
1—48 x 48 x 12-ft.—2-head Putnam.
1—36 x 36 x 12 Woodward & Powell, 4-head.
6—26 x 26 x 8-ft.—2-head Putnam.
1—30 x 30 x 8-ft.—1-head Gray.
1—26 x 26 x 10-ft.—1-head Pond.

TURRET LATHES
2—NEW 1-in., Biggs Wire Feed.
11—2¼-in. Gridley Automatics.
12—3 x 36 Jones & Lamson; geared head.
4—2¼-in. x 26 Greenlee.
6—No. 1B Foster Universal.
9—NEW No. 1 Warner & Swasey.
3—No. 3-A Warner & Swasey.
7—No. 4 Foster. Plain. Head.
1—No. 00 Brown & Sharpe forming.
2—No. 2 Brown & Sharpe forming.

MILLING MACHINES
1—NEW No. 3A Becker Vertical.
1—NEW No. 4B Becker Vertical; rotary.
1—Becker Model C Vertical.
1—No. 4 Cincinnati Vertical.
2—No. 3 Garvin Duplex.
1—No. 2 Rockford Universal; S.P.D.
1—No. 3B Milwaukee Plain; S.P.D.
1—No. 3 Brown & Sharpe Plain; S.P.D.
1—No. 34 Oesterlein Plain; Cone Drive.
5—NEW Type B Briggs.
ALSO 250 Hand and Mfg. Millers such as No. 6 Whitney; No. 12 Pratt & Whitney; No. 4 Hendey, etc.

MISCELLANEOUS
1—2-in. National sgle.-hd. Bolt Threader.
2—1-in. Acme, Double Head Bolt Threaders.
1—E-3 Keller Auto. Engraving Machine.
5—Power Presses, cap. 100 to 700 ton.
1—60-in. Gould & Eberhardt gear cutter.
1—54-in. Newark (Eberhardt Bros.) Gear Cutter.
2—NEW No. 205 Rivett Radial Grinders.
1—24-in. S. & S. Gear Hobber.
1—6-in. Gleason Bevel Gear Generator.
4—NEW No. 6 Nutter & Barnes Cold Saw.
1—No. 3 Byerson H.S. Friction Saw.
1—1100-lb. Erie Steam Hammer.
1—½-in. Cap. 48-in. throat QUICK-WORK Rotary Shear.
1—No. 3 L. & A. 48-in. throat Shear.
1—80-in. P. & W. Measuring Machine.
1—No. 4 Lapointe Broaching Machine.
3—NEW 15-in. Newton Slotters.

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24 in. x 24 in. x 6 ft., 8 ft. and 10 ft. Whitcomb
26 in. x 26 in. x 6 ft. Gray
30 in. x 30 in. x 6 ft. and 10 ft. Ponds 2 Hds.
30 in. x 30 in. x 12 ft. Pond Reversing Motor
36 in. x 36 in. x 8 ft. to 25 ft. Belt Drives
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42 in. x 42 in. x 14 ft. Bement, 4 Hds.
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72 in. x 72 in. x 12 ft. Bement, 4 Hds.
72 in. x 72 in. x 20 ft. Heavy Ridgway Reversing Motor.
10 ft. x 10 ft. x 36 ft. Betts, 4 hds.

MILLERS AND GEAR CUTTERS
No. 1½ and 2 B. & S. Universal Cone Type
No. 2-A. B. & S. Universal All Geared
No. 2-B. B. & S. Plain all geared
No. 4 and 5 B. & S. Plain Cone Type
No. 5 B. & S. Vertical Cone Type
No. 3, 4 and 6 B. & S. Gear Cutters.
15 in. Gleason, bevel gear generator
6 in. x 48 in. and 6 x 80 in. P. & W. old style Thread Millers

DRILLING MACHINES
26 in., 32 in. and 40 in. Sliding Head Drills
3 ft., 4 ft., 5 ft. 6 ft. Plain Radials
4 ft. and 6 ft. Universal Radials.
12 Spindle P. & W. No. 13 Multiple

BORING MACHINES
2½ in. Bar 4 ft. W. & S. Horizontal
2½ in. Bar 5 ft. Binsse Horizontal
3⅞ in. Bar 6 ft. and 8 ft. Bement Horizontals
4½ in. Bar 8 ft. Niles Horizontal
4⅝ in. Bar, 9 and 10 ft. Bement Horizontals
3 in. Bar No. 1 Lucas Horizontal
4½ in., 5 in. and 6½ in. Niles Floor Borers
42 in. and 51 in. Niles Vertical Mills
60 in. Bement Vertical Mill
10 ft. Niles 220, volt Motor D.C.

LATHES
14 in. x 8 ft. Whitcomb, Q. C.
16 in. x 10 ft. LeBlond Standard
17 in. x 6 ft. and 8 ft. LeBlond Geared Head
20 in. x 10 ft. LeBlond, q.c.
24 in. x 10 ft. Whitcomb, q.c.
26 in. x 10 ft. Pond 220 volt motor D.C.
24 in. x 24 ft. Niles, c.r.
28 in. x 12 ft. Pond, c.r.
32 in. x 12 ft. Pond, c.r.
36 in. x 20 ft. Pond 220 volt Motor D.C.
42 in. x 20 ft. Niles Triple Geared
48 in. x 30 ft. Niles Triple Geared
54 in. x 28 ft. American 220 volt Motor D.C.

GRINDERS
No. 8 Higley Saw Grinder
8 in. x 30 in. Fraser Universal
10 in. x 72 in. Norton. Plain
12 in. x 36 in. No. 2 Cincinnati Plain
12 in. x 40 in. No. 3 B. & S. Universal

TURRET LATHES
No. 6-A P. & J. 220 volt Motor D.C.
1 in., 2 in., and 2½ in. P. & W.
2 in. x 24 in. W. & S. Hollow Hex.
2 in. x 24 in. J. & L. Cone Head
24 in., 28 in. and 34 in Gisholts
32 in. Conradson American

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Air Compressors, 215 ft., 535 ft. and 835 ft. capacity
Blowers No. 10 Sturtevant; No. 70 Buffalo
Crane, 3-ton Niles, 14 ft. 2 in. Span, D.C.
Crane, 20-ton 48 ft. Span, Sellers D.C.
Engines, 125, 150 and 200 h.p. Philadelphia Corliss
Generator set 100 kw. D.C. and Engine
Graduating Machine, LeBlond
Hammer, 750 lb. Sellers
Hot Blast Apparatus, 120 in. Fan engine, Sturtevant
Motors, 5 to 100 hp. D.C.
Pump, 500 gal. Steam Drive
Saw 8 in. rounds, Higley
Screw Shaver No. 2 P. & W.
Separator, Oil No. 1 American
Slotter 6 in. Bement

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Milling Machines
2—No. 5-C BECKER Verticals, heavy duty.
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1—No. 2 ROCKFORD Universal, S.P.D., heavy.
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14—BECKER, FOX and VAN NORMAN small millers. HAND and POWER FEEDS.

Slotters and Shapers
2—NEWTON 6 in., with rotary tables.
2—GOULD & EBERHARDT, B.G., late types, 1—24 in., 1—16 in. (USED).
8—QUEEN CITY 16-20-24 in., B.G., ALL brand NEW—LOW PRICES! GET DETAILS!

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5—16 in. x 6 ft. Q.C. Geared, latest types.
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1—30 in. x 11 ft. AMERICAN—Q.C. Geared.
1—20 in. x 10 ft. L. & S., Q.C.G., very latest.
30—Good LATHES—all sizes, makes and types.
10—No. 2 FOSTER HAND SCREW MACHINES—1 1/16 in. cap., wire feed, 95% new.
2—No. 2-A W. & S. Univ. Hollow Hex., latest.
1—No. 2 UNIVERSAL GRINDER, complete; like new. WEBSTER & PERKS.
2—3 ft. RADIALS—Morris and Bickford, s.p.d.
1—BROACHER—No. 1 J. N. LaPointe.
2—KEYSEATERS—Baker Bros. Nos. 1 and 2.
30—HIGH SPEED DRILLS—2, 3, 4, 5 and 6 spindles ALLEN and H. & W., very latest types, all over 95% new.
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2—No. 6 Toledo Inclinable.
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14—V & O 101 Presses, 5-in. stroke.
9—V & O 102, 5-in. stroke, dial feed.
3—V & O 103, 6-in. stroke, dial feed.
3—No. 39 B Bliss Horning.
3—No. 10 Z. & H. Power Screw Presses.
8—No. 2 V & O Presses.
2—No. 6 Lemer Double Action Presses.
1—No. 74½ Bliss Geared Press, like new.
1—No. 1½ Bliss Toggle Drawing Press.

DRILLS AND GRINDERS
6—New Excelsior, 14-in. sensitive.
9—Champion 20-in. B. G. drill, new.
5—No. 11 B. & S. plain grinders, late type.
1—Greenfield Universal Tool Grinder.

LATHES AND MILLERS
8—14-in. x 6-ft. Walcott Lathes, new, Q.C.G., D.B.G.
2—20 x 10 Monarch Lathes, Q.C.G., D.B.G.
6—Meyers Lathes, 11 x 5, brand new.
2—16 in. American Fox Lathes.
2—Monarch 14 x 6 Lathes, taper attachment, latest type.
10—LeBlond 19 x 8, Q.C.G., D.B.G. Like new.
No. 5 Brainard 60-in. table mtr. dr. Miller.
1—No. 1½ B. & S. Universal Miller.
1—No. 2 Van Norman Duplex Miller.
1—No. 2B Milwaukee Universal Miller.

MISCELLANEOUS
3—Model G. Cleveland Automatic ⅜-in., like new.
2—No. 3 Foster F. B. G. Turret Lathes, like new.
4—No. 5 Foster F. B. G. Turret Lathes, like new.
2—No. 515 National Acme Automatics.
1—No. 105½ Bliss Metal Slitter.
2—No. 0 B. & S. Semi-Automatic Screw Machines.
1—Powell Planer, 24 x 24 x 10 ft., fine condition.
1—300-lb. Drop Hammer, belt lift.
1—No. 1 Rhodes 7-in. Shaper with vertical attachment, like new.
3—15-in. Potter & Johnston Shapers.
1—Acme Screw Slotter.
1—No. 1 Gray Sheet Metal Cutter.

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2—sp. Avey, ball bearing.
2—sp. Henry & Wright, ball bearing.
3—sp. Taylor & Fenn, plain bearing.
4—sp. Francis Reed, plain bearing.
20-in. Prentice Br. sl. hd., BG., PF.
25-in. Snyder sl. hd., BG., PF., tapping att.
32-in. Cinti. Bick. H.S. shaft drive, speed box, tapping att.
42-in. Cinti. Bick. sl. hd., BG., PF., tapping att.
No. 11 Natco multiple sp.
No. 30 Bausch multiple sp. tapping att.
4-ft. Dreses pl. radial, tapping att.
5-ft. Cinti. Bickford pl. radial tapping att.
Baker Bros. & Colburn Manufacturing Type Drills.

LATHES

7-in. x 12-in. Stark precision slide rest.
14-in. x 6-ft. Lodge & Shipley, C.R., P.C.F., taper att.
14-in. x 6-ft. Hendey, C.R., P.C.F.
14-in. x 6-ft. Mulliner, C.R., P.C.F., relieving att.
14-in. x 6-ft. Prentice Br., C.R., P.C.F., Q.C.G.
16-in. x 8-ft. Lodge & Shipley geared head, C.R., P.C.F., taper att.
17-in. x 8-ft. LeBlond, C.R., P.C.F., Q.C.G.
17-in. x 8-ft. Flather, C.R., P.C.F., Q.C.G.
18-in. x 8-ft. Rahn Larmon, C.R., P.C.F.
20-in. x 8-ft. American, C.R., P.C.F.
26-in. x 12-ft. Putnam, C.R., P.C.F.
32-in. x 14-ft. Hamilton, C.R., P.C.F., triple geared.
38-in. x 20-ft. New Haven, C.R., P.C.F.

BORING MACHINES

No. 2 Beamen & Smith, floor type, horiz. arr. M.D.
24 in. Colburn turret head, vertical.
38 in. Niles, 2 reg. heads, vertical.
51 in. Niles, 2 reg. heads, vertical.
110-in. Betts, 2 reg. heads, vertical.

SCREW MACHINES AND TURRET LATHES

½-in. cap. Cleveland pl. auto. Model B screw mchs.
1-in. cap. Acme, wire feed.
1¼-in. cap. Acme, wire feed.
1½-in. cap. Acme, wire feed.
16-in. x 18-in. Acme univ. fox type.
No. 3 Acme univ. 3½-in. cap. flat turret.
2¼-in. x 24-in. Jones & Lamson, bar or chucking.
3¼-in. x 36-in. Jones & Lamson, bar or chucking.
No. 1B Foster geared hd. turret lathe.

MILLERS

Nos. 2, 3 and 4 Cincinnati, plain.
Nos. 2-A and 5, and 9 Kempsmith, plain.
Nos. 3 and 4 Cincinnati, vertical.
Nos. 2A, C2, 4B and 5 Becker Vert.
No. 2 Brown & Sharpe, universal.
36 in. x 10 ft. Newton Face Slab Miller.
4½ x 12 Pratt & Whitney thread milling machine.

GRINDERS

3-in. x 18-in. Norton plain.
6-in. x 32-in. Norton plain.
10-in. x 36-in. Norton plain.
14-in. x 72-in. Norton pl. M.D
18-in. x 96-in. Norton plain.
10-in. x 30-in. Landis, plain.
12-in. x 120-in. Landis, plain.
12-in. x 36-in. and 48-in. Cincinnati, plain.
No. 2 Cincinnati, 12 in. x 36 in., universal.
No. 1 Cincinnati Cutter and Reamer Grinder.
No. 70 and No. 75 Heald Internal Grinders.
No. 6 Rivett Internal.
No. 11 Rivett, ball race.
Saxon Face Grinder.
10-in. Garrigus Rotary, with magnetic chuck.
No. 2 LaSalle Surface Grinder.
No. 10 & 16 Blanchard Grinder, direct M.D. type.
18-in. and 20-in. Disc Grinders.

SHAPERS AND PLANERS

12-in. Springfield Crank Shaper.
14-in. Springfield Crank Shaper.
16-in. Cincinnati Crank, back geared Shaper.
20-in. Davis Crank, BG.
20-in. Whipp Crank, back geared Shaper.
24-in. Stockbridge Crank, back geared Shaper.
15-in. x 24-in. Hendey Friction Shapers.
24-in. x 24-in. x 6-ft. Flather Planer, 1 hd.
24-in. x 24-in. x 8-ft. Cincinnati Planer, 1 hd.
36-in. x 36-in. x 8-ft. Pond Planer, 2 hds.
36-in. x 36-in. x 12-ft. Pond Planer, 2 hds.
36-in. x 30-in. x 14-ft. Cincinnati Planer, 3 hds.
36-in. x 36-in. x 12-ft. Cincinnati Planer, 4 hds.
48-in. x 48-in. x 15-ft. Sellers Planer, 3 hds.
66-in. x 60-in. x 30-ft. Bement Planer, 3 hds.

MISCELLANEOUS

No. 00 S. & S. hobbing gear cutter.
No. 000 S. & S. hobbing gear cutter.
36-in. B. & S. gear cutter.
No. 3 Lapointe broaching machine.
No. 72 Ferracute press.
No. 12 & 13 P. & W. profiling machines.
3-in. P. & W. Centering machine.
½-in. & 4-in. Acme nut tapper.
¾-in. x ¾-in. Single end punch and shear.
26-in. x 8-in. Crescent single surfacer.
2½-in. to 6-in. Merrill hand pipe machine.
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Newton, Burr and Racine Saws.

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"SIMMONS"

MILLING MACHINES

1— No. 4 Cincinnati High-Powered Universal, complete.
1— No. 3 Cincinnati High-Power Universal, complete.
5— No. 3-S Cincinnati Universal, complete.
2— No. 2-B Hendey Universal, complete.
1— No. 2 Hendey Universal, complete.
4— No. 2 Cincinnati High Power Universal, complete.
2— No. 1½ Cincinnati Cone Type Universal Complete.
1— No. 1½-B Milwaukee Universal, complete.
1— No. 1-B Hendey Universal, complete cone drive.
1— No. 1 Kearney & Trecker Universal.
2— No. 4 Cincinnati High Power Vertical Rapid Traverse.
1— No. 3 Cincinnati High Power Vertical Rapid Traverse.
2— No. 2 Brown & Sharpe Vertical Cone Drive.
1— No. 1½-B Kearney & Trecker Vertical, complete.
1— No. 5 Brown & Sharpe Plain Cone Drive.
1— No. 3-B Brown & Sharpe Plain Single Pulley Drive.
1— No. 3 Brown & Sharpe Plain Cone Drive.
1— No. 3 Cincinnati Plain Cone Drive.
1— No. 3 LeBlonde Heavy Duty Plain Cone Drive, complet
4— No. 2 Rockford Heavy Duty Plain Cone Drive.
4— No. 2 Kempsmith Plain Cone Drive, complete.
1— No. 2 Cincinnati High-Powered Plain.
9— Pratt & Whitney, Standard Hand Millers.
1— Pratt & Whitney Heavy Duty Slab Miller.
3— Type B Gooley & Edlund High Duty Millers.

PLANERS

2 NEW 60" Newton Rotary Planers.
3— 60" x 60" x 20' Woodward-Powell, 4 hds., 35-hp.
1— 48" x 48" x 20' Ridgeway, high duty, four heads.
1 NEW 48" x 48" x 28' Cincinnati, two heads.
1 NEW 42" x 42" x 12' Openside Simmons Planer.
1— 36" x 36" x 20' Woodward-Powell, four heads
1— 32" x 32" x 8' Powell, one head.
1— 30" x 30" x 18' Cincinnati, two heads.
1— 24" x 24" x 5' Woodward-Powell, one head.
1 — 24" x 24" x 8' Cincinnati.

LATHES

1— 22" x 12' Niles Lathe, complete.
7— 24" x 10' American High Duty Geared Head.
1— 24" x 18' LeBlonde Heavy Duty Lathe.
8— 27" x 18' LeBlonde Heavy Duty, QCG with motor.
7—NEW 27" x 24' LeBlonde Heavy Duty, DBG, QCG.
1— 28" x 24' Putnam Lathe complete, Taper.
4— 30" x 12' American High Duty, Geared Head, motor drive.
1— 30" x 35' Niles-Bement-Pond Lathe, complete.
1— 36" x 14' Putnam All Geared Head.
4—NEW 36" x 34' Bridgeford Geared Head, QCG 1.
1— 42" x 28' Niles-Bement-Pond, T.G. Taper.
4—NEW 48" x 29' Niles-Bement-Pond Motor Drive.
3—NEW 60" x 29'-56' Niles-Bement-Pond Motor Drive.

SHAPERS AND SLOTTERS

1— 12" Smith & Mills Plain Crank Shaper.
1— 14" Smith & Mills Plain Crank Shaper.
2— 15" Smith & Mills Plain Crank Shapers.
1— 16" Gould & Eberhardt Back Geared Crank.
2— 16" Whipp Back Geared Crank Shapers.
3— 20" Smith & Mills Back Geared Shapers.
1— 24" Gould & Eberhardt Back Geared.
1— 24" Flather Heavy Duty Back Geared.
2— 36" Fellows Gear Shapers.
4— 10" Bement Slotters Cone Drive.
1— 10-12" Dill Slotter, arranged motor drive.
1— 15-18" Dill Slotter, arranged motor drive.
1— 24" Newton Slotter, arranged motor drive.

MISCELLANEOUS

1—NEW 14" x 96"-Norton Plain Grinder.
1— No. 60 Heald Grinder, complete.
4— 1½" Four-Spindle Cone Automatics.
1— No. 2 Davis Keyseater.
1— Gould-Eberhardt Spur & Bevel Auto. Gear Cutter.
1— 96" Horizontal Gear Hobber.
1— Oxweld Duplex Generator.
8— No. 4 Warner-Swasey Screw Machines, friction geared head
3— No. 6 Warner-Swasey Screw Machines, friction geared head

SIMMONS MACHINE CO., Albany, N. Y.
Warehouses and Offices
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2—No. 77½ Bliss Presses, Straight Side, Tie Rod Frame, 12- and 16-in. stroke. Condition nearly new.
9—No. 60½ Bliss Reducing Presses, Rack & Pinion Movement.
10—No. 2 New Pratt & Whitney Trimming Presses.
1—No. 5-A New Willard Inclinable Power Press.

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1—36-in. x 14-ft. Putnam Lathe, D.B.G. Triple geared, Face plate drive; nearly New.
2—26-in. x 12-ft. Putnam Lathes, D.B.G. Quick Change Gear.
1—25-in. x 12-ft. LeBlond Lathe, D.B.G. Heavy Duty Type, Quick Change Gear; nearly New.
1—20-in. x 8-ft. Hendey Lathes, Latest Type, Tie Bar Head, Three-step cone, D.B.G. Complete regular equipment. Condition 99% New.

MILLING MACHINES

1—No. 3 Cincinnati Universal Milling Machine, with Vertical att..
1—No. 1½ Cincinnati Universal Milling Machine.
1—No. 1½ Garvin Universal Milling Machine.
5—No. 2 Cleveland Plain Milling Machines, S.P.D.
1—No. 3 Cincinnati Plain Milling Machine.
1—No. 2 Cincinnati Plain Milling Machine.
1—No. 2 Brown & Sharpe Plain Milling Machine.
1—No. 15 Garvin Plain Milling Machine.

DRILL PRESSES

1—4-ft. Arm Bickford Radial Drill. Gear Box Drive.
1—4-ft. Arm Dreses Radial Drill, Cone Drive.
1—No. 25 Foote-Burt Heavy Duty Drill Press.
1—No. D-2 Colburn Heavy Duty Drill. Press.
9—Baker Heavy Duty Drill Presses.
2—No. 12 Pratt & Whitney Multiple Spindle Drills.
1—No. 11 Pratt & Whitney Multiple Spindle Drill.

SHAPERS

1—20-in. Milwaukee Back Geared Shaper.
1—20-in. American Back Geared Shaper.
1—30-in. Morton Draw Cut Shaper.
4—7½-in. New Rhodes Shapers.

GRINDERS

2—No. 60 Heald Cylinder Grinders. Extra spindle. Complete regular equipment; nearly New.
1—No. 3 Modern Universal Grinder. Full equipment (New).
1—No. 2 Ott Universal Grinder. Full Equip.

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Brown and Sharpe No. 11 Cyl. Grinding Machine.
Ohio No. 34 Heavy Plain Milling Machine, with Vertical Head.
Rockford No. 1½ B.G. Plain Milling Machines, Index Heads, etc.
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Milwaukee No. 1½ B. Plain Milling Machine, Index Heads, etc.
Hendey No. 2 A. S.P.D. Drive Univ. Mill. Mach.
Brown and Sharpe No. 2 Cone Drive Universal Milling Machine.
Garvin No. 1½ Cone Drive Univ. Mill. Machine.
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CHUCKING MACHINES

No.		Price
329,	330, 381, 382—4 Potter & Johnson Chucking Machines, some 5½-in., some 8-in. and some 10-in. turret travel, 10-in. swing over the cross slide, with many tools.....Each,	$100

AUTOMATIC SCREW MACHINES

269—1-in. Pratt & Whitney	$100
281—2⅞-in. Pratt & Whitney	200
291—2-in. Pratt & Whitney	175
292—2-in. Pratt & Whitney	175
351—2-in. Cleveland	300
438—2-in. Cleveland	375
508—4¼-in. Gridley	850
521—1¼-in. Gridley Multiple	850
627—4¼-in. Gridley	1,275

ENGINE LATHES

332—12 x 6 Reed Lathe	$175
369—16 x 7 Reed, overhead motor drive	200
681—16 x 6 Reed	450
834—12 x 6 Flather	250
959—16 x 8 Worcester, 4 years old	450
056—16 x 6 Reed	250
150—16 x 7 Reed	200
333—12 x 6 Reed Lathe	175

MILLERS

126—No. 3 Brown & Sharpe Horizontal	$150
235—Garvin Profiler	100
293—Warner & Swasey Mfg. Miller	100
296—No. 2 Brown & Sharpe Vertical	350
313—Warner & Swasey Mfg. Miller	100
971—No. 2 Sloan & Chase Bench, 4 years old	340
428—1½ B. & S. Universal Miller	350

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975—12-in. Leland & Gifford Drill	125

SHAPERS AND PLANERS

945—42 x 42 x 10-ft. Cincinnati, hardly used with 20-hp. D.C. motor drive, two heads on cross rail and one side head	$3,000

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465—No. 11 Brown & Sharpe Plain 4-in. x 24-in.	350
556—6-in. x 48-in. Pratt & Whitney, with center grinding attachment	350
836—No. 6 Bryant	400
842—No. 6 Bryant Chucking Grinder	400
902—No. 6 Bryant	400
906—8 x 30 Modern	500
907—8 x 30 Modern	500
983—No. 6 Bryant	500
1063—No. 6 Bryant	500
201—Disc Grinder	25

GEAR CUTTERS

256—No. 4 36-in. Brown & Sharpe	$400
986—Sloan & Chase Automatic	200
1001—Dwight & Slate Automatic	50
1094—Sloan & Chase Automatic	500

MISCELLANEOUS

718—Newton Slotter, 10-in. stroke, 24-in. table	$600
780—Automatic Thread Chas. Lathe 4½ in. x 40 in.	600
882—Automatic Thread Chas. Lathe 4½ in. x 40 in.	600
1093—2-in. Oliver Filling Machine	100
1106—Taft-Pierce Thread Miller	900
5—Wells Speed Lathes, motor drive	50

TAKEN IN TRADE

1-in. Garvin Screw Machine	$150

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Progressive Manufacturer, Esq.

New tools for old.

Let new tools in your shop announce the dawn of a better day. A day when the shop finds itself again. Out with the wartime monkey-business and back to a safer, sensible routine.

Better telegraph that order today.

P. S.—Discard the Old; install the New.

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$\frac{3}{8}''$	$750.00
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9-in. x 36-in. Johnston, Bench, New.
13-in., 14-in. and 16-in. Carroll-Jamieson, New.
10-in. to 36-in. Sidney, New.
13-in. x 5 ft. 6 in., Carroll-Jamieson, Used.
13-in. x 7-ft., Willard, Used.
16-in. x 8-ft., Monarch, Q.C., Used.
17-in. x 8-ft., Sidney, Q.C., Used.
19-in. x 8-ft., LeBlond, Q.C., Used.
19-in. x 10-ft., Sidney, Q.C., Used.
20-in. x 8-ft., Whitcomb, Q.C., Used.
24-in. x 12-ft., Sellers, P.C.G., Used.

TURRET LATHES

No. 1 and No. 6 Bardons & Oliver, W.F., Used.
2¼-in., Mult. Spindle Gridley Aut., Used.
No. 6 Warner & Swasey, W.F. and Chuck, Used.
No. 12½ Garvin, W.F., Used.
21-in. Gisholt, 2⅛ in. cap., Used.
26-in. Davis, Chuck Outfit, Used.

DRILLING MACHINES

36-in. Hamilton Plain, T.A., New.
42-in., Martin, Plain, G.B., New.
36-in., Aurora, Sliding Head, Used.
32-in., Superior Sliding Head, New.
28-in., Superior, Sliding Head, New.
25-in., Superior, Sliding Head. Used.
25-in., Buffalo, Stationary Head, New.
28-in., Rockford, Sliding Head, Used.
26-in., Rockford, Sliding Head, Used.
23-in., Rockford, Sliding Head, Used.
20-in., Champion & Excelsior, New.
14-in. and 10-in., Excelsior, New.
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36-in. x 36-in. x 14-ft., Ohio, 4 heads, Used.
36-in. x 36-in. x 10-ft., Cincinnati, 3 heads, mtr., Used.
24-in. x 24-in. x 8-ft., Hendey, 1 head, Used.
24-in. x 24-in. x 6-ft., Pease, 1 head, Used.
36-in. x 36-in. x 8-ft., Gray, 2 heads, Used.

SHAPERS

16-in. to 24-in., Steptoe, New.
20-in., Cincinnati, B.G., Used.
20-in., Smith & Mills, B.G., Used.

MILLERS

No. 1 Dow, Plain, New.
No. 2 Cincinnati, Universal, Used.
No. 3 Cincinnati, Plain, Used.
No. 2-B Milwaukee, Plain, Used.
No. 1½ American, Plain, New.
No. 0 Steptoe, Hand, New.
No. 3 Burke, Hand, New and Used.

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Norton, 10 x 30 in., Plain, Used.
Modern, 8 x 30 in., Plain, Used.
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BORING MILLS

42-in., Bullard, 2 heads, Used.
3-in., Bar Binnse, hor., Used.

MISCELLANEOUS

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Hack Saws, Peerless & North Wales, New.
Hack Saws, No. 4 Marvel, Used.
Hack Saws, Kwik-Kut, 8 in., Used.
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Keyseaters, No. 2 and No. 4, Catlin, Used.
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Slotters, 10-12-in. Drill, Used.

1—9 in. x 11½ in. square rim 2 section **Fly Wheel**—18 ft. dia. with 13 15/16 in. bore, weighs about 30,000 ..... $ 500.00

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1—10 in. x 22 in. x 24 ft. shaft **Straightening Machine**, complete with screw press. Overhauled, weighs about 4000... 180.00

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1—60 in. x 28 ft. **Betts Lathe** complete and in fair condition. 2000.00

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8—8 x 40 in., No. 608 B.G., screw cutting Precision Lathes. Made by Rivet Lathe & Grinding Co. Will take material 20 in. long between centers; standard equipment as follows: Wall countershaft, 8 in. slotted face plate, two plain face plates, stops, chuck, closing ring, driving plate, "T" rest, steady rest, patent compound rest, change gears, and six cutting tools. These were installed at the Old Hickory Powder Plant but never used. Write for photo and prices.

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11-in. x 4-ft. Artisan, Q. C., new	$150
12-in. x 5-ft. Hendey Q. C.	450
16-in. x 6-ft. Flather,	250
16-in. x 8-ft. Sebastian (Gap),	300
20-in. x 11-ft. American,	450
22-in. x 8-ft. Schumacker-Boye,	250
24-in. x 12-ft. Springfield,	750

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No. 3 Kempsmith plain, late type, A-1 condition, $800.
No. 34 Kempsmith Universal, dividing head, serviceable condition, $450.

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18-in. x 10-ft. American Geared Head Lathe.
28-in. x 12-ft. 6-in. Boye & Emmes Heavy Duty Engine Lathe.
12-in. x 72-in. Norton Plain Cylindrical Grinder.
8-in. x 60-in. Lo-Swing Lathes.
24-in. Steinle Side Carriage Turret Lathes.
24-in. x 24-in. x 5-ft. Whitcomb Single Head Tool Room Planer.
4-in. Bignall & Keeler Pipe Machine, Single Pulley Drive.
No. 77½ BLISS STRAIGHT SIDE PRESS.
No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.
No. 76 TOLEDO OVERHANGING FLY-WHEEL PRESS, OPEN BACK.
8-in. Newton Slotter, Rotary Table, LIKE NEW.
24-in. Bullard Vertical Turret Lathe.

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Automatic Screw Machines

Three OO G Brown & Sharpe with screw slotting attachments and two OO turret forming machines. On hand crated for immediate shipment. Never used. Sell market price.

FS-699, American Machinist,
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No. 00, No. 0-G and No. 2 B. & S. Automatics.
2¼-in. x 24-in. J. & L. Flat Turret Lathe.
No. 4 D. & W. Geared Friction Head 1½ in.
1¼-in.-1½-in. Model "A" Cleveland Automatic.
2-in. Cleveland Automatic Model "A."
24-in. Davis Chucking Machine.

MILLING MACHINES

No. 1-B Kearney & Trecker Universal with Vertical Slotting, Universal Milling Attachments, Rotary Table and Rack Vise.
No. 2 B. & S. Universal, cone drive.
No. 1-M Potter & Johnston Automatic Horizontal.
16-in. Briggs Plain Manufacturing.
No. 6 Whitney Hand.
Garvin Index Centers.

LATHES

9 x 4 Handy.
10 x 4 Reed.
14-in. x 6-ft. Worcester.
16 x 6 Reed.
20 x 8 Reed.
21 x 13 Porter.

SHAPERS AND PLANERS

16-in. Hendey Friction.
16-in. Kelly 16-in. Gould & Eberhardt SPD.
20-in. Kelly BG.
17-in. x 17-in x 4-ft. Whitcomb.
22-in. x 22-in. x 5-ft. Whitcomb.
30-in. x 30-in. x 8-ft. Cleveland Open Side.
36-in. x 36-in. x 13-ft. Betts.
72-in. x 72-in. x 12-ft. Betts.

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No. 7-S Standard Inclinable.
No. 3 Sidney Inclinable.
No. 1 Standard Broaching and Drawing 7-in. stroke.
Single Action Pillar Pattern Presses 3½-in. stroke.
No. 5 Bliss.
No. 9 Manville Knuckle Joint.
No. 12 Bliss Arch Screw.
25-ton Greenerd Arbor Press.
400-ton Forging Press.

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No. 612 Fellows Gear Shaper.
3-spindle Reed-Prentice Drills.
40 lbs. Bradley Cushioned Helve Hammer.
No. 2 Standard Rotary Swaging Machine.
No. 3 Langelier Swaging Machine with Pencil Barrel Holder.
No. 3½ Langelier Swaging Machine.
No. 11 Standard Wire Bull Block.
6-in. McWilliams Rotary Shear.

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Boring Mach., No. 1 Cleve. Horiz.
Boring Mill, 42-in. Bullard Vert.
Boring Mill, 60-in. Bullard Vert., 2 hds.
Drill Rail, No. 7-D Moline "Hole Hog."
Drill Rail, No. 17-D Moline "Hole Hog."
Drill, D-3 Colburn 24-in. Heavy Duty.
Drill, 28-in. Aurora Sl. Hd.
Driller-Multi., No. 11 Natco, 12-in. rd hd.
Drill-Multi., 12 sp. Western Mach.
Drill-Multi., 12 sp. Valley City.
Gear Planer, 12-in. Gleason Auto.
Gear Hobber, No. 1 Adams-Farwell.
Gear Miller, No. 1½ Bilton Auto.
Grinder Cyl., 12 in. x 24 in. Modern Pl.
Grinder, No. 1 B. & S. Univ.
Grinder Tool, No. 1 Sellers Pat.
Grinder Surf., No. 16 Blanchard Vert.
Hammer, 800-lb. Massillon.
Keyseat Miller, No. 3 John T. Burr.
Lathe, 26-in. x 12-ft. Putnam, Q.C. Feed.
Lathe, 30-in. x 14-ft. Boye-Emmes, D.B.G.
Lathe, 30-in. Streit Pulley.
Miller, No. 33 Becker-Brainard Pl. Type.
Planer, 42-in. x 42-in. x 10-ft. Gray, 1 hd.
Shear and Punch No. 3 S. E. Long, Black & Allst.

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2—12 and 14 x 6 Worcester Tool Room.
1—Ea. Sidney Medium Pattern Lathes, 14, 16, 18, 20 in. x 6, 8, 10, 12 and 14 ft. beds; D.B.G., 3-step cone, Q.C.G.
1—Ea. Sidney Heavy Duty Lathes, 15, 17, 19, 25 and 27 in. x 6, 8, 10, 12 and 14 ft. bed; D.B.G., 3-step cone, Q.C.G.
1—3½ x 60 Fitchburg Lo-Swing Lathe.
1—14 x 6 LeBlond, H. S., P. R.
1—14 x 6 Flather, H. S., P. R.
1—15 x 6 Von Wyck, C. R., H. S.
1—16 x 6 Hamilton, C. R., H. S.
2—16 x 8 ft. Sidney, Q. C., C. R., D. B. G.
1—17 x 6 Cincinnati, C. R., H. S.
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1—24 x 10 ft. Lodge & Shipley; arranged M. D.
1—25 x 8 Economy Heavy Duty, C. R., H. S.
1—36 x 8 ft. American Chucking Lathe.
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12—24 in. Gisholt Turret Lathes.
2—No. 1 Pratt & Whitney Screw Machines; ½ in. cap.
14—No. 2 Smith Screw Machines; 1⅛ in. cap.
2—No. 2½ Pratt & Whitney Screw Machines.
3—J. & L. 3 x 36 in. Flat Turret Lathes.
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Wayne Machinery Co., Ft. Wayne, Ind.

FOR SALE

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1—No. 3 Universal Cutter Grinder, 46 in. stand.
1—No. 2 Detroit Centerless Grinder, complete 98% new.
5—Brand New No. 0 Shuster Wire Cutting and Straightening Machines.
2—No. 0 Brown & Sharpe Automatics.
1—No. 00 Brown & Sharpe Automatic.
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Low prices for immediate disposal

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POWER PRESSES

All Makes and Types

New and Rebuilt

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At Prices that Represent a Large Saving

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200—No. 2 Baird Pendulum Foot Presses. Every one as good as new.

PRICE - $18.00 Each.

10-Grant-Bench Type No. 81 Riveters, ¼ Capacity.

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Machinery and Equipment
45 Chapel St., New Haven, Conn.

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1—Powell Planer, 36 in. widened to 60 in. between housings, 20 ft. bed, parallel drive, 2 heads $2150
1—33 in. x 60 in. LeBlond screw cutting extension bed, gap lathe, 16 ft. bed, latest model, quick change gear $2500

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2—Putnam 5 ft. Radial Drills in good order, each $450

The above tools are in excellent condition, available for immediate delivery, and prices quoted are f.o.b. cars Boston, Mass.

FACTORY & MILL SUPPLY CO.
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1—9-in. Porter Cable Manufacturing Lathe.
1—9-in. Sunstrand Mfg. Lathe; 1—16-in. Chard Prod. Lathe; 1—16x7 Oliver QCG Lathe.
1—24x10 Schumacher-Boye Std. Lathe.
1—6-spindle Rockford 14-in. Gang Drill.
1—No. 2 Rockford High Power Miller.
1—No. 2 H. Becker Vertical Miller.
1—30x30x8 Pond Planer.

Ask for complete list.
McMULLEN MACHINERY CO.
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Universal Geared Scroll

Made by Gisholt Machine Co.

50% off List Price

Improved Standard Pattern, particularly high class and heavy construction. Chuck bodies are of close grained Cast Iron.

Sizes and Prices:

7½ in.	$16.00
9 in.	19.00
10½ in.	22.00
12 in.	26.00

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A quantity of patented. "Try-Me."

Pressure Reducing Valves

for air; threaded for ¼-in. pipe connections. These valves are new and have never been used. The lot will be sold, all or in part, at very reasonable prices. Sample on request. Write

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Keller Mechanical Die Sinker Complete, No. 3 cutter grinder; 1½ x 18-in. Pratt & Whitney Chucking Machine with countershaft; Quickwork large universal wiring machine; Grant Riveter; Ideal Babbitt Lining Machine; American Automatic Hollow Chisel Mortizer serial No. 910636; 20-in. American Laundry Machinery Company Extractor, motor driven, complete.

NASH MOTORS CO.
Kenosha, Wisconsin.

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1—Bliss Redrawing Press with 6-in. stroke, or its equivalent.
Send full information, and photographs.

W-700, American Machinist
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Additional Machinery Wanted ads on page 99.

We offer at attractive prices, the following equipment in Machinery and Transmissions.

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1—Hydraulic Press Mfg. Co., 10,000 tons, four Pillar, **Hydraulic Press,** 41-in. x 48-in. lower and upper platen, 28-in. plunger, driven by vertical pump, 36-in. x 6-in. tight and loose pulleys.
1—Sibley & Ware **Drill Press,** 20-in. swing, screw and lever hand feed.
1—Mechanics Machine Co. **Drill Press,** 14-in. swing, lever hand feed.
1—Slack Mfg. Co. high speed **Metal Cutter,** 10-in. diameter saw.
1—G. J. Brown & Son, metal **Cut-Off Saw,** 9½-in. x 30-in. table, 10-in. diameter saw.
1—Pettingell Automatic **Power Hammer,** 30 lbs.
1—Goddard swing **Grinder,** 5-ft.-6-in. swing, 1⅛-in. Arbor, 12-in. wheel.
1—Radial **Post Drill,** 5-ft. sweep, capacity 0 to ½-in. drill.
1—Stewart Oil Tempering **Furnace,** size 17, with blower.
1—Connersville **Positive Blower,** capacity 288 cu. in. per minute.
1—New York Blower Co. **Seri Vane Fan,** No. 4, type A, capacity 3000 cu.-ft. per minute.
1—Buffalo Forge Co. **Steel Plate Fan,** left hand, top horizontal discharge, with 16 section heater 6 ft. x 8 ft. 4 in. Steam receiver and valves complete. Belt driven 36-in. x 8-in. pulley will heat 400,000 cu. ft. space.
A quantity of Transmissions, such as pulleys, shaft hangers, pillow blocks, shaft couplings, etc.
Quotations and complete list furnished on request.

Dahlstrom Metallic Door Co.
Jamestown, N. Y.

FOR SALE

4—14-in. x 5-ft. **Fay & Scott Lathes.**
4—18-in. x 8-ft. **Greaves Klusman Lathes.**
1—24-in. x 16-ft. **Reed Lathe.**
1—2½-ft. **Cin. Bickford Radial Drill.**
1—24-in. x 24-in. x 6-ft. **Powell Planer.**
1—36-in. x 36-in. x 12-ft. **Powell Planer,** 4 heads.
1—60-in. x 60-in. x 22-ft. **Putnam Planer,** 4 heads.
1—No. 5 **Brown & Sharpe Univ. Miller.**
1—1½-in. **Acme Screw Mach., P. F.**
1—3 x 36 **J. & L. Double Spindle.**
2—12-in. **Leland Gifford Sensitive Drills.**
1—3-in. **Forbes Pipe Machine.**
1—4-in. **Forbes Pipe Machine.**

HARRY F. ALLEN
30 Church Street, New York.

Radio Parts Makers Attention

No. 1 and No. 2 Langelier and Leland Gifford B.B. high-speed bench drills.
⅝ and ⅝, Model A & B, Cleveland auto. screw machines. Nearly new.
No. 00 Hartford Horizontal turret, auto. screw machines. Fast and accurate. A-1 working condition.
No. 00G B & S auto. forming and cutting off machine. A-1 working condition.
No. 0 B. & S. auto. screw machine. A-1 condition.
No. 2 Carter & Hakes milling machine. Like new.

Also a lot of other machinery new and A-1 condition at very low prices.

IDEAL MACHINERY COMPANY
Plainville, Conn., U. S. A.



No. 4 Manville Screw Thread Roller

Practically same as illustration
Rebuilt and guaranteed

Capacity ¾-in. x 3⅜-in.
Length of dies—9-in.
Stroke of die—20-in.
Weight—8300 lbs.

Price, $500.00
F.O.B. Bridgeport

J. L. Lucas & Son, Inc.
Bridgeport, Conn.

MACHINERY AND TOOLS

For Immediate Delivery

MILLING MACHINES

Ingersoll 24 in. x 24 in. x 12 ft. Table Horizontal Slab Milling Machines with INCLINED ADJUSTABLE RAIL—(Brand new), (6 machines)—Weight about 25,000 lb.
HENDEY No. 2½ Milling Machines, Table 11 in. x 30 in.—(Automatic Feed 20 in.)—20 machines.
HENDEY No. 4 Milling Machines, Table 9 in. x 24 in.—(Automatic Feed 20 in.)—250 machines.
BECKER No. 7H Milling Machines, Table 9 in. x 29 in.—(Automatic Feeds 34 in. x 10 in. x 18 in.)—Table 32 in. x 14 in.
Whitney No. 6 Hand Milling Machines, Table 20 in. x 4 in.—(Feeds 16 in. x 6 in. x 13 in.)—10 machines.
SMITH No. 6 Hand Milling Machines, Table 20 in. x 4 in.—(Feeds 16 in. x 6 in. x 1 in.)—20 machines.

AIR RIVETING AND CHIPPING HAMMERS

6—No. 80 Boyer 1-1/16 in. x 8 in. (new) Riv. Hammer.
7—No. 60 Boyer 1-1/16 in. x 6 in. (new) Riv. Hammer.
9—No. 80 Boyer 1-1/16 in. x 8 in. (used) Riv. Hammer.
9—No. C Thor 1-1/16 in. x 3 in. Chip Hammer.
23—No. 60 Thor 1-1/16 in. x 6 in. Riv. Hammer.
1—No. 8 New Chicago Chipping Hammer, 1⅛ in. x 4 in.
3—Ingersoll 1⅛ in. x 5 in. No. 2709 Chip Hammer.
8—No. 50 Boyer 1-1/16 in. x 5 in. No. 2710 Riv. Hammer, with invert handles.
1—No. 50 Boyer 1-1/16 in. x 5 in. No. 2711 Riv. Hammer.
2—No. 11 Boyer 1-3/16 in. x 11 in. No. 27½, Long stroke. Capacity up to 1½ in rivets. Riveting Hammer.
3—No. 90 Ingersoll Little David Riveting Hammers, No. NS-28½.

DRILL PRESSES

Meyers 10 in. Swing Bench Sensitive
Champion 20 in. Swing Stationary Head Square Base Wheel and Lever and Power Feed Back Geared
Colburn 25 in. Swing (No. D-4) Heavy Duty High Speed Single Pulley Drive, Compound Table
Barnes 42 in. Sliding Head Back Geared—Power Feed (All geared feeds)
Foote Burt Vertical 2 Spindle Adjustable Heavy Model, 3 in. capacity, also adapted for cylinder boring
Foote Burt Vertical 4-Spindle—Same
Pratt & Whitney 6-Spindle Adjustable table, 3 in. capacity
Bausch 8-Spindle Multiple Circular Head 20 in. diameter, will drill to the center of a 40 in. dia. circle.
Kerr Murray Plain Radial 4 ft. arm for boiler and structural shop and rough work
Bickford Plain Radial with tapping attachment, 5 ft. arm
Niles Bement Pond Co. Plain Radial 6 ft. arm with tapping attachment.

Send for Bulletin No. 205, describing our complete stocks of Machinery and Tools.

HARRIS BROTHERS CO.
35th and Iron Sts., Chicago, Ill.

TOOLS FOR IMMEDIATE SHIPMENT

Air Compressors, Franklin, 12 x 10 and 9 x 8
Automatics, National Acme, No. 52and 56
Boring Mill, Bullard, turret head, 34 in.
Boring Mill, 10 ft., 2 swivel head
Drills, Std. Makes, 20-in., new, $111.50 ea. (6)
Flat Turret, 2 x 24 and 3 x 36 J & L
Gear Cutter, Whiton, 36-in. spur and worm.
Grinder, Cutter and Reamer, Grand Rapids
Lathe, Fitchburg, low swing, 8 x 60 in.
Lathe, Hamilton, 14 in. x 6 ft., h.s., comp. rest.
Lathe, Hamilton, 18 in. x 8 ft., dbl. bk. gr. New
Lathe, Schumacher-Boye, 25 in. x 14 ft.
Magnetic Chucks, Heald, 110-volt.
Miller, B. & S., No. 2, heavy, plain
Millers, Kempsmith, production, No. 32 (3)
Motors, G. E., ½ to 50 hp., 3-ph., new.
Planer, Pease, 24 x 24 x 6 ft.
Planer, Pond, 36 x 36 in. x 18 ft.
Radial, Canedy-Otto, 3½-in., plain. New
Screw Machine, Wood hand, 1½ in.
Shaper, Smith & Mills, 14 in.
Shapers, O.&S., crank, 16, 20 and 24 in., B.G., new

The Osborne & Sexton Mchy. Co., Columbus, O.
Branch—Dayton, O., 1118 Lindsey Bldg. X

GISHOLT TURRET LATHES

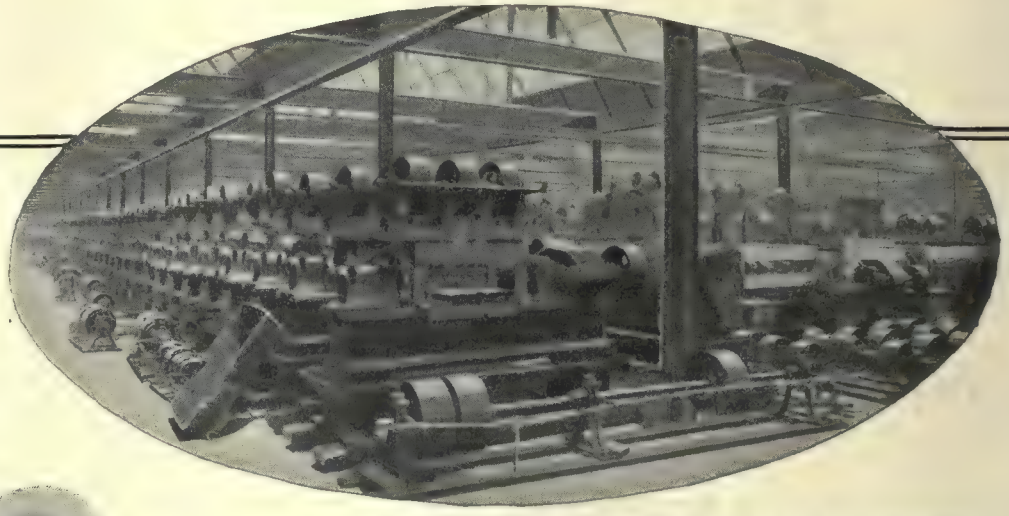
AT BARGAIN PRICES

2—21-inch	$950
2—24-inch, 4-in. hole in spindle	975
2—24-inch, 6-in. hole in spindle	1050

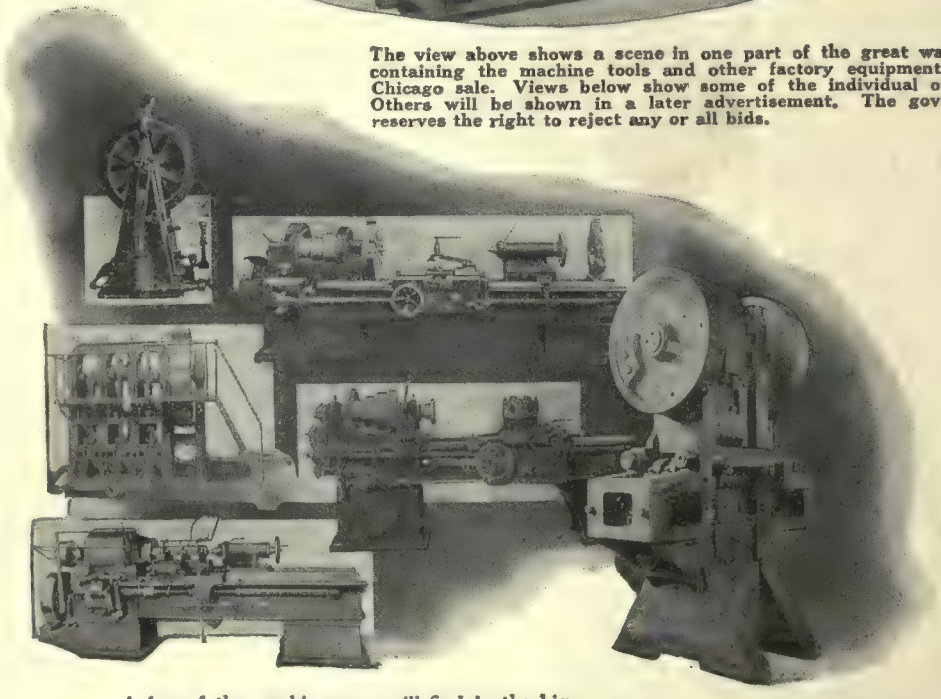
These Tools are in first class second hand condition. Wire or write,

Myers Machine Tool Corp.
90 West Broadway, N. Y.

A WAREHOUSE



The view above shows a scene in one part of the great warehouse containing the machine tools and other factory equipment in the Chicago sale. Views below show some of the individual offerings. Others will be shown in a later advertisement. The government reserves the right to reject any or all bids.



A few of the machines you will find in the big Chicago Sale. There are hundreds of others.

WAR DEP

FULL

Of Machine Tools for Sale,

At CHICAGO, During June and July

IF your plant is needing any sort of machine equipment — lathes, grinders, millers, pumps, accumulators, hydraulic fittings, forging presses, steam hammers, gear-driven presses, blowers, air compressors, scales, lifting magnets, jib cranes, or roller conveyors,

Send a Man to Chicago

Instruct him to inspect the hundreds of offerings—all suited to industrial use and in good condition—and make an offer on machines you need.

Sale by Negotiation

This equipment, all standard makes, is being sold during June and July by negotiation; which means simply this—offer the CHICAGO ORDNANCE SALVAGE BOARD what you consider these machines are worth to you. If your offer is considered fair, the War Department will accept it.

Hundreds of special purpose machines will go at slightly more than scrap value. Perhaps you can use some. Look them over.

Act Now—Send Your Buyer

Buyers are already selecting machines. Get full information for your inspector by writing

Chairman—

Chicago District Ordnance Salvage Board
7400 South Ashland Avenue, Chicago, Ill.

Here's the Kind of Material Offered

Hydraulic Fittings
Large stock of miscellaneous valves, relief valves, check valves and hydraulic pipe, suitable for pressures up to 2500 lb. per sq. in.

150 Horizontal Tire Presses
Adaptable for commercial uses. Made by West Tire Setter Co., Maplewood Mfg. Co., Devilbliss.

3 Steam Hammers
1500-lb., 3-ft. stroke Erie Steam Hammers complete. New and in original condition with anvil blocks, adaptable for use on air as well as steam

43 Blowers
28 Standard G.E. motor driven centrifugal air compressors (blowers) up to 3-lb. pressure, 5,000 to 50,000 cu. ft. of free air per minute. New and in original condition. Complete with 440-v., 60-cy. 3-ph. induction motors, dir. conn. to blowers.

15 Root & Vandervoort mechanical pressure blowers, belt driven. No. 3 and No. 6 size. Suitable for steel plant or foundry work. Connellsville Centrifugal pressure blowers, belt driven.

124 Furnaces
Furnaces of various sizes and makes for forging and heat-treating, readily adaptable for commercial use. Equipped for oil burning with burner equipment installed. Made by Tate-Jones, Gilbert & Barker, and American Shop Equipment Co.

2 Air Compressors
22-in. x 14-in. x 18-in. stroke, 1500 cu. ft. at 100-lb. pressure Bury Air Compressors, cross com. with intercoolers, dir. conn. to G.E., 350-hp., 440-v., 60-cy., 3-ph., synchronous motors, unity power factor with starting equipment and excitation switchboard equipment but without exciters.

160 Scales
Standard scales. Toledo springless type. Fairbanks and Standard Scale Co. std. platform scales of various sizes and capacities.

3 Lifting Magnets
42-1., 220-v., D.C., Electric Control and Mfg. Co.

10 Jib Cranes
Std. jib cranes, 2-ton cap. Whiting Fdry. & E. Co.

5,000 Feet of Roller Conveyor in standard lengths with stands. Suitable for manufacturing purposes, duit, switch boxes, panel boards, switchboards, and miscellaneous shop maintenance equip., supplies, etc.

ARTMENT

METAL TRADE

Needs and the means to meet them make an

OPPORTUNITY

of the

Curtis-Elmwood Air Reserve Depot AUCTION, BUFFALO, July 11th, 1922

U.S. AIR SERVICE

FOR every item in this sale there exists a practical use in one or more of the thousands of machine shops and factories of the country. Help to connect the need and the opportunity to purchase at low figures. Compare the wants in *your own* shops with what is offered; go to Buffalo if possible, for inspection always suggests possibilities of profitable use.

Machine Tools

Le Blonde Crankshaft Lathes; Metal Jig Saws; Eureka Filing Machine; Automatic Shaper (double end); Heavy Duty Lathes (various); Acme Turret Lathe; Boring Machines; Jewellers Lathe; Auto Copying Lathes; Thread Millers; Load Testing and Gear Measuring Machines; and a quantity of spare parts, gears, bearings, centers fixtures, etc.

Small Tools

7,540 High Speed and Carbon Steel Blades;
2,800 Die Chasers;
2,000 Counterbores;
3,400 High Speed Cutters
400,000 High Speed and Carbon Drills;
5,000 Files;
4,000 Lathe Jaws;
26,000 Taps;
80,000 Grinding Wheels, and many other items.

Used Tools and Gauges

Nine Sets Johansson Blocks; Boring Bars; Calipers; 231 Micrometers; 1300 Lathe Centers; 321 Drill and Lathe Chucks; 8,000 Clamps; 9,200 High Speed and Carbon Milling Cutters; 1,400 Collets; 12,000 Dies; 7,100 Drills; 41,000 Gauges; 17,000 Reamers; 34,000 Taps; 2,500 Grinding and 3,000 Buffing Wheels.

Metals

Hot and Cold Rolled Bars; Vanadium Steel Sheets; Seamless Steel Tubing; High Speed Steel Bars; Ribbon Copper; Band Iron; Channel Iron; Bronze, Brass and Copper Ingots; Chrome Nickel Steel Bars (quantities in rd. and sq. up to 4½ and 5 in.); Carbon and High Speed Tool Steel; various other metals.

Shop Equipment

Blowers; Shafting; Hangers; Couplings; Electric Heat-Treating Furnaces; Sand Blast Guns; Chain Hoists; Drying Ovens; Steel, Wood and Paper Split Pulleys; Quenching, Gasoline and Plating Tanks; Transveyors; Shop and Hand Trucks.

Miscellaneous Material

Laboratory Equipment; Paints; Oils and Chemicals; Liberty Silver Rod ⅛ in. round; Heat Treating Equipment; 10,000 Bronze Bushings; Cooling Tanks; Retorts; Sanders; Scrapers; I Beams; Earthenware Crocks; Leather and Canvas Straps; 170,000 yds. 1-in. Cloth Tape, Gummed, and many other items.

The Government reserves the right to reject any or all bids.
For catalogs and further information, write—

Commanding Officer, Curtis-Elmwood Air Reserve Depot
Buffalo, N. Y.

or

Chief, Material Disposal and Salvage Section
Room 2624 Munitions Bldg., Washington, D. C.

WAR DEPARTMENT

WANTED

Tensile Testing Machine

Second hand, in good condition; capacity between 5,000 and 10,000 lbs. Olsen Machine preferred.

W-701, American Machinist
10th Ave. at 36th St., New York City.

WANTED

SHAPER

28-in. or larger, second hand. Give full particulars as to age, condition, make and price. Address,

BOX 535, Marion, Ind.

POSITIONS VACANT

Massachusetts

GENERAL and sales manager wanted in established Massachusetts corporation of high standing manufacturing quality standard product in great demand by one of world's largest industries. Retiring interest may be taken over offering exceptional opportunity. Man of experience and ability required; purchase of interest of secondary importance. Address P. O. Box, 3272, Boston, Mass.

Michigan

TOOLMAKERS, gaugemakers, diemakers and Lucas boring mill men on high class automobile tools wanted. State experience fully and rate expected; no labor trouble. Lamb Co., 1938 Franklin St., Detroit, Mich.

Pennsylvania

COMPETENT foreman, to take charge of gear-cutting department; must have had thorough experience on Fellows gear shapers, Gleason machines and hobbers. Applicant should state age, whether married and salary desired and give references. P-705, Am. Machinist, Real Estate Trust Bldg., Phila., Pa.

GRINDING department foreman for internal and external grinders on automobile parts and miscellaneous work. State experience, age, whether married or single, wages desired and references. P-703, Am. Machinist, Real Estate Trust Bldg., Phila., Pa.

EMPLOYMENT SERVICE

A LEADING organization desiring to fill an important position, for obvious ethical and other reasons, cannot invite directly the candidacy of any particular man. Similarly, no well-connected man will exploit personally his own qualifications, no matter how receptive he may be to overtures. The undersigned has been retained by a national clientele for many years, as a medium for negotiating preliminaries in such cases. Your permission to send booklet discussing this problem and describing the service, will in no degree obligate or compromise you. Strictly confidential. R. W. Bixby, Inc., 307 Lockwood Bldg., Buffalo, N. Y.

POSITIONS WANTED

Illinois

WANTED—Position as manager by a man trained in the hard school of practical experience in the successful supervision and management of manufacturing plants in various lines; open-shop conditions always maintained without labor troubles. PW-711, Am. Machinist, Old Colony Bldg., Chicago, Ill.

EXECUTIVES

Engineers and men of proven ability seeking positions find our service satisfactory. Our Mr. H. H. Harrison can confidentially negotiate for you suitable connections, as he has successfully done for thousands of others since 1909. Inquiries invited.

The National Business Bourse, Inc.
Confidential Negotiators
Association Bldg., Chicago.

POSITIONS WANTED

WANTED—Position as an executive by a practical man who understands factory management in all its branches from A to Z; wide experience in handling labor under open shop conditions in many lines; insures success without labor trouble. PW-610, Am. Machinist, Old Colony Bldg., Chicago, Ill.

Missouri

AS practical machine shop foreman or as assistant superintendent; would prefer location in Middle-West; have had 25 years' experience in supervising heavy machine shop work, the last 5 years as superintendent of one of the largest machine shops in the Middle-West. PW-713, Am. Machinist, 713 Star Bldg., St. Louis, Mo.

TITLE and location open by post-graduate of "university of hard knocks and experience" in plant layout, design, production, manufacture on basis of quality, quantity, interchangeability at proper costs; successful with large forces of employees, intelligent executives and appreciative employers. This is your opportunity to connect a real, honest-to-goodness go-getter. Pass it up and be sorry too late. Open August 1. PW-698, Am. Mach.

New Jersey

EXECUTIVE wishes connection with progressive concern; 5 years mechanical engineer, 10 years foreman and general foreman; well experienced in production methods; good organizer and able to get results. PW-708, Am. Machinist.

FOREMAN gear cutting; 12 years' experience Fellows gear shapers, Gleason bevel gear generators, straight tooth type; best reference as to character and ability. PW-709, Am. Machinist.

WORKS manager, high grade organization builder, desires to sell his services; 15 years' experience on novelties, elect. goods, special machinery, valves and fittings; thoroughly familiar with modern factory methods. PW-491, Am. Mach.

New York

FACTORY manager, with long practical experience in all branches of manufacturing machinery, special tools and automobile parts or hardware. PW-704, Am. Machinist.

GENERAL manager, an executive especially qualified to take charge of a plant making supplies or small tools. For seven straight years I paid a handsome profit on a business which had previously run at a large deficit; salary not so important as a fair arrangement for sharing in the profits resulting from my work; am willing to leave New York. PW-710, Am. Machinist.

MACHINIST, 23 years' wide experience as tool diemaker and tool designer, technically graduated, inventive ability, practical, handle men, wishes position as foreman or assistant. Frank Ruszkowski, c/o Mr. Binder, drug store, 1710 Third Ave., New York City.

MECHANICAL draughtsman, with varied experience, wishes position. Address PW-694, Am. Mach.

PRACTICAL man, with 25 years' experience in machine shop, is open for position as general foreman or production manager. PW-714, Am. Machinist.

Ohio

MACHINE shop executive wishes to connect with progressive concern; record O.K.; small or large job; hustler on production, expert in handling men. I can get you results; any location, prefer Middle-West. PW-712, Am. Machinist, Leader-News Bldg., Cleveland, Ohio.

Pennsylvania

FACTORY manager. Practical man with technical education, have had 20 years' experience in shop-management system, methods, tools and machine design, manufacturing small and accurate interchangeable product also a variety of electrical apparatus. Proven ability, resourceful and energetic. Member A.S.M.E., desires position with good concern. Best of references. Age 44. PW-707, Am. Mach., Real Estate Trust Bldg., Phila., Pa.

POSITIONS WANTED

FACTORY manager or superintendent, 20 years' successful experience handling help and training foreman, familiar with modern methods of manufacturing duplicate and interchangeable parts, setting of piece work prices for hand screw machine punch press and automatic screw machine work. Production my specialty. Age 39; at present holding responsible position, salary $4,000; looking for a city or town with good schools. First class references. PW-684, Am. Mach., Real Estate Trust Bldg., Phila., Pa.

TOOL designer, first-class, wide experience on special automatic machinery, jigs, fixtures and tools, desires position; American, good executive, with thorough shop training. PW-706, Am. Machinist, Real Estate Trust Bldg., Phila., Pa.

PATENT ATTORNEYS

PATENTS, C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed Form fee schedule, information, free Lancaster and Allwine, 262 Ouray Bldg., Washington, D. C.

BUSINESS OPPORTUNITIES

American Sales Engineer

Returning and to stay in Europe, desires two or three good lines to represent. Will travel British Isles, France, Belgium, Holland, Germany, Switzerland, Italy, Spain. BO-690, Am. Mach.

WANTED

Machinery Wanted

Must be in good condition; a large profiling or vertical milling machine with rotary table for cam cutting similar to Becker No. 5. Also Arbor press and Peerless cold hack saw. Address E. Conner, c/o Rathbun & Bird, 17 Walker St., New York City.

FOR SALE

Patent for Sale

Brass fitting to be made in great quantities; sound design; chance for firm wanting regular standard products. FS-696, Am. Mach.

HERE IS WORK FOR YOUR PLANT

Consulting Engineer back from five months' stay in Europe, tied up the exclusive American rights for several big and successful manufacturing propositions. All are thoroughly ripened, and being marketed now in Europe, but entirely new for U. S.

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Only responsible firms with ample financial backing, but requiring a new line, which is ready to start work on tomorrow, state equipment or present products.

P. O. BOX 112, ROCKY RIVER, O.

FACTORY OPPORTUNITY
THAT COMES BUT ONCE

New, brick, steel and concrete buildings; over 50,000 square feet floor space.
Power plant and iron working machinery.
Everything modern in plant and office constructions.
Plant has neve been operated; absolutely new.
Located on two trunk lines with private switches in.
One of the best towns in Central States; ideal labor conditions.
To be sold at private sale on or before July 15, 1922.

For full particulars address,

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"NIXIES" is a word coined by Uncle Sam. It is a name the post office uses to designate undeliverable mail matter. If the person to whom mail is addressed is unknown or has removed and left no forwarding address, such mail goes into the Nixie box. Any postmaster will tell you that a lot of well-intentioned printed matter winds up a brief career due to this fate.

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Contract Work

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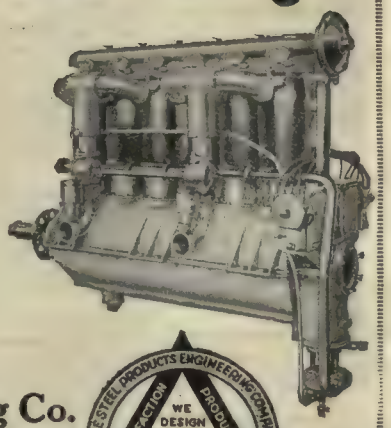
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No matter how big, how small, how intricate, how accurate

In fact, no matter what kind of a machine you need, or how accurate your tools must be, or how big a quantity production of parts you need, or how quick you must have delivery—your first step should be—

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Lovejoy Tool Co., Springfield, Vt.
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Colburn Mach. Tool Co., Cleveland
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Lapointe Mach. Tool Co., Hudson.

Broaching Machines
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson.

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Bronze, Phospor
Bunting Brass & Bronze Co., Toledo.

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Link-Belt Co., Chicago; Philadelphia

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Advance Furnace & Eng. Co., Springfield, Mass.
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Johnson Gas Appliance Co., Cedar Rapids.

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Tate, Jones & Co., Pittsburgh

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Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
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Rowbottom Machine Co., Waterbury

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Light Mfg. & Fdry. Co., Pottstown

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Bunting Brass & Bronze Co., Toledo.
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Gilbert & Barker Mfg. Co., Springfield, Mass.
Imperial Brass Mfg. Co., Chicago.
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Castings, Die Molded
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Franklin Die Cast. Corp., Syracuse.
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Marf Mch. & Die Cast Co., Bklyn.

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Cincinnati Planer Co., Cincinnati.

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Cushman Chuck Co., Hartford.

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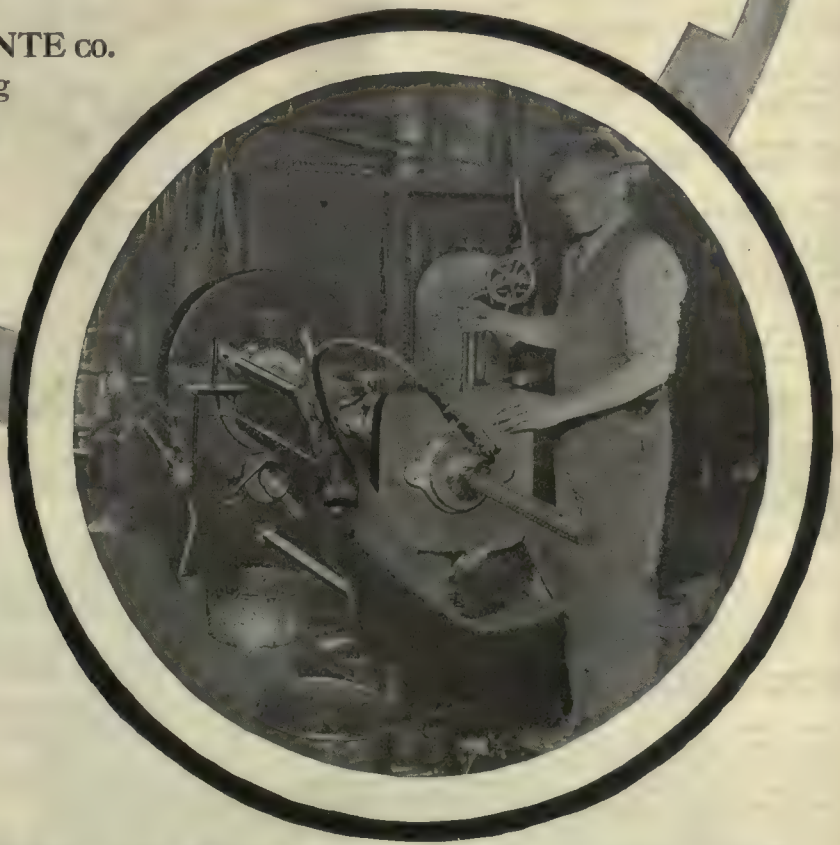
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Union Twist Drill Co., Athol, Mass.

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National Tool Co., Cleveland.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.
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Garvin Mach. Co., N. Y.
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Greenfield Tap & Die Corp. Greenfield
Hurlbut-Rogers Mchy. Co., So. Sudbury
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Nashville Ind. Corp., Old Hickory
N. J. Mchy. Exch., Newark
Niles & Co., F. H., N. Y.
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Osborne Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
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Standard Mchy. Co., New Haven
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Warner & Swasey Co., Cleveland
Wayne Mchy. Co., Ft. Wayne.

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Luma Elec. Equip. Co., Toledo

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Dickinson, Thomas L., N. Y.
Wheel Trueing Tool Co., Detroit.

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Keller Mech. Engraving Co., Bklyn.

Dies, Forging
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Steel Prod. Eng. Co., Springfield

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Geometric Tool Co., New Haven
Jones & Lamson Mach. Co., Springfield, Vt
Murchey Mch. & Tool Co., Detroit
Victor Tool Co., Waynesboro

Dies, Sheet Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
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Errington Mechanical Laboratory, N. Y.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp. Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro, Pa.
Murchey Mch. & Tool Co., Detroit
National Mchy. Co., Tiffin, Ohio.
Steel Prod. Eng. Co., Springfield
Victor Tool Co., Waynesboro

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Armstrong Bros. Tool Co., Chicago.

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Armstrong Bros. Tool Co., Chicago.

Drill Speeders
Graham Mfg. Co., Providence.
Turner Mach. Co., Danbury.

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Langelier Mfg. Co., Cranston
Nelson-Blanck Mfg. Co., Detroit.

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Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond
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Clemson Bros., Inc., Middletown
Hoefer Mfg. Co., Freeport
Langelier Mfg. Co., Cranston
Rockford (Ill.) Drilling Mach. Co.
Silver Mfg. Co., Salem
Standard Elect. T. Co., Cincinnati
Taylor & Fenn Co., Hartford.

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Drilling Machines, Electric and Pneumatic
Black & Decker Mfg. Co., Baltimore
Chicago Pneumatic Tool Co., N. Y.
Louisville Elect. Mfg. Co., Louisville
Neil & Smith Elec. T. Co., Cincinnati
Silver Mfg. Co., Salem
Standard Elect. T. Co., Cincinnati

Drilling Machines, Gang
Baker Bros., Toledo
Barnes Drill Co., Rockford.
Cincinnati (O.) Bickford Tool Co.
Colburn Mach. Tool Co., Cleveland
Dreses Mch. T. Co., Cincinnati
Foote-Burt Co., Cleveland
Fosdick Mch. T. Co., Cincinnati
Langelier Mfg. Co., Cranston
Moline Tool Co., Moline, Ill.
Silver Mfg. Co., Salem
Sipp Mch. Co., Paterson
Taylor & Fenn Co., Hartford.

Drilling Machines, Heavy Duty
Baker Bros., Toledo
Betts Mach. Co., Rochester.
Buffalo Forge Co., Buffalo
Colburn Mach. Tool Co., Cleveland
Foote-Burt Co., Cleveland
Fosdick Mch. T. Co., Cincinnati
Hoefer Mfg. Co., Freeport
Minster Mch. Co., Minster
Niles-Bement-Pond Co., N. Y.
Rockford (Ill.) Drilling Mach. Co.
Ryerson & Son, Joseph T., Chicago

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baker Bros., Toledo
Baush Mch. T. Co., Springfield, Mass.
Foote-Burt Co., Cleveland
Fox Machine Co., Jackson, Mich.
Harrington Son & Co., Ed., Phila
Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond
Newton Mach. Tool Wks., Phila.
Rockford (Ill.) Drilling Mach. Co.
Sellers & Co., Wm., Philadelphia.
Turner Machine Co., Danbury.

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Baush Mch. T. Co., Springfield, Mass.
Betts Mach. Co., Rochester.
Cincinnati (O.) Bickford Tool Co.
Fosdick Mach. Tool Co., Cincinnati.
Harrington Son & Co., Ed., Phila.
Lynd-Farquhar Co., Boston.
Morris Mach. Tool Co., Cincinnati.
Mueller Mach. Tool Co., Cincinnati.
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester.
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia.

Drilling Machines, Sensitive
Buffalo Forge Co., Buffalo
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester.
Reed-Prentice Co., Worcester.
Royersford Fdry. & Mach. Co., Royersford
Sipp Mch. Co., Paterson
Taylor & Fenn Co., Hartford.

STELLITE TOOLS

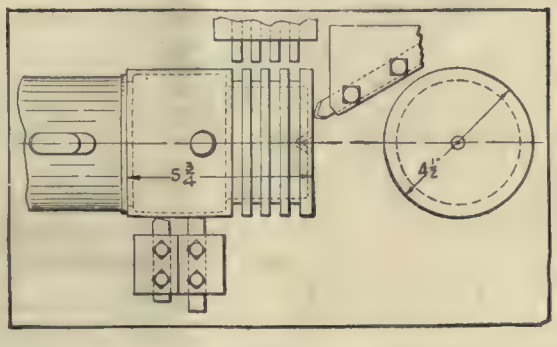
Turning Large Tractor Pistons

Table Travel Roughing	5" per minute
" " Finishing	13" " "
Speed	124' " "
Cutting Time	2 minutes
Number completed per grind	165

We will survey your standard operations or proposed operations, giving comparative speeds, feeds, floor to floor time, production per day, first cost of tools, accumulative cost of tools, tool cost per cubic foot of metal removed including all necessary labor and machine costs, showing Stellite performance versus other tools.

No claims are made without facts to support them because we guarantee production shown by our data sheets where the customer makes the cutting conditions favorable to specifications.

NOTE THE DIMENSIONS



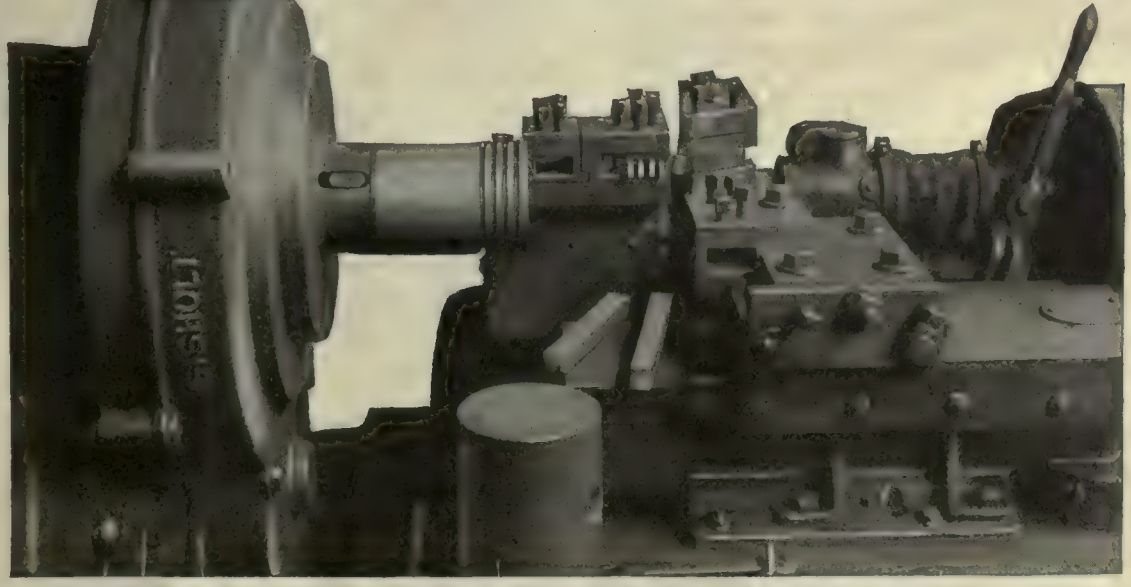
When you purchase Stellite you purchase production wherever we receive co-operation.

HAYNES STELLITE COMPANY

Carbide and Carbon Building, 30 East 42nd Street, New York

THE OPERATION

Rough turn, groove and face as tools travel toward the head stock. Semi-finish turn, finish face and center as tools return across the piston.



Drilling Machines, Turret
Nat'l Automatic Tool Co., Richmond
Turner Mach. Co., Danbury.

Drilling Machines, Vertical
Baker Bros., Toledo
Barnes Co., W. F. & John, Rockford.
Barnes Drill Co., Rockford
Baush Mch. T. Co., Springfield, Mass.
Betts Mach. Co., Rochester.
Cincinnati (O.) Bickford Tool Co.
Colburn Mach. Tool Co., Cleveland
Foote-Burt Co., Cleveland
Fosdick Mch. T. Co., Cincinnati
Harrington Son & Co., Ed., Phila.
Hoefer Mfg. Co., Freeport
Knight Mchy. Co., W. B., St. Louis
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester.
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester.
Rockford (Ill.) Drilling Mach. Co.
Royersford Fdry. & Mach. Co., Royersford
Ryerson & Son, Jos. T., Chicago
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford.
Turner Mach. Co., Danbury.

Drills, Center
Detroit Twist Drill Co., Detroit
Gledhill Mfg. Co., Providence
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
Detroit Twist Drill Co., Detroit
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.

Drills, Twist and Flat
Buckeye Twist Drill Co., Alliance.
Detroit Twist Drill Co., Detroit
Latrobe Tool Co., Latrobe.
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes Mfg. Co., Akron

Electrical Instruments
Westinghouse Elec. & Mfg. Co. E. Pittsburgh

Electrical Supplies
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Elevating Trucks (See Trucks)

Elevators and Conveyors
Albro-Clem Elevator Co., Phila.
Caldwell & Son Co., H. W. Chicago
Link-Belt Co., Chicago, Philadelphia

Emery Wheels (See Grinding Wheels)

Enamels Machinery
Hilo Varnish Corp, Brooklyn

Engines, Oil, Gas and Steam
Chicago Pneu. Tool Co., N. Y.

Engineers, Industrial & Mechanical
Hartford Special Mchy. Co., Hartford
Underwood Corp., H. B., Phila.

Engraving Machinery
Gorton Mach. Co., Geo., Racine.
Keller Mech. Engraving Co., Bklyn.

Expanders, Tube
Watson-Stillman Co., N. Y.

Eyeglasses, Safety (See Goggles, Safety)

Fans, Electric
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Exhaust
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans Ventilating
Westinghouse Elec. & Mfg. Co. E. Pittsburgh

File Handles
Nicholson File Co., Providence

Files and Rasps
American Swiss File & T. Co., N. Y.

Filing Machines
Ames Co., B. C., Waltham
Cochrane-Bly Co., Rochester
Nicholson File Co., Providence
Oliver Instrument Co., Adrian.

Filler, Iron (See Cements, Iron)

Fittings, Hydraulic
Burroughs Composition Mchy. Corp., Newark.
Elmes Eng. Wks., Chas. F., Chicago.
Watson-Stillman Co., N. Y.

Flexible Shafts
Errington Mechanical Laboratory, N. Y.
Strand & Co., N. A., Chicago.

Forges
American Gas Furnace Co., N. Y.

Forgings, Drop
Bearings Co. of America, Lancaster
Universal Mch. Co., Bowling Green
Williams Co., J. H., Brooklyn

Forging Machinery
Acme Mchy. Co., Cleveland.
Bradley & Son, C. C., Syracuse
National Mchy. Co., Tiffin.

Foundry Equipment
Adams Co., Dubuque

Fuel Oil Burning System
Advance Furnace & Eng. Co., Springfield, Mass.
Chicago Flexible Shaft Co., Chicago

Furnaces, Forging
Chicago Flexible Shaft Co., Chicago.

Furnaces, Heat-Treating, Coal
American Industrial Furnace Corp., Boston

Furnaces, Heat Treating, Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., N. Y.
American Industrial Furnace Corp., Boston
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids

Furnaces & Ovens, Electric
Westinghouse Elec. & Mfg. Co. E. Pittsburgh

Furnaces, Tempering and Annealing
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., N. Y.
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids

Furniture, Machine Shop
Brown Eng. Co., Reading
Manufacturing Equip. & Eng. Co., Framingham.

Gages, Comparator
Jones & Lamson Mch. Co., Springfield, Vt.

Gages, Dial
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Niles-Bement-Pond Co., N. Y.
Randall & Stickney, Waltham
Starrett Co., L. S., Athol, Mass.

Gages, Recording
Bristol Co., Waterbury

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp. Greenfield

Gages, Standard
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp. Greenfield
Hartford Special Mchy. Co., Hartford

Gear Cutting Machines
Adams Co., Dubuque.
Becker Milling Mch. Co., Hyde Park.
Bilgram Machine Works, Phila.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Gear Cutting Mch. Co
Fellows Gear Shaper Co., Springfield, Vt.
Flather & Co., Nashua
Garvin Mach. Co., N. Y.
Gleason Works, Rochester
Gould & Eberhardt, Newark
Harrington Son & Co., Ed., Phila.
Newark Gear Cutting M. Co., Newark
Newton Mach. Tool Works, Phila.
Waltham Mach. Wks., Waltham
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Adams Co., Dubuque
Brown & Sharpe Mfg. Co., Providence
Gisholt Mch. Co., Madison
Gleason Works, Rochester
Newark Gear Cut Mch. Co., Newark

Gear Tooth Rounders
Cross Gear & Eng. Co., Detroit

Gears, Cast
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Caldwell & Son Co., H. W., Chicago
Franklin Die Cast Corp., Syracuse
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland.
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Philadelphia
Philadelphia Gear Works, Phila.

Gears, Cut
Adams Co., Dubuque
Albaugh-Dover Co., Chicago
Albro-Clem Elevator Co., Phila.
Boston Gear Wks., Quincy
Bilgram Machine Works, Phila.
Boston Gear Wks., Quincy, Mass.
Brown & Sharpe Mfg. Co., Providence
Brown Co., A. & F., N. Y.
Cincinnati Gear Co., Cincinnati
Connecticut Gears, Inc., Waterbury
Diefendorf Gear Corp., Syracuse.
Earle Gear & Mch. Co., Philadelphia
Fawcus Machine Co., Pittsburgh.
Fellows Gear Shaper Co., Springfield, Vt.
Flather & Co., Nashua
Foote Bros. Gear & M. Co., Chicago.
Garvin Mach. Co., N. Y
Gleason Works, Rochester
Grant Gear Works, Boston.
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Philadelphia
Massachusetts Gears & T. Co., Woburn
Meacham Gear Corp., Syracuse
Meisel Press Mfg. Co., Boston
Newark Gear Cutting Mach. Co., Newark.
Niles-Bement-Pond Co., N. Y.
Philadelphia Gear Works, Phila.
Simonds Mfg. Co., Pittsburgh

Gears, Forged
Philadelphia Gear Wks., Philadelphia

Generators, Electric
General Electric Co., Schenectady
Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Grab Buckets
Link-Belt Co., Chicago, Philadelphia
Toledo Crane Co., Bucyrus

Greases, Lubricating
Royersford Fdry. & Mach. Co., Royersford
Sun Co., Philadelphia
Texas Co., N. Y.
White & Bagley Co., Worcester

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Bench
Athol Mch. & Fdry. Co., Athol
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Norton Co., Worcester
Diamond Mach. Co., Providence
Greenfield Tap & Die Corp. Greenfield
Louisville Elect. Mfg. Co., Louisville
Ranson Mfg. Co., Oshkosh
Ryerson & Son, Jos. T., Chicago
Safety Emery Wheel Co., Springfield, O.
Standard Elect. T. Co., Cincinnati
Union Twist Drill Co., Athol

Grinding Machines, Center
Louisville Elect. Mfg. Co., Louisville
Standard Elect. T. Co., Cincinnati
U. S. Electrical Tool Co., Cincinnati

Grinding Machines, Chaser
Geometric Tool Co., New Haven

Grinding Machines, Chucking
Blanchard Mach. Co., Cambridge
Bryant Chuck Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Co., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Armstrong Bros. Tool Co., Chicago
Barnes Co., W. F. & John, Rockford.
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Gear Cut. Mch. Co.
Cincinnati (O.) Milling Mach. Co.
Diamond Mach. Co., Providence
Garvin Mach. Co., N. Y.
Gisholt Mch. Co., Madison
Greenfield Tap & Die Corp. Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
LeBlond Mach. Tool Co., R. K., Cincinnati
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Sterling Grind. Wheel Co., Tiffin
Taylor & Fenn Co., Hartford
Union Twist Drill Co., Athol
Universal Grind. Mch. Co., Fitchburg
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck Grinder Co., Springfield, Vt.
Detroit Mch. Tool Co., Detroit
Fitchburg Grind. Mch. Co., Fitchburg
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Co., Boston
Sanford Mfg. Co., F. C., Bridgeport
U. S. Electrical Tool Co., Cincinnati
Universal Grind. Mch. Co., Fitchburg
Van Norman Mch. Tool Co., Springfield, Mass.
Whitney & Son, Baxter D., Winchendon.
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Die
Bignall & Keeler Mach. Co., Edwardsville.
Blanchard Mach. Co., Cambridge
Diamond Mach. Co., Providence
Geometric Tool Co., New Haven
Heald Machine Co., Worcester
Murchey Mch. & Tool Co., Detroit
National Machinery Co., Tiffin
Newton Mach. Tool Wks., Phila.
U. S. Electrical Tool Co., Cincinnati
Universal Grind. Mch. Co., Fitchburg
Wilmarth & Morman Co., Grand Rapids.

Grinding Machines, Disc
Badger Tool Co., Beloit
Besly & Co., Chas. H., Chicago
Diamond Mach. Co., Providence
Gardner Mch. Co., Beloit
Graham Mfg. Co., Providence
Rowbottom Mach. Co., Waterbury
U. S. Electrical Tool Co., Cincinnati
Universal Grind. Mch. Co., Fitchburg

Grinding Machines, Drill
Greenfield Tap & Die Corp. Greenfield
Louisville Elect. Mfg. Co., Louisville
Safety Emery Wheel Co., Springfield, O.
Sellers & Co., Wm., Philadelphia
Sterling Grind. Wheel Co., Tiffin, O.
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Face
Blanchard Mach. Co., Cambridge
Detroit Mch. Tool Co., Detroit
Diamond Mach. Co., Providence
Graham Mfg. Co., Providence

Grinding Machines, Floor
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Detroit Mch. Tool Co., Detroit
Diamond Mach. Co., Providence
Forbes & Myers, Worcester
Glow Elec. Co., Cincinnati
Louisville Elect. Mfg. Co., Louisville
Ransom Mfg. Co., Oshkosh
Royersford Fdry. & Mach. Co., Royersford
Ryerson & Son, Jos. T., Chicago
Safety Emerg. Wheel Co., Springfield, O.
Sterling Grind. Wheel Co., Tiffin, O.
U. S. Electrical Tool Co., Cincinnati
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Gage
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder Co., Boston
Universal Grind. Mch. Co., Fitchburg
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Internal
Bryant Chuck Grinder Co., Springfield, Vt.
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp. Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Co., Boston
Universal Grind. Mch. Co., Fitchburg
Van Norman Mch. Tool Co., Springfield, Mass.
Whitney & Son, Baxter D., Winchendon
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Baltimore
Chicago Pneumatic Tool Co., N. Y.
Hergi Mfg. Co., Bridgeport
Forbes & Myers, Worcester
Louisville Elect. Mfg. Co., Louisville
Neil & Smith Elec. T. Co., Cincinnati
Stroud, Arva, N. Y.

Grinding Machines, Radial
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Co., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Ring Wheel
Badger Tool Co., Beloit
Besly & Co., Chas. H., Chicago
Diamond Mach. Co., Providence
Gardner Mch. Co., Beloit

Grinding Machines, Snagging
Blount Co., J. G., Everett
Diamond Mach. Co., Providence
Ransom Mfg. Co., Oshkosh
U. S. Electrical Tool Co., Cincinnati

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Bliss Double Crank Toggle Drawing Press in production.

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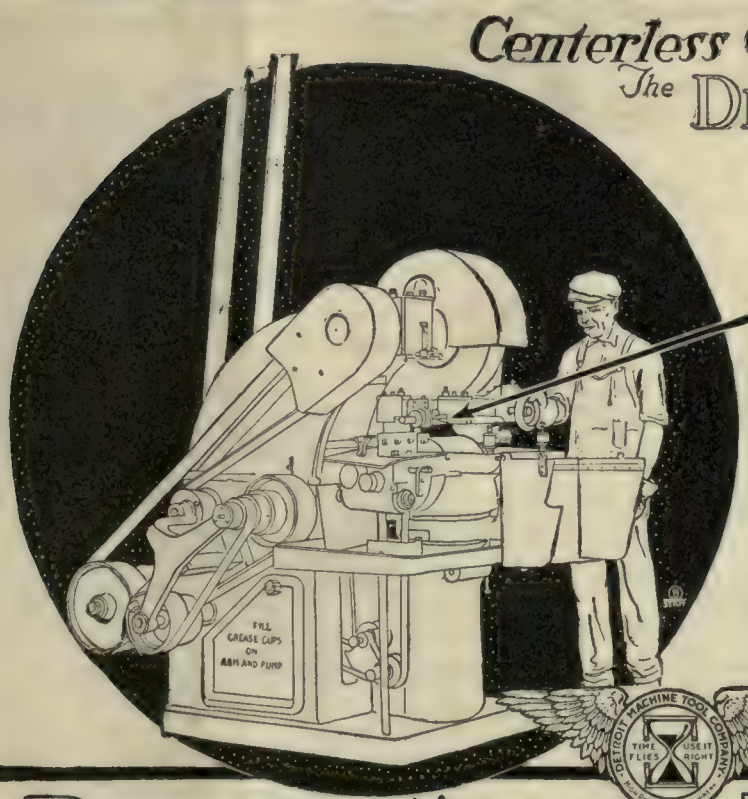
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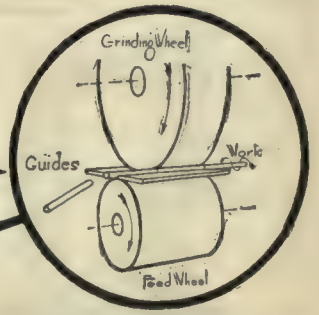
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No. 191

Centerless Grinding The DETROIT Way





A continuous line of ground pieces—from 200 to 500 feet per hour—and each piece accurately ground within the limits.

No wind cuts—no delays for centering or set-ups—no loss of time in handling the pieces.

Nothing to do but supply the work to the wheel—the grinding and feeding are positive and automatic.

Think of the enormous production possibilities and reduction of grinding costs when a Detroit Centerless Grinder is on the job.

We would prefer to give you all the facts. Your name and address?

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DETROIT, MICH.

Grinding Machines, Surface
Blanchard Mach. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
Detroit Mch. Tool Co., Detroit
Diamond Mach. Co., Providence
Graham Mfg. Co., Providence
Heald Mach. Co. Worcester
Newton Mach. Tool Wks., Phila.
Rowbottom Mach. Co., Waterbury
Safety Emery Wheel Co., Springfield, O.
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.
Gisholt Mch. Co., Madison
Greenfield Tap & Die Corp. Greenfield
Landis Tool Co., Waynesboro
Wilmarth & Morman Co., Grand Rapids

Grinding Wheels
Carborundum Co., Niagara Falls
Dickinson, Thomas L., N. Y.
Safety Emery Wheel Co., Springfield, O.
Sterling Grind. Wheel Co., Tiffin.
Vitrified Wheel Co., Westfield

Guides, Elevator
Standard Gauge Steel Co., Beaver Falls

Gun-Barrel Machinery
Baush Mch. T. Co. ,Springfield, Mass.

Hammers, Drop
Bradley & Son, C. C., Syracuse
Niles-Bement-Pond Co., N. Y.

Hammers, Forging
Nazel Eng. & Mch. Wks., Philadelphia

Hammers, Pneumatic
Chicago Pneu. Tool Co., N. Y.

Hammers, Power
Bliss Co., E. W., Brooklyn.
Bradley & Son, C. C., Syracuse
Nazel Eng. & Mach. Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Ryerson & Son, Joseph T., Chicago
West Tire Setter Co., Rochester.

Handles, Machine
Rockwood Sprinkler Co., Worcester

Hangers, Shafting
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence
Gurney Ball Bearing Co., Jamestown
Jones Fdry. & Mch. Co., W. A., Chicago
Royersford Fdry. & Mach. Co., Royersford

Hardness Testing Apparatus
Shore Instrument & Mfg. Co., N. Y.

Heaters, Electric Water
Bridgeport Mch. & T. Mfg. Co., Bridgeport

Hobbing Machines
Cincinnati (O) Gear Cut. Mch. Co.
Gould & Eberhardt, Newark
Newark Gear Cut Mch. Co., Newark

Hobs
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp. Greenfield
National Tool Co., Cleveland.
Newark Gear Cut Mch. Co., Newark
Union Twist Drill Co., Athol.

Hoists & Cranes, Electric
Link-Belt Co., Chicago, Philadelphia
Niles-Bement-Pond Co., N. Y.
Northern Eng. Works, Detroit.
Pawling & Harnischfeger Co., Milwaukee
Toledo Crane Co., Bucyrus

Hoists, Hand
Canton Fdry & Mach. Co., Canton
Chisholm-Moore Mfg. Co., Cleveland
Ford Chain Block & Mfg. Co., Phila.
Harrington Son & Co., Ed., Phila.

Hoists, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Sullivan Mchy Co., Chicago

Holders-On, Pneumatic
Chicago Pneumatic Tool Co., N. Y.

Hydraulic Leather
Schieren Co., Chas A., N. Y.

Hydraulic Machinery
Hydraulic Press Mfg. Co., Mt. Gilead
Watson-Stillman Co., N. Y.

Igniters, Gas Engine
Doehler Die Casting Co., Brooklyn.

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Marvin & Casler Co., Canastota
Starrett Co., L. S., Athol.

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros Tool Co., Chicago.

Japans
Hilo Varnish Corp, Brooklyn

Jigs and Fixtures (See Contract Work)

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence
Gray & Prior Mach. Co., Hartford.
Manufacturing Equip. & Eng. Co., Farmingham.

Keyseating Machines
Baker Bros., Toledo
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson.
Mitts & Merrill, Saginaw.
Morton Mfg. Co., Muskegon Heights.
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.

Keys, Machine
Moltrup Steel Products Co., Beaver Falls
Morton Mfg. Co., Muskegon Heights.
Whitney Mfg. Co., Hartford.

Knurl Holders
Williams & Co., J. H., Brooklyn.

Lathe Attachments
Ames Co., B. C., Waltham
Flather & Co., Nashua
Rivett Lathe & Grinder Co., Boston
Walcott Lathe Co., Jackson

Lathe Tools
Armstrong Bros. Tool Co., Chicago
Gisholt Mch. Co., Madison
Lovejoy Tool Co., Springfield, Vt.
Williams & Co., J. H., Brooklyn

Lathes, Automatic and Semi-Automatic
Gisholt Mch. Co., Madison
Jones & Lamson Mach. Co., Springfield, Vt.
Reed-Prentice Co., Worcester
Steinle Turret Mach. Co., Madison.

Lathes, Bench
Ames Co., B. C., Waltham
Blount Co., J. G., Everett
Diamond Machine Co., Providence
Greenfield Tap & Die Corp. Greenfield
Hjorth Lathe & T. Co., Boston.
Potter Tool & Mch. Wks., N. Y.
Rivett Lathe & Grinder Co., Boston
Seneca Falls Mfg. Co., Seneca Falls.
South Bend Lathe Wks., South Bend.
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass.
Wade-American T. Co., Waltham

Lathes, Boring
Gisholt Mch. Co., Madison
Niles-Bement-Pond Co., N. Y.

Lathes, Chucking (See Lathes, Horizontal Turret)

Lathes, Engine
American Tool Wks. Co., Cincinnati.
Barnes Co., W. F. & John, Rockford
Barnes Drill Co., Rockford
Blount Co., J. G., Everett
Bradford Mach. Tool Co., Cincinnati
Carroll-Jamieson Mch. T. Co., Batavia
Champion Tool Wks. Co., Cincinnati.
Fitchburg Mach. Wks., Fitchburg
Flather & Co., Nashua
Gisholt Mch. Co., Madison
Greaves, Klusman T. Co., Cincinnati
Hamilton Mch. Tool Co., Hamilton
LeBlond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
Monarch Mach. Tool Co., Sidney, O.
Morris Mach. Tool Co., Cincinnati
Mueller Mach. Tool Co., Cincinnati
Niles-Bement-Pond Co., N. Y.
Reed-Prentice Co., Worcester
Robbins Mch. Wks., Worcester
Rockford (Ill.) Drilling Mach. Co.
Rockford (Ill.) Tool Co.
Ryerson & Son, Joseph T., Chicago
Seneca Falls Mfg. Co., Seneca Falls
Sidney Mch. Tool Co., Sidney
South Bend Lathe Wks., South Bend
Springfield Mch. T. Co., Springfield, O.
Walcott Lathe Co., Jackson
Whitcomb-Blaisdell M. T. Co., Worcester

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
Barnes Drill Co., Rockford
Harrington Son & Co., Ed., Phila.
Niles-Bement-Pond Co., N. Y.

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford.
Greenfield Tap & Die Corp. Greenfield
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Horizontal Turret
Acme Mach. Tool Co., Cincinnati
Foster Mach. Co., Elkhart
Gisholt Mch. Co., Madison
International Mach. Tool Co., Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Millholland Mch. Co., Indianapolis
Reed-Prentice Co., Worcester
Steinle Turret Mach. Co., Madison

Lathes, Polishing (See Polishing and Buffing)

Lathes, Speed and Hand
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Diamond Machine Co., Providence
Flather Mfg. Co., Nashua
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp. Greenfield
Seneca Falls Mfg. Co., Seneca Falls

Lathes, Threading
Automatic Mach. Co., Bridgeport
Flather Mfg. Co., Nashua
Rivett Lathe & Grinder Co., Boston

Lathes, Vertical Turret
Bullard Mach. Tool Co., Bridgeport

Lathes, Wood Turning
Barnes Co., W. F. & John, Rockford.
Blount Co., J. B., Everett.
Seneca Falls Mfg. Co., Seneca Falls

Letters and Figures
Brown & Sharpe Mfg. Co., Providence
Hoggson & Pettis Mfg. Co., New Haven
Pannier Bros. Stamp Co., Pittsburgh

Lockers, Clothes
Manufacturers Equip. & Eng. Co., Framingham.

Lubricants
Oakley Chemical Co., N. Y.
Royersford Fdry. & Mach. Co., Royersford
Sun Co., Philadelphia
Texas Co., N. Y.
White & Bagley Co., Worcester

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago.
Athol Mch. & Fdry. Co., Athol
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Simplex Tool Co., Woonsocket
Starrett Co., L. S., Athol.
Williams & Co., J. H., Brooklyn

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester
Nicholson & Co., W. H., Wilkes-Barre

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
Nicholson & Co., W. H., Wilkes-Barre
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Marking Machines
Luma Electric Equip. Co., Toledo
Noble & Westbrook Mfg. Co., Hartford.

Marking Devices (See Stamps, Steel)

Metal Finishers
Hilo Varnish Corp., Brooklyn

Meters, Steam Flow
Norma Co. of America, N. Y.

Micrometer Calipers
Almond Mfg. Co., T. R., Ashburnham
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Starrett Co., L. S., Athol.

Milling Attachments
Adams Co., Dubuque.
Becker Milling Mch. Co., Hype Park.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Garvin Mach. Co., N. Y.
Ingersoll Milling Mach. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Standard Eng. Wks., Pawtucket.

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providenc
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford

Milling Machines Bench
Ames Co., B. C., Waltham.
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Continuous
Ingersoll Mill Mch. Co., Rockford
Newton Mach. Tool Wks., Phila.

Milling Machines, Duplex
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mch. Co., Rockford
Knight Mchy. Co., W. B., St. Louis.
Newton Mach. Tool Wks., Phila.

Milling Machines, Hand
Becker Milling Mch. Co., Hyde Park.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Standard Eng. Wks., Pawtucket.
Van Norman Mach. Tool Co., Springfield, Mass.
Whitney Mfg. Co., Hartford.

Milling Machines, Horizontal and Planer Type
Beaman & Smith Co., Providence
Betts Mach. Co., Rochester.
Ingersoll Milling Mch. Co., Rockford
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.

Milling Machines, Plain
Becker Milling Mch. Co., Hyde Park.
Betts Mach. Co., Rochester
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cochrane-Bly Co., Rochester
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Ingersoll Milling Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mach. Tool Co., R. K., Cincinnati
Newton Mach. Tool Wks., Phila.
Ryerson & Son, Joseph T., Chicago
Standard Eng. Wks., Pawtucket
Van Norman Mch. Tool Co., Springfield, Mass.

Milling Machines, Portable
Ingersoll Mill Mch. Co., Rockford
Newton Mach. Tool Wks., Phila.
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Automatic Mach. Co., Bridgeport
Foster Mach. Co., Elkhart
Gisholt Mch. Co., Madison
Hall Planetary Thread Milling Mch. Co., Philadelphia
Harrington Son & Co., Ed., Phila.
Newton Mach. Tool Wks., Phila.
Waltham Mach. Wks., Waltham

Milling Machines, Universal
Becker Milling Mch. Co., Hyde Park.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cochrane-Bly Co., Rochester
Fox Machine Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Ingersoll Mill Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee
Kempsmith Mfg. Co., Milwaukee
LeBlond Mach. T. Co., R. K., Cincinnati
Ryerson & Son, Joseph T., Chicago
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Becker Milling Mch. Co., Hyde Park.
Betts Mach. Co., Rochester
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cochrane-Bly Co., Rochester
Garvin Mach. Co., N. Y.
Ingersoll Milling Mach. Co., Rockford
Kearney & Trecker Co., Milwaukee
Knight Mchy. Co., W. B., St. Louis
LeBlond Mach. Tool Co., R. K., Cincinnati
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Van Norman Mach. T. Co., Springfield, Mass.

Milling Machines, Worm
Cleveland Auto Mach. Co., Cleveland
Newton Mach. Tool Wks., Phila.
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Milling Tools, Adjustable, Hollow
Geometric Tool Co., New Haven

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Tucker, W. A. & C. F., Hartford

Oils
Sun Co., Philadelphia
Texas Co., N. Y.
White & Bagley Co., Worcester

Oxygen
Linde Air Products, N. Y.

Packing, Hydraulic
Schieren Co., Chas. A., N. Y.

Paints, Machinery
Hilo Varnish Corp., Brooklyn

Pattern Shop Machinery (See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mach. Tool & Die Co., Roselle.

Pipe Bending Machines
Harrington Son & Co., Edwin, Phila.
Underwood Corp., H. B., Phila.

Pipe Cutting and Threading Machines
Bignall & Keeler Mach. Wks., Edwardsville.
Fox Machine Co., Jackson, Mich.
Greenfield Tap & Die Corp. Greenfield
Harrington Son & Co., Edwin, Phila.
Landis Mach. Co., Waynesboro
Merrell Mfg. Co., Toledo
Murchey Mch. & Tool Co., Detroit
Ryerson & Son, Jos. T., Chicago
Saunders Sons, D., Yonkers

Pipe Fitters' Tools
Butterfield & Co., Derby Line.
Greenfield Tap & Die Corp. Greenfield
Saunders Sons, D., Yonkers
Williams & Co., J. H., Brooklyn

Planing Machines
American Tool Wks. Co., Cincinnati
Betts Machine Co., Rochester
Cincinnati Planer Co., Cincinnati
Hamilton Mch. Tool Co., Hamilton
Liberty Mch. Tool Co., Hamilton
Newton Mach. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia
Whitcomb-Blaisdell Mch. Tool Co., Worcester

Planing Machines, Rotary
Newton Mch. Tool Wks., Phila.
Niles-Bement-Pond Co., N. Y.
Underwood Corp., H. B., Phila.

Plate Rolls
Niles-Bement-Pond Co., N. Y.

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Chicago Pneu. Tool Co., N. Y.

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford
Blanchard Mach. Co., Cambridge
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Bryant Church Grinder Co., Springfield, Vt.
Diamond Mach. Co., Providence
Gardner Mch. Co., Beloit
Glow Elec. Co., Cincinnati
Greenfield Tap & Die Corp. Greenfield
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Newton Mach Tool Wks., Phila.
Potter Tool & Mach. Wks., N. Y.
Rivett Lathe & Grinder Co., Boston
Rowbottom Mach. Co., Waterbury
Royersford Fdry. & Mach Co., Royersford
Safety Emery Wheel Co., Springfield, O.
Union Twist Drill Co., Athol
Van Norman Mch. T. Co., Springfield, Mass.

Presses, Arbor
Atlas Press Co., Kalamazoo
Barnes Co., W. F. & John, Rockford
Nicholson & Co., W. H., Wilkes-Barre

Presses, Broaching
Atlas Press Co., Kalamazoo

Presses, Drop and Forging
Ams Mach. Co., Max, N. Y.
Bliss Co., E. W., Brooklyn
Elmes Eng. Wks., Chas. F., Chicago
Niles-Bement-Pond Co., N. Y.
Toledo Mach. & Tool Co., Toledo

Presses, Foot and Hand
Atlas Press Co., Kalamazoo
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Shuster Co., F. B., New Haven
Taylor & Fenn Co., Hartford

Presses, Forcing
Ams Mach. Co., Max, N. Y.
Atlas Press Co., Kalamazoo
Barnes Co., W. F. & John, Rockford
Hydraulic Press Mfg. Co., Mt. Gilead
Lucas Mach. Tool Co., Cleveland

Presses, Hydraulic
Burroughs Composition Mchy Corp., Newark
Elmes Eng. Wks., Chas. F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead
Niles-Bement-Pond Co., N. Y.
Watson-Stillman Co., N. Y.

Presses, Power
Ams Mach. Co., Max, N. Y.
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Loy & Newrath Co., N. Y.
Rowbottom Mach. Co., Waterbury
Stoll Co., D. H., Buffalo
Toledo Mach. & Tool Co., Toledo
V. & O. Press Co., Glendale, N. Y.

Presses, Screw
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn

Profiling Machines
Becker Milling Mch. Co., Hyde Park.
Cochrane-Bly Co., Rochester
Garvin Mach. Co., N. Y.
Newton Mach. Tool Wks., Phila.
Stark Tool Co., Waltham
Wade-American T. Co., Waltham

Pulley Turning and Boring Machines
American Tool Wks. Co., Cincinnati
Niles-Bement-Pond Co., N. Y.

Pulleys, Cork Insert
American Pulley Co., Philadelphia

Pulleys Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co., H. W., Chicago
Johnson Mach. Co., Carlyle, Manchester.
Jones Fdry. & Mch. Co., W. A., Chicago

Pumps, Hydraulic
Burroughs Composition Mchy Corp., Newark
Elmes Eng. Wks., Chas F., Chicago
Hydraulic Press Mfg. Co., Mt. Gilead

Pumps, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence

Pumps, Power
Sullivan Mchy. Co., Chicago

Punches, Center
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol.

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago.

Punches, Power
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton
Mitts & Merrill, Saginaw
Royersford Fdy. & Mach. Co., Royersford
Ryerson & Sons, Joseph T., Chicago
Watson-Stillman Co., N. Y.

Pyrometers, Electric
Bristol Co., Waterbury.

Rack Cutting Machines
Gould & Eberhardt, Newark
Newark Gear Cut Mch. Co., Newark

Rack Machine
Standard Gauge Steel Co., Beaver Falls

Racks, Cut
Moltrup Steel Products Co., Beaver Falls

Racks, Storage (See Furniture, Machine Shop)

Radiators, Japanning Oven
American Gas Furnace Co., N. Y.

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.

Rawhide, Rope
Schieren Co., Chas. A., N. Y.

Reamer, Holders
Gisholt Mch. Co., Madison
Victor Tool Co., Waynesboro

Reamers, Adjustable
Hannifin Mfg. Co., Chicago

Reamers, Expanding
Brubaker & Bros. Co., W. L., N. Y.
Detroit Twist Drill Co., Detroit
Gisholt Mch. Co., Madison
Greenfield Tap & Die Corp. Greenfield

Reamers, Solid
Butterfield & Co., Derby Line.
Buckeye Twist Drill Co., Alliance.
Butterfield & Co., Derby Line, Vt.
Detroit Twist Drill Co., Detroit
Gammon Holman Co., Manchester
Morse Twist D. & M. Co., New Bedford
National Tool Co., Cleveland.
National Twist D. & T. Co., Detroit
Reed Mfg. Co., Erie.
Union Twist Drill Co., Athol.
Whitman & Barnes Co., Akron

Reamers, Taper
Brown & Sharpe Mfg. Co., Providence
Gammon-Holman Co., Manchester
Greenfield Tap & Die Corp. Greenfield
Union Twist Drill Co., Athol

Recorders, Pressure
Bristol Co., Waterbury.

Recorders, Temperature
Bristol Co., Waterbury.

Recorders, Time
Gisholt Mch. Co., Madison

Rheostats
Westinghouse Elec. & Mfg. Co.
E. Pittsburgh

Rivet, Heating
Kobert Mach Co., New York

Rivet Making Machinery
Cook Co., Asa S., Hartford.
National Machinery Co., Tiffin.

Rivet Sets
Chicago Pneu. Tool Co., N. Y.

Riveting Machines
Chicago Pneumatic Tool Co., N. Y.
Grant Mfg. & Mach. Co., Bridgeport
Kobert Mach Co., New York
Ryerson & Son, Jos. T., Chicago
Shuster Co., F. B., New Haven
Townsend Mfg. Co., H. P., Hartford.

Rod Cutters
Tucker, W. A. & C. F., Hartford

Rules, Steel
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol.

Rust Preventatives
Oakley Chemical Co., N. Y.

Sand Rammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y.

Saw Frames and Blades, Hack
American Saw & Mfg. Co., Springfield, Mass.
Clemson Bros. Inc., Middletown
Diamond S. & Stamp Wks., Buffalo
Hunter Saw & Mch. Co., Pittsburgh
Napier Saw Wks., Springfield, Mass
Starrett Co., L. S., Athol.
Thompson & Son Co., Hy. G., New Haven.

Saw Sharpening Machines
Cochrane Bly Co., Rochester
Greenfield Tap & Die Corp. Greenfield

Saw Tables, Universal
Silver Mfg. Co., Salem

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago
Cochrane-Bly Co., Rochester
Diamond S. & Stamp Wks., Buffalo
Earle Gear & Machine Co., Phila.
Greenfield Tap & Die Corp. Greenfield
Napier Saw Wks., Springfield, Mass.
Newton Mach. Tool Wks., Phila.
Vandyck Churchill Co., N. Y.

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago.
Clemson Bros. Inc., Middletown
Diamond S. & Stamp Wks., Buffalo
Napier Saw Wks., Springfield, Mass.
Thompson & Son Co., Hy. G., New Haven.

Saws, Circular Metal
Cochrane Bly Co., Rochester
Hunter Saw & Mch. Co., Pittsburgh
Napier Saw Wks., Springfield, Mass.
Union Twist Drill Co., Athol

Saws, Metal Band
American Saw & Mfg. Co., Springfield, Mass.
Hunter Saw & Mch. Co., Pittsburgh
Silver Mfg. Co., Salem

Saws, Metal Cutting
Brown & Sharpe Mfg. Co., Providence
Cochrane-Bly Co., Rochester
Hunter Saw & Mch. Co., Pittsburgh

Saws, Milling
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
Union Twist Drill Co., Athol

Saws, Screw Slotting
Brown & Sharpe Mfg. Co., Providence
Union Twist Drill Co., Athol.

Scales
Brown & Sharpe Mfg. Co., Providence

Scraping Outfits
Hergi Mfg. Co., Bridgeport

Screw Driving Outfits
Hergi Mfg. Co., Bridgeport

Screw-Machine Work
Automatic Products Co., L. I. City
Cincinnati (O.) Automatic Mach. Co.
Eastern Mch. Screw Corp., New Haven
Link-Belt Co., Chicago, Phila.
Meisel Press Mfg. Co., Boston
Simplex Tool Co., Woonsocket

Screw Machinery, Wood and Lag
Cook Co., Asa., S., Hartford.
Townsend Mfg. Co., H. P., Hartford.

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Automatic Mach. Co.
Cleveland (O.) Auto. Mach. Co.
Cone Auto. Mch. Co., Windsor

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati.
Brown & Sharpe Mfg. Co., Providence
Cleveland (O). Auto Mch. Co.
Foster Mach. Co., Elkhart.
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp. Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Millholland Mch. Co., Indianapolis.

Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line
Card Mfg. Co., S. W., Mansfield.
Greenfield Tap & Die Corp. Greenfield
Morse Twist D. & M. Co., New Bedford

Screws, Cap and Set
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.

Screws, Machine
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury

Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery (See Searchlight Section)
Allen, Harry F., N. Y.
Bertolette Mch. T. Co., Jersey City
Botwinik Bros., New Haven
Brownell Mchy. Co., Providence
Cincinnati Planer Co., Cincinnati.
Essley, E. L., Mchy. Co., Chicago
Factory & Mill Supply Co., Boston
Garvin Mach. Co., N. Y.
Gelb & Co., J., N. Y.
Harris Bros., Chicago
Hill, Clarke & Co., Chicago.
Hyman & Sons, Jos., Philadelphia
Ideal Mchy. Co., Plainsville
Lamberg & Co., A., N. Y.
Lucas & Son, J. L., Bridgeport
McMullen Mchy. Co., Grand Rapids
Miles Machy Co., Saginaw
Modern Machy Ex., New York
Morey & Co., N. Y.
Nashville Ind. Corp., Old Hickory
N. J. Mach. Exch., Newark
Niles & Co., F. H., N. Y.
Niles-Bement-Pond Co., N. Y.
Osborne & Septon Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Simmons Mach. Co., N. Y.
Standard Mchy. Co., New Haven
Stokvis & Sons, R. S., N. Y.
Toomey Inc., Frank, Philadelphia
Van Bleick Motor Co., Monroe
Warner & Swasey Co., Cleveland
Wayne Mchy Co., Ft. Wayne.

Shafting
Royersford Fdry. & Mach. Co., Royersford
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American Tool Wks. Co., Cincinnati.
Cincinnati Shaper Co., Cincinnati.
Cochrane-Bly Co., Rochester
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Lynd-Farquhar Co., Boston.
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Tucker, W. A. & C. F., Hartford.

Shears, Power
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton, N. J.
Loy & Newrath Co., N. Y.
Mitts & Merrill, Saginaw
Royersford Fdry. & Mach. Co., Royersford
Stoll Co., D. H., Buffalo.
Toledo Mach. & Tool Co., Toledo.

Sheet Metal Working Machinery
Ams Mach. Co., Max, N. Y.
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Ryerson & Son, Joseph T., Chicago
Savage Co., W. J., Knoxville.
Toledo Mach. & Tool Co., Toledo.

Shelving, Steel
Niles-Bement-Pond Co., N. Y.

Slide Rests
Milliken Mch. Co., West Newton

Slotting Machines
Betts Mach. Co., Rochester.
Cochrane-Bly Co., Rochester
Garvin Mach. Co., N. Y.
Newton Mach. Tool Wks., Phila.
Sellers & Co., Wm., Phila.

Sockets and Sleeves
Detroit Twist Drill Co., Detroit

Soldering Equipment
Luma Elect. Equip. Co., Toledo

Special Machinery and Tools (See Contract Work)

Speed Reducers
Jones Fdry. & Mch. Co., W. A., Chicago
Philadelphia Gear Wks., Phila.

Sprockets and Chains
Baldwin Chain & Mfg. Co. Worcester
Bilgram Mach. Wks., Philadelphia
Boston Gear Wks., Quincy.
Cullman Wheel Co., Chicago.
Grant Gear Wks., Boston.
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Phila.
Massachusetts Gears & T. Co., Woburn
Morse Chain Co., Ithaca.
Philadelphia Gear Works, Phila.
Whitney Mfg. Co., Hartford

Squares
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol

Stampings, Metal
American Pulley Co., Philadelphia
Bay State Stamp. Co., Worcester.
Detroit Stamp. Co., Detroit.
Globe Mch. & Stamp Co., Cleveland

Stamps, Steel
Hoggson & Pettis Mfg. Co., New Haven.
Noble & Westbrook Mfg. Co., Hartford.
Pannier Bros. Stamp Co., Pittsburgh
Schwerdtle Stamp Co., Bridgeport

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence.

Steel, Cold Rolled Strip
Hawkridge Bros. Co., Boston.

Steel Hardness Measuring and Treating Instruments
Shore Instrument & Mfg. Co., N. Y.

Steel Shafting and Free Cutting Screw
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Steel, Sheet
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Steels, Alloy Carbon, and High Speed
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Firth-Sterling Steel Co., McKeesport
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Turner Machine Co., Danbury

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Vermont Tap & Die Corp., Newport

Taps, Collapsing
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Errington Mechanical Laboratory, N. Y.
Geometric Tool Co., New Haven, Ct.
Murchey Mch. & Tool Co., Detroit
Victor Tool Co., Waynesboro

Thermometers
Bristol Co., Waterbury

Thread-Cutting Tools
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Geometric Tool Co., New Haven
Greenfield Tap & Die Corp. Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro
Murchey Mch. & Tool Co., Detroit
Rivett Lathe & Grinder Co., Boston
Victor Tool Co., Waynesboro

Threading Machines
Automatic Mach. Co., Bridgeport
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Geometric Tool Co., New Haven
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Landis Mach Co., Waynesboro
Murchy Mch. & Tool Co., Detroit
National Machinery Co., Tiffin.
Universal Mch. Co., Bowling Green

Thread Rolling Machines
Murchey Mch. & Tool Co., Detroit
National Machinery Co., Tiffin.

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Hoggson & Pettis Mfg. Co., New Haven.

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Athol Mach. & Fdry. Co., Athol
Hartford Special Mchy. Co., Hartford
Reed Mfg. Co., Erie

Vises, Milling Machine
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Vises Planer and Shaper
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Hoggson & Pettis Mfg. Co., New Haven.

Vises, Universal Machine
Brown & Sharpe Mfg. Co., Providence
Graham Mfg. Co., Providence
Hartford Special Mchy. Co., Hartford
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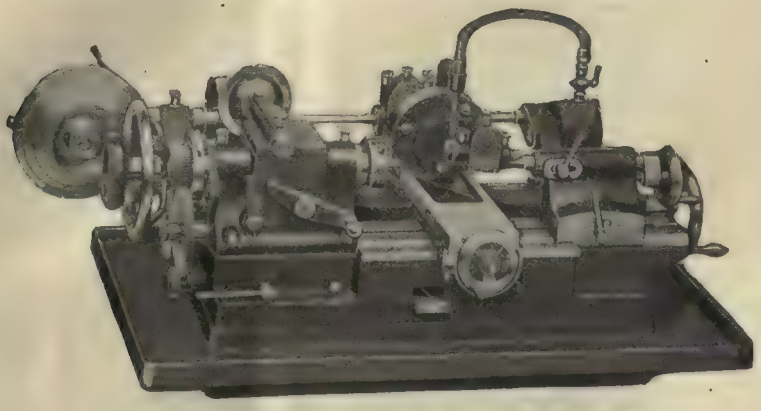
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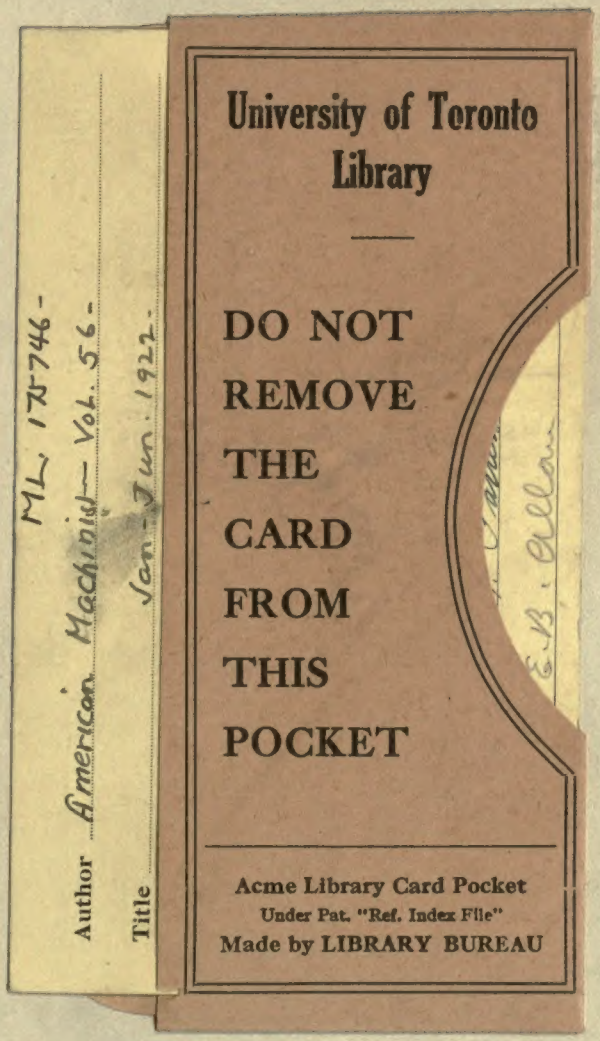
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